APSTRACT

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Applied Studies in Agribusiness and Commerce

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Contents

PREFACE

This issue is number 1-2 of the 2017 volume of Apstract. This means that the journal Apstract had its 10years anniversary in 2016. In the aftermath of this special occasion, attention is paid to the history of our open access journal. This done in the first paper of this issue.

The other 19 papers deal with a range of topics in the field of agribusiness and commerce. There is a variety in approach, methods, topics and scope. Contributions come from all parts of the academic world e.g. Africa, America, Asia but also Europe, demonstrating that Apstract is becoming a truly international journal and not confined to Europe.

Three papers deal with consumers and households. One paper deals with food waste and the waste of bread in particular in Hungary. In another paper consumer willingness to pay a premium for functional food in Ghana is analysed. The socio-economic determinants of fish shoppers in Trinidad- Tobacco is the topic if the third paper in the area of consumers and households.
Several papers deal with the choice of sophisticated econometric models and techniques to societal problems such as the long run equilibrium between exports and imports in Ghana. Another paper deals with the interior point algorithm for solving farm resource allocation problems as an alternative to the simplex algorithm, whereas in a third paper a stochastic frontier model is used to assess the effect of off-farm participation on the technical efficiency of smallholder farmers in Ghana.
Finance is the umbrella for four papers. There is a note on simple and logarithmic return for financial assets like stocks or portfolios. Another contribution pays attention to an international outlook in financial reporting, whereas in a third paper systematic risk factors and stock return volatility are analysed for the case of Pakistan. The fourth paper assesses the financial viability of the floricultural industry in Ghana using various investment appraisal methods.

Two papers deal with issues in the field of labour. One paper addresses the impact of ICTS on occupational choice and labour productivity in Nigeria, whereas a second paper uses structural equation modelling to assess the contribution of various factors on job satisfaction of public sector employees in Mongolia.
Four papers relate to market phenomena. In the one paper the price erosion of generic plant protection products is analysed for Poland, whereas in the second paper the effect of Russian food import sanctions on the restaurant business in Moscow is addressed. The effect of the economic crisis on the market of corporate philanthropy is the topic of the third paper, whereas the effect of type of greenhouses on economic indicators and supply of peppers in Hungary is discussed in the fourth one.
Universities not only produce research, but also enrich the human capital of students. This can be done thru MBA education, as is discussed in one paper for the university of Debrecen. A second paper in this area of human capital of students analyses the impact of entrepreneurship education on students behaviour.
Apstract is also paying attention to sports issues. One of the papers in this issue addresses gender equalization on ice, a comparison of female figure skaters with female ice hockey players.

Wageningen, August 2017

Johan A.C. van Ophem

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SCIENTIFIC PAPER

10 YEAR ANNIVERSARY OF THE JOURNAL APSTRACT: THE HISTORY OF AN OPEN ACCESS JOURNAL

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JEL code: A10

The idea initiating the birth of the journal APSTRACT was initiated by András Nábrádi, during a 2005 AGRIMBA[1] executive board meeting held in Aberdeen, UK. AGRIMBA is an open international network of academics and professionals from universities and related institutions dealing with education and research in agribusiness (Csapó et al., 2010). Currently, the Network is especially active in Central and Eastern Europe (Heijman, 2015). The main objective of the Network is to set standards based on best practices for programmes it oversees and to accredit them on the basis of these standards. The International MBA Network was established in 1995, by founding members from Wageningen University, Scottish Agricultural College, the Czech University of Life Sciences in Prague, Warsaw Agricultural University, University College Cork and the University of Wolverhampton. Between 2000 and 2009, the following universities joined the Network: Humboldt University Berlin, the University of Debrecen, Arkansas State University, the Agricultural University of Ukraine, the Timiryazev Academy in Moscow, the University of Belgrade and the University of Zagreb (Heijman, 2015). The Universities of Belgorod (Russia) and Kazan (Russia) has also joined the network last year.

At the time the idea was initially circulated, it was unclear whether the Journal would be published or not, who would finance it and who would manage it. There was some scepticism concerning the proposed title, as well. András Nábrádi's idea for one was not easily accepted by some of the partnership. Later, it turned out that the title of the Journal "APSTRACT" was a very good idea, since almost everybody noticed it and believed that it is a mistyping thus they easily remembered it. It also has to be emphasised that the Journal APSTRACT is the first result on the list to appear in a Google search using that keyword! The first issue was published after one and a half years of preparatory work by the Agroinform Publishing House in 2007, with the financial support of the University of Debrecen. The scientific journal was registered by The National Media and Info Communications Authority, in Hungary, in 2008, under Registration No. 163/800/3/2008, with the founders listed in the foundation documents as Mr. Bence Bolyki and Dr. András Nábrádi. Four issues per year were proposed by the founders, which is still considered to be a minimum requirement by the editors.

APSTRACT (Applied Studies in Agribusiness and Commerce) publishes high quality contributions on topics related to Agribusiness and Commerce and provides managers, researchers and teachers with a forum where they can publish and acquire research results, case studies and reviews, which are important to the global food chain. Submitted manuscripts should be related to the economics of agriculture, natural resources, environment or rural development. Later, the editors considered it important to broaden the range of topics; therefore, tourism, tourism management, economic questions of the health industry and sport management - as a new field of applied economics - have been added to the list of original topics.

Papers should have a practical orientation and demonstrate innovation in analysis, methods, or application. Topic areas include production economics and farm management, agricultural policy, agricultural environmental issues, regional planning and rural development, methodology, marketing of agricultural and food products, international trade and development, tourism management and sports management. Research on a significant economic component, analyses of problems connected to research, extension, and teaching of the International MBA Network in Agribusiness and Commerce are also encouraged.

The original aims of the founders are still valid:

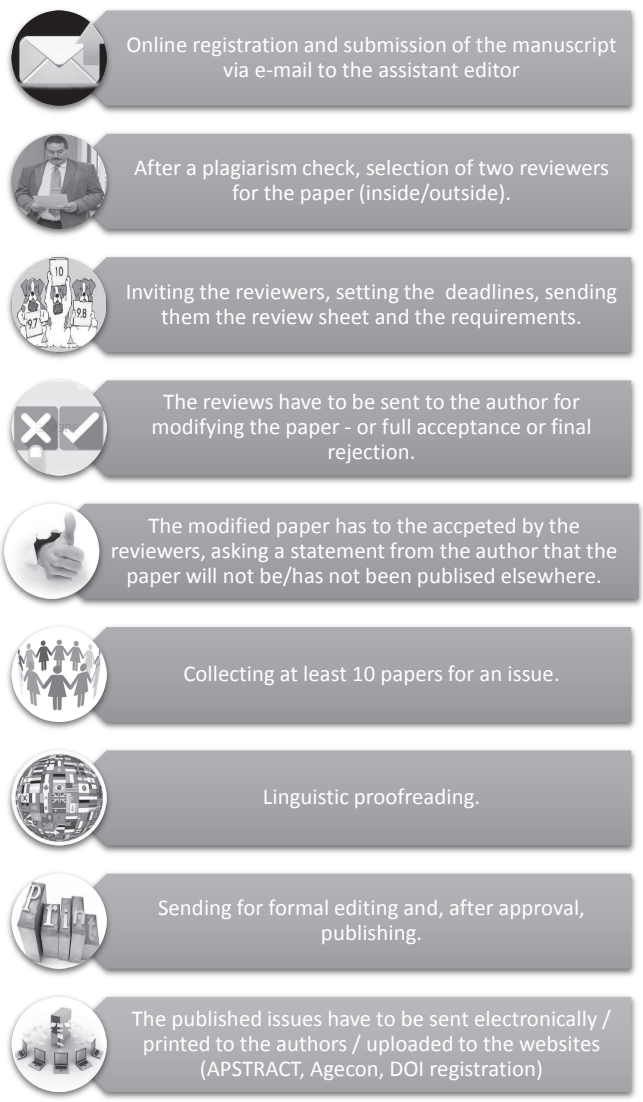
- The **editor in chief** should be a highly recognised **expert**.
- The Journal should be published **in Hungary/by a Hungarian publishing house**.
- **Representatives of institutions active in MBA educa-**

1 "The AGRIMBA network was established in 1995, as a successful Tempus project, by Warsaw Agricultural University (now Warsaw University of Life Sciences, WULS) and the Czech Agricultural University, Prague (now Czech University of Life Sciences, Prague, CULS). Since that time, the network has developed into an efficient means for young managers to update their knowledge of management, mainly in Central and Eastern Europe. An MBA is not only a way of improving the business skills of students, but also an effective way of intensifying the participating teaching staff's (mainly academics) contacts with the globalised world of agribusiness and their colleagues from the participating institutions (ICA 2016)."

tion should be involved among the "**executive" members of the editorial board**.
- **Honorary editorial board members should be accepted at MBA Board meetings** after nomination (nomination can be done via e-mail, as well)
- **Only "*double-blind,*" reviewed papers should be accepted.**
- **Primarily members of the editorial board should be the peer-reviewers.**
- Possibility should be provided in the Journal to publish **abstracts and key-notes of noteworthy non-MBA events/conferences**.

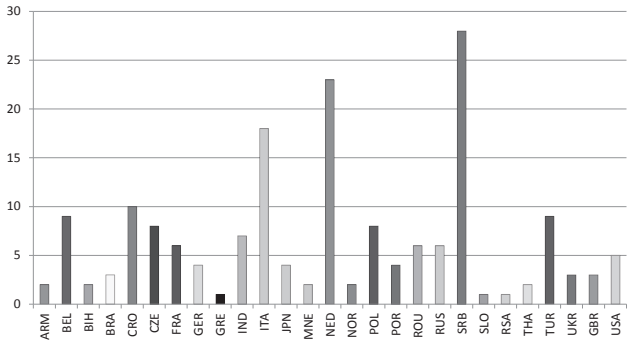
During the 10 years of its existence, the Journal has continuously developed, improved and tried to automate its operation, in order to serve better the needs of authors and readers and shorten the publishing time. Figure 1, a flow chart, shows the operational steps of the Journal.

Figure 1.: Flow-chart of the operational steps of APSTRACT



During the previous 10 years, more than 380 scientific papers from more than 30 countries have been published in the Journal. Most papers have been written by Hungarian authors, for whom APSTRACT is considered to be an outstanding Journal, representative of Hungarian agro-business higher education. A significant number of papers have been sent to the Journal from Serbia, the Netherlands, Italy and Croatia (Figure 2).

Figure 2.: Papers published in APSTRACT by the nationality of authors

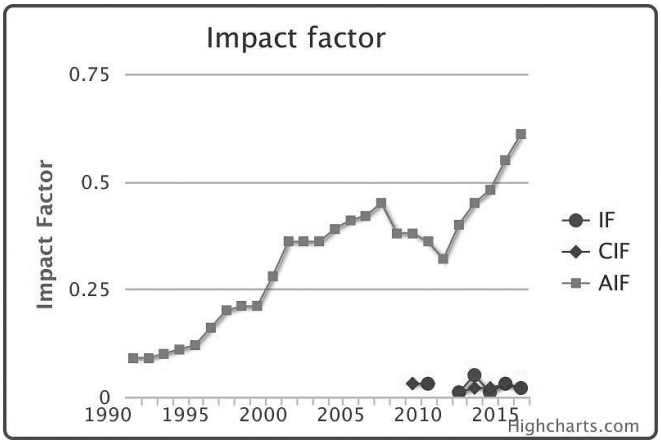


The popularity of the Journal has increased not only among AGRIMBA members, but also among the PhD students and researchers of Hungarian and foreign - mainly European - business higher education institutions. More and more organisations and libraries have registered the Journal, such as the American AgEcon Search website, which was later selected by the editorial board as the repository of the Journal. This means that all the papers are stored in this database first. Further organisations recording, noting, following APSTRACT:
- RePEc
- Cabell' Dictionary
- LogEc
- IDEAS
- ECONBiz
- DRJI (Directory of Research Journals Indexing)

The increasing popularity led to the following result in 2009: the impact factor calculated by CITEC/REPEC (2016) became 0.03. Until that time, it had fluctuated between 0.01 and 0.05. This is a considerable result for a relatively small agribusiness journal.

The average impact factor per issue also shows an increasing tendency, reflected by the figures of the previous 10 years. Figure 3 illustrates this trend.

Figure 3.: Impact factor of APSTRACT by REPEC/IDEALIS



IF: Impact Factor: C2Y / D2Y

AIF: Average Impact Factor for series in RePEc in year y

CIF: Cumulative impact factor

Source: CITEC/REPEC (2016)

Table 1.: Main abstract reading index of APSTRACT REPEC/IDEALIS

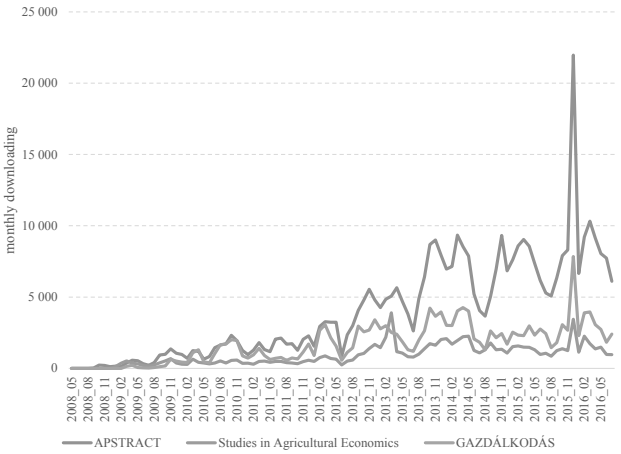
Year	IF	AIF	DOC	CDO	CCU	CIF
2009	0.03	0.03	63	95	3	0.03
2010	-	0.32	26	121	0	-
2011	0.01	0.40	38	159	1	0.01
2012	0.05	0.45	65	224	5	0.02
2013	0.01	0.48	67	291	5	0.02
2014	0.03	0.55	40	331	9	0.03
2015	0.02	0.61	42	373	9	0.02

IF: Impact Factor: C2Y / D2Y
AIF: Average Impact Factor for series in RePEc in year y
DOC: Number of documents published in year y
CDO: Cumulative number of documents published until year y
CCU: Cumulative number of citations to papers published until year y
CIF: Cumulative impact factor

Source: CITEC/REPEC (2016)

The Journal publishes scientific papers mainly in the field of social sciences and, within them, in the field of economics of agriculture and management. In this area, there are two main competitor journals in Hungary: *Gazdálkodás* (published in Hungarian language) and *Studies in Agricultural Economics* (published in English). It is important to mention the competition, since it has a great impact on the performance of a journal.

Figure 3.: Download statistics of scientific journals published in Hungary in the field of economics of agriculture

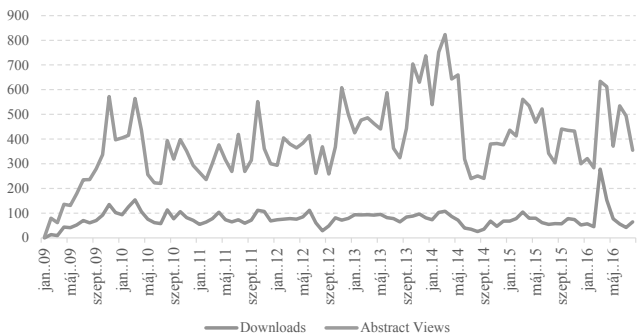


Source: AgeconSearch (2016)

Downloading statistics of AgEcon Search can be seen on Figure 3. As can be seen, in the previous 10 years, APSTRACT has continuously increased its leading position in terms of downloads started from the AgEcon system. This result underscores the increased international popularity of the Journal during the previous few years.

On another indexing page (system of LogEc), paper downloads show quite a fluctuating trend. Extreme figures can be seen mainly between September and January (Figure 4).

Figure 4.: Download and view statistics of APSTRACT papers by the LogEc system



Source: Logec/Repec (2016)

As a summary, the following success factors can be highlighted from the previous 10 years of the Journal:

- **10 published years** so far, min. **4 issues/year** since 2009 (quarterly), including joint issues (approx. **80 pages/quarterly**, **40 papers/year** on average).
- Number of published papers: **380**, from authors from **30 countries** of the World.
- **Editorial board** of the Journal involves **MBA leaders** and internationally recognised experts from **17 countries**.
- **Committed editorial board and support from the Faculty (University of Debrecen Faculty of Economics and Business).**

In order to maintain or improve this success, the Journal has to face the following future challenges:

- Continuous maintenance and **development** of the **website**
- Increasing, developing web marketing activities
- Looking for further **international professional reviewers**
- Meeting **deadlines** (reviewers and authors)
- **Increasing** REPEC/IDEALIS **impact factor**
- Maintaining and **increasing the interest of authors in the Journal**

Trusting the further activity of the enthusiastic, professionally outstanding and committed editorial and reviewer boards, we can be sure that the Journal will be able to achieve the goals set for it, provide young researchers and MBA students with a safe start, and ensure professional recognition for researchers active in the field of business and management in the long run. All these elements were in fact the original expectations of the founders. A considerable change happened in the life of the Journal in 2015. The leadership of the University of Debrecen Faculty of Economics and Business decided to take over the publishing rights from *Agroinform* and to provide 100% financial support to cover the expenditures of the Journal, as well. Also, the website of the Journal got a new design, logo and became user friendly.

In closing, we would like to extend our thanks to those who have done a lot for the achieved success of the Journal: to the first editor in chief of APSRTACT, Dr. Mark Cochran, who is currently Vice President for Agriculture of the University of Arkansas, Division of Agriculture; to Professor M.J.M. Heijman from the University of Wageningen, who was the second editor in chief between 2008-2015. The current editor in chief, since 2016, is Dr. Johan van Ophem, also from the University of Wageningen. Since 2005, the deputy editor in chief position and management of the Journal has been held by Dr. András Nábrádi. The associate editor's tasks have been covered by Dr. Krisztián Kovács for 3 years.

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Without the contributions of these individuals, the scientific journal "APSTRACT" (Applied Studies in Agribusiness and Commerce) would not have been maintained.

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SCIENTIFIC PAPER

THE ANALYSIS OF AGRO-ECONOMIC EFFECTS OF HOUSEHOLD FOOD WASTAGE THROUGH THE EXAMPLE OF BREAD

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Abstract: *In our busy world, where numerous people starve and where the resources are restricted, it is a key issue to pay particular attention to the topic of prevention and decrease of food loss as well as food wastage.Wastage of food produced and delivered to the end user (customer) is an issue arising globally and nationally as well, which results in efficiency loss at economic level in any case. While the FAO study mentions food waste of the order of 1.3 billion tonnes on a world scale, then the annual quantity of food waste in Hungary is estimated at about 1.8 million tonnes, which contains the waste of every member of the chain from production to consumption. On the basis of the data published by the Hungarian Food Bank (2015), the amount of food waste caused by the population is 400 000 tonnes.*

In compliance with our objectives, inputs – expressed by non-financial and financial indicators – emerge during production are assigned to the quantity of wasted food. Applying the aforementioned method we would like to make customers realize how many resources (land, water, artificial fertilizer, pesticide, seed and gasoil) are utilized needlessly in food verticum by the end products – at present by different breads they throw out.

As our calculations prove by 10% waste of breads the utilization of 5 300 hectares of wheat land and 660 hectares of rye land can be considered unnecessary. By 10% waste of breads the financial value of the utilized resources is altogether 3.25 million EUR. Out of this the financial value of utilized artificial fertilizer is 1.10 million EUR (34%), of utilized pesticide is 1.15 million EUR (35%), of utilized gasoil is 0.70 million EUR (22%) and of utilized seed is 0.30 million EUR (9%).

Among different breads, white bread is purchased in the greatest volume by the Hungarian households, from which 121 900 tonnes are bought annually on an average. This quantity is equal to almost the 40% of the annual bread sell. If 10% of purchased white bread is thrown out, it results in useless utilization of 2 676 hectares of wheat land in food verticum. The quantity of utilized water arising form wastage is 15.8 million m3. Further losses emerge as regards material inputs: artificial fertilizer- to the value of 0.50 million EUR, pesticide- to the value of 0.58 million EUR, seed to the value of 0.15 million EUR and gasoil-loss to the value of circa 0.35 million EUR. Totally, material input to the value of 1.58 million EUR is owing to the Hungarian households in case of 10% white bread wastage.

Keywords: *food wastage, household, food waste, resources* (JEL code: *Q53*)

INTRODUCTION

It is well-known that waste of food products is a matter that appears throughout the food chain from production through harvesting and processing to trade and final consumer (Schneider, 2008).

While in developed countries greater amount of waste is typically generated by consumers in the food chain, in developing countries post-harvest waste is more defining (Parfitt et al., 2010a; Császár, 2014a; Borbély, 2014).

In the less-developed countries the greatest problem evolves from the lack of cold chain being essential to perishable products, from the underdeveloped producing- and harvesting techniques as well as from the lack of appropriate means of transport (Parfitt et al., 2010b). Losses in households particularly derive from the changed lifestyle and consumption patterns of consumers (Bánáti, 2006).

It is estimated that processing industry provides the greatest amount of food waste (62%), while households are responsible for „not more than" 21% of it. As regards the order of wastage, trade and catering services are represented by 6 and 11% (Zentai, 2013).

Three categories of household losses are distinguished by Parfitt et al., (2010c). Consumable food thrown out are considered preventable losses (e.g. leavings, do not use in time); food or food parts, which are consumed by each one

and are not by others, are mentioned as possibly preventable losses (e.g. bread-crust, potato peel); while inedible parts are treated as unavoidable losses (e.g. bone, eggshell, coffee-grounds, vegetable peels, apple-core).

In Hungary two-thirds of food waste belong to the latter mentioned group, apart from this households are important intervention points.

The following objectives are defined in present study:
- How does the extent of utilized land change by the waste of one unit bread?
- How much water is utilized needlessly by the waste of one unit bread?
- How do needlessly utilized material inputs (water, artificial fertilizer, pesticide, seed, gasoil) change by the wastage of one unit bread?

MATERIAL AND METHOD

On behalf of reviewing the above-mentioned issue a calculation for the product chain of cereals is carried out – especially for bread in the food subgroup of cereals as a food product with the highest costs.

Annually 304 758 tonnes of bread are sold on the national market (KSH, 2013), which shows the following distribution in Hungary on the basis of the product scale published by the Hungarian Baker Association *(1. table)*.

Table 1.: Evolution of bread structure

Title	Distribution *(%)*	Quantity *(tonnes)*
White, semi-brown bread	**65**	**198 093**
out of this white bread	40	121 903
out of this semi-brow bread	25	76 190
Farmhouse bread	**15**	**45 714**
Other bread	**20**	**60 952**
out of this rye-bread	6	18 285
out of this packed bread	4	12 190
Sum total	**100**	**304 758**

Source: own calculation based on the data of Hungarian Baker Association (2009)

According to a statement of the Hungarian News Agency (MTI) (2017), the average annual bread consumption in Hungary is 37 kilograms per capita while the European average is up to 50 kilograms. Annual bread consumption in Hungary is 370 thousand tones calculated on the total population which triggers a land use of 86 000 thousand ha, regarding an average yield of 4.3 tones/ha. Supposing 10% of bread purchased is wasted (Császár's assumption), the use of 8 600 ha proves unnecessary.

Bread consumption habits in Hungary have changed significantly over the last 15 years: the population consumed mainly white bread around 2 000 while there has been greater demand for brown and wholemeal products recently.

Last year's research of GfK Kft. suggests that the rate of white bread consumers, who eat white bread on a daily basis or more times a week, decreased from 76% (2007) to 61% while the rate of brown bread consumers increased from 34% to 50%.

Based on a report of the Hungarian Central Statistical Office this year, it also entailed significantly less purchase for bread among the Hungarian population: annual bread consumption per capita was 63 kilograms in 2002 while it is only 37 kilograms per capita these days.

According to EU surveys, the German and Austrian consume 80 kilograms while it is 60 kilograms for the Spanish and Italian population annually.

To illustrate how much land is used needlessly by the wastage of different breads in food chain, the ratio of wheat- and rye flour necessary for producing different breads had to be taken into consideration (*Table 2.*), as well as the average yields of wheat and rye. The average yield of wheat was 4.3, while the average yield of rye was 2.7 tonnes per hectare in the light of averages in the past years (KSH, 2012-2014).

Furthermore in the course of bread production the proportion of other additives is taken into account over the flour-ratios, which is determined in the ratio of 80 to 20 in each bread. In addition losses arise from grinding process are not ignored, the ratio of them are estimated 20% (Lakatos, 2013).

Beyond the land use the utilization of other resources during rye production are not taken into consideration.

Table 2.: The quantity of wheat- and rye flour in the production of different breads

Title	Wheat flour ratio *(dkg)*	Rye flour ratio *(dkg)*
White bread	80	-
Semi-brown bread	68	12
Farmhouse bread	65	-
Rye-bread	48	32
Packed bread	45	-

Source: based on own calculation (PAPNÉ SZABÓ, 2008)

Water footprint defined by Hoekstra (2010) is applied to present the average water footprint of the wasted breads by non-financial indicators, which is 1300 litre per one kilogram bread.

An average wheat production technology is supposed to demonstrate the further material inputs (artificial fertilizer, pesticides, seed) used needlessly, which is prepared by the following inputs defined by non-financial indicators and expressed by financial values (*Table 3.*). The total material inputs of wheat production indicate the intensity of technology, which is due to mill quality wheat production.

Table 3.: Material inputs of the average wheat production

Title	Quantity	Measurement unit	Material inputs (EUR/ha)
NPK* 8-24-24	200	kg/ha	81.94
27% nitrogen content "Pétisó"	200	kg/ha	46.75
Nitrosol	100	l/ha	21.75
Trimmer Max	35	g/ha	17,09
Tomigan	0.3	l/ha	
Zamir	2x1.5	l/ha	79.74
Pyrinex	2x1.5	l/ha	27.57
Amalgerol	3	l/ha	28.67
Yaravita gramitrel	2	l/ha	9.89
Mirador Forte	2	l/ha	52.47
Aperon/Athos	20	g/ha	41.18
Mv Magdaléna	200	kg/ha	58.44
Total	-	-	465.49

Source: own calculation
**: Nitrogen phosphorous potassium*

The unnecessary gasoil consumption is illustrated by the consideration of the gasoil prices of the past three years, which was 1.38 EUR/litre in 2013, 1.37 EUR/litre in 2014 and 1.19 EUR/litre in 2015 (NAV, 2014-2016). The quantity of utilized gasoil by intensive technology is 100 litre per hectare.

Every calculation performed was carried out relating to 5%, 10%, 15%, 20%, 25% and 30% extent of wastage, taking the most recent official MNB (2017) exchange rate into account.

RESULTS

Financial loss

Food wastage generates considerable financial losses in any sector of food chain. As regards household sector the food expenditures of consumers are described to demonstrate the aforementioned issue.

While in the United Kingdom one-third of purchased food is thrown trash, then this ratio in the Hungarian households is 10% according to Császár (2015).

As the report of the European Commission (2011) shows 25% of food bought by the households in the European Union is wasted.

In Great-Britain 6.7 million tonnes food are thrown out annually. It is equal to the dumping of 420 GBP value food per household annually, i.e. it is greater than 10 billion GBP calculating with 25 million households (WRAP, 2008).

Food wastage is annually estimated to 1.8 million tonnes in Hungary, which value can access 0.64 billion EUR (Császár, 2014b). In our view this value contains the replacement cost value of food, since it is well known that the food value is the highest in the moment of production and then it decreases.

In the middle of '90s the food expenditures gave more than one-third of households' budget. By 2005 this indicator has moved to 20% as a positive trend. It is well known that the greater purchasing power a country and its consumers have, the lower value this indicator represents, since consumers spend their income for services with higher added value (Kozák, 2009).

In Hungary families spend 18-23% of their average income on food. As a recent EU estimation from 2006 claims food to the value of 0.12 thousand EUR per households is thrown out annually. Hereby Hungary is one of the moderately wasting societies. Simultaneously, as the per capita income grows the quantity of wasted food increases as well.

On the basis of the data by KSH (2010-2012a), nowadays per capita average food expenditure (without refreshing- and alcoholic drinks) is more than 519.48 EUR/capita/year. As regards the ratio of food expenditures the greatest expenses occur in case of meat and meat products, milk and milk products, egg as well as cereals food subgroups. Expenses on meat and meat products give the 30% of total food expenditure (0.16 thousand EUR), while expenses on cereals, milk, milk products and egg represent equally 17-17% (0.09-0.09 thousand EUR). These together contribute to food expenditure by 65%. 11% (0.06 thousand EUR) of our food expenditures apply for purchasing vegetable and potato; 7-7% of them (0.03-0.03 thousand EUR) is spent on fruit-, sugar- and sweets purchasing, and nearly the same amount of money is spent on buying oils and fats (0.02 thousand EUR). The less money is spent on other food products, e.g. sauces, spices, baby- and dietary meals (0.02 thousand EUR), as well as on purchasing fish and fruits of the see (0.006 thousand EUR). These together contribute to our food expenditures by 5% (*Table 4.*).

Table 4.: Evolution of annual per capita food expenditures (2010-2011-2012) M.U.:EUR/capita/year

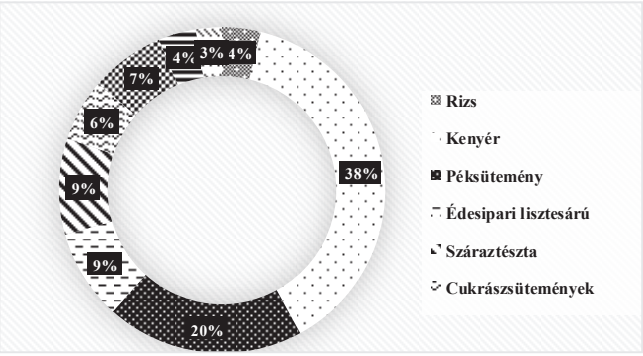
Food subgroups	Food expenditure
Cereals	**91.14**
Meat and meat products	163.23
Fish and fruit of the see	5.84
Milk, milk product, egg	94.52
Oils, fats	29.73
Fruit	36.07
Vegetable, potato	60.92
Sugar, sweets	37.14
Other food	21.40
Total food expenditures	**539.99**

Source: own calculation, based on KSH (2010-2012a) data

By the survey of expenses on cereals in the years of 2010-2011-2012 it can be proved that expenses on bread are the most significant (38%), which contribute to our food expenditures by circa 0.03 thousand EUR annually. Further significant items of expenditure within cereals are the proportion of

bakery products (20%), on which approximately 0.01 thousand EUR is spent. The ratio of noodles and confectionary flour products is also noteworthy (9-9%), which almost contribute to expenditures on cereals by nearly 0.008-0.008 thousand EUR. Purchasing pastry goods (6%), as well as flour and grits (7%) increases food expenditure by not more than 0.006-0.006 thousand EUR. Rice (4%), other cereals (4%) as well as preserved rice- and pasty food (3%) give the least expenses on cereals, on which 0.003 thousand EUR per food subgroups is spent on an average (*Figure 1.*).

Figure 1.: Composition of the expenditures on cereals (2010-2011-2012)



/Rice, Bread, Bakery products, Confectionary flour products, Noodle, Pastry goods, Flour, grits/
Source: own calculation, based on KSH (2010-2012b) data

Furthermore, solely bread wastage within food subgroups of cereals is analysed in present study. White bread (121 903 tons), semi-brown bread (76 190 tons) and farmhouse bread (45 714 tons) are the three breads sold in the greatest quantity calculating by the average of the years of 2012-2013-2014.

The average consumer price of breads was the following in the last three years: white bread 0.88 EUR/kg, semi-brown bread 0.75 EUR/kg, farmhouse bread 1.00 EUR/kg (KSH, 2016a).

The Hungarian households at the same time with the wastage of 10% of the purchased white bread throw away 1.11 million EUR. By wasting semi-brown bread the aforementioned value is equal to 5.80 million EUR, in case of farmhouse bread it is 4.58 million HUF.

If households waste 10% of the three breads purchased in the greatest quantity, they waste simultaneously 21.19 million EUR absolutely needlessly (*Table 5.*)

Table 5.: Financial loss owing to the waste of different breads
M.U.: million EUR

Title	5%	10%	15%	20%	25%	30%
White bread	5.42	10.85	16.28	21.71	27.14	32.57
Semi-brown bread	2.88	5.77	8.65	11.54	14.42	17.31
Farmhouse bread	2.28	4.56	6.85	9.13	11.41	13.69
Total	10.58	21.18	31.78	42.38	52.97	63.57

Source: own calculation

Within the scope of the social activity of the Hungarian Red Cross (2014) donations were distributed to approximately 253 539 persons to the value of 2 449 395 EUR. Donation per capita was about 9,74 EUR/capita.

Utilizing the wasted money 2 176 000 pieces parcels could be distributed containing such basic food that includes 3 kg flour, 3 kg granulated sugar, 3 kg potato, 3 kg onion and 3 kg rice (*Table 6.*).

Table 6.: Average consumer price of basic food
M.U.: EUR/kg

Title	2013	2014	2015	Átlag
Flour	0.54	0.45	0.43	0.47
Granulated sugar	0.89	0.72	0.63	0.75
Potato	0.56	0.47	0.46	0.50
Onion	0.57	0.58	0.57	0.57
Rice	0.95	0.93	0.98	0.95
Total	-	-	-	**3.24**

Source: own calculation based on KSH (2016b) data

Resource loss
The evolution of the extent of needlessly used land

In our view the wastage of food in the end consumer sector points beyond the fact that if food is thrown trash money is wasted as well. In economic approach this problem is generated not only by wasting food products. Since those huge amount of resources are also wasted by wasted food that are necessary for the production of the base material of our food. The following tables present the extent of needlessly used land by wasting different breads in different quantities.

The quantity of breads sold annually demonstrates the average quantity of breads sold in the year of 2012-2013-2014.

On an average 121 900 tonnes white bread are sold annually, which are accompanied by 26 760 hectares of wheat land utilization. Assuming 10% food wastage in Hungarian households, the wasted white bread needlessly utilizes 2 676 hectares of wheat land in food verticum (*Table 7.*).

Table 7.: The extent of utilized land by wasting white bread
M.U.: kg

White bread	5%	10%	15%	20%	25%	30%
Bread	6 095 160	12 190 320	18 285 480	24 380 640	30 475 800	36 570 960
Wheat flour used for bread	4 876 128	9 752 256	14 628 384	19 504 512	24 380 640	29 256 768
Wheat used for wheat flour	5 851 354	11 702 707	17 554 061	23 405 414	29 256 768	35 108 122
Wheat used land (ha)	1 338	2 676	4 014	5 352	6 690	8 028

Source: own calculation

Table 8.: The extent of utilized land by wasting semi-brown bread
M.U.: kg

Semi-brown bread	5%	10%	15%	20%	25%	30%
Bread	**3 809 475**	**7 618 950**	**11 428 425**	**15 237 900**	**19 047 375**	**22 856 850**
Wheat flour used for bread	**2 590 443**	**5 180 886**	**7 771 329**	**10 361 772**	**12 952 215**	**15 542 658**
Wheat used for bread	**3 108 532**	**6 217 063**	**9 325 595**	**12 434 126**	**15 542 658**	**18 651 190**
Rye flour used for bread	**457 1327**	**914 274**	**1 371 411**	**1 828 548**	**2 285 685**	**2 742 822**
Rye used for bread	**548 564**	**1 097 129**	**1 645 693**	**2 194 258**	**2 742 822**	**3 291 386**
Wheat utilized land (ha)	**711**	**1 422**	**2 132**	**2 843**	**3 554**	**4 265**
Rye utilized land (ha)	**201**	**403**	**604**	**806**	**1 007**	**1 209**

Source: own calculation

Table 9.: The extent of utilized land by wasting farmhouse bread
M.U.: kg

Farmhouse bread	5%	10%	15%	20%	25%	30%
Bread	**2 285 685**	**4 571 370**	**6 857 055**	**9 142 740**	**11 428 425**	**13 714 110**
Wheat flour used for bread	**1 485 695**	**2 971 391**	**4 457 086**	**5 942 781**	**7 428 476**	**8 914 172**
Wheat used for bread	**1 782 834**	**3 565 669**	**5 348 503**	**7 131 337**	**8 914 172**	**10 697 006**
Wheat utilized land (ha)	**408**	**815**	**1 223**	**1 631**	**2 038**	**2 446**

Source: own calculation

Annually 76 190 tonnes of semi-brown bread are sold on an average, which generate the utilization of approximately 18 245 hectares land. The extent of utilized land consists of 14 215 hectares of utilized wheat land and 4 030 hectares of utilized rye land. By wasting the 10% of purchased semi-brown bread the utilization of 1 420 hectares of wheat land and 400 hectares of rye land is unnecessary in food verticum (*Table. 8.*).

By the sell of 45 710 tonnes farmhouse bread on an average approximately 8 150 hectares of wheat land is utilized. If households do not consume 10% of the purchased farmhouse bread, 815 hectares of wheat land is needlessly utilized in food verticum (*Table 9.*).

Annually 18 285 tonnes of rye bread are sold on an average, which generate the utilization of approximately 4 990 hectares of land. The extent of utilized land consists of 2 410 hectares of utilized wheat land and 2 580 hectares of utilized rye land. Calculating by wasting the 10% of purchased rye bread the utilization of 240 hectares of wheat land and 260 hectares of rye land is unnecessary in food verticum (*Table 10.*).

Table 10.: The extent of utilized land by wasting rye bread
M.U.: kg

Rye bread	5%	10%	15%	20%	25%	30%
Bread	**914 274**	**1 828 548**	**2 742 822**	**3 657 096**	**4 571 370**	**5 485 644**
Wheat flour used for bread	**438 852**	**877 703**	**1 316 555**	**1 755 406**	**2 194 258**	**2 633 109**
Wheat used for bread	**526 622**	**1 053 244**	**1 579 865**	**2 106 487**	**2 633 109**	**3 159 731**
Rye flour used for bread	**292 568**	**585 135**	**877 703**	**1 170 271**	**1 462 838**	**1 755 406**
Rye used for bread	**351 081**	**702 162**	**1 053 244**	**1 404 325**	**1 755 406**	**2 106 487**
Utilized land by wheat (ha)	**120**	**241**	**361**	**482**	**602**	**722**
Utilized land by rye (ha)	**129**	**258**	**387**	**516**	**645**	**773**

Source: own calculation

Table 12.: The quantity of utilized water by wasting breads M.U.: m3

Utilized water	5%	10%	15%	20%	25%	30%
White bread	7 923 708	15 847 416	23 771 124	31 694 832	39 618 540	47 542 248
Semi-brown bread	4 952 318	9 904 635	14 856 953	19 809 270	24 761 588	29 713 905
Farmhouse bread	2 971 391	5 942 781	8 914 172	11 885 562	14 856 953	17 828 343
Rye bread	1 188 556	2 377 112	3 565 669	4 754 225	5 942 781	7 131 337
Packed bread	792 371	1 584 742	2 377 112	3 169 483	3 961 854	4 754 225
Total	17 828 343	35 656 686	53 485 029	71 313 372	89 141 715	106 970 058

Source: own calculation

By the sell of 12 090 tonnes packed bread on an average approximately 1 500 hectares of wheat land is utilized. If households do not consume 10% of the purchased packed bread, 815 hectares of wheat land is needlessly utilized in food verticum (*Table 11.*).

Table 11.: The extent of utilized land by wasting packed bread M.U.: kg

Packed bread	5%	10%	15%	20%	25%	30%
Bread	609 516	1 219 032	1 828 548	2 438 064	3 047 580	3 657 096
Wheat flour used for bread	274 282	548 564	822 847	1 097 129	1 371 411	1 645 693
Wheat used for bread	329 139	658 277	987 416	1 316 555	1 645 693	1 974 832
Utilized land by wheat (ha)	75	151	226	301	376	452

Source: own calculation

The evolution of the quantity of needlessly utilized water

Assuming 10% food wastage in Hungarian households, the utilized quantity of water by wasting breads is the following: in case of white bread 15.8 million m^3, in case of semi-brown bread 9.9 million m^3, in case of farmhouse bread approximately 5.9 million m^3, in case of rye bread about 2.3 million m^3, while in case of packed bread 1.5 million m^3. The quantity of utilized water by breads is nearly 35.6 million m^3 (*Table 12.*).

The evolution of the quantity of needlessly utilized artificial fertilizer

In the course of wheat production, as the most important base material of bread, the following artificial fertilizers are assumed during the applied nutrient management: NPK (Nitrogen phosphorous potassium) 8-24-24, a 27% nitrogen fertilizer called "Pétisó", as well as liquid Nitrosol. On behalf of soil-amelioration Amalgerol as a foliar fertilizer and Yaravita gramitrel are applied (*Table 13.*).

It can be proved that the largest demand on artificial fertilizer emerges on wheat production, which is the base material of 12 190 tonnes white bread produced on needlessly utilized 2 680 hectares of land. In quantitative approaching it results in the unnecessary application of more than 535 tonnes NPK 8-24-24, 535 tonnes 27% nitrogen content "Pétisó" and 268 tonnes Nitrosol. The wasted quantity of foliar fertilizer is 13.3 hl, which consists of the quantity of applied Amalgerol and Yaravita gramitrel.

During wheat production being necessary for the wasted 7 620 tonnes semi-brown bread the utilization of a bit more than 284 tonnes NPK 8-24-24, 284 tons 27% nitrogen content "Pétisó" and 142 tonnes Nitrosol seems to be unnecessary. The quantity of wasted foliar fertilizer is 5.2 hl, which is owing to the applied quantity of Amalgerol and Yaravita gramitrel.

In case of the wasted 4 570 tonnes farmhouse bread in the course of nutrient management the utilization of 163 tonnes NPK 8-24-24 and the same amount of 27% nitrogen content "Pétisó" as well as 81.5 tonnes Nitrosol is unrequired. The quantity of wasted foliar fertilizer is 4 hl, which is owing to the applied quantity of Amalgerol and Yaravita gramitrel.

The utilized wheat for the 1 830 tonnes uneaten rye bread requires less artificial fertilizer inputs, however it still results in the unnecessary utilization of 48 tonnes NPK 8-24-24, 48 tonnes 27% nitrogen content "Pétisó" as well as 24 tonnes Nitrosol The quantity of wasted foliar fertilizer is 1.2 hl, which contains the applied quantity of Amalgerol and Yaravita gramitrel.

The packed bread is the bread with the smallest demand on artificial fertilizer. With its 1220 tonnes wastage 30 tonnes NPK 8-24-24, the same amount of 27% nitrogen content "Pétisó" and approximately 15 tonnes Nitrosol artificial fertilizer get lost. The quantity of wasted artificial fertilizer is 0.75 hl, which refers to the applied quantity of Amalgerol and Yaravita gramitrel.

Table 13.: Artificial fertilizer inputs in case of different breads

Title	Measurement unit	Quantity	Material inputs (Thousand EUR)
White bread			
NPK 8-24-24	kg	535 200	219.29
27% nitrogen content "Pétisó"	kg	535 200	125.11
Nitrosol	l	267 600	58.21
Amalgerol	l	8 028	76.73
Yaravita gramitrel	l	5 352	26.48
Total	-	-	505.82
Semi-brown bread			
NPK 8-24-24	kg	284 317	219.29
27% nitrogen content "Pétisó"	kg	284 317	66.46
Nitrosol	l	142 158	30.92
Amalgerol	l	2 446	40.76
Yaravita gramitrel	l	2 843	14.06
Total	-	-	371.49
Farmhouse bread			
NPK 8-24-24	kg	163 064	66.81
27% nitrogen content "Pétisó"	kg	163 064	38.12
Nitrosol	l	81 532	17.73
Amalgerol	l	2 446	23.37
Yaravita gramitrel	l	1 631	8.06
Total	-	-	154.09
Rye bread			
NPK 8-24-24	kg	48 167	19.73
27% nitrogen content "Pétisó"	kg	48 167	11.25
Nitrosol	l	24 083	5.24
Amalgerol	l	722	6.90
Yaravita gramitrel	l	482	2.38
Total	-	-	45.50
Packed bread			
NPK 8-24-24	kg	30 104	12.33
27% nitrogen content "Pétisó"	kg	30 104	7.03
Nitrosol	l	15 052	3.27
Amalgerol	l	452	4.31
Yaravita gramitrel	l	301	1.49
Total	-	-	28.43

Source: own calculation

Calculating with 10% wastage of purchased breads the wastage of artificial fertilizer in financial value is the following: in case of white bread 0.50 million EUR, in case of semi-brown bread 0.37 million EUR, in case of farmhouse bread 0.15 million EUR, in case of rye bread 0.04 million EUR, in case of packed bread 0.02 million EUR. The financial value of needlessly utilized artificial fertilizer is 1.08 million EUR in case of 10% wastage of all breads.

The evolution of the quantity of needlessly utilized pesticides

By means of mill quality wheat production technology requires the accomplishment of intensive plant protection operations. Different herbicides (Trimmer Max, Tomigan, Aperon/Athos), fungicides (Zamir, Mirador Forte) as well as insecticides are applied in production technology assumed in present study (*Table 14.*).

The safety of production is threatened by fusarium disease, also known as spike fusariosis by the side of other diseases (e.g. powdery mildew, blights, leaf- and glume blotch). Diseases caused by Fusarium spices, among which F. graminearum and F. culmorum play outstanding role in epidemic years. The risk of infection is not only in direct damage, since in indirect damage unhealthy metabolites (toxins) are formed, which can appear in feed or in bakery products (Anonymus).

Table 14.: Pesticide input of breads

Title	Measurement unit	Quantity	Material inputs (thousand EUR)
White bread			
Trimmer Max	g	93 660	45.74
Tomigan	l	245	
Zamir	l	8 028	213.39
Pyrinex	l	8 028	73.78
Mirador Forte	l	5 352	140.42
Aperon/Athos	g	53 520	110.22
Total	-	-	583.55
Semi-brown bread			
Trimmer Max	g	49 755	24.30
Tomigan	l	426	
Zamir	l	4 265	113.36
Pyrinex	l	4 265	39.19
Mirador Forte	l	2 843	74.59
Aperon/Athos	g	28 432	58.55
Total	-	-	309.99
Farmhouse bread			
Trimmer Max	g	28 536	13.93
Tomigan	l	245	
Zamir	l	2 446	65.01
Pyrinex	l	2 446	22.48
Mirador Forte	l	1 631	42.78
Aperon/Athos	g	16 306	33.58
Total	-	-	177.78
Rye bread			
Trimmer Max	g	8 429	4.11
Tomigan	l	72	
Zamir	l	722	19.20
Pyrinex	l	722	6.63
Mirador Forte	l	482	12.63
Aperon/Athos	g	4 817	9.91
Total	-	-	52.48
Packed bread			
Trimmer Max	g	5 268	2.57
Tomigan	l	45	
Zamir	l	452	12.00
Pyrinex	l	452	4.14
Mirador Forte	l	301	7.89
Aperon/Athos	g	3 010	6.20
Total	-	-	32.80

Source: own calculation

Assuming 10% bread wastage in Hungarian households the wastage of pesticides is the following: 0.58 million EUR in case of white bread, 0.30 million EUR in case of semi-brown bread, 0.17 million EUR in case of farmhouse bread, 0.05 million EUR in case of rye bread and 0.03 million HUF in case of packed bread. By 10% wastage of all breads the financial value of needlessly utilized pesticide is 1.13 million EUR.

The evolution of the quantity of needlessly utilized seed

In present study Mv Magdaléna is selected as a seed type in wheat production, since it has been a significant type in Hungarian wheat production for ages. Its quality is suitable for the requirements of baking industry in all respects. Its grains can be properly ground, its flour can absorb 5-6% more water than traditional species. Paste made out of it is well rollable, flexible and it has high bread volume.

Calculating with 10% waste of sold breads, in case of white bread to the value of 535.2 tonnes, of semi-brown bread to the value of 284.3 tonnes, of farmhouse bread to the value of 163 tonnes, of rye bread to the value of 48.1 tonnes and of packed bread to the value of almost 30.1 tonnes seed wastage emerges. The quantity of needlessly utilized seed is 1060.7 tonnes by 10% waste of different breads (*Table 15.*).

Table 15.: Seed input of breads

Title	**Measurement unit**	**Quantity**	**Material inputs (thousand EUR)**
White bread			
Mv Magdaléna	kg	535 200	156.38
Semi-brown bread			
Mv Magdaléna	kg	284 317	83.08
Farmhouse bread			
Mv Magdaléna	kg	163 064	47.64
Rye bread			
Mv Magdaléna	kg	48 167	14.07
Packed bread			
Mv Magdaléna	kg	30 104	8.79

Source: own calculation

As regards the 10% waste in Hungarian households, the seed wastage is the following: it is 0.15 million EUR in case of white bread, 0.08 million EUR in case of semi-brown bread, 0.04 million EUR in case of farmhouse bread, 0.01 million EUR in case of rye bread, and 0.008 million EUR in case of packed bread. The financial value of the needlessly utilized seed beside 10% waste of all breads is 0.28 million EUR.

The evolution of the quantity of needlessly utilized gasoil

The operations of wheat production require 100 litre gasoil per hectare on an average. On the bases of it gas oil loss is 267 590 litre in case of wasted white bread, 142 160 litre in case of wasted semi-brown bread, 81 530 litre in case of wasted farmhouse bread, 24 080 litre in case of wasted rye bread and 15 050 litre in case of wasted packed bread. The quantity of needlessly utilized gasoil is 530 410 litre by 10% wastage of breads (*Table 16.*).

Table 16.: Gasoil input of different breads

Title	Measurement unit	Quantity	Material inputs (thousand EUR)
White bread			
Gasoil	l	267 592	353.62
Semi-brown bread			
Gasoil	l	142 158	187.86
Farmhouse bread			
Gasoil	l	81 532	107.74
Rye bread			
Gasoil	l	24 083	31.82
Packed bread			
Gasoil	l	15 052	19.89

Source: own calculation

Calculating with 10 % wastage of purchased breads by the Hungarian households, the gasoil loss in financial value is 0.35 million EUR in case of white bread, 0.18 million EUR in case of semi-brown bread, 0.10 million EUR in case of farmhouse bread, 0.03 million EUR in case of rye bread and 0.01 million EUR in case of packed bread. By 10% wastage of all breads the financial value of needlessly utilized gasoil is 0.67 million EUR.

CONCLUSIONS

In the light of annual per capita food expenditure – which is 519.48 EUR/capita/year – it can be proved that cereals have an important role in our every day meals, since almost 97.40 EUR is spent on their purchasing from the annual per capita food expenditure. Furthermore the proportion of bread is the greatest within the subgroup of cereals, its ratio is approximately 40%. Our annual food expenditure is increased by more than 32.46 EUR by the annual per capita bread expenditure.

Annually 304 760 tonnes bread are sold on an average. By 10% wastage of the three breads purchased in the largest quantity, nearly 0.02 billion EUR financial loss emerges.

This money would be enough donating food parcels contain base food of 9.74 EUR value for more than 2.1 million needy persons.

The total financial value of the utilized resources is 3.25 million EUR beside 10% waste of breads. Out of this the financial value of utilized artificial fertilizer is 1.10 million EUR (34%), of utilized pesticide is 1.15 million HUF (35%), of utilized gasoil is 0.70 million EUR (22%) and of utilized seed is 0.30 million EUR (9%) (*Table 17.*) .

Annually 121 900 tonnes white breads are purchased. If 10% of purchased white bread are thrown out, then 2 676 hectares of wheat land are utilized needlessly in food verticum. The quantity of utilized water arising from wastage is 15.8 million m^3. Further losses are emerges as regards material inputs as well, whereas the loss of 0.50 million EUR artificial fertilizer, of 0.58 million EUR pesticides, of 0.15 million EUR seed and of approximately 0.35 million EUR gasoil is owing to the white bread wastage of the Hungarian household. The financial value of the all material inputs related to the quantity of wasted white bread is equal to 1.58 million EUR (*Table 17.*).

Annually 76 190 tonnes semi-brown bread are sold. Assuming 10% wastage of households the utilization of 1 420 hectares of wheat land and 400 hectares of rye land is unnecessary in food verticum. The quantity of utilized water by wastage is 9.9 million m^3. As regards material inputs by 10% waste of semi-brown bread in households the utilization of artificial fertilizer to the value of 0.37 million EUR, of pesticide to the value of 0.30 million EUR, of seed to the value of 0.08 million EUR as well as of gasoil to the value of 0.18 million EUR is proved to be unnecessary. The financial value of the total material inputs related to the quantity of wasted semi-brown bread is equal to 0.93 million EUR (*Table 17.*).

Annually 45 710 tonnes farmhouse bread are sold. In case of 10% wastage, the extent of the needlessly utilized wheat land is 815 hectares in food verticum. The quantity of utilized water is 5.9 million m^3. Together with the wasted farmhouse bread there is a loss of artificial fertilizer to the value of 0.15 million EUR, of pesticide to the value of 0.17 million EUR, of seed to the value of 0.04 million EUR, of gasoil to the value of 0.10 million EUR, as material losses. The financial value of the total material inputs related to the quantity of wasted farmhouse bread is equal to 0.46 million EUR (*Table 17.*).

Annually 18 285 tonnes rye bread are sold on an average. If 10% of purchased rye bread are not consumed, then 240 hectares of wheat land and 260 hectares of rye land are utilized needlessly in food verticum. The quantity of utilized water is 2.3 million m^3. The following material inputs can be considered money thrown out: the cost of artificial fertilizer – 0.04 million EUR, the cost of pesticide – 0.05 million EUR, the cost of seed – 0.01 million EUR and the cost of gasoil – 0.03 million EUR. The financial value of the total material inputs related to the quantity of wasted rye bread is equal to 0.13 million EUR (*Table 17.*).

Annually 12 190 tonnes packed bread are sold on an average. Assuming 10% wastage the extent of land utilized by wheat is 150 hectares. The quantity of utilized water is 1.5 million m3. The cost of wasted artificial fertilizer is 0.02 million EUR, of pesticide is 0.03 million EUR, of seed is 0.008 million EUR, of gasoil is 0.01 million EUR. The financial value of the total material inputs related to the quantity of wasted packed bread is equal to 0.068 million EUR (*Table 17.*).

Table 17.: Material inputs in case of different breads

Items	Material inputs (million EUR/ha)
White bread	
Artificial fertilizer	0.50
Pesticides	0.58
Seed	0.15
Gasoil	0.35
Water	-
Total	1.58
Semi-brown bread	
Artificial fertilizer	0.37
Pesticides	0.30
Seed	0.08
Gasoil	0.18
Water	-
Total	0.93
Farmhouse bread	
Artificial fertilizer	0.15
Pesticides	0.17
Seed	0.04
Gasoil	0.10
Water	-
Total	0.46
Rye bread	
Artificial fertilizer	0.04
Pesticides	0.05
Seed	0.01
Gasoil	0.03
Water	-
Total	0.13
Packed bread	
Artificial fertilizer	0.02
Pesticides	0.03
Seed	0.008
Gasoil	0.01
Water	-
Total	0.068

Source: own calculation

Overall, in agro-economic approach the wastage of breads is accompanied by significant resource utilization beyond the considerable financial loss – both expressed by non-financial and financial value. However, in our opinion the extent of food wastage in Hungarian households is much bigger than 10% published by Császár (2015), it rather approaches to the ratio of food wastage in EU households, which is 25%.

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SCIENTIFIC PAPER

COMPARING PARAMETRIC AND SEMIPARAMETRIC ERROR CORRECTION MODELS FOR ESTIMATION OF LONG RUN EQUILIBRIUM BETWEEN EXPORTS AND IMPORTS

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Abstract: *This paper introduces the semiparametric error correction model for estimation of export-import relationship as an alternative to the least squares approach. The intent is to demonstrate how semiparametric error correction model can be used to estimate the relationship between Ghana's export and import within the context of a generalized additive modelling (GAM) framework. The semiparametric results are compared to common parametric specification using the ordinary least squares regression. The results from the semiparametric and parametric error correction models (ECM) indicate that the error correction term and import variable are significant determinants of Ghana's exports. On the basis of Akaike Information Criteria and Generalized Cross-Validation (GCV) scores, it is found that the semiparametric error correction model provides a better fit than the widely used parametric error correction model for modeling Ghana's export-import relationship. The results of the analysis of variance provide further evidence of nonlinearity in Ghana's export and import relationship. In effect, this paper demonstrates the usefulness of semiparametric error correction model in the estimation of export – import relationship.*

Keywords: *Exports, imports, semiparametric, nonlinearity, generalized additive model, ECM*
(JEL code: *C14, C18, C22, F10, F14.*)

INTRODUCTION

Explaining the relationship between exports and imports of countries have been given considerable attention in the literature. Noticeably, some studies (Acquah and Acquah 2015, Al-Khulaifi 2013, Mukhtar and Rasheed 2010, Amoah and Loloh 2009, Uddin 2009) have applied the parametric error correction model (ECM) in estimating export and import relationship. Empirically, these studies find a long run equilibrium relationship existing between export and import. They note that imports and the error correction terms are significant determinants of export.

However, the parametric error correction model which employs the ordinary least squares (OLS) estimation technique imposes restrictions on the data. For example, it assumes a linear relationship between the dependent and independent variables in the model. In effect the parametric ECM does not allow for non-linearity. The specification of a functional form, for the export-import relationship, involves the risk of specifying a functional form, which is not similar to the true relationship between exports and imports. This misspecification may lead to bias in estimation results.

An alternative approach to model the export-import relationship within the ECM framework whilst relaxing the restrictions of the parametric approach is to implement a semi-parametric error correction model (ECM) using the generalized additive modelling (GAM) approach. The GAM allows for the nonlinear relationship between the dependent and independent variables within the error correction framework. In effect, the semi-parametric ECM complements the parametric ECM by relaxing the assumptions of linearity and providing evidence of non-linearity in the export-import relationship.

This paper demonstrates that semi-parametric regression offers an alternative and useful approach to model the export-import relationship within the ECM framework. The paper is outlined as follows. The introduction is followed by the methodology which discusses the Error Correction Model,

Parametric Regression (Ordinary Least Squares) and Semi-parametric regression model (Generalized Additive Model), results and discussion and conclusion.

METHODOLOGY

The methodology describes the data and the parametric and semiparametric econometric techniques employed in the study. Econometric techniques such as ordinary least squares and semiparametric regression analysis and the Error Correction model are emphasized.

Error Correction Model (ECM)

A simple error correction model for modelling export and import relationship can be written as

$$\Delta Y_t = \alpha_1 \Delta x_t + \alpha_2 (y-x)_{t-1} + U_t \qquad (y-x)_{t-1}$$
$$U_t \sim N(0, \sigma^2) \qquad [1]$$

Where *y* denotes exports and x denotes imports and $(y - x)_{t-1}$ refers to the error correction term which captures the long run equilibrium relationship between exports and imports. The error correction model above can be represented as a standard regression model as defined in equation 2.

Parametric Regression Model (Ordinary Least Squares Method)

The parametric regression model employs the ordinary least squares (OLS) estimation technique which fits the best straight line to data by minimizing the sum of squares residuals. In effect, the parametric model specifies a linear functional form between the dependent and independent variables. The standard regression model is specified in equation 2.

$$y = \beta_0 + \sum_{j=1}^{p} \beta_j x_j + e \qquad [2]$$

Semiparametric Regression Model (Generalized Additive Modelling Approach)

In order to avoid the necessity of parametric assumptions, the standard regression model specified in equation 2 can be rewritten in the form of an additive model as

$$y = \beta_0 + \sum_{j=1}^{p} f_j(x_j) + e \qquad [3]$$

Where is f_j an arbitrary smooth function. Stone (1986) provides a detailed discussion about the function.

The smooth function f can be estimated using penalized smoothing spline method (penalized maximum likelihood) which was first developed by Wood (Wood, 2000 and 2006). This method is applied because of its efficiency, model selection and inferential capabilities (Wood and Augustin, 2002).

Suppose we represent $f_j(x) = \sum_i \beta_i \phi_i(x)$ for a family of spline basis functions. A penalty $f\left[f_j''(x)\right]^2$ which can be written in the form $\beta_j^T S_j \beta_j$, for a suitable matrix S_i that depends on the choice of basis.

Then maximize $\log L(\beta) - \sum_j \lambda_j \beta_j^T S_j \beta_j$, where $L(\beta)$ is likelihood with respect to β and the $\lambda_j s$ control the amount of smoothing for each variable.

The current study is interested in comparing semiparametric and parametric error correction models in estimation of export-import relationship. The study therefore uses the co-integrated export and import data on Ghana used by Acquah and Acquah (2015) and downloaded from the World Trade Organization. The total merchandise annual imports and exports data (measured in USD) are for the period of 1948 to 2012. Acquah and Acquah (2015) established for this time series data set, that the exports and imports are co-integrated and imports granger causes the exports. Consequently in this study, the dependent variable is export and the independent variables are import and the error correction term.

DATA ANALYSIS

The parametric and semiparametric regression analysis were applied in the study. The R programming language was used to analyse the data. The error correction model was estimated using the ordinary least squares approach and semiparametric generalized additive model. The generalized additive model was estimated using the penalized smoothing spline method of the mgcv package in R.

Graphical approach was applied to explain the fitted generalized additive model. The nature of the non-linearity between the imports and exports relationship is graphically revealed. Model selection techniques were used to provide the basis for comparing and choosing between the fitted parametric and semi-parametric error correction models.

RESULTS

Table 1 presents the results of parametric error correction model. There is a significant and positive relationship between import as an independent variable and export as the dependent variable. There is also a significant and negative relationship between the Error Correction Term (ECT) as independent variable and export as the dependent variable. In summary, the results show that the import and the error correction term are significant determinants of export. The import and error correction terms have estimated coefficients of 0.56276 and -0.32257 respectively. The adjusted $R^{2,}$ AIC and GCV scores for the parametric error correction model are 0.409, 0 -45.48056 and 0.027946 respectively.

Table 1: Parametric ECM Estimates

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	0.01787	0.02150	0.831	0.40916
Diff(Im)	0.56276	0.08551	6.581	1.21e-08***
Lag(ECT)	-0.32257	0.10071	-3.203	0.00216**

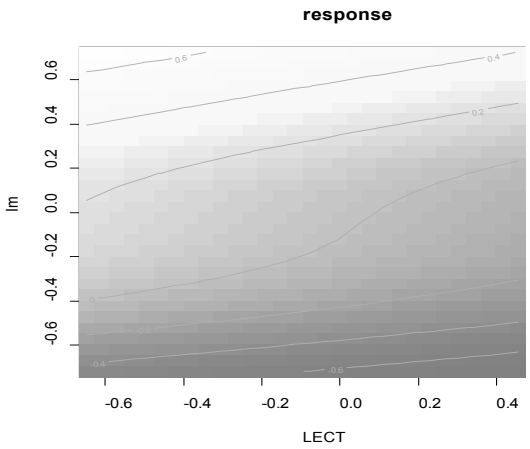
R-sq.(adj)	Deviance explained	GCV	AIC	Scale est.	n
0.409	42.7%	0.027946	-45.48056	0.026636	64

Signif. codes: 0 '' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1***

Table 2 presents the results of the semi-parametric generalized additive model error correction analysis. Similarly, there is a significant and negative relationship between error correction term as an independent variable and export as the dependent variable. Notably, the import and the error correction term are significant determinants of export. The error correction term has an estimated coefficient of

-0.25339. The adjusted R2, AIC and GCV scores for the semi-parametric error correction model are 0.479, -51.13979 and 0.025731 respectively. The graph shows lag of ECT (LECT) on horizontal (x) axis and Import (Im) on vertical (y) axis. The response (export) scale is given by the contours, with lighter colour indicating higher values. From Figure 1, very low import levels are associated with contours with darker colours whilst higher levels of import are associated with contours with lighter colours. In effect, low levels of import are associated with poor overall response in export, whilst high import levels are associated with high response in export.

Figure 1: A Contour Plot of Import (lm) and Error Correction Term (LECT) against Response



The p-value of 0.01929 derived from the analysis of variance suggests that incorporating non-linear effects has improved the model. In effect, the analysis of variance provides support in favour of the semi-parametric ECM against the parametric ECM.

DISCUSSION

In the parametric error correction model estimation, the significant and positive relationship between import as an independent variable and export as the dependent variable suggests that, an increase in import will lead to an increase in the export. In the short run, 1% increase in import significantly results to 0.56% increase in export. There is also a significant and negative relationship between the Error Correction Term as an independent variable and export as the dependent variable. In the long run, 32% of the disequilibrium in the export and import in the previous time period is eliminated in the subsequent time period. In summary, the results show that the import and the error correction term are significant determinants of export. Similarly, Uddin (2009) and Al-Khulaifi (2013) find that imports and the error correction term were significant determinants of exports.

In the semi-parametric generalized additive error correction model, the significant and negative relationship between error correction term as an independent variable and export as the dependent variable suggest that in the long run, 25 % of the disequilibrium in the export and import in the previous time period is eliminated in the subsequent time period. Furthermore, the results show that the import is a significant determinant of export and nonlinearly related to the export. From Figure 1, very low import levels are associated with contours with darker colours whilst higher levels of import are associated with contours with lighter colours. This suggests that, low levels of import are associated

Table 2: Semi-parametric ECM Estimates

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	0.06184	0.01916	3.227	0.00205 **
Lag(ECT)	-0.25339	0.10109	-2.507	0.01499*
	edf	Ref.df	F	p-value
s(Diff(Im))	3.592	4.463	12.78	2.44e-08***

R-sq.(adj)	Deviance explained	GCV	AIC	Scale est.	n
0.479	51.7%	0.025731	-51.13979	0.023482	64

Signif. codes: 0 '' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1***

Table 3: Analysis of Variance

Model	Resid. Df	Resid. Dev	Df	Deviance	Pr(>Chi)
Parametric ECM	**61.000**	**1.6248**			
Nonparametric GAM ECM	**57.537**	**1.3716**	**3.4633**	**0.25323**	**0.01929***

Signif. codes: 0 '' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1***

with poor overall response in export, whilst high import levels are associated with high response in export. And middling on import leads to a steady moderate response in export. Similarly, Acquah and Acquah (2015) and Amoah and Loloh (2009) using a linear error correction model find imports and the error correction term as significant determinants of exports. Notably, we allow for nonlinear relationship between exports and imports but a linear relationship between exports and the error correction term. This is because when the ECT enters the model nonlinearly and non-parametrically as illustrated in Table 3 in the appendix, its effective degrees of freedom (edf) obtains a value of 1. The effective degrees of freedom with a value of 1 suggests that the ECT has essentially been reduced to a simple linear effect. Consequently, the ECT is allowed to enter the model linearly as illustrated in Table 2.

On the basis of statistical significance, both the semiparametric ECM and the parametric ECM find the import and the error correction term as significant determinants of export. Thus, we come to the same conclusion as in the linear model regarding the statistical significance of individual effects. On the basis of model comparison measures, the semi-parametric generalized additive error correction model outperforms the parametric error correction model. Model selection methods such as the Akaike Information Criteria (AIC) and the Generalized Cross Validation (GCV) scores were computed for the models. Notably, for AIC and GCV, models with lower scores are preferred. The AIC and GCV scores of -51.13979 and 0.025731 for semi-parametric generalized additive error correction model were lower than -45.48056 and 0.027946 for the parametric error correction model. Thus, on the basis of the AIC and GCV scores the fitted semiparametric Error Correction Model tends to be superior and provides a better model fit when compared with the parametric ECM. Furthermore, the adjusted R2 suggests that the semiparametric ECM accounts for much of the variance in the exports than the parametric ECM. The analysis of variance test also provides a basis for comparing the competing models. The analysis of variance test suggests that incorporating non-linear effects has improved the model considerably. The results of the study suggest evidence of non-linearity in the export-import relationship for Ghana. This is a departure from previous studies which emphasized the use of a linear model (ECM) in estimating import-export relationships (Acquah and Acquah 2015, Al-Khulaifi 2013, Mukhtar and Rasheed 2010, Amoah and Loloh 2009, Uddin 2009). Similarly, Bachmeier and Li (2002) estimated a semiparametric error correction model (ECM) using US interest rate data and find the semiparametric ECM to be superior to the parametric ECM, suggesting evidence of nonlinearities in the term structure.

CONCLUSION

This paper proposes a semi-parametric error correction modelling technique for estimating export and import relationship as an alternative to the parametric ordinary least squares estimation approach. A comparison of the result from the error correction model using the least squares method and the semi-parametric regression approach indicate that the results obtained in the alternative methods are similar.

On the basis of statistical significance, both import and the error correction term are significant determinants of exports in the semi-parametric and parametric ECM. In effect, the semiparametric ECM yields meaningful results which are reasonable and consistent with the results derived from the parametric ECM. The analysis of variance test suggests that incorporating non-linear effects has improved the model considerably. In effect, the results of the study suggest evidence of non-linearity in the export-import relationship for Ghana. Furthermore, the analysis of the Ghana's export-import relationship shows that the semiparametric ECM proves to be superior to the widely used parametric ECM on the basis of Akaike Information Criteria and the GCV scores. In summary, this paper has demonstrated that the semi-parametric error correction model offers an alternative and a useful approach to modelling import - export relationships.

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APPENDIX

Table 3: Semi-parametric ECM Estimates

	Estimate	**Std. Error**	**t value**	**Pr(>|t|)**
(Intercept)	0.06332	0.01915	3.305	0.00162 **
	edf	Ref.df	F	p-value
s(Diff(Im))	3.592	4.463	12.778	2.44e-08***
s(Lag(ECT))	1.000	1.000	6.283	0.0149 *

R-sq.(adj)	**Deviance explained**	**GCV**	**AIC**	**Scale est.**	**n**
0.479	51.7%	0.025731	-51.13979	0.023482	64

Signif. codes: 0 '' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1***

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SCIENTIFIC PAPER

IMPORTANCE OF THE GENERIC SEGMENT OF THYE PLANT PROTECTION PRODUCTS – THE CASE OF THE POLISH MARKET

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Abstract: *Authors present results of the analysis of developments in the plant protection products industry, with a focus on its generic part. Authors concentrate on long-term changes of prices, volumes and values of generic pesticides launched into the market. There were two strategic groups of producers identified: research and development (R&D) and generic. The analyses conducted prove that there is a relationship between the amount of generic products on the market and their prices. It is also clear that the number of competitors significantly influences the speed and range of price erosion. Used as examples generic plant protection products were placed on the market with an average price 15% lower comparing to branded pesticides.*

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Keywords: *plant protection products, generic pesticides, price erosion, competition*
(JEL code: *M31*)

INTRODUCTION

Plant protection products belong to important land productivity factors protecting yields and ensuring efficiency of other inputs, mainly fertilizers. The use of plant protection products minimalizes a threat of a decline in efficiency of other inputs in agricultural production and increases profitability of crop production [KUCEWICZ, 2011].

Application of pesticides is regulated in the EU by the Directive 1107/2009 from the 21st October 2009 concerning the placing of plant protection products on the market [DIRECTIVE, 2009] and repealing Council Regulation No 79/117/EWG and 91/414/EWG. The regulation provides the definition of pesticides and indicates the range of their use. According to this regulation pesticides are defined as "products, in the form in which they are supplied to the user, consisting of or containing active substances, safeners or synergists, and intended for one of the following uses" :

- protecting plants or plant products against all harmful organisms or preventing the action of such organisms, unless the main purpose of these products is considered to be for reasons of hygiene rather than for the protection of plants or plant products;
- influencing the life processes of plants, such as substances influencing their growth, other than as a nutrient;
- preserving plant products, in so far as such substances or products are not subject to special Community provisions on preservatives;
- destroying undesired plants or parts of plants, except algae unless the products are applied on soil or water to protect plants;
- checking or preventing undesired growth of plants, except algae unless the products are applied on soil or water to protect plants [REGULATION (EC), 2009].

The present European plant protection market is strongly influenced by three major forces:

- increasing demand for food in the global scale and thus need to protect yields; ,
- globalization, making market transparent and open for all participants, that creates chances also for new entrants, mainly from China and India,
- regulatory activity of the EU Commission which implements complex rules, greatly because of potentially harmful impact of pesticides on human's and animal's health as well as on the abiotic environment, especially water and soil.

Strong regulations result with lasting long products development, including time needed for receiving an official approval, and high investments costs [HARTNELL, 1996]. However, despite all risks related to sales and disturbances caused by strong ecological, anti-pesticide lobbies the industry is still highly profitable.

In the pesticides industry two strategic groups of producers may be distinguished:

- producers developing new, original brand-name products based on own research and development activities;
- producers of generic pesticides that manufacture equivalents of branded products.

The first group is characterized by a wide range of research programs and high budgets for developing new active substances. They are large scale producers, active on the global scale in different market segments what allows them to maximize returns on their investments. The biggest international companies such as Bayer, BASF, Syngenta, Dow, Du Pont, Monsanto belong to this group. Producers that belong to the second group (e.g. Adama, UPL, Nufarm, Sipcam and Polish producers such as CIECH – Sarzyna, Synthos, Pestila, Chemirol, Invigo) do not conduct their own research, but simply copy technologies developed earlier by the originators.

Innovative plant protection product meets a new need or an old need with the use of new active substance (biological active), new formula or a new method of use. They bring into agricultural practice an unknown aspect. Usually they are subject to the patent protection[1].

It is more difficult to define generic products. Their description appears in the literature [THORNHILL and WHITE, 2007: p.553, BASS et al., 2005 P:556, ZAJAC and SHORTELL, 1989: p.413] mainly in relation to pharmaceuticals. In the English dictionary the following definition can be found: *generic – not protected by trademark*, *generic - applicable to an entire class or group*. The word "generic" generally appears in the context of medicines as a generic drug, imitative, imitation. Generic *drug,* is considered "a substitute for the original product with the same chemical composition and the same effect" [PETRUSEWICZ, 2010].

The term *generic* applies also to pesticides. By analogy to the pharmaceutical market, it relates to products, which:

do not have the patent protection,

are produced without a licence and other exclusive rights by firms, which did not patent them, did not elaborate them and did not invent them,

contain the same biological active substance like original products, however, from a different source,

have the same or very similar chemical composition (similar auxiliary substances and solvents),

may be used alternatively with the original product.

RYAN [2002, p.35] is quoting HICKS (1994), who probably in the simplest way defines generic pesticide "as one which is manufactured by a company other than the original manufacturer", whilst a generic manufacturer is, "a company, or division of a company, whose major activity consists of manufacturing the active substances of pesticides, the patents for which have expired, and for which it did not hold the original patents". Generic products are often described as non-branded, generics, imitations or equivalents. The number of equivalents of original plant protection product ranges from one to eight. It depends on the time elapsed since the expiry of patent protection and other protected data, margin of the product, biological efficiency of an active substance, size of the segment, the crop and level of intensity of its cultivation [STAJSZCZAK, 2015].

The most important differences between original products and generics are presented in *Table 1.* The consequence of the differences is the perception of products by marketers and farmers.

Table 1. Comparison of an original product (from the company that patented it) with a generic product

Characteristics	Original product	Generic product
Producer	Company with R&D activities that develop new substance	One of many generic companies
Biological active substance	Research team's results	Reproduced on the basis of the original product
Patent	Declared to the patenting process	Product is developed after the expiry of patent protection
Production period	Produced in the period of patent protection and then terminated	Produced after the expiry of patent protection of the original product
Price strategy	Depends on the stage of life cycle of the product, all price strategies applicable	Lower prices
Distribution strategy	Push and pull	Push
Expenses on adver-tisement and promotion	High	Limited or none
Name of the product	Different strategies, usually developing the brand	Often called "umbrella" e.g. Rathiopharm

Source: Stajszczak A., (2012).

Sometimes generic pesticides are treated as "counterfeit" products, which is, however, not appropriate. The most important differences between generics and counterfeits are presented in *Table 2*.

1 The patent protection is valid 20 years for the revealed molecule and after that period "the invention is free to be exploited by the public" [Timmermann 2015].. In the EU the Supplementary Protection Certificate (SPC) was introduced that "in effect extends the period of protection initially conferred by a patent to compensate for some of the patent life lost while obtaining marketing approval" [Hartnell 1996, p. 391].

Table 2. Comparison of generic products with counterfeits

Characteristics	Generics	Counterfeits
Place of production	Well-known and registered	Unknown
Compliance with the period of patent protection	Company obeys the patent rights	Company breaks the patent rights regarding technology of production, product itself, packages, logo
Main countries of origin	China, India, Israel and others	China
Quality and norms	Obeyed and controlled	No control
Trade mark	Their own	Falsified
Placing to the market	Legally through general selling network	Illegally, often without invoices or with falsified invoices
Distribution	Like in the case of branded products	Often through legally operating distribution firms
Similarity of labelling to the brand	Depends on strategy. Often attempted to make it similar to the name and logo of the branded product	As close as possible, making an exact copy of an etiquette, packages
Publicity measures	Limited or none	None
Price in the comparison with the brand product	5-35% lower	10-80% lower

Source: Stajszczak A., (2012).

The distinctions above gets a special meaning because of the protection from the Intellectual Property Rights. The Europol estimates, however, scale of trade with falsified pesticides for a 10% of the value of the European market [www.farmer.pl 03-12-2012].

The basic aim of this article is to show relations between the number of generic companies, which bring in the same technical products and the speed and depth of the erosion of prices of pesticides. Moreover, the authors analyze differences between prices of generic products and prices of original, branded pesticides as well as the change in the value of the market in a specific period due to the reduced prices.

The research hypotheses formulated by authors are: (1). There is a relationship between the amount of generic products on the market and their prices. (2) The number of competitors influences the speed and range of price erosion.

It should be emphasized that the picture of the pesticide industry is more complex than it is possible to describe in this short paper. That is why authors make consciously some simplifications in presenting processes and phenomena that characterize developments in the industry.

MATERIALS AND METHODS

The analyses are based on the primary and secondary data collected by the authors. The basic source of data were price lists of the companies. In addition, analyses were supported by information received from interviews with traders of pesticides.

In the paper four original products for which the period of patent protection has expired and which have equivalents registered as generics have been analyzed.

Prices of analyzed pesticides were collected from price lists of selected companies which have a permission to sell their products to the Polish market: Adama, Barclay, Ciech-Sarzyna, Chemirol, Globachem, Helm, Nufarm, Rotam, Sharda. The price lists for each year contain February-May prices from 8 wholesalers.

The following products were considered in the analysis: *tebuconazol, tribenuron, fluroxypyr, nicosulfuron and trinexapac*. Their possible use and importance in crop protection is presented in *Table 1.*

Table 1. Pesticides considered in the analysis

Product	Group	Use in crops	Importance in crop protection
Tebuconazol 250 EW	Fungicide	rapeseed, cereals, apple trees, cherry trees	utmost
Tribenuron 75 WG	Herbicide	winter and spring cereals	medium
Fluroxypyr 200 EC	Herbicide	winter cereals	medium
Nicosulfuron 40 S.C.	Herbicide	corn	great
Trinexapac 250 EC	Growth regulator	winter and spring cereals	utmost

Source: Own analysis based on Oliver R.P., Hewitt H.G. (2012)

The size of the market was determined every year on the basis of 15 face-to-face interviews with representatives of the key players on the pesticides market and the use of available secondary data.

RESULTS AND DISCUSSION

From the marketing point of view, original producers and generic companies offer the same basic product and the same basic benefits for the users. They satisfy the same needs on the level of a physical product (functional), but referring to motivations and values, they provide different psychophysical (symbolic) properties of the product. Many users believe that innovative products are more efficient. From generic products buyers expect a lower price. The original products give the farmers a sense of security and generics give them the feeling of a maximum thrift [STAJSZCZAK, 2011].

This phenomenon should be taken into account in the generic product management. Existing specialized literature provides analyses of marketing activities in the pharmaceutical industry, from which generic products originated. There is much less publications on marketing pesticides. Most of the information about strategies and marketing activities of the agrochemical companies may found in not public, own internal documents or reports of consulting companies.

From the perspective of strategic analysis pesticides

industry is in the stage of maturity. However, in recent years still the evident growth of the global pesticides market may be observed, also in the regions of relatively intensive agriculture such as Europe and North America (*Table 3).*

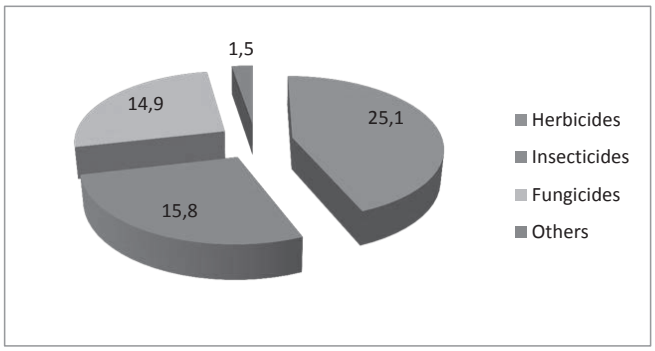
Table 3. Development of global pesticides market divided by regions in billion USD (value in nominal producers prices)

Region	2010	2011	2012	2013
Asia	12,8	14,8	15,2	16,4
Latin America	9,7	11,4	12,6	14,1
Europe	11,2	12,7	13,1	14,1
North America	7,4	7,9	8,5	9,7
Others	2,0	2,4	2,5	2,6
Total	43,5	49,4	52,2	57,2

Source: http://www.slideshare.net/prkonceptanalytics/global-crop-protection-pesticides-market-report-2013-edition-concept-analytics. read day: 22.04.2016.

In the production structure herbicides have a dominant share, followed by almost equal shares of insecticides and fungicides *(Figure 1).*

Figure 1. Share of different categories of pesticides in the global market of plant protection products in 2013 (billion USD)



Source: http://www.marketsandmarkets.com/PressReleases/crop-protection.asp, read on April 22, 2016.

The industry is characterized by a high level of concentration. In the global market there is about 20 global active companies in the product developing and registration process as presented in Table 4.

Table 4. Global sales of main companies in 2010

	Company	Country	Segment	Sales 2010 in bln USD	Market share %
1	Syngenta	Switzer-land	R & D	8,5	19,5%
2	Bayer	Germany	R & D	8,3	19,1%
3	BASF	Germany	R & D	5,1	11,7%
4	Dow	USA	R & D	3,9	9,0%
5	Monsanto	USA	R & D	3,5	8,0%
6	DuPont	USA	R & D	2,9	6,7%
7	Makhteshim - Agan	Israel	Generic	2,0	4,6%
8	Nufarm	Australia	Generic	1,8	4,1%
9	Sumitomo Chem.	Japan	R & D	1,4	3,2%
10	Arysta	Japan	Generic	1,1	2,5%
11	FMC	USA	R & D	1,1	2,5%
12		Others		3,9	9,1%

Source: www.phillipsmcdougall, Agrow World Crop Protection News, August 2010

The four largest companies have a 60% market share and the eight largest hold 82% of the market. There is still, however a space for likely mergers and acquisitions. The largest R&D companies are registered in Europe, and next three, considering their market share, are registered in the United States. The latest news inform, however, about an agreed all stock merger of equals of Du Pont with Dow[2] and expected to be finalized by the end of 2016 the ChemChina's $44bn takeover of the Syngenta. [3]

The largest generic company is Makhteshim - Agan from Israel, for some years controlled by the Chinese capital.

In the effect, the pesticides industry meets criteria of an oligopolistic structure, because:

- there are strong entry barriers, mainly due to a long period of product's development and its registration;
- products are mostly homogeneous, that means they are based on the same or very similar active substances, formulations and the way of use,
- distribution channels and competitors have a good knowledge about prices and terms offered by producers. Therefore, any significant decision taken by one of the players causes reactions of the other competitors.

Importance of generics in the pesticides market

The limited financial resources of farmers should be spent as efficiently as possible. One of the solutions might be the use of generic (imitative) preparations for protecting crops. However, in many discussions problem of quality of generic products and their efficiency in the comparison with the original products is brought up. It is a common view among farmers that generic products are worse that the original ones [CASE, 2010]. However, there is a lack of awareness that the registration requirements impose on the generic products the requirement of the active substance identity with the substance of the original product, thus quality of the generic cannot be worse than quality of the branded product. Generic products should have the quality, efficiency and safety of use of original pesticides.

2 http://www.dow.com/en-us/news/press-releases/dupont-and-dow-to-combine-in-merger-of-equals

3 https://www.syngenta-growth.com/en/home/

Due to lower prices, however, generic products become more and more popular in the global scale. Over past twenty years the share of generic products in the whole agrochemical market has increased from 20% in 2000 to 30% in 2012. Estimates on the share of generic pesticides in the market of plant protection products in selected countries are presented in table 5.

Table 5. Estimated share of generic pesticides in selected countries in 2012 – 2014

Market	% of the generic segment
USA	32%
France	30%
Germany	20%
Poland	35%-40%
Brazil	40%
China	72 %
India	60%
Great Britain	40%
Average	35%

Source: Author's own analysis on the basis of interviews with traders of the Helm Company in various countries

The share of generic pesticides in less developed countries (e.g. China, India, Brazil) is noticeably higher, although significant also in other countries (e.g. Great Britain, Poland, USA). Generic products may be an important factor in lowering costs of agricultural production and thus, becoming more accessible, contributing to an increase of productivity of agricultural land [NORWOOD et al., 2015].

The importance of generics is growing in the whole industry largely due to the increasing number of products without the patent protection, slower pace of introducing new active ingredients because of limited investments in research and development, as well as due to a pressure from buyers on reducing costs of pesticides.

Influence of generics on prices of pesticides with the use of selected examples.

Responding to the intensity of competition and constant changes in the macroeconomic environment and market conditions companies forming the pesticide industry show different market behaviours, e.g. regarding investments to improve market position, development of innovations, strengthening cooperation or choosing specific pricing strategies. The strongest reaction of the competitors usually takes place when competition is weak, products are similar and all buyers are well orientated in the market situation. This is the case of the pesticides industry, which can be characterized as an oligopolistic structure strongly protected by high entry barriers associated with legislation. Products are very similar or even identical chemical-wise and use-wise, the buyers, namely distributors and farmers are professionals and know characteristics of, not only products, but also their specific ingredients (active substances). Companies in this industry can pursue different pricing policies. Usually there are homogenous in the strategic groups and they differ from each other among the groups [STAJSZCZAK, 2015].

The existence of companies offering generic products at relatively low prices has a significant influence on pricing policies of all producers and, in a consequence on the levels and trends of price changes of specific pesticides in a longer period.

Table 7. Price and value changes of the tebuconazol's products market in the formulation of 250 EW in 2003-2015.

Tebuconazol 250 EW	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Number of generic producers	1	1	2	4	5	5	6	7	7	7	7	8	8
Price of the R&D product in PLN	106,0	106,0	95,0	87,0	82,4	67,5	61,6	59,8	56,7	54,1	54,1	50,3	50,3
Average price of the generic product in PLN	80,0	80,0	70,0	60,0	58,0	45,0	46,0	43,0	42,0	41,0	41,0	39,0	39,0
Difference in prices of generic and R&D products	-33%	-33%	-36%	-45%	-42%	-50%	-34%	-39%	-35%	-32%	-32%	-29%	-29%
Value of R&D segment in mln PLN	14,4	14,4	6,6	6,6	6,0	4,5	3,1	3,1	2,9	2,4	2,4	2,2	1,6
Value of ge-neric segment in mln PLN	2,4	4,8	7,0	12,0	20,9	25,2	36,8	43,0	50,4	57,4	63,6	60,5	60,5
Total value of tebuconazol 250 EW in mln PLN	17	19	14	19	27	30	40	46	53	60	66	63	62
Changes of the market's value of Tebuconazol 250 EW 2003=100%	100%	114%	81%	111%	160%	177%	238%	274%	317%	356%	393%	373%	370%
Share of gene-ric product in the total value of sales [%]	15,3	24,2	52,9	65,3	77,8	85,0	92,3	93,3	94,5	96,0	96,4	96,5	97,4

Source: Own analysis

Table 8. Price and value changes of the market of tribenuron's market in the formulation of 75 WG in 2006 – 2015

Tribenuron 75 WG	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Number of generic producers	1	1	1	1	1	1	1	2	3	3
Price of the product R&D in PLN	1887	1612	1612	1612	1656	1621	1575	1330	1254	1233
Average price of the generic product in PLN	1700	1300	1300	1300	1440	1340	1250	1000	950	920
Percentage difference of prices between generic to the R&D product	-11%	-24%	-24%	-24%	-15%	-21%	-26%	-33%	-32%	-34%
Value of the R&D segment in mln PLN	28,5	23,8	23,8	23,8	20,4	17,0	17,0	13,5	11,2	4,2
Value of the generic segment in mln PLN	3,4	4,1	4,1	4,1	4,6	6,0	6,9	6,9	7,6	11,9
Total value of tebukonazol 250 EW in mln PLN	31,9	27,9	27,9	27,9	25,0	23,0	23,9	20,4	18,8	16,1
Change of the value of the Tribenuron 75WG market 2006=100%	100%	87%	87%	87%	78 %	72%	75%	64%	59%	50%
Change of the price of the generic product 2006=100%	100%	76%	76%	76%	85%	79%	74%	59%	56%	54%

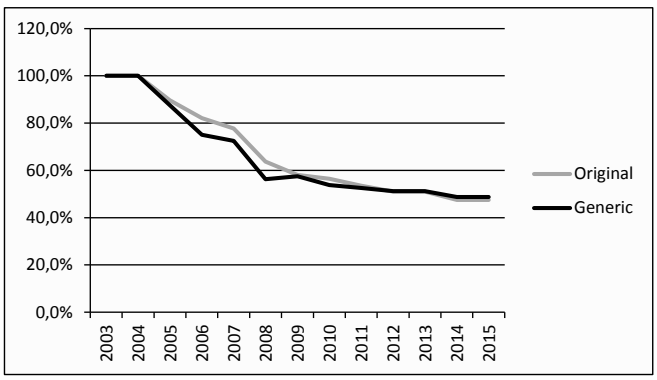
Source: Own analysis

The results of the analysis of price formation of specific products are presented in Tables 7-10. The first year of the analysis is a season, in which the first generic product, of each pesticides was offered.

Table 7 shows changes in prices and relations between values of the original (R&D) and generic equivalents of Tebuconazol 250 EW's in the period 2003-2015 in Poland. In that period the number of generic producers has increased from one to eight. The value of sales of the branded pesticide has significantly decreased for the advantage of the generic. The share of the generic equivalent of the original Tebuconazol 250 EW grew up from about 15% in the initial year, to over 97% in the year 2015. It should be emphasized that the value of the whole market of Tebuconazol 250 EW has increased in the analyzed period by about 370%. At the same time prices of both, the original products (e.g. Horizon 350 EW from Bayer) and generics have been systematically falling down by more than 50% of the initial price. In all years prices of the generic pesticide were lower, comparing with the price of the branded product, by 29-50%.

The trend of the price change of Tebuconazol 250 EW is illustrated in the Figure 2.

Figure 2. Trend of price change of Tebuconazol 250 EW in the period 2003-2015



Source: Own analysis

The diagram clearly suggests that producers of both, the original and generic product apply the skimming pricing strategy in the first years after introducing pesticide to the market and later, lowering significantly the original price, shift to the penetration strategy.

Changes of prices and structure of sales of other pesticides considered in the analysis show the same pattern (tables 8-10).

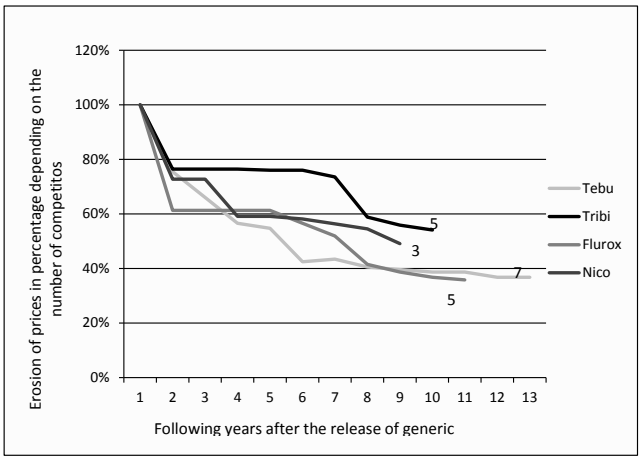
The results compiled in *Tables 8-12* are presented in a synthetic way in the *Figure 3* that shows the influence of the number of competitors on the range and the speed of the price erosion.

Table 9. Price and value changes of the fluroxypyr market in the formulation of 200 EC in 2005 – 2015.

Fluroxypyr 200 EC	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Number of generic producers	1	1	1	1	1	1	2	4	5	7	7
Price of the product R&D in PLN	80,0	80,0	75,0	75,0	75,0	75,0	65,0	65,0	65,0	60,0	59,0
Average price of the generic product in PLN	65,0	65,0	65,0	65,0	65,0	60,0	55,0	44,0	41,0	39,0	38,0
Percentage difference of prices between generic to the R&D product	-23%	-23%	-15%	-15%	-15%	-25%	-18%	-48%	-59%	-54%	-55%
Value of the R&D segment in mln PLN	2,0	1,8	1,9	1,9	1,9	1,9	1,6	1,6	1,6	1,5	1,5
Value of the generic segment in mln PLN	0,5	0,7	1,0	1,3	1,4	1,5	4,1	7,0	8,2	11,7	11,4
Total value of Fluroxypyr 200 EC in mln PLN	2,5	2,5	2,9	3,2	3,3	3,4	5,8	8,7	9,8	13,2	12,9
Change of the market's value 2005=100%	100%	99%	113%	126%	131%	134%	228%	344%	390%	524%	512%
Price change 2005=100%	81%	81%	81%	81%	81%	75%	69%	55%	51%	49%	48%

Source: Own analysis

Figure 3. The number of competitors and the erosion of prices in particular years after they were released on the market



Source: Own analysis

The crucial question is: are those tendencies the same in other countries? Author's observations indicate that yes. The generic segment is shaped by the period of patent protection and other exclusive rights for specific products. In Europe they are the same or very similar in all the countries.

CONCLUSIONS

Pesticides may be differentiated due to different characteristics. As physical products they may be distinguished from each other by physical and chemical proprieties and their biological activity. As marketed products they are subject to different marketing strategies.

On the basis of the analyses the following conclusions may be drawn:

- Each of the analysed generic products is registered by minimum 3 companies. Usually this number ranges from 4 to 7. Generic products are released to the market with a price discount, usually 15% on average.
- The number of competitors influences a magnitude of price reductions of generic products. In the case of five competitors, the price erosion is between 50% to 60% against the price of the original product in the year of releasing the first equivalent.
- Price reduction makes plant protection products more attractive, which generally leads to the increase of their sales.
- Most of the farmers is keen to purchase a new, generic product with similar characteristics and functions like the one they used to buy before, however under the condition of getting a discount, because of the risk they think is associated with the use of the generic.

The trials of forecasting tendencies of the prices of the generic plant protection products for longer time shows clear trend to reduce the prices as long as the margin on the product exist and the pay back from investment in approval (sell allowance) is possible.

The plant protection products industry is strongly concentrated. The companies can be divided into two strategic groups:

- the originators, conducting research and development activities that result with releasing active ingredients;
- the imitators, producing generic pesticides, that are introduced to the market after the patent protection of original substances expires.

Table 10. Price changes and value of the market of nicosulfuron in the formulation of 040 SC in 2007 – 2015.

Nicosulfuron 40 SC	2007	2008	2009	2010	2011	2012	2013	2014	2015
Number of generic producers	1	2	2	5	5	5	6	7	8
Price of the product R&D in PLN	120	120	120	105	100	95	80	80	80
Average price of the generic product in PLN	110	80	80	65	65	64	62	60	54
Percentage difference of prices between generic to the R&D product	-9%	-50%	-50%	-62%	-54%	-48%	-29%	-33%	-48%
Value of the R&D segment in mln PLN	12	12	14	12	12	9	5	4	4
Value of the generic segment in mln PLN	1	1	4	5	10	13	15	18	16
Total value of Nicosulfuron 40 SC in mln PLN	13	13	18	17	22	22	20	22	20
Change of the market's value Nicosulfuron 40 SC 2007=100%	100%	105%	146%	137%	174%	175%	159%	175%	160%
Price change of the generic product 2007=100%	100%	73%	73%	59%	59%	58%	56%	55%	49%

Source: Own analysis

This creates a specific "duo-oligopolistic" structure of the industry. Despite oligopolistic characteristics (e.g. relatively low number of producers and a large number of buyers, homogenous products in terms of specific active substances and use, high entry barriers) producers compete on prices. The existence of generic pesticides, but probably also increasing volume of sales after a new product is released to the market, have a visible impact on pricing strategies and price trends in a long period. Typically, producers of both, the original and generic products apply the skimming pricing strategy introducing pesticide to the market and later shift to penetration strategy that results with a downward shift of prices accompanied by the increase of sales.

Analyses presented in the paper are limited to four products and restricted to the specific, Polish market. However, because of the common European registration, patent and data protection laws identified trends are very likely applicable on other European markets. Broadening the scope of the research would give more light to an interesting issue of the generic segment of the pesticide industry and behavior of firms that operate in this industry.

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SCIENTIFIC PAPER

OFF-FARM PARTICIPATION AND TECHNICAL EFFICIENCY AMONG SMALLHOLDER FARMERS IN THE NORTHERN REGION, GHANA

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Abstract: *The study aimed at investigating the effects of off-farm participation on technical efficiency of maize production in the Tolon district of the Northern Region, Ghana. The Logit regression model was used to analyze the determinants of off-farm participation while the stochastic frontier production function was used to model the determinants of maize output and technical efficiency. The empirical results from the logistic regression model indicate that age of farmer, educational attainment, farming experience, farm size, and previous farm income are significant drivers of farmers' participation in off-farm activities. Farmers' average technical efficiency level was 90.7% suggesting a 9.3% potential loss to inefficiency. Moreover, participation in off-farm activities had a negative influence on farmers' technical efficiency level. The study, therefore, recommends that farm-level policy should be directed towards making the agricultural sector attractive by promoting investment and agricultural employment opportunities in the rural areas so as to ensure full commitment to farming activities.*

Keywords: *Logit model; Northern Ghana; Off-farm participation; stochastic frontier model; Technical efficiency;*
(JEL code: *Q22*)

INTRODUCTION

Maize production in Ghana has seen significant improvements with an average production of 1.4 million metric tonnes over the period 2005 – 2010 (Ministry of Food and Agriculture, Ghana [MOFA], 2011). Such an impressive performance could partially be attributed to factors such as favourable rainfall pattern, the introduction of subsidy, high food prices which could have stimulated domestic prices over the period 2008 – 2010. Nevertheless, the actual yields observed fall short of the potential yield in the maize industry. The observed yield of about 1.9mt/ha is about 70% less than its potential yield of about 6mt/ha (MOFA, 2013). Thus, the impressive performance of the maize sub-sector was driven by land expansion rather than increase in yield. The lower yields have been partially attributed to poor soil fertility, erratic rainfall pattern, the use of traditional farming practices, low-yielding varieties and inappropriate control of weeds as well as inadequate capital to purchase inputs. However, a major hindrance to the adoption of most of these productivity-enhancing inputs has been the lack of liquid capital to finance the acquisitions of the inputs (Byerlee et al. 2005).

One of the most significant challenges facing agricultural production in developing countries like Ghana has been the need to raise farm incomes through increased agricultural productivity. Many farm households often resort to alternative means like off-farm activities to deal with the challenges of income variability. Off-farm activities have therefore become an essential component of livelihood strategies of many rural households in Ghana. One of the reasons for farmers' engagement in this income diversification is to guide against agricultural production and market risks (Ellis et al. 2004). Thus, when farm business becomes less profitable, farm households are likely to be pushed into off-farm business leading to *"distress push"* income diversification. On the other hand, households get into off-farm activities when return to off-farm employment is greater and less risky than agricultural employment, leading to *"demand pull"* diversification.

Moreover, off-income opportunities have been identified as an important strategy for overcoming credit constraints faced by farmers in most rural areas of many developing countries (Readon et al. 2007). However, many pieces of literature on the linkage between off-farm income and agricultural production have presented mix conclusions. One

strand of literature (Babatunde and Qaim 2010) argues that off-farm income may help to increase agricultural production, serve as collateral to credit accessibility and could even be used as a substitute for borrowed capital in rural economies with imperfect credit markets. However, another school of thought argues that off-farm income may undermine farmers' adoption of modern technologies (especially labour-intensive technologies) by reducing the amount of household labour allocated to farming activities (Godwin and Mishra 2004; Mcnally, 2002). The study, therefore, seeks to investigate the effects of off-farm participation on crop productivity and technical efficiency using maize farmers in the Tolon District of the Northern Region of Ghana as a case study.

There is a paucity of knowledge in African agricultural economics literature on off-farm income and its effect on productivity and technical efficiency. In-depth knowledge in this regard could help policy planners develop better strategies relative to farm development programmes. In the Northern Region of Ghana, production, and marketing of crop serves as a source of livelihood for many people. Therefore, any study that aims to inform policy planners on ways to increase maize yield will go a long way to better the lives of the rural farm households. The remainder of this paper has been organized into four sections. Section one provides both theoretical and empirical literature review. The methodology is presented in the next section. In section three, we discuss the empirical results from the study. The final part of the paper ends with conclusions and recommendations for policy and future studies.

METHODOLOGY

The study area, sampling technique and data type

The study was carried out in the Tolon district in the Northern region of Ghana. The district lies between latitude 90-201 degrees North and longitude 10-50 degrees west. The district is in the guinea savannah zone with a single rainfall season. Annual rainfall is about 100 mm with temperature ranging from 17- 40 degrees in a year (Tolon District Agriculture Profile, 2013). The district has a total population of 22,990 with farming as their primary occupation. A multi-stage sampling technique was employed in the study. At the first stage, random sampling was used to select eight communities from the district. Secondly, fifteen respondents stratified into off-farm income earners and non-off-farm income earners were selected from each community giving a total sample size of one-hundred and twenty (120). Semi-structured questionnaires were used to collect primary data from the respondents serving as the unit of analysis.

Conceptual framework and estimation technique

In this study, we employed the framework of individual time allocation proposed by Huffman (1991), where farm households allocate their time to various activities including off-farm businesses. According to this model, a person is assumed to maximize his/her utility (U) given the consumption of goods (Y) and leisure (L) such that, $U_i = U(Y, L)$ and this utility is maximized subject to time, budget, production, and non-negativity constraints. The time constraint is given as, $T = l_f + l_{of} + L$, where l_f, l_{of} and L represent time allocated to farm work, off-farm work, and leisure, respectively. Further, the budget constraint on household cash income is expressed as,

$$PY = p_1 q_1 + w_1 l_f + w_2 l_{of} + I \qquad (1)$$

where P denotes the price of consumption of goods purchased at the market, p_1 and q_1 are respectively the price and quantity of output produced annually, w_1 and w_1 are labour wages attributed to farm and off-farm work and I represent non-labour income. The return to labour from the first order condition can be obtained as, $(\partial U/\partial l)/(\partial U/(\partial Y))$.

The labour supply function with respect to time allocation to farm work and off-farm work can be expressed as;

$$l_f = l_f(w_1, w_2, p_1, p_2, X) \qquad (2)$$

$$l_{of} = l_{of}(w_1, w_2, p_1, p_2, I, X) \qquad (3)$$

omic and other non-socioeconomic characteristics influencing their reservation and off-farm wages. Huffman (1991) observed that an individual farmer will engage in off-farm activity if the potential market wage (w_i^m) is greater than the reservation wage (w_i^r).

Thus, $l_i = 1, \; if \; w_i^m > w_i^r$ and $l_i = 0 \; if \; w_i^m \leq w_i^r$.

Nevertheless, this differential wage rate cannot be observed by the researcher. What can be observed is the farmer's decision to participate in an off-farm business which can be expressed as an index function with unobserved variables shown in equation (4).

$$l_i^* = \beta X^{/} + \varepsilon_i$$

$$l_i = 1 \, if \, l_i^* > 0 \qquad (4)$$

$$l_i = 0 \, if \, l_i^* \leq 0$$

where ε represents the disturbance term.

The study employed three approaches to estimate the effect of off-farm income participation on technical efficiency. First, farmers' engagement in off-farm businesses as a choice variable was modelled. Secondly, we corrected for the endogeneity of off-farm participation by predicting its probabilities. In step three, we used the predicted probabilities as a regressor in the technical inefficiency model; after which a single stochastic frontier was estimated. The coefficient of the off-farm participation variable was used to assess the effect of farmers' engagement in off-farm activities on technical efficiency. Asante et al. (2014) applied the same technique to estimate the effect of yam minisett technology on technical efficiency of yam farmers in the forest-savannah

transition zone of Ghana. The mean difference in technical efficiency between participants and non-participants of off-farm economic activities as well as a likelihood ratio test were used to assess the technical efficiency effects of off-farm participation further.

Estimating off-farm work participation

In this study, a farmer is said to have engaged in off-farm work if, in addition to crop farming, he/she engages in any non-agricultural activity such as trading or salary work. This study adopted the logistic regression to model the determinants of off-farm business participation in the study area. The response variable (dependent) was binary; taking values of one (1) if a farmer was into an off-farm business and zero (0) otherwise. However, the independent variables were both discrete and continuous. According to Gujarati (2005), logistic regression is simple in terms of its calculation, and its probability lies between 0 and 1. Another advantage of using logit model is that its estimates are consistent, efficient, do not require normally distributed variables, and above all, they are flexible to compute and interpret. The probability that a farmer will engage in at least one off-farm business was postulated to be a function of some socio-economic, farm-specific and institutional factors. Hence, the cumulative logistic probability model can be econometrically specified as;

$$P_i(y_i = 1/x_i\beta_i) = 1 - e^{-x^1\beta}/(1 - e^{x^1\beta}) = e^{x^1\beta}/(1 + e^{x^1\beta}) \quad (5)$$

The binary model as a regression model is written as:

$$y_i = 1 - f(x_i\beta) + \varepsilon_i \quad (6)$$

where y_i is the dependent variable denoting farmers' participation in off-farm business and x_i is a vector of factors influencing such participation. ε_i is a residual representing the deviation of the binary from its conditional mean. The empirical logit model specified to analyse the determinants of off-farm participation of farmers in the study area can be expressed as;

$$A_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \varepsilon_i \quad (7)$$

where A_i is the probability of off-farm participation, X_1 denotes gender of the farmer, X_2 age of the farmer, X_3 the square of the age of the farmer, X_4 household size, X_5 educational level of the farmer, measured in years, X_6 cocoa farming experience, X_7 farm size, and X_8 value of farm output (farm income).

Estimating technical efficiency of maize farm households

Farm technical efficiency is the ability of a farmer to maximize output with a given quantity of inputs and a certain technology (output-oriented) or the ability to minimize input use with a given objective of output (input-oriented). However, the output-oriented technical efficiency is commonly used. Following the work of Aigner et al. (1977) and Meeusen and Van den Broeck (1977), the stochastic production function for a given farm can be specified as;

$$Q = f(X;\beta) + V_i - U_i \quad (8)$$

where Q, X, β are maize output in kilograms, vector of inputs and the estimated parameters, respectively.

V_i captures the stochastic effects outside the farmers' control, measurement errors and some statistical noise and U_i captures farmers' inefficiency effects. The possible production Q is bounded by the stochastic quantity, hence the name stochastic frontier. V_i is a random error, assumed to be independent and identically distributed as $N(\mu,\sigma^2)$,. U_i is non-negative technical inefficiency effect assumed to be independent among them and between the $V_i s$. U_i is defined by the truncation of the $N(\mu,\sigma^2)$ distribution where it is defined by socio-economic and farm-specific variables postulate to explain the variations in technical efficiencies. Technical efficiency of the i^{th} farm is the observed output Q^* to that of the corresponding frontier output Q. Thus;

$$TE = \frac{Q_i}{Q_i^*}, Q_i = f(X_i;\beta)\ ,\ TE = \exp(-U) \quad (9)$$

$$\textit{Technical inefficiency} = \textit{1-TE} \quad (10)$$

Q_1 is the observed output and Q_1^* is the unobserved frontier production level. This is such that $0 < TE < 1.$ The parameters of the stochastic production function frontier were estimated by the maximum likelihood function using STATA 13. The maximum likelihood estimates of the stochastic frontier model provide the estimates of β and the gamma, where (γ) the gamma explains the variation of the total output from the frontier output.

The gamma estimate is specified as, $\gamma = \frac{\sigma_u^2}{\sigma^2}$.

Where γ lies between zero and one $(0 \le \gamma \le 1)$, σ_u^2 is the variance of the error term associated with the inefficiency effect and σ^2 is the overall variation in the model specified as the sum of the variance associated with the inefficiency effect (σ_u^2) and that associated with random noise factors (σ_v^2). Thus, $\sigma^2 = \sigma_u^2 + \sigma_v^2$. The closer the value of the gamma is (γ) to one (1), the greater the deviation of the observed

output from the deterministic output which is because of inefficiency factors. However, if the value is close to zero, then the deviations result from random factors and if the value lies between one (1) and zero (0), then the deviations are as a result of both inefficiency and random factors.

Empirical model

The empirical model for the stochastic transcendental production function can be specified as;

$$\ln Q_i = \beta_0 + \sum_{j=1}^{5} \beta_j \ln X_{ji} + \frac{1}{2} \sum_{j\geq}^{5} \sum_{k=1}^{5} \beta_{jk} \ln X_{ji} \ln X_{ki} + V_i - U_i \quad (11)$$

where Q denotes the output of maize, X_i is a vector of inputs used in maize production which include family labour, hired labour, the quantity of fertilizer, herbicides, and farm size. β_j is the parameter to be estimated and ε_j is the error component. The translog functional form was selected for this study after a preliminary test that suggests it is more appropriate than the Cobb-Douglas functional form. The translog has an advantage over the Cobb-Douglas in that it does not place any restriction on the elasticity of production, hence its flexibility. Studies such as Adzawla et al. (2015); Mekonnena et al. (2015); Asante et al. (2014); among others have used the translog production function to estimate technical efficiencies in the Ghanaian agricultural crop sector.

Input elasticities and returns-to-scale

In estimating the elasticity of output with respect to inputs, the variables included in the translog stochastic frontier were mean-corrected by subtracting the mean of the variable from their individual values. The elasticities of mean maize output in the translog production frontier for different inputs are a function of some parameters and values of the inputs. According to Battese and Broca (1997), the elasticity of mean maize output with respect to some *jth* input can be expressed as follows;

$$\frac{\partial \ln E(Y_i)}{\partial \ln X_{ji}} = \left\{ \beta_j + \sum_{k=1}^{5} \beta_{jk} \text{ h } X_{ki} \right\} - C_i \left(\frac{\partial U_i}{\partial \text{h } X_{ji}} \right) \quad (12)$$

The first component of the right-hand side of the equation above is called the *elasticity of frontier output* with respect to the *jth* inputs in the model. The second component is referred to as *the elasticity of technical efficiency* with respect to input included in the model.

U_i is the inefficiency model;

$$C_i = 1 - \frac{1}{\sigma} \left\{ \frac{\phi\left(\frac{U_i}{\sigma} - \sigma\right)}{\varphi\left(\frac{U_i}{\sigma} - \sigma\right)} - \frac{\phi\left(\frac{U_i}{\sigma}\right)}{\varphi\left(\frac{U_i}{\sigma}\right)} \right\}; \quad (13)$$

where ϕ and φ represent density and distribution functions of the standard normal random variable, respectively. However, since none of the conventional inputs in the production function is also involved in the technical inefficiency model, elasticity of technical efficiency is expected to be zero. Return-to-scale (RTS) is expressed as the summation of the elasticities, thus;

$$RTS = \sum_{j=1}^{5} X_j \quad (14)$$

If *RTS* is greater than one (*RTS > 1*) it means there are increasing returns-to-scale, if it is equal to unity (*RTS = 1*) also implies constant returns-to-scale and if *RTS* is less than one (*RTS < 1*), there are decreasing returns- to-scale.

Specification of hypotheses

In estimating the stochastic maize production function, we performed three main null hypotheses to examine the appropriateness of the specified model used, the significance of exogenous variables in explaining inefficiency and the significant effects of off-farm activities on technical efficiency. The three null hypotheses are presented as follows;

$$H_0 : \beta_{jj} = \beta_{ji} = 0$$

The coefficients of the squared values and the interaction terms in the translog model sum up to zero

$$H_0 : \delta_0 = \delta_1 = ...\delta_{10} = 0$$

Exogenous factors are not responsible for the inefficiency term μ_i

$$H_0 : \beta_1 = 0$$

The probability of maize farmers' participation in off-farm activities has no significant effect on technical efficiency.

These hypotheses were tested by using the generalized likelihood-ratio test statistic specified as;

$$LR(\lambda) = -2\left[\{\ln L(H_0)\} - \{\ln L(H_1)\}\right] \quad (15)$$

where $L(H_0)$ and $L(H_1)$ are the likelihood functions under the null and the alternate hypotheses, respectively. If the given null hypothesis is true, then the test statistic (γ) has a chi-square distribution with a degree of freedom which is equal to the difference between the estimated parameters under (H_1) and (H_0).

However, if the null hypothesis involves $\gamma^1 = 0$, then the asymptotic distribution involves a mixed chi-square distribution (Coeli, 1995).

Estimating the effects of off-farm business on technical efficiency

To measure the effects of off-farm income on TE, we follow Asante et al. (2014) by predicting the probability of off-farm income after modelling off-farm participation as choice variable and estimated its determinants. The predicted probabilities of off-farm participation were then regressed together with other socioeconomics, farm-level and other institutional variables in the maize stochastic frontier inefficiency model. This approach was employed to correct for endogeneity in off-farm participation before inserting into the technical efficiency estimation. The technical inefficiency model can be express as;

$$U = \beta_0 + \beta_j \sum_{j=1}^{4} X_j + \alpha_i OFI_j + \varepsilon_j \quad (14)$$

where; X_1, X_2, X_3, and X_4 represent farmers' age, distance to farm, educational level, and farmers' experience, respectively. OFI_i denotes predicted off-farm income probabilities and ε represents the error term. We then estimate a single stochastic frontier for off-farm beneficiaries and non-beneficiaries and the mean technical efficiency scores were used as a robustness check of the effects of off-farm income on technical efficiency.

RESULTS AND DISCUSSIONS

Determinants of off-farm activity participation

As indicated earlier, the logistic regression model was used to determine the factors influencing off-farm participation in the study area. From Table 1, the Pseudo R^2 value of 0.7369 implies that 73.69% of the variation in the probability of engaging in off-farm activities was explained by the factors included in the model. The results of the logistic regression analysis shown in the Table demonstrate that age, age squared, the number of years in formal education, the number of years in maize farming, land size allocated to maize production, and the previous output of maize exert significant effects on off-farm participation. The coefficient of age and the age squared of the household head exert significant positive effects at 5% significant level on off-farm employment. This could partially be attributed to the fact that advancement in age reduces the physical energy for rigorous farming activities especially in Ghana where farming involves the use of man-power. The significant positive effect of the age of farmers is contrary to the study by Demissie and Legesse (2013) on rural households in Ethiopia who reported a negative and significant effect on off-farm participation. Similarly, farmers with longer years of experience in maize farming allocate part of their time to off-farm activities as indicated by the 10% significance level of farm experience variable. Educational attainment has a positive and significant effect on off-farm participation at 5% significant level which is in line with our *a priori* expectation. Higher educational achievement of rural household makes them more reluctant to participate in farming activities because a greater standard of education presents them with better opportunities elsewhere. These results support the findings of Owusu et al. (2011) and McCarthy and Sun (2009) in rural Northern Ghana.

Table 1: Estimates of the logistic regression model

Variable	Coefficient	Standard Error	P-values
Gender	0.41362	0.63643	0.566
Age of the farmer	0.25872	0.15399	0.023**
Age of the farmer squared	1.01860	0.00798	0.019**
Farm experience	1.49720	0.31987	0.059*
Educational attainment	0.58969	0.13836	0.024**
Farm labour	1.10826	0.12438	0.360
Farmer-based organization	0.98765	1.26889	0.992
Farm size	2.83553	0.86750	0.001***
Previous year's output	0.46192	0.09413	0.000***
Constant	3.21E+10	3.23E+11	0.016
Sample size	120		
Pseudo R2	0.7369		

******, **, * represent 1%, 5% and 10% significance level respectively.***

The coefficient of farm size exerts a significant positive effect at 1% level of significance. This result is contrary to the theoretical expectation that increase in farm size encourages farmers to increase output and income and consequently discourages off-farm participation. However, it is in line with the report documented by Nasir (2014) who used ordered probit regression model to determine factors contributing to off-farm participation in Ethiopia. The negative effect of farm size on off-farm participation, however, is reported by Babatunde et al. (2010). This outcome could partly be attributed to the fact that farmers with larger farm sizes get more crop income to diversify into other income generating activities to serve as an insurance against crop failure. Furthermore, the value of previous maize output had a positive and significant effect on off-farm participation. Higher output translates into higher income which may push the farmer into other off-farm income generating activities as a source of insurance against agricultural production and marketing risk. However, higher farm income from the previous season means the household may not need to go into off-farm activities. The positive effect of previous output on off-farm participation is consistent with the findings of Tasie et al. (2012).

Empirical estimation of the stochastic frontier model Results of hypotheses tests

Table 2 presents the results of the hypotheses tests. The test statistic of the functional form with its corresponding *P-value* shows that the decision to use Cobb-Douglas functional form was rejected in favour of the translog frontier function. The result of this hypothesis suggests that the translog specification was a more accurate representation of the data, given the frontier assumptions. The second hypothesis test indicated that the socio-economic variables in the inefficiency model do not explain the variation in the inefficiency term (u_i).

Table 2: Test of null hypotheses in the stochastic production for maize farmers

Hypotheses	Test statistic	P-value	Decision rule
Functional form test	29	0.00	Reject H_0: Translog is appropriate
Inefficiency effects are stochastic	15.89	0.00	Reject H_0: Presence of inefficiency
			Reject H_0: Off-farm activities exert
Effects of off-farm activities	13.64	0.00	significant effect

This hypothesis was also rejected in favour of the fact that at least one of the socio-economic variables included in the inefficiency model determine the inefficiency term (u_i). The final hypothesis states that the probability of maize farm households participating in off-farm activities has no influence on farm technical efficiency level. This null hypothesis was also rejected in favour of the alternate that engagement in off-farm activities explains the variation in farmers' technical efficiency levels.

The Determinants of maize output

The results of the maximum likelihood estimation of the stochastic frontier model are presented in Table 3. The values of the explanatory variables included in the transcendental production frontier were mean-corrected so that their averages were zero. The mean correction was to allow the first-order coefficient of the explanatory variables to be inferred as the output elasticities. Moreover, while the squared variables in the translog model show the effect of continuous use of that variable on maize production, the interaction terms indicate a complementarity or substitutability of the inputs employed on the maize farm. A significant positive coefficient of interaction term means the two factors are complements while a significant negative term means the two factors are substitutes.

Table 3: Maximum-likelihood estimates for parameters of the translog stochastic frontier production function for maize farmers in the study area

Variable	Parameter	Coefficient	Standard error
constant	β_0	0.89836[a]	0.02809
Farm Size	β_1	0.20159[b]	0.08226
Fertilizer	β_2	0.57994[a]	0.08452
Herbicides	β_3	-0.02807	0.06628
Family Labour	β_4	0.50076[a]	0.18724
Hired Labour	β_5	-0.59523[a]	0.20937
(Farm size)(Farm size)	β_{11}	0.63204[b]	0.3066
(Fertilizer)(Fertilizer)	β_{22}	0.3575	0.25121
(Herbicides)(Herbicides)	β_{33}	0.29482	0.25434
(Family Labour)(Family Labour)	β_{44}	0.38169	1.18252
(Hired Labour)(Hired Labour)	β_{55}	2.04394	1.46284
(Farm Size)(Fertilizer)	β_{12}	-0.92384[c]	0.50185
(Farm size)(Herbicides)	β_{13}	-0.73417[b]	0.35628
(Farm size)(Farm labour)	β_{14}	1.31132	0.923687
(Farm size)(Hired Labour)	β_{15}	-1.46426	1.05721
(Fertilizer)(Herbicides)	β_{23}	0.34132	0.40526
(Fertilizer)(Family Labour)	β_{24}	0.38794	0.82404
(Fertilizer)(Hired Labour)	β_{25}	0.01152	0.82571
(Herbicides)(Family Labour)	β_{34}	0.2697	0.69997
(Herbicides)(Hired Labour)	β_{35}	0.00413	0.99839
(Family Labour) (Hired Labour)	β_{45}	-2.326	2.50693
Sigma Squared	σ^2	0.027	
lambda	λ	0.128	

a, b and c denote 1%, 5%, and 10% level of significance.

A significant positive coefficient of interaction term means the two factors are complements while a significant negative term means the two factors are substitutes.

The results indicate that farm size, the quantity of fertilizer and family labour exert positive and significant effects on the maize output. The positive effects of farm size and fertilizer are in line with the findings from a similar study by Ogundari (2013). The quantity of hired labour exerts a significant negative effect on output, indicating that larger amounts of hired labour reduce the level of maize production. That is, to say, a high cost of labour reduces the amount that a farmer wishes to retain for his or her farming activities which will consequently reduce the expected quantity of

output. Moreover, "farm size squared" was positive and statistically significant at 5% indicating that the continuous use of land increases output, all other things being equal. However, the interactions terms between "farm size and fertilizer" and "farm size and herbicides" were negative and statistically significant at 10% and 5%, respectively indicating substitutability of the inputs, meaning that to increase output if farm size is increased, then fertilizer or herbicides application must be reduced.

Input elasticities

Computing the input elasticity was important to determine the level of responsiveness of the various inputs to the mean output of maize. The estimated elasticities from the translog production function of mean maize output with respect to the inputs are reported in Table 4. The table indicates that farm size, the quantity of fertilizer, the quantity of herbicides, the supply of family labour and hired labour at their mean values were; 0.202, 0.580, -0.028, 0.501, and -0.595, respectively. The results suggest that, if land allocated to maize farming, with the right quantities of fertilizer and family labour were to be individually increased by 100%, then the mean output of maize is estimated to increase by 20%, 58%, and 50%, respectively.

Table 4: Elasticities of the mean maize output in the translog production frontier

Variable	Coefficient	Standard error
Farm size	0.20159	0.08226
Fertilizer	0.57994	0.08452
Herbicides	-0.02807	0.06628
Family labour	0.50076	0.18724
Hired labour	-0.59523	0.20937
Return-to-scale	0.659	

On the other hand, if the required quantities of herbicides and hired labour employed were to be individually increased by 100%, then the mean output of maize is estimated to decrease by about 2% and 60%, respectively. The expected decline in output as a result of an increase in hired labour and herbicides could partially be attributed to high cost of herbicides and labour in the study area. Moreover, the estimated returns-to-scale was 0.659 implying that maize production in the study area exhibited decreasing returns-to- scale. The decreasing returns-to-scale means that when all inputs included in the model are increased by 100%, the mean output of maize is estimated to increase by 65.9%. Thus, the proportionate increase in the input levels results in a less than proportional increase in output. This outcome may partly be attributed to poor management and agronomic practices. Similar findings were obtained by Ogundari (2013) and Solis et al. (2009).

Effects of off-farm participation on technical efficiency

In this study, the effects of farm households' participation in off-farm activities on technical efficiency were estimated by including the predicted, rather than the actual values of off-farm participation as an additional regressor in the technical inefficiency model. Table 5 provides the empirical results of the estimates of the determinants of technical efficiency. The Table reveals that the predicted technical efficiency varies considerably ranging from 31.5% to 99.8% with an average technical efficiency of approximately 90.7%, indicating that less than 10% of output is lost through inefficiency. This result could be ascribed to farmers' scale of operations and mismanagement of farming practices, among others. However, the average technical efficiency score of 90.7% obtained in the study is high compared to other studies. Fasasi (2007), Harmozia et al. (2012), Begum et al. (2016), and Awonyinka et al. (2009) reported an average technical efficiency score of 70%, 67%, 65%, and 52%, respectively.

Table 5: Determinants of technical inefficiency of maize farmers in Ghana

Variable	Coefficient	Standard error	P-value
Predicted off-farm income scores	6.23660	2.49160	0.012**
Educational attainment	-0.27445	0.1316	0.037**
Age of farmer	-15.4795	5.27597	0.003***
Distance to farm	6.65131	2.66041	0.012**
FBO membership	-0.0709	0.64593	0.913
Minimum TE	0.315		
Mean TE	0.907		
Maximum TE	0.998		

****** and ** denote significance level at 1% and 5%, respectively.***

Table 6: Mean technical efficiencies of participants and non-participants of off-farm income activities.

Parameter	Observation	Mean	Standard error
Participants of off-farm income	59	0.671	0.0283
Non-participants of off-farm income	61	0.867	0.02284
Mean difference		- 0.415	0.0338***

****** represent significant at 1% level***

The results also show that off-farm participation had a positive and significant effect on technical inefficiency. That is, the participation in off-farm activities reduces the technical efficiency levels of farmers. This result conforms to the results in Table 6 indicating that the estimated mean technical efficiency among the sub-sample of off-farm income participants and non-participants are 67.14% and 86.73%, respectively. Thus, engagement in off-farm income by maize farmers in the study area reduces their technical efficiency

level by about 20%. The loss of productivity gains resulting from participation in off-farm income may be due to a reduction in quality of time allocated to farm management. Similarly, Diiro (2012) reported a negative influence of off-farm income participation on technical efficiency of maize production in Uganda. The result also agrees with the one obtained by Addai et al. (2014) who found that off-farm income has a positive correlation with the technical inefficiency of farmers. However, it contradicts the results of the study by Shittu (2014) who reported a significant positive effect of off-farm labour supply on technical efficiency of rural farm households in South-west Nigeria.

However, educational attainment and age of the farmer positively and significantly affect the technical efficiency of maize production in the study area. That is, farmers' level of education and age tend to increase their technical efficiency level. Education enhances farmer's ability to acquire technical knowledge, which consequently pushes them closer to the frontier output. The positive influence of age suggests that older farmers are more technically efficient than younger farmers. This may be due to farming experience and excellent managerial skills, which older farmers have acquired over time. The positive estimated coefficient of the variable 'distance to farm' suggests that farmers who have to walk a long distance to their farms might be tired before they start work, after walking for a long time. Again, walking for a long time also means that quality time for work on the farm is reduced which further reduces the level of efficiency. This may further reduce the amount of quality time allocated to farming activities at a given time, hence, reduces farmers' level of technical efficiency.

CONCLUSIONS

The study had identified the determinants of off-farm participation and its effects on the technical efficiency of maize production in the Tolon district of the northern region, Ghana. The main finding that farmers with no off-farm participation were more technically efficient than farmers with off-farm participation suggests that engagement in off-farm economic activities may undermine maize productivity gains. This is because off-farm opportunities are in competition with farm activities from the same household labour and other resources. Thus, farm-level policy measures directed towards making the agricultural sector attractive by promoting investment and employment opportunities in the rural areas so as to boost farmers commitment to farming activities is highly recommended. This may make farmers allocate more time to their farm management thereby increasing productivity levels. Moreover, to help policy makers introduce better target agricultural systems; there is a need for better understanding of what determines the participation of off-farm income and its effects on productivity. The study, therefore, recommends that research of such nature should be replicated in other areas of the country to get more knowledge about the issue of off-farm income and agricultural productivity.

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SCIENTIFIC PAPER

INTERIOR POINT ALGORITHM FOR SOLVING FARM RESOURCE ALLOCATION PROBLEM

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Abstract: *This paper introduces interior point algorithm as an alternative approach to simplex algorithm for solving farm resource allocation problem. The empirical result of interior point algorithm is compared with that of the simplex algorithm. It goes further to address a profit maximization problem. The result revealed several relevant patterns. Results of the interior point algorithm is similar to that of the simplex algorithm. Findings indicated that in both algorithms, the farm is to produce peppers, wheat which is irrigated and weeded manually, hire additional month of labour, and also purchase urea and muriate fertilizer to realize a similar amount of profit. Additionally, both algorithms suggested that practicing crop rotation where beans, if grown, should be altered with wheat cannot be possible since no beans will be grown. The Simplex algorithm saves 39 iterations over Interior Point algorithm in solving the farm resource allocation problem. The findings demonstrate that the interior point algorithm offers a useful alternative to the simplex algorithm when addressing farm resource allocation problem.*

Keywords: *Linear Programming, Simplex Algorithm, Interior Point Algorithm, Farm Resource Allocation*
(JEL code: *D24, D57, C61, C63, C67*)

INTRODUCTION

Farm resource allocation has been given considerable attention in the literature. Numerous authors have addressed the issue of farm resource allocation using linear programming technique. Specifically, most of these studies employ the simplex algorithm in addressing the farm resource allocation problem. For example, Majeke and Majeke (2010) applied linear programming technique to address the farm resource allocation problem among small-scale commercial farmers in Zimbabwe. Majeke (2013) applied linear programming technique to address optimum combination of crop farm enterprises of small-scale farm in Marondera, Zimbabwe. Also, Majeke, Majeke, Mufandaedza and Shoko (2013) modelled a small farm livelihood system using linear programming in Bindura, Zimbabwe. Moreover, Wankhade and Lunge (2012) applied linear programming to address allocation of agricultural land to the major crops of Saline track. The concept of farm resource allocation is highly relevant to farmers. Knowing the optimal resource mix can lead to increase crop productivity, increased purchasing power, increase farm income, maximise consumer surplus and subsequently decrease food insecurity. The fundamental question this paper seeks to answer is whether there is an alternative programming technique for farm resource allocation whose performance is similar to the simplex method. Having alternative programming technique is extremely relevant to researchers because it will provide a means of validating the results of the simplex programming technique.

GAP

Although numerous studies have examined farm resource allocation problem using the simplex algorithm, an alternative approach to addressing the problem, namely the interior point algorithm have remained relatively understudied. Though the interior point algorithm developed by Karmarkar (1984) offers an alternative approach to solving the farm resource allocation problem, very little work has been done with regard to its application to the farm resource allocation problem. Tomlin (1989) notes that interest in the empirical applications of interior point method is arouse by claims that it improves upon the performance of the Simplex method. Similarly, Hoffman et al (1953) notes that there are competing methods

to the Simplex method. A fundamental research question which remains unaddressed with regard to the farm resource allocation problem is that can alternative approaches such as the interior point algorithm be used to validate the results of the Simplex method? Additionally, can the interior point method improve upon the performance of the Simplex method when it is applied to solve the farm resource allocation problem? In order to address these issues, this paper compares the estimation results of the Simplex and Interior Point algorithm to demonstrate their usefulness in solving the farm resource allocation problem.

MATERIALS AND METHODS

Linear Programming (LP)

Linear programming is a special case of mathematical programming. When the mathematical representation uses linear functions exclusively, (that is, both the objective function and the constraints are all in a linear form), we have a linear programming model. Mathematically, it is of the form:

Optimise (maximise or minimise):

$$z - c_1x_1 + c_2x_2 + ... + c_nx_n = 0$$

Subject to structural constraints:

$$a_{11}x_1 + a_{12}x_2 + ... + a_{1n}x_n (\geq)(\leq) b_1$$

$$a_{21}x_1 + a_{22}x_2 + ... + a_{2n}x_n (\geq)(\leq) b_2$$

$$\vdots \quad \vdots \quad \vdots \quad \vdots \quad \vdots$$

$$a_{m1}x_1 + a_{m2}x_2 + ... + a_{mn}x_n (\geq)(\leq) b_m$$

$$x_1, x_2, ...x_n \geq 0$$

In performing the simplex algorithm, the objective function $z = c_1x_1 + c_2x_2 + ... + c_nx_n$ is rewritten as $z - c_1x_1 - c_2x_2 - ... - c_nx_n = 0$. This is referred to as row 0.

Basic Assumptions of Linear Programming

Several assumptions underlie or are implicit in linear programming problems. They include:

1. Linearity: There exist linear relationships between the output of each product and the total quantity of each resource consumed.
2. Additivity: Activities contribution and consumption are additive.
3. Non-negativity: The values of the activities cannot be negative.
4. Proportionality: The level of activity is proportional to the contribution as well as consumption of resources.
5. Fixed external factors: This implies that the external environment is assumed not to vary.
6. Certainty: This presupposes that all values and quantities are known.
7. Single objective function: There can only be one objective in a particular problem, either to maximise profit or to minimise cost not both.

Components of a Linear Programming Problem

Below are the various components that make up an LP model:

1. Decision variables
2. Objective function
3. Constraints
4. Non-negativity constraints/sign restrictions

Simplex Algorithm

The Simplex algorithm is used to solve LP problems involving two or more decision variables. There are no theoretical restrictions placed on the number of decision variables or constraints in a linear problem. It utilizes the property of an LP problem of having an optimal solution only at the corner point of the feasible solution space. It systematically generates corner point solutions and evaluates them for optimality. It stops when an optimal solution is found. Steps involved in the simplex algorithm are as follows (Bronson and Naadimuthu, 1997):

Step 1: Convert the LP to standard form. In converting LP to standard form, we convert all inequality constraints to equality constraints. To convert a "≤" constraint to equality "=" constraint, we add a slack variable, and a "≥" constraint to equality constraint we subtract a surplus (excess) variable. Slack variables are the fictitious variables which indicate how much of a particular resource remains unused in any solution and surplus (excess) variables are the fictitious variables which indicate additional amount of a particular resource needed in any solution.

Step 2: Obtain a basic feasible solution (BFS) (if possible) from the standard form. Notably, a basic variable (BV) refers to variables having positive values in a basic feasible solution; this variable has a coefficient of 1 in only one of the constraints and zero in the row 0 and remaining constraints, and non-basic variable (NBV) also refers to variables which are set equal to zero, so as to define a corner point.

Step 3: Determine whether the current BFS is optimal.

Step 4: If the current BFS is not optimal, then, determine which NBV should become a BV and which BV should become a NBV to find a new BFS with a better objective function value. This is done by determining the entering variable and the outgoing variable. An entering variable is a variable we choose to find new BV from a current basic feasible solution that is not optimal. We choose the entering variable (in a maximization problem) to be the non-basic variable with the most negative coefficient in row 0 (ties may be broken in an arbitrary fashion). Similarly, we choose the entering variable (in a minimization problem) to be the non-basic variable with the most non-negative (positive) coefficient in row 0 (ties may be broken in an arbitrary fashion). Outgoing variable refers to the variable with the smallest non-negative ratio (to find the ratios, divide the right hand side of the constraint by the

coefficient of the entering variable, wherever possible). It is also called the pivot term/element. The constraint with the smallest ratio wins the ratio test.

Step 5: Use the Elementary Row Operations (EROs) to find the new BFS with the better objective function value. Repeat step 3 through step 5 until an optimal solution is found.

Interior Point Algorithm

Interior point algorithms (also referred to as barrier algorithms) are a certain class of algorithms that solves linear and nonlinear convex optimization problems. An interior point method is a linear or nonlinear programming method (Forsgren et al. 2002) that achieves optimization by going through the middle of the solid defined by the problem rather than around its surface. Current efficient implementations are mostly based on a predictor-corrector technique (Mehrotra, 1992), where the Cholesky decomposition of the normal equation or LDL^T factorization of the symmetric indefinite system augmented system is used to perform Newton's method (together with some heuristics to estimate the penalty parameter). All current interior point methods implementations rely heavily on very efficient code for factoring sparse symmetric matrices. The simplex algorithm of linear programming finds the optimal solution by starting at the origin and moving along adjacent corner points of the feasible region. Narendra Karmarkar in 1984 introduced the Karmarkar's algorithm for solving linear programming problems that reaches a best solution by traversing the interior of the feasible region.

Consider a Linear Programming problem in matrix form:

$$\begin{aligned} \text{Minimize:} \quad & z = C^T X \\ \text{Subject to:} \quad & AX = 0 \\ & 1X = 1 \\ & X \geq 0 \end{aligned}$$

where X is a column vector of size n; C is an integer column vector of size n; $\mathbf{1}$ is a unit row vector of size n; A is an integer matrix of size $(m \times n)$; $n \geq 2$.

In addition, assume the following two conditions:

1. $X_0 = (1/n, \ldots, 1/n)$ is a feasible solution.
2. Minimum $z = 0$

Steps involved in using Karmarkar's algorithm as simplified by Bronson and Naadimuthu (1997) as outlined below:

Preliminary Step:

$$k = 0$$

$$X_0 = \left(1/n, \ldots, 1/n\right)^T$$

$$r = 1/\sqrt{n(n-1)}$$

$$\alpha = (n-1)/3n$$

Iteration k:

a. Define the following:

i. $Y_0 = X_0$
ii. $D_k = diag\{X_k\}$, which is the diagonal matrix whose diagonal consists of the elements of .
iii. $P = \begin{pmatrix} AD_k \\ \mathbf{1} \end{pmatrix}$
iv. $\bar{C} = C^T D_k$

b. Compute the following:

i. $C_P = \left[I - P^T (PP^T)^{-1} P\right] \bar{C}^T$
Note: If $C_P = 0$, any feasible solution becomes an optimal solution. Stop.
ii. $Y_{new} = Y_0 - \alpha r \frac{C_P}{\|C_P\|}$
iii. $X_{k+1} = (D_k Y_{new})/(\mathbf{1} D_k Y_{new})$
iv. $z = C^T X_{k+1}$
v. $k = k + 1$
vi. Repeat iteration k until the objective function (z) value is less than a prescribed tolerance ϵ.

Repeat iteration k until the objective function (z) value is less than a prescribed tolerance .

Linear Programming Formulation

A farmer who grows beans, peppers and wheat on his plots wishes to find the combination of crops that maximizes his total profit. The gross profit per hectare of beans is \$1800, \$2300 for peppers and \$1500 for wheat. He has 10 hectares of land and \$1200 of capital. He and the members of his family are able to spend 16.5 months on farming activities. Additionally, he can use his mules for 11 months. The labour requirements per hectare of beans, peppers, and wheat are 1.87, 2.64, and 1.42 respectively. Mules and capital requirements per hectare of beans, peppers, and wheat are 1.27, 1.45, 1.25 and \$100, \$220, \$12 respectively. The farmer can choose between weeding his wheat by hand (weeding manually) or by application of weedicide. The use of weedicide reduces the total labour requirement per hectare from 1.42 to 0.98 months, but increases the total capital requirement from \$12 to \$52. The farm has 3 hectares of irrigated land and 7 hectares of rain fed land. Wheat can be grown on the irrigated land, and reaches a gross profit of \$1700 under irrigated conditions. The farmer has the option of hiring additional labour at a monthly wage of \$50. Moreover, a hectare of wheat grown on the farm requires 25kg of nitrogen and 10kg of potash. The available fertilizers are urea (46% nitrogen), compound fertilizer (16% nitrogen and 10% potash), and muriate of potash (30% potash). A kilogram of urea, compound fertilizer, and muriate of potash cost \$1.23, \$1.78, and \$0.89 respectively. The application of fertilizers increases the gross profit of wheat by \$200. The farmer adheres to crop rotation where beans, if grown, must be altered with wheat. The problem above is expressed in linear programming form as shown in Table 1.

Table 1: The Basic Model for the Problem Above

Activities	Beans (ha)	Peppers (ha)	Irrigated Wheat Weeded Manually (ha)	Rain Fed Wheat Weeded Manually (ha)	Irrigated Wheat Weeded by Weedicide (ha)	Rain Fed Wheat Weeded by Weedicide (ha)	Hire Labour (months)	Buy Urea (kg)	Buy Compound (kg)	Buy Muriate (kg)		
Objective Values, Max	1800	2300	1900	1700	1900	1700	-50	-1.23	-1.78	-0.89		
Constraints											Inequality	Capacity
Rotation requirement (ha)	1	0	-1	-1	-1	-1	0	0	0	0	≤	0
Dry land (ha)	1	1	0	1	0	1	0	0	0	0	≤	7
Irrigated land (ha)	0	0	1	0	1	0	0	0	0	0	≤	3
Labour (months)	1.87	2.64	1.42	1.42	0.98	0.98	-1	0	0	0	≤	16.5
Nitrogen (kg)	0	0	25	25	25	25	0	-0.46	-0.16	0	≤	0
Potash (kg)	0	0	10	10	10	10	0	0	-0.10	-0.30	≤	0
Mules (months)	1.27	1.45	1.25	1.25	1.25	1.25	0	0	0	0	≤	11
Capital ($)	100	220	12	12	52	52	0	0	0	0	≤	1200

RESULTS AND DISCUSSION

The results from the Simplex algorithm to the farmer's problem presented in Table 2 reveal that the strategies for this farm as specified in the model are to produce 5.31056 ha of peppers, 2.63975 ha of irrigated wheat to be weeded manually, no beans, no irrigated wheat weeded by weedicide and no rain fed wheat. In addition, the farm has to purchase 143.46476 kg of urea, 87.99172 kg of muriate, no compound fertilizer, and hire 1.26832 months of labour to realize a total profit of $16911.60. These results suggest that practicing crop rotation where beans, if grown, should be altered with wheat cannot be possible since no beans will be grown (Table 2).

Similarly, the results from the Interior point algorithm to the farmer's problem presented in Table 2 shows that the strategies for this farm as specified in the model are to produce 5.310190 ha of peppers, 2.639690 ha of irrigated wheat to be weeded manually, no beans, no irrigated wheat weeded by weedicide and no rain fed wheat. In addition, the farm has to purchase 143.4603 kg of urea, 87.98551 kg of muriate, no compound fertilizer, and hire 1.268401 months of labour to realize a total profit of $16910.66. This is consistent with the results from the simplex algorithm. Similarly, the results suggest that practicing crop rotation where beans, if grown, should be altered with wheat cannot be possible since no beans will be grown.

It has been observed that the Interior Point algorithm takes 45 iterations while the Simplex algorithm takes only 6 iterations to find an optimum solution to the problem. Thus Simplex algorithm saves 39 iterations over Interior Point algorithm while solving the problem (Table 2).

Table 2: The Optimal Solution to the Problem

	Simplex Algorithm	**Interior Point Algorithm**
Optimal Value	16911.60	16910.66
Activities		
Beans	0.00000	2.076755e-08
Peppers	5.31056	5.310190e+00
Irrigated Wheat Weeded Manually	2.63975	2.639690e+00
Rain Fed Wheat Weeded Manually	0.00000	3.762265e-09
Irrigated Wheat Weeded by Weedicide	0.00000	1.161979e-07
Rain Fed Wheat Weeded by Weedicide	0.00000	2.490331e-09
Hire Labour	1.26832	1.268401e+00
Buy Urea	143.46476	1.434603e+02
Buy Compound	0.00000	4.157138e-06
Buy Muriate	87.99172	8.798551e+01
Number of Iteration	6	45

These results establish the superiority of the simplex method over the interior point method in solving the farm resource allocation problem. This is consistent with Hoffman et al (1953) whose experiments established the superiority of the simplex method over its competitors. Similarly, Tomlin (1989) notes that the interior point method complements rather than duplicates or supersedes the efficiency of the simplex method on the problems it handles well.

Resource Utilization

As shown in Table 3 under the simplex algorithm, 5.31056 ha of dry land and 2.63975 ha of irrigated land are used up while 1.68944 ha and 0.36025 ha are unused respectively. All the months of labour, months of mule's labour and capital are utilised. Similarly, the results from the Interior point algorithm suggest that 5.31019 ha of dry land and 2.63969 ha of irrigated land are used up while 1.68981 ha and 0.36031 ha are unused respectively. All the months of labour, months of mule's labour and capital are utilised. This is consistent with the results from the simplex algorithm. If months of labour, months of mule's labour and capital could be increased, more land could be utilised, thus, increasing total profit.

Table 3: Resource Utilization

		Usage		Left Over	
Resources	Available	Simplex Algorithm	Interior Point Algorithm	Simplex Algorithm	Interior Point Algorithm
Dry land (ha)	7.00000	5.31056	5.31019	1.68944	1.68981
Irrigated land (ha)	3.00000	2.63975	2.63969	0.36025	0.36031
Labour (months)	16.50000	16.50000	16.50000	0.00000	0.00000
Mules (months)	11.00000	11.00000	11.00000	0.00000	0.00000
Capital ($)	1200.00000	1200.00000	1200.00000	0.00000	0.00000

CONCLUSION

This paper proposes the interior point method as an alternative to the simplex method for solving the farm resource allocation problem. A comparison of the results from the interior point method and simplex method indicate that the estimates obtained in the alternative methods are similar.

On the basis of the interior point method and simplex algorithm the farm is to produce peppers, wheat which is irrigated and weeded manually, hire additional month of labour, and also purchase urea and muriate fertilizer to realize a similar amount of profit. Furthermore, both algorithms suggested that practicing crop rotation where beans, if grown, should be altered with wheat cannot be possible since no beans will be grown. In summary, this paper has demonstrated that the interior point method offers an alternative and a useful approach to solving farm resource allocation problem.

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SCIENTIFIC PAPER

CONSUMER WILLINGNESS TO PAY A PREMIUM FOR A FUNCTIONAL FOOD IN GHANA

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Abstract: *Interest in functional foods has been growing in sub-Saharan Africa due to consumer concerns with diet and nutrition. This paper analyses consumer awareness, perceptions and effects of the determinants of consumer willingness to pay (WTP) a premium for Moringa bread in Ghana. An ordered probit model is employed. The empirical results indicate that consumer knowledge of the nutritional and health benefits of Moringa bread is what matters most to consumers in respect of their WTP a higher premium for the product. Consumers with knowledge on Moringa products are more willing to pay above 50% price premiums for Moringa bread. Fruitful policy recommendations are made in the paper.*

Keywords: *Functional foods; Ghana; Moringa bread; Ordered probit model; Willingness to pay*
(JEL code: *D12*)

INTRODUCTION

Interest in functional foods has been growing in Ghana and other parts of sub-Saharan Africa due to consumer concerns with diet and nutrition. Functional foods contain one or more added ingredients which provide positive health benefits over and above the functions of normal food products (Frewer et al. 2003; Doyon and Labrecque, 2008; Szathvary and Trestini, 2014). These added nutritional benefits could either be naturally occurring or added at the point of production (Traill, 2008; Markosyan et al. 2009; Lähteenmäki, 2013). The nutritional emphasis in the past on survival, hunger, and prevention of adverse effects is now being expanded to include the use of foods that promote the state of well-being and better health and which help to reduce the risk of diseases (Maynard, 2003; Niva and Makela, 2007). Increasingly, consumers are seeking for functional foods to control their own health and well-being (Frewer et al. 2003; Krystallis et al. 2008; Markosyan et al. 2009). Moreover, consumers with more information on food safety issues tend to shift their demand for food from "eating fully" to eating well" or "eating safely" resulting in consumer willingness to pay (WTP) for higher premiums for such foods (Liu et al. 2009; Berning et al. 2011; McCluskey et al. 2011). To sustain consumers' interest in nutritional and health benefits of foods, functional foods are being developed all over the world to specifically promote healthy lifestyle and to reduce the risks of diseases (Niva and Makela, 2007; Markosyan et al. 2009; Betoret et al. 2011).

Various types of functional food ingredients exist worldwide but products from the *Moringa oleifera* plant are the most abundant in developing countries. Materials from Moringa plant are sustainable and potent in fighting micronutrient malnutrition in developing countries (Aboagye et al. 2007). The World Health Organization (WHO) argued that *Moringa oleifera* is the most low cost health enhancer in the poorest countries around the world (WHO, 2002). *Moringa oleifera* thrives well in Ghana but the production and consumption of its products are still in the infant stages (Sauveur and Broin, 2010), leading to low patronage of Moringa products in Ghana. Policy makers, researchers, Moringa Associations, NGOs, and nutritional and health experts are making conscious efforts to promote the production and consumption of Moringa products in the country (Sauveur and Broin, 2010). It is argued that one possible ways through which functionality of food could be delivered to consumers is through bakery products (Krystallis et al. 2008; Sirò et al. 2008).

Functional foods are increasing in popularity for dairy products or confectionery sectors worldwide (Maynard, 2003; Alldrick, 2007; Sirò et al. 2008), but market information on functional bakery products is relatively very scanty in Ghana. Consumer studies that have examined consumer preferences for functional foods (Frewer et al. 2003; Markosyan, et al. 2009; Annunziata and Vecchio, 2011; Cranfield et al. 2011) did not consider the market for Moringa products. Most of the existing literature on Moringa products in Ghana (Aboagye et al. 2007; Oduro et al. 2008; Sauveur and Broin, 2010) and in Africa (McBurney et al. 2004; Rweyemamu, 2006**;** Moyo et al. 2011), focused mainly on the nutritional and health potency of Moringa leaves. Rigorous research on the awareness, perceptions and consumer preferences for Moringa products or consumer WTP a premium for Moringa bread in Ghana have not been adequately researched. Relevant policies on consumer preferences for functional foods would assist agribusiness firms to investment and improve upon their marketing strategies (Veeman, 2002; Annunziata and Vecchio, 2011). Notably, any agribusiness firm that wants to increase its chance of success in today's market cannot ignore consumer perceptions and attitudes toward functional foods (Sirò et al. 2008; Annunziata and Vecchio, 2011).

Given that consumers generally have positive attitudes toward functional foods (West et al., 2002), the understanding of factors which influence consumers' preferences and WTP for functional foods becomes relevant. Amongst these factors, consumer socio-economic characteristics such as age, gender, education, income level, the level of consumer awareness and perceptions, knowledge of the product, as well as product characteristics, including taste, nutrition and health have received attention in the empirical literature. Liu et al. (2009) found an inverted-U-shaped relationship between age and consumer WTP for additive free foods, indicating that WTP increases with age but decreases as age increases beyond a threshold age. Females in particular tend to pay higher premiums for safer foods (Liu et al, 2009). Consistent with these findings, Cranfield et al. (2011) reported that *females and older individuals have positive attitude towards functional foods and tend to consume foods with more functional ingredients in them*. Educated consumers are assumed to be knowledgeable on the importance of functional foods to the body in terms of dietary needs and improvement in health status (Markosyan et al. 2009). The level of consumer income may play a critical role in determining if the consumer would pay higher premiums for functional food products (Herath et al. 2008). Consumer WTP is expected to increase as income of the consumer increases (Teratanavat and Hooker, 2006; Liu et al. 2009) due to negative correlation between consumer WTP for food safety and marginal utility of money. In contrast, Stranieri et al. (2010) found a negative relationship between consumers' income and their nutritional claims, the possible reason been that the time pressure of high-income consumers tend to affect their information use on nutrition labels. This therefore makes the effect of income on consumer WTP inclusive in the empirical literature.

The perception of consumers about the healthiness of functional foods is the main factor which affects their attitudes toward them (Annunziata and Vecchio, 2011). The level of consumers' cognition of food safety therefore has a positive impact on the WTP for such healthy foods (Liu et al. 2009). Markosyan et al. (2009) indicate that consumers who have positive feeling about nutritionally enriched foods are more likely to pay higher premiums for them whilst those with negative perceptions are less likely to pay higher premiums for the functional foods. Cranfield et al. (2011) pointed out that if consumers are aware of the nutritional value of functional foods and know that the functional ingredients in them have direct link to their health, they will be willing to consume foods that are incorporated with functional ingredients.

The main objective of the present paper is to analyze consumer perceptions, attitudes and WTP a premium for Moringa bread in Ghana. The study contributes to the existing literature on consumer preferences for functional foods by providing an empirical analysis on consumer WTP a premium for Moringa bread. The paper is organized into five sections. Section 2 provides the material and methods. Section 3 presents the results of the study. Section 4 discusses the results. Section 5 provides conclusions and recommendations.

MATERIALS AND METHODS

Conceptual Framework

Willingness to pay (WTP) is the premium a consumer is willing to pay for non-marketed good or product which is not yet on the market. Different consumers have different WTP. It is therefore the distribution of WTP among the target population that offers interesting market information on the product. Generally, consumers are assumed to maximize their preferences or utilities for such non-market goods subject to their budget constraints (Hanemann and Kanninen, 1998). WTP for non-market product is not directly observable but its distribution and parameters, including the mean WTP in monetary terms could be estimated using a survey data (Lusk and Hudson, 2004) from a contingent valuation survey (Hanemann et al. 1991; Hanemann and Kanninen, 1998).

The present paper follows the double-bounded dichotomous choice (DBDC) framework proposed by Hanemann et al. (1991). The double-bounded approach has been used extensively to analyze consumer acceptance of functional foods (Li et al. 2003; Markosyan et al. 2009). The technique provides asymptotically more efficient estimates by incorporating adequate information on the consumer WTP (Hanemann et al. 1991). In terms of statistical efficiency, the double-bounded approach is better than the single-bounded approach. Also the double-bounded approach is simple, incentive compatible and provides tighter confidence intervals (Mitchell and Carson, 1989) than the single-bounded technique. Other studies have also employed the multiple-bounded and polychotomous choice methods that require limited information on the bids (Alberini et al. 2003) but they are often associated with design bias on the range of bids to use (Vossler et al. 2004).

Using the double-bounded dichotomous choice (DBDC)

framework in a contingent survey, the consumer is presented with two consecutive bids. The bids are presented in such a way that the second bid depends on the response to the first bid. If the consumer responded "YES" to the first bid (Λ_1), the second bid (Λ_2^H) is set higher, but if the response to the first bid was "NO", then the second bid (Λ_2^L) is set lower. The four possible outcomes from the proposed bids are "YES–YES"(Λ_2^H, ∞); "YES–NO" (Λ_1, Λ_2^H); "NO–YES" (Λ_2^L, Λ_1); and two consecutive "NO–NO" responses $(-\infty, \Lambda_2^L)$. In the present paper, the outcomes are collapsed into three WTP categories or latent constructs (Markosyan, et al. 2009) and the factors affecting consumers' WTP for each of the three categories are estimated jointly with the ordered probit model (Cranfield and Magnusson, 2003). The advantages of estimating the ordered probit model is to allow for the predicted probabilities of each WTP category and marginal effects to be computed (Cranfield and Magnusson, 2003). The three price premium categories investigated in the present paper are consumers' unwillingness to pay (UWTP) for any of the proposed price premiums for Moringa bread (i.e. WTP=0, representing respondents who responded "NO–NO" to the proposed bids), consumers' WTP for 1% – 50% price premiums for Moringa bread (i.e. WTP=1, representing respondents who responded "NO–YES" and "YES–NO"), and consumers' WTP for price premiums above 50% (i.e. WTP=2, representing respondents who responded "YES–YES").

The determinants of consumers' WTP for Moringa bread is examined using the ordered probit model specification:

$$\Re_i^* = \lambda' Z_i + \varepsilon_i \quad (1)$$

where $\Re_i^*$ is latent and a continuous measure of the WTP category of the consumer i, Z_i is a vector of explanatory variables, λ' is a vector of parameters to be estimated and ε_i is a random error term that assumes a standard normal distribution. Since $\Re_i^*$ is latent, we observe coded discrete responses of the variable $\Re_i$ as:

$$\Re = \begin{cases} 0 \text{ if } -\infty \le \Re_i^* < \Lambda_2^L & \text{(UWTP any price premium)} \\ 1 \text{ if } \Lambda_2^L \le \Re_i^* < \Lambda_2^H & \text{(WTP 1\% to 50\% price premium)} \\ 2 \text{ if } \Lambda_2^H < \Re_i^* \le \infty & \text{(WTP above 50\% price premium)} \end{cases}$$

(2)

The choice probabilities of the consumers' WTP for the jth categorized premium for Moringa bread is represented as:

$$\Pr(\Re = j) = \begin{cases} \Pr(\Re_i^* < \Lambda_2^L) = \Phi_1(\lambda' Z_i) \\ \Pr(\Lambda_2^L \le \Re_i^* < \Lambda_2^H) = \Phi_2(\lambda' Z_i) - \Phi_1(\lambda' Z_i) \quad j = 0,1,2 \\ \Pr(\Lambda_2^H < \Re_i^* \le \infty) = 1 - \Phi_2(\lambda' Z_i) \end{cases}$$

(3)

The vector of parameters λ' and the thresholds $\Lambda' s$ are jointly estimated using the maximum likelihood estimation (MLE) procedure which yields consistent and asymptotic estimators. The ϕ**'s** assume a standard normal distribution (Greene, 2008).

The vector Z_i includes personal and household characteristics of the consumer such as age, gender, marital status, religion, education and income status, consumer awareness, consumers' sources of information on Moringa bread, and consumer knowledge and perceptions on the nutritional and health potency of Moringa bread. Age is hypothesized to have a positive relationship with consumer preferences for foods with health and nutritional claims (Barrena and Sanchez, 2010; Stranieri et al. 2010). Liu et al. (2009) posit that after the consumer's age has increased beyond a certain threshold, the WTP tends to decrease with age. Females are expected to pay higher premiums for foods with high nutritional and health claims (Stranieri et al. 2010; Cranfield et al. 2011). Married consumers are expected to pay higher premiums for functional foods since they may have younger children and family members who are ill and living with them (Annunziata and Vecchio, 2011). It is hypothesized that religious consumers will be willing to pay higher premiums for functional foods (Annunziata and Vecchio, 2011). Income is expected to have a positive effect on consumer WTP a premium for functional foods (Herath et al. 2008; Teratanavat and Hooker, 2006). Higher educated consumers are hypothesized to pay higher premiums for functional foods (Markosyan et al. 2009). Consumers' awareness of functional foods is expected to have a positive influence on their WTP premiums (Liu et al. 2009; Cranfield et al. 2011). Consumers will be willing to pay higher premiums for functional foods if they have knowledge of the nutritional and health claims of such food products (Barreiro-Hurle et al. 2010; Annunziata and Vecchio, 2011; Cranfield et al. 2011). Moreover, consumers with positive perceptions of functional foods will be willing to pay higher premiums for the products (Markosyan et al. 2009).

Data Description

The data employed in this study were obtained from a contingent valuation survey of 400 consumers in the Kumasi Metropolis of Ghana in 2010. The city of Kumasi is the second largest city in Ghana and the administrative capital of the Ashanti Region in Ghana. The unique centrality of

the metropolis makes it conducive for vigorous marketing activities. As an urban economy in a developing country, the agricultural sector in Kumasi is very small accounting for only about 10% of the regional Gross Domestic Product. The city's population is about 1,520,117 with a growth rate of 5.47% (GSS, 2010). The survey was essentially based on consumers in Bomso, Ayeduase and Denyase suburbs of the Kumasi Metropolis. Specifically, 175 consumers were randomly selected from Bomso, 190 from Ayeduase and 35 from Denyase making a total sample size of 400 consumers. Primary data on socio-economic variables such as consumer characteristics, including age, gender, education, religion and income status were collected with a carefully designed structured questionnaire. The price bids and consumer knowledge, awareness and perceptions on functional foods (notably, Moringa bread) were also solicited.

In the contingent valuation (CV) survey, the respondents were asked about their frequency of consumption of non-Moringa bread. They were asked about how much they were willing to pay for Moringa bread given proposed prices or bids. In stating the bids, the price of Moringa bread was assumed to be more expensive than that of non-Moringa bread (i.e. the normal bread, which is already on the market) because of the health and nutritional advantages. The bid price of 1 kilogram (kg) of Moringa bread was set by computing a percentage increase of the market price of 1kg non-Moringa bread. Employing the double-bounded dichotomous choice (DBDC) technique, about 50% increase in the price of 1kg of the non-Moringa bread was proposed to the respondents as a base price or bid for the Moringa bread. Respondents who responded "NO" to this first bid were given a bid lower than 25% of the price of 1kg non-Moringa bread. If the response to the first bid was "YES", a 100% increase in the price of 1kg non-Moringa bread was proposed to the respondents.

RESULTS

The empirical distributions of the respondents with the 3 categorized WTP premiums are provided in Table 1. Respondents who are unwillingness to pay premiums for Moringa bread are 32%. Those with WTP of 1%–50% price premiums are 42.2% and those with WTP above 50% price premiums for Moringa bread are 25.5%. The respondents generally have positive perceptions on the nutritional and health benefits of consuming Moringa bread (Table 2). About 44% agreed that Moringa bread is more nutritious than non-Moringa bread, giving an average perception score of 0.21. Averaging the two scores results in nutrition perception index of 0.22. Consumers were asked about their perceptions on health benefits of Moringa bread. Approximately 44% agreed that Moringa bread could solve the malnutrition problems in Ghana, giving an average perception score of 0.19. Almost half (49.25%) of the respondents agreed that Moringa bread could prevent many known diseases. With this statement, the average score on the Likert scale is 0.23. Averaging the two scores yields a positive health perception index of 0.21.

Table 1. Empirical distributions of consumer WTP for Moringa Bread

	WTP=0	WTP=1	WTP=2
Distribution of respondents	129(32.2)	169(42.2)	102(25.5)
Proposed mean bid for 1kg of Moringa bread (GH¢)	0	1.3012	1.9951
Awareness and Knowledge			
Awareness of Moringa bread	77 (59.7)	122 (72.2)	64 (62.7)
Knowledge on nutrient content of Moringa oleifera	97 (75.2)	153 (90.5)	91 (89.2)
Have you eaten any Moringa bread before?	50 (38.8)	101 (59.8)	57 (55.9)
Do you still eat Moringa bread?	16 (12.4)	42 (24.9)	37 (36.3)
Sources of information on Moringa bread			
Media	43 (33.3)	57 (33.7)	32 (31.4)
Friends and relatives	84 (65.1)	109(64.5)	60 (58.8)
Books/internet	17 (13.2)	23 (13.6)	15 (14.7)

Note: Figures in parentheses are percentages
1 US Dollar (US$) = 1.4012 Ghana Cedi (GH¢) in 2010
WTP=0 denotes consumer unwillingness to pay any price premium for Moringa bread; WTP=1 denotes consumer willingness to pay for 1%–50% price premium and WTP=2 denotes consumer willingness to pay above 50% price premium.

Source: Authors' computations based on survey data

The descriptive statistics of the variables used in the regression model specifications are provided in Table 3. The maximum likelihood estimates (the coefficients and the marginal effects) from the ordered probit model are presented in Table 4. The value of the likelihood ratio (LR) test statistic is highly significant indicating a rejection of the null hypothesis that the parameters in the model are jointly equal to zero. This also suggests that the estimated ordered probit model has a statistically significant explanatory power. The marginal effect of the age variable is negative in the unwillingness to pay category specification but positive for in other two WTP category specifications (i.e. WTP for 1%–50% premiums and WTP above 50% premium). The marginal effect for the marital status variable is positive and statistically significant in the "unwilling to pay" specification but exhibit negative and significant marginal effects in the willingness to pay a premium of above 50% for Moringa bread specification. We observe opposite empirical findings with respect to the religion variable. The education variable is not statistically significant even at the 10% level in all the WTP categories investigated in the ordered probit model.

The awareness variable (AWARE) has a significant positive marginal effect in the unwillingness to pay (WTP=0) specification but exhibits statistically insignificance even at the 10% level in the other two WTP specifications (i.e. WTP for 1%–50% price premiums and WTP above 50%

Table 2. Consumers' perception on Moringa bread

Perception statement	Number of respondents									Mean scores		
	Agree (Score=0.5)			Neutral (Score=0)			Disagree (Score= -0.5)			Consumer Aware	Consumer Unaware	Overall
	Yes	No	Total	Yes	No	Total	Yes	No	Total			
Moringa oleifera contains almost all micro-nutrients	138 (34.5)	50 (12.5)	188 (47)	116 (29)	85 (21.3)	201 (50.3)	9 (2.3)	2 (0.5)	11 (2.8)	0.25	0.18	0.22
Moringa bread is more nutritious than non-Moringa bread	147 (36.8)	29 (7.3)	176 (44)	111 (27.8)	105 (26.3)	216 (54)	5 (1.3)	3 (0.8)	8 (2)	0.27	0.10	0.21
Nutrition perception index *(NPI)*										0.26	0.14	0.22
Moringa bread helps solve malnutrition problems in Ghana	139 (34.8)	36 (9)	175 (43.8)	112 (28)	92 (23)	204 (51)	12 (3)	9 (2.3)	21 (5.3)	0.24	0.10	0.19
Moringa bread helps prevent many known diseases in man	147 (36.8)	50 (12.5)	197 (49.3)	105 (26.3)	82 (20.5)	187 (46.8)	11 (2.8)	5 (1.3)	16 (4)	0.26	0.16	0.23
Health perception index *(HPI)*										0.25	0.13	0.21

Note: Figures in parentheses are percentages
Source: Authors' computations based on survey data

price premiums). In contrast, respondents with knowledge on Moringa products are more willing to pay higher premiums for Moringa bread (i.e. WTP for 1%–50% price premiums and WTP above 50% price premiums). The same empirical findings emerge for the respondents who have eaten Moringa products (EATEN) or Moringa bread (EATBREAD) before. As expected, the respondents are less "unwilling to pay" any premium for Moringa bread but are more willing to pay higher premiums of above 50% for Moringa bread as the number of years of consumption of Moringa products increase. The marginal effect of the perception variable (PCEPDISEA) indicating consumers' agreeing perceptions on the potency of Moringa products to cure diseases is significantly negative in the "unwillingness to pay" category specification but shows significant positive marginal effects in the other two WTP category specifications (i.e. WTP for 1%–50% price premiums and WTP above 50% price premiums). This variable was measured as a dummy variable indicating 1 if the respondents agree that Moringa products can cure some of the known diseases in man and 0 otherwise.

There is a higher probability of being more "unwilling to pay" a premium and less willingness to pay higher premiums for Moringa bread when the source of information on Moringa bread are from friends or relatives and from the media. Statistically, two of the three interaction terms of the explanatory variables investigated in the WTP models are significantly different from zero.

DISCUSSIONS

The effects of consumer socioeconomic characteristics and product attributes were analyzed with the ordered probit model. The discussions on the empirical estimates focus on the marginal effects, which are of policy interest rather than the estimated coefficients. For each variable, the marginal effect show the change in the predicted probability for each WTP category for an average consumer (Cranfield and Magnusson, 2003). The significant negative marginal effect of the age of the consumer for the unwillingness to pay a premium category indicates that younger individuals are unwilling to pay a premium for Moringa bread. The significant positive marginal effects of the age variable in the other WTP category specifications (i.e. WTP for 1%–50% premiums and WTP above 50% premium) and the negative marginal effects of the quadratic age variable indicate that consumers' WTP for higher premiums for Moringa bread increases with age but decreases as age increases beyond a threshold age. These empirical results are line with what Liu et al. (2009) found for Chinese data. Cranfield et al. (2011) also reported that *individuals who consume more functional ingredients and have positive attitudes toward functional foods tend to be older.*

The positive marginal effect of the marital status variable indicates that married respondents are more "unwilling to pay" for Moringa bread. However, the positive marginal effects of the variable in the other WTP categories suggest that married respondents are less willing to pay above 50% premium for Moringa bread. The negative marginal effect for the religion variable suggests that Christian respondents are less "unwilling to pay" premiums for Moringa bread. They are however more willing to pay higher premiums of above 50% for Moringa bread. The statistically insignificant marginal effects of the education variables in all the three specifications imply that education exerts no effect on WTP to pay for Moringa bread. The relatively less variation in the education variables may have contributed to these statistical insignificant results.

The empirical findings on awareness and knowledge on

Table 3. Descriptive statistics of the variables used in the ordered probit model

Variable	Definition of variables	WTP=0	WTP=1	WTP=2
AGE	Age of respondent in years	24.38 (9.34)	24.27 (8.82)	23.74 (7.27)
GEN	1 if respondent is a female, 0 otherwise	0.54 (0.50)	0.44 (0.49)	0.50 (0.50)
MARITS	1 if the respondent is married, 0 otherwise	0.15 (0.36)	0.12 (0.33)	0.08 (0.28)
RELIG	1 if respondent is a Christian, and 0 otherwise	1.08 (0.28)	1.10 (0.33)	1.16 (0.37)
NYEDUC	Number of years of formal education	16.67 (1.63)	16.62 (1.64)	16.81 (1.21)
LOWINC	1 if respondent's income is less than GH¢50, and 0 otherwise	0.2326 (0.42)	0.26 (0.44)	0.29 (0.45)
MIDINC	1 if respondent's income is between GH¢50 – GH¢200, and 0 otherwise.	0.51 (0.50)	0.59 (0.49)	0.50 (0.50)
HIGINC	1 if respondent's income is above GH¢200, and 0 otherwise	0.25 (0.43)	0.14 (0.35)	0.20 (0.40)
AWARE	1 if the respondent is aware of Moringa bread, and 0 otherwise	0.59 (0.49)	0.72 (0.44)	0.62 (0.48)
KNOW	1 if the respondent has knowledge on Moringa product, and 0 otherwise	0.75 (0.43)	0.9053 (0.2936)	0.89 (0.31)
EATEN	1 if respondent has eaten any Moringa product before, and 0 otherwise.	0.38 (0.48)	0.59 (0.49)	0.55 (0.49)
EATBREAD	1 if respondent has eaten any Moringa bread before, and 0 otherwise.	0.30 (0.46)	0.42 (0.49)	0.30 (0.46)
YRUSEM	Number of years consumer has used Moringa products	1.87 (2.3)	2.03 (1.53)	2.66 (2.94)
FRIEND	1 if the respondent had information on Moringa products from friends/relatives, 0 otherwise	0.65 (0.47)	0.64 (0.47)	0.58 (0.49)
MEDIA	1 if the respondent had information on Moringa products from the media, 0 otherwise	0.33 (0.47)	0.33 (0.47)	0.31 (0.46)
BOOKS	1 if the respondent had information on Moringa products from books, 0 otherwise	0.13 (0.33)	0.13 (0.34)	0.14 (0.35)
PCEPDISEA	1 if respondent agrees that Moringa products can cure known disease in man, 0 otherwise	0.29 (0.45)	0.59 (0.49)	0.57 (0.49)

Note: ***Figures represent means and those in parentheses are standard deviations***
1 US Dollar (US$) = 1.4012 Ghana Cedi (GH¢) in 2010
WTP=0 denotes consumer unwillingness to pay any price premium for Moringa bread;
WTP=1 denotes consumer willingness to pay for 1 – 50 price premium and WTP=2 denotes consumer willingness to pay above 50 price premium.

Source: Authors' computations based on their survey data

argue that consumers are more likely to pay higher premiums for functional foods if they have adequate information on the product. The empirical results thus suggest that awareness of Moringa products alone Moringa bread are in agreement with the study by Cranfield et al. (2011) that consumers are more likely to consume functional foods if they know the direct link between the nutritional value of functional foods and their health. Markosyan et al. (2009)

does not translate into paying higher premiums by consumers but having knowledge on the nutritional and health benefits of the functional food is what matters most to consumers when it comes to paying higher premiums for functional foods. Chadwick et al., (2003) posited that consumers are likely to be cautious about making changes to their established consumption patterns when they are unclear about functional foods and their purported health effects.

The empirical findings on the health potency of Moringa products are consistent with the studies by Annunziata and Vecchio (2011) and Liu et al. (2009) that consumers with positive perceptions on health benefits of functional foods are more likely to pay higher premiums for them. As noted by Sun (2008), the likelihood of functional foods' consumption increases as consumers' concern on threat of infection of non-communicable diseases increases.

The findings on the sources of information on Moringa products suggest that the variable has no influence on consumer WTP to pay for Moringa bread. The results on the interaction terms indicate the relevance of the inclusion of these interaction terms in the WTP specifications. Notably, Christian respondents with knowledge on Moringa products (RELIG*KNOW) are less "unwilling to pay" for Moringa bread but are more willing to pay higher premiums for

Table 4. Ordered probit estimates on consumer WTP for Moringa bread

Variables	Coefficient	Marginal effects		
		WTP=0	WTP=1	WTP=2
AGE	0.1042*(1.81)	-0.0367*(-1.81)	0.0047*(1.73)	0.0319*(1.81)
AGE*AGE/100	-0.1291*(-1.78)	0.0454*(1.78)	-0.0059*(-1.72)	-0.0396*(-1.78)
GEND	-0.0268(-0.21)	0.0094(0.21)	-0.0012(-0.21)	-0.0082(-0.21)
MARITS	-0.7733**(-2.22)	0.2946**(2.20)	-0.1105*(-1.64)	-0.1840***(-3.05)
RELIG	1.4164**(2.13)	-0.4981**(-2.13)	0.0642*(1.76)	0.4339**(2.12)
NYEDUC	0.0020(0.04)	-0.0007(-0.04)	0.0001(0.04)	0.0006(0.04)
LOWINC	-0.1568(-0.53)	0.0561(0.52)	-0.0094(-0.42)	-0.0467(-0.55)
MIDINC	-0.3244(-1.23)	0.1129(1.25)	-0.0128(-1.12)	-0.1002(-1.22)
AWARE	-0.4611*(-1.64)	0.1550*(1.71)	-0.0072(-0.65)	-0.1478(-1.56)
KNOW	1.6617**(2.19)	-0.5923***(-2.91)	0.2934**(2.09)	0.2990***(4.34)
EATEN	0.3762***(2.47)	-0.1322***(-2.48)	0.0179*(1.67)	0.1143***(2.50)
EATBREAD	0.3208**(1.88)	-0.1150**(-1.85)	0.0203(1.31)	0.0947**(1.95)
YRUSEM	0.0522*(1.71)	-0.0183*(-1.71)	0.0024(1.30)	0.0160*(1.70)
FRIEND	-0.2732*(-1.77)	0.0941*(1.81)	-0.0083(-1.25)	-0.0857*(-1.73)
MEDIA	-0.2660*(-1.79)	0.0954*(1.76)	-0.0167(-1.26)	-0.0787**(-1.85)
BOOKS	-0.2338(-1.27)	0.0853(1.24)	-0.0183(-0.88)	-0.0670(-1.37)
PCEPDISEA	0.4246***(3.45)	-0.1482***(-3.49)	0.0183*(1.69)	0.1299***(3.46)
RELIG*KNOW	1.2725**(1.85)	-0.4475**(-1.85)	0.0577*(1.75)	0.3898**(1.84)
AWARE*LOWINC	0.3763(1.05)	-0.1229(-1.14)	-0.0018(-0.08)	0.1247(0.98)
AWARE*MIDINC	0.6057**(1.88)	-0.2021**(-2.01)	0.0079(0.54)	0.1942**(1.82)
Predicted probability		0.3076	0.4587	0.2337
No. of observations	400			
Log- likelihood	-400.8782			
Wald $x^2(20)$	60.18***			

Note: z-values are in parentheses
**** P <0.001 denotes 1 percent significant level*
*** P <0.05 denote 5 percent significant level*
** P <0.01 denotes 10 percent significant level*
*AGE*AGE/100 denotes the product of the age variable divided by 100*
*RELIG*KNOW denotes the product of the dummies representing religion and knowledge of consumers of Moringa products.*
*AWARE*LOWINC denotes the product of the dummies representing awareness of Moringa bread and consumers with income less than GH¢50.*
*AWARE*MIDINC denotes the product of the dummies representing awareness of Moringa bread and consumers with income between GH¢50 – GH¢200.*
WTP=0 denotes consumer unwillingness to pay any price premium for Moringa bread; WTP=1 denotes consumer willingness to pay for 1 – 50 price premium and WTP=2 denotes consumer willingness to pay above 50 price premium.
1 US Dollar (US$) = 1.4012 Ghana Cedi (GH¢) in 2010.

Source: Authors' computations based on their survey data

Moringa bread. The implication of this result is that the effect of KNOW depends upon RELIGION and the vice versa. The same empirical results hold for middle income respondents who are aware of Moringa products (AWARE*MIDINC). This result confirms the hypothesis that consumers' income plays a critical role in determining their WTP for Moringa bread.

CONCLUSIONS AND RECOMMENDATIONS

This study has analyzed consumer willingness to pay (WTP) for Moringa bread with a contingent valuation data collected from 400 consumers in the Kumasi Metropolis of Ghana. Consumer awareness, attitudes and perceptions of Moringa bread were analyzed. The results of the study indicate that consumers generally have positive perceptions of the health and nutritional potency of Moringa bread. In addition, the empirical estimates from the ordered probit model indicate that socio-demographic factors such as age, marital status and religion of consumers and the number of years consumers have been using Moringa products significantly influence consumer WTP for Moringa bread. Consistent with other studies, our findings suggest that consumer knowledge of the nutritional and health benefits of functional food (specifically, Moringa bread) is what matters most to consumers when it comes to paying a higher premium for the product.

The results of the study provide a benchmark for the formulation of policies by the government towards effective regulation of foods with nutritional claims. Policies which promote foods that incorporate micro-nutrients should be encouraged and supported. Stakeholders should intensify the campaign of improving the awareness and knowledge of consumers concerning the health and nutritional benefits of Moringa bread. Agribusiness managers should shift their emphasis from promoting only the consumption of Moringa leaves to bakery and confectionery food products that incorporate Moringa products. In addition, agri-food businesses should evolve promotional campaigns and marketing strategies that consider household-level demographic characteristics such as the age, marital status religion and income status of consumers.

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SCIENTIFIC PAPER

SYSTEMATIC RISK FACTORS AND STOCK RETURN VOLATILITY

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Abstract: *This study analyzes the transmission of systematic risk exhaling from macroeconomic fundamentals to volatility of stock market by using auto regressive generalized auto regressive conditional heteroskedastic (AR-GARCH) and vector auto regressive (VAR) models. Systematic risk factors used in this study are industrial production, real interest rate, inflation, money supply and exchange rate from 2000-2014. Results indicate that there exists relationship among the volatility of macroeconomic factors and that of stock returns in Pakistan. The relationship among the volatility of macroeconomic variables and that of stock returns is bidirectional; both affect each other in different dynamics.*

Keywords: *Macroeconomic factors, stock return volatility, GARCH, VAR* (JEL code: *C32, C58, G11, G12*)

INTRODUCTION

The macroeconomic factors have important concerns with stocks traded in the stock market and these factors make investors to choose the stock because investors are interested to know about the factors affecting the working of stock to manage their portfolios. Abrupt variations and unusual movements of macroeconomic variables cause the stock returns to fluctuate due to uncertainty of future gains. Volatility is the risk or uncertainty to stock prices, which can either be measured by using the annualized standard deviation of daily changes in price of stock/ security (Li & Ouya, 2013). Volatility of stock price is a form of market efficiency (Hameed, 2006), which is the reaction to the incomplete information in the market (i.e. uncertainty). If prices of the stocks move up and down rapidly then there would be high volatility existing in the market. If there is almost no changes in stock prices, then there exists low volatility. Prices of stock are highly volatile in Pakistani capital market. This unpredictability of returns may affect the riskiness of stocks. Therefore, investors demand higher return for the increased risk. Companies with high volatile stocks need grow profitably, showing a sudden increase in earnings and stock price over the time, or pay very high dividends. Some investors mistakenly believe that stock price volatility is based on directional trend in the stock price; however, volatility is amount of fluctuation in stock prices (Malkiel & Xu, 1999).

Volatility in macroeconomic fundamentals is existing either in the form of unidirectional or bidirectional. This study has made substantial improvement on modeling the volatility which is changing with time. There is a better understanding of predicting volatility over the short periods of time with a time span of one day to one month. This research is conducted to analyze the relationship among the uncertain behavior of stock market returns and of macroeconomic variables like inflation (INF), real interest rate (RIR), gross domestic production (GDP), money supply (M2) and industrial production growth rate (IP). These macroeconomic fundamentals are chosen through the extensive literature upon the variables and their relationship of dynamic nature with stock market returns. Fascinatingly, although the successive financial econometric volatility is so considerable but it remains silent on the relationships among the volatility of stock returns and its determinants. The relationship between stock market volatility and uncertainty of macroeconomic fundamentals stay unstudied most of the times; often the

modeling and forecasting of capital market volatility is done in separation of volatility of macroeconomic fundamentals. Here the fundamental volatility is defined as the volatility of basic economic indicators. This research has two possible outcomes; it aims to forecast the volatility of factors included in study and to analyze the relationship among the volatility of these factors. This study focus upon the volatility of macroeconomic fundamentals and volatility of stock market returns. Secondly, it investigates the casual relationship between the volatility of stock returns with that of macroeconomic fundamentals like as GDP, interest rate, money supply and industrial production.

From the theoretical perspective, the dividend discount model (DDM) and arbitrage pricing theory (APT) provide the theoretical framework through which the behavior of macroeconomic fundamentals can be linked to the stock market volatility (Chen et al., 1986). These models emphasize that any expected or unexpected arrival of new information and policy decisions regarding macroeconomic variables such as gross domestic product (GDP), interest rates, exchange rates and foreign institutional investments (FIIs), money supply and inflation will change the equity prices and further the volatility of stocks via change in the future cash flows and expected dividends. Intuitively, the essence of the theoretical link between the macroeconomic fundamentals and equity market volatility is that any change or shock in the macroeconomic variables will raise the source of systematic and idiosyncratic risk of the market portfolio, irrespective of how well the portfolio is diversified (Chowdhury and Rahman, 2004).

This study is organized in different chapters, first chapter is the introduction of study, which further comprises of the background of the study and it introduces the study. This chapter also explains the underlying theories of study which support the study. Third chapter is about data description, variable measurement and methodology. Fourth chapter comprises of the interpretations of the results and discussions. Fifth chapter is the discussion and future recommendations for research. At the end references are attached here with and then some terms are also explained in appendix.

LITERATURE REVIEW

Volatility is a process of change in behavior, value or investment over the time and cumulative persistence of that change to the next phase. An extensive work has been done upon volatility in different types such as modeling, measuring and forecasting the volatilities. Quite huge work has been done upon measuring and modeling the stock market volatilities. Year after year, finance literature is enriched with broad discussions about the volatility in markets which represents that emerging and emerged stock markets are responsive to macroeconomic updates and market players are likely to adhere with the significance of any declaration of changes in policy and economic figures.

Schwert (1989) found that stock market volatility can be explained through macroeconomic fundamentals if macroeconomic variables give information in regard of volatility of future expected cash flows and discount rates. It is of immense importance for understanding the cause of stock market volatility because it helps to predict stock returns and to understand the major determinants of stock market uncertainty and its transmitting effects to the real economy (Corradi et al., 2006). Variance of stock returns is affected by many of other explanatory factors which are deterministic factors for stock returns and macroeconomic variables are also the deterministic factors for stock returns (Schwert, 1989). Christie (1982) examined the relationship between volatility in equity returns and many other descriptive variables and found that equity variances have a significant link with both financial and interest rate, unlikely to the options literature. French and Schwert (1986) examined the link of stock returns with stock market volatility and it was found that there is a theoretical linkage between stock returns and stock return volatility. They found a positive relation of expected capital market risk premium with expected stock returns volatility. They suggested that risk premium in market is caused by macroeconomic fundamentals so there is also relation between variance in macroeconomic fundamentals and uncertainty of stock returns. Chen et al. (1986) studied the influence of economic forces upon stock returns, it was suggested that vector auto regression cause some problems whereas lagged market returns have a strong predictive situation for macroeconomic variables. Study found that lagged market variables can indirectly explain expected returns of portfolio. They found that real and nominal forces change the expected cash flows as variation in anticipated rate of inflation have a significant impact upon predictable cash flows and rates of interest also.

Chen et al. (1986) found that a set of economic variables that has impact on market returns and its influence upon asset pricing and interpreted that price of assets in markets should depend on their experience to macroeconomic fundamentals that portray the economy. Darrat and Mukharjee (1987) conducted a study to analyze the relationship of equity market returns and some macroeconomic factors by employing granger-type causality along other error prediction test and found that there is a strong lagged relationship among stock returns and selected macroeconomic variables. Ross (1989) suggested another source of volatility which is fluctuations in market microstructure of economy. Variance of returns is affected by liquidity of assets and trader's information and here for the proxy role of turnover ratios in explaining the cross-section variability. Many of the models for asset pricing suggest a significantly positive relationship among expected returns and risk, which is mostly predicted through the variance of prices of assets (Baillie & DeGennaro, 1990).

During the different periods of the economy, investors are likely to have probability to react in different manner to the similar news (Li & Hu, 1998). During a period of shortfall, a trivial fall in expected industrial production could give a start to panic in investors if they thought that economy is at an edge. Therefore, they would short their positions and stay for no longer time causing a volatile condition in the capital market. Whereas empirical observations supported the view

that the link between uncertainty in macroeconomic factors and in capital returns was referred to structural breaks at the times of tranquility and financial instability was subjected to developed countries (Hamilton & Li, 1996; Stock & Watson, 2002). It is found that stock market liberalization most of the times increases the correlation between local and international market returns but is unable to derive up market variations at local level (Bekaert & Harvey, 1996). Fraser and Power (1997) conducted a cross-country study to analyze the impact of news disbursement on stock market volatility and suggested that information is one the major factors that have direct impact upon stock markets. Bekaert and Harvey (1997) found that markets which are fully integrated are affected by international macroeconomic fundamentals at several times and periods whereas markets which are segmented and operate at local levels are merely affected by local market forces. These market forces cause the variance in stock returns and a volatile condition is emerged.

Liljeblom and Stenius (1997) explained the relationship of stock market variability and variance in macroeconomic factors by analyzing the data for Finland from 1920-1991, by employing generalized auto regressive conditional heteroscedastic (GARCH) and vector auto regression (VAR) methods and it was found that there was a significant relationship between stock market variability and variances in macroeconomic fundamentals. But Mitchell and Mulherin (1994) found significant and strong relationship of publically available information and activities being done in the stock market, it was reported that the existing relationship is as weak as reported in previous researches and therefore the difficulty of linking volume and volatility to calculated measures of information has been confirmed. Errunza and Hogan (1998) explored the macroeconomic fundamentals affecting European capital market volatility. They found that unlike the previous studies upon USA, in many cases, time variability of European stock market was found to be more significantly influenced by the previous variations in either monetary or real macroeconomic fundamentals. Reinhart and Kaminsky (1999) argued that capital movement in market enhances the opportunity of crises in exchange rate or banking sector. It is because productivity collapsed in this situation and benefits that were to be derived from cash inflows could not be derived.

The procedure through which market returns move within an economy depicts the level of economic development as the economy develops more it becomes more diverse and variations in stock returns inclined to uplift with changes in macroeconomic fundaments. But when the index is moving then the volatility should decrease but its negative relation may not exist in emerged economies (Stiglitz, 1999). It resulted in providing significant interconnections among emerging financial markets regardless of the geographical closeness. It was also observed that those states which were more under the effect of financial liberalization were seen to have combined moves to high volatile conditions. These states of uncertainty were observed during periods of financial crises, as it raises the volatility also increase as the financial situation of a state stabilize, uncertain movements of interest rate also stabilized (Edwards & Susmel, 2001). It was documented by Spyrou (2001) in the study that inflation rate is a response to the fluctuations in commodity market happening due to different economic forces. During the period 1995-2000 a negative but insignificant result was shown whereas from 1990-1995 a negative but significant relation was reported. It can also be deducted that there exists negative correlation between inflation and real output. Chinzara (2011) found that financial crises increase the volatility in both of stock market as well as macroeconomic variables. Chinzara (2011) linked variations in stock market and persistence of this variation to next period with instability of macroeconomic factors. Chowdhury and Rahman (2004) also conducted a study to analyze the relationship between volatility of macroeconomic fundamentals and uncertainty of stock returns. They used vector auto regression and seasonality-adjusted predicting model to determine the unidirectional impact from macroeconomic uncertainty to stock market volatility for Bangladesh. Whereas, Chowdhury et al. (2006) used GARCH and VAR models to determine a weak relationship among macroeconomic and capital market uncertainty for the similar country but in opposite to efficient market hypothesis, they also predict that inflation volatility is being influenced by stock market uncertainty. Beltratti and Morana (2005) found a twofold relationship between stock market volatility and volatility of macroeconomic fundamentals. It was found in this study that uncertainty of capital market is linked with uncertainty of macroeconomic fundamentals like as federal funds rate and M1 growth. The other fact was found about the relationship of volatility of output and volatility of inflation with capital market volatility, it makes the break-free volatility series.

When the economy of country is suffering from different factors and monitory policy is not plausible then money supply may have a significantly negative effect upon stock returns as it has direct relation with inflation variability (Abugri, 2006). Diebold and Yilmaz (2008) estimated the association between the macroeconomic variables and uncertainty of stock returns in African and Asian under developed countries. Their study showed a positive link between stock returns, GDP and consumption. Sohail and Hussain (2009) found that industrial production, real exchange rate and money have a significantly positive link with stock return movements in both scenario long run as well as short run. Buyuksalvarci (2010) found that there exists a significantly negative relationship between oil price and exchange rate whereas a positive relation was there between money supply and returns. Inflation rate was also not having any significant relation with Istanbul stock exchange. Attari and Safdar (2013) study suggested that there is no longer association in between GDP and Karachi stock exchange and stock returns move towards the independent direction and there is no effect of volatility of inflation with volatility of stock market in Pakistan. But inflation rate has casual association with variance in stock returns. They found a unidirectional link in between the variance of interest rate and stock returns. Issahaku, Ustarz and Domanban (2013)

studied the movement of macroeconomic variables and its impact upon stock market fluctuations and concluded that money supply has negative role in the uncertain conditions of capital market of Ghana (GSE) whereas consumer price index, exchange rate and foreign direct investment show a positive link with market fluctuations. The negative relation of money supply with stock market volatility is consistent with the prior studies. Kumari and Mahakud (2014) made an empirical observation to study the theoretical associations among capital market variance and macroeconomic uncertainty in emerging Indian capital market. They found unidirectional and bidirectional relations among variance of stock returns and of macroeconomic fundamentals. Results of this study show the increasing interdependence of financial markets in India like as stock returns and macroeconomic fundamentals.

MATERIALS AND METHODS

Macroeconomic variables are interconnected. Change in one variable also affects others and these overall affect the economy of a country. These have impact over working of equity market. Their linkage is mostly short in nature and get volatile early. So analyze the volatility of macroeconomic factors and that of equity market GARCH model is used. After having the volatility values, their relationship is found through VAR model. In order to analyze the different dynamics of VAR system impulse response function and vector decomposition is also carried out. In this study, different macroeconomic variables are used. Industrial production growth is also used as a country specific factor by Mody, Taylor and Kim (2001), so this factor also affect on volatility of stock returns. Industrial production shows the overall economic activity and stock prices are affected by it. It is measured through industrial production index as it was in previous studies. Interest rate differential plays crucial role in fluctuation of returns of a market. Investors are interested to invest in those securities where high interest rate is offered than those where interest rate is low. This data is collected from WDI. The relationship between stock returns and inflation was theorized by Fisher (1930) and here inflation is calculated as consumer price index. If any change happens in supply of money, then it creates relative change in the level of price either negatively or positively in the value of money through variation in the volatility of expected future cash flows and supply of credit by the monetary aggregates in the economy (Friedman and Schwartz 1970). Here the rupee-dollar exchange rates are used taking into consideration the relative importance of dollar as main currency in Pakistan's trade and investment.

In current study, different comprehensive classes of Bollerslev's (1986) GARCH model are used. This model is fairly known to capture the volatility clustering and volatility symmetry impacts in the equation of conditional variance. As GARCH model is the most suitable model for volatility estimation so classes of its different models have been used to predict volatility in macroeconomic fundamentals and volatility in stock returns also. The GARCH (1, 1) proceeds with normal distribution and it is the most famous generalized ARCH requirement in the empirical research. This model supposes some power on previous squared residuals to turn down geometrically at a rate to be measured from the data.

$$R_t = \beta_0 + \beta_1 R_{t-1} + \varepsilon_t \quad (1)$$

$$\sigma_t^2 = \gamma_0 + \gamma_1 u_{t-1}^2 + \gamma_2 \sigma_{t-1}^2 \quad (2)$$

To analyze the relationship among those volatility series vector auto regression model was applied. Sims (1980) developed the vector auto regression model which is a dynamic model establishing the linkage between economic variables.

$$hs_t = \alpha_0 + \sum_{i=1}^{4} \lambda hs_{t-1} + \sum_{i=1}^{4} \delta h\, mv_{jt-1} + \varepsilon_t \quad (3)$$

$$hmv_{jt} = \omega_0 + \sum_{i=1}^{4} \theta h\, mv_{jt-1} + \sum_{i=1}^{4} \Psi hs_{t-1} + \varepsilon_t \quad (4)$$

RESULTS AND DISCUSSION

Table 1 exhibits the statistical behavior of the data for the period of 2000-2014. The mean is range from -0.0096 of money supply to 0.0056 of consumer price index. Standard deviation which is the measure of dispersion or deviation from mean is range from 0.0059of exchange rate to 0.0475 of real interest rate. Skewness indicates that some of the values are positively skewed whereas CPI, EX and RI are negatively skewed. In case of Kurtosis, if the value is equal to 3 then normal distribution and pattern is called mesokurtic. If the value is $>$ 3 then pattern is called leptokurtic that are associated with simultaneously peaked and fat tail. But when value of kurtosis is less than 3 it is called platykurtic and is associated with simultaneously less peaked and have thinner tail. All the values in the table are showing the platykurtic behavior that is less that 3 with the maximum value of 2.9898 and minimum value of 1.8979. Furthermore, kurtosis shows that the data is flat and have thinner tail.

Table 1 Descriptive Statistics

	M2	RCPI	REX	RI	RIGP	RRIR
Mean	-0.0096	0.0056	-0.0027	0.0008	0.0032	0.0124
Median	-0.0031	0.0070	-0.0008	0.0010	-0.0009	0.0090
Maximum	0.0594	0.0351	0.0055	0.0045	0.4461	0.0965
Minimum	-0.0726	-0.0297	-0.0144	-0.0039	-0.4925	-0.0631
Std. Dev.	0.0419	0.0175	0.0059	0.0026	0.0270	0.0475

Table 2 presents results of correlation analysis. Result indicates that volatility all macroeconomic variables are positively correlated with volatility of stock returns whereas volatility of real interest is negatively correlated with stock returns. Results are consistent with previous studies of Morelli (2002), Chinzara (2011) and Kumari and Mahakud (2014). The value of money

supply to inflation is comparatively showing that there may the problem of multicollinearity in the data. To eliminate any kind of ambiguity regarding the multicollinearity in the data, variance inflation factor test is also applied. As it is evident from the table that all values are below the threshold point showing that there is no multicollinearity problem in the data.

Table 2 Correlation Matrix

	RI	RIGP	M2	RCPI	RRIR	REXP
RI	1					
RIGP	0.0189	1				
M2	0.0157	0.0211	1			
RCPI	0.0514	-0.0198	0.1142	1		
RRIR	-0.0767	-0.001	0.2793	0.0237	1	
REXP	0.1119	0.0003	-0.1123	-0.1105	-0.2459	1

The GARCH (1,1) specification is selected based on AIC criteria. Table 3 shows that variance equation is significant at GARCH (1,1) level. Once it is judged that volatility in the data then volatility series have been generated using GARCH model. Then these volatility series are used to analyze the relationship among the volatility of macroeconomic fundamentals and stock market returns.

Table 3 GARCH estimates

Variance Equation				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Index return	0.4156	0.1051	25.4696	0.0000
M2	0.6621	0.0120	55.2304	0.0000
CPI	0.4072	0.0146	27.8698	0.0000
EX	0.5993	0.0128	46.7951	0.0000
IGP	0.6227	0.0125	49.7555	0.0000
RIR	0.8904	0.0073	122.2878	0.0000

In time series analysis, stationary or non-stationary procedure is carried out to observe the integration level of the factors under observation. In the present study data set the Augmented Dickey Fuller (ADF) test is carried out. Above given table shows that all six variables are stationary at level with constant so linear trend, i.e. *I (0)* is existing here. It shows that the variables are having constant mean, variance and covariance and results are significant now. It shows that all effects of the shocks are eradicated and now these are helpful in making an accurate decision for the future forecasting. All the volatility series are stationary at level so we apply VAR model to analyze the relationship of these volatility series.

Table 4 Unit Root Test

Variable	t-stat	p-value	Decision
M2	7.01251	0.000	I (0)
CPI	10.3906	0.000	I (0)
EX	5.32571	00.000	I (0)
Index return	9.00551	00.000	I (0)
IGP	10.6379	00.000	I (0)
RIR	3.08405	0.0279	I (0)

To apply the VAR model first of all lags length criteria is find out. Then at most appropriate lag the vector auto regression model is applied. According to the above given table (5) the VAR model is to be applied at lag four because most of the information criteria suggest the fitness of this model at this stage.

Table (6) presents the relationship of volatility of macroeconomic factors with volatility of stock market returns and vice-verse. It shows the relationship among different volatility series of macroeconomic fundamentals generated through GARCH model. Vector auto regressive model shows the influence of one variable upon other along with its lagged terms. To capture the combined effect of volatility of one macroeconomic variable upon volatility of stock market returns Wald's coefficient test is also applied in this study. This table shows the influence or predictability of macroeconomic factors upon the volatility of stock market returns. Money supply shows that it has no influence upon volatility of stock returns with p-value of 0.5277, 0.5408, 0.8744 and 0.9847 at four different lags. It is argued that money supply is settled by the central bank and it has no specific time to be adjusted with the stock returns. Thus it does not have influence on variations of stock returns. Volatility of inflation is significant which shows that in Pakistani economy volatility in inflation causes volatility in stock returns. Its coefficient is positive showing that variations in inflation rate influence the variations in stock returns positively although at little rate. Industrial growth production is positive and significant depicting that any variations in industrial growth production will also enhance the variation of stock returns in similar direction. Volatility in exchange rate is also positively and significantly influences the variations in stock returns and it happens to move in the similar direction if any cause is happening there. But real interest rate has insignificant affect; means volatility occurred in exports

Table 5 Lag Length Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	53854.97	NA	3.76e-20	-27.70009	-27.69042	-27.69666
1	113297.9	118671.9	2.01e-33	-58.25922	-58.19154	-58.23520
2	126850.9	27015.22	1.92e-36	-65.21237	-65.08667	-65.16775
3	127276.1	846.2449	1.57e-36	-65.41258	-65.22886*	-65.34736
4	127410.6	267.4315*	1.50e-36*	-65.46329*	-65.22156	-65.37748*

Table 6 VAR Results

	M2		CPI		EXP		RI		IGP		RIR	
	C	p-stat	C	p-stat	C	p-stat	C	p-stat	C	p-stat	C	p-stat
M2(-1)	2.004	0.0000	0.09	0.0087	0.165	0.3459	0.86	0.5277	0.005	0.7697	0.074	0.3634
M2(-2)	-1.305	0.0000	0.23	0.0006	1.210	0.0011	0.49	0.5408	0.003	0.4214	0.131	0.4729
M2(-3)	0.387	0.0000	0.28	0.0009	1.906	0.0000	0.10	0.8744	0.006	0.3593	0.126	0.4897
M2(-4)	-0.082	0.0000	0.07	0.0193	0.869	0.0000	0.08	0.9847	0.07	0.5767	0.067	0.4068
CPI(-1)	0.028	0.0001	1.95	0.0000	1.939	0.0000	0.08	0.0000	0.001	0.7912	0.106	0.3421
CPI(-2)	0.099	0.0000	06.jan	0.0000	4.601	0.0000	0.01	0.0000	-0.01	0.5227	-0.09	0.2055
CPI(-3)	0.123	0.0000	0.06	0.0313	3.478	0.0000	0.02	0.0000	0.006	0.3894	0.027	0.2398
CPI(-4)	0.052	0.0000	0.02	0.0886	0.813	0.0000	0.06	0.0000	-0.05	0.4616	0.009	0.4560
EXP(-1)	0.005	0.0003	0.04	0.2021	1.771	0.0000	-0.03	0.1146	-0.001	0.4856	-0.005	0.4654
EXP(-2)	-0.015	0.0000	-0.01	0.0103	-0.657	0.0000	0.05	0.0607	0.000	0.0175	0.008	0.6224
EXP(-3)	0.017	0.0000	0.02	0.0007	-0.152	0.0000	0.09	0.0839	0.054	0.0002	-0.006	0.7020
EXP(-4)	-0.007	0.0000	-0.09	0.0022	0.035	0.0440	0.06	0.0568	0.068	0.0005	0.007	0.6386
RI(-1)	-4.64	0.5610	0.01	0.4093	-0.002	0.8455	-0.07	0.0000	-0.022	0.8189	0.132	0.0024
RI(-2)	-0.003	0.3933	-0.01	0.4037	-0.019	0.8333	0.97	0.0702	-0.067	0.6487	0.097	0.0127
RI (-3)	0.0119	0.5103	0.02	0.6934	-0.037	0.4393	0.87	0.1730	0.094	0.6596	-0.178	0.3896
RI (-4)	0.0092	0.8660	-0.01	0.8577	0.118	0.3359	0.00	0.1689	-0.087	0.8569	0.061	0.5330
IGP (-1)	-0.013	0.9241	0.25	0.3978	-0.690	0.6504	0.06	0.0576	1.830	0.0000	-0.054	0.9381
IGP (-2)	-0.053	0.8638	-0.47	0.4524	1.435	0.6556	0.37	0.0469	-0.769	0.0000	0.324	0.8380
IGP (-3)	0.1165	0.7067	0.38	0.5420	-2.768	0.4129	0.02	0.0664	-0.094	0.0049	-0.94	0.5507
IGP (-4)	-0.046	0.7398	-0.14	0.6136	2.047	0.2129	-0.57	0.1280	0.027	0.0918	0.676	0.3387
RIR (-1)	0.0070	0.0264	-0.01	0.6705	0.007	0.9851	-0.00	0.8550	0.009	0.7679	2.013	0.0000
RIR (-2)	-0.015	0.0337	0.05	0.6866	-0.033	0.6457	0.00	0.8388	-0.056	0.4623	-1.104	0.0000
RIR (-3)	0.0091	0.1965	-0.03	0.9203	0.043	0.5752	-0.00	0.9489	0.044	0.1623	0.075	0.0379
RIR (-4)	-0.001	0.6639	-0.00	0.7311	-0.010	0.7880	0.00	0.9040	-0.000	0.1106	0.015	0.3426

has no influence upon the volatility of stock returns. Results of this study are consistent with previous studies of Morelli (2002), Chinzara (2011) and Kumari and Mahakud (2014). This model shows the simultaneity of relationship, as in previous table it shows the influence of volatility of macroeconomic factors upon volatility of stock market returns.

Volatility of stock indices is explained 100% by itself in first period and it is also explained by other variables in second period. Similarly, variance decomposition function is applied on each of the variable mention that how it is explained by other variables included in the study. It can also be explained that stock returns are sensitive to the macroeconomic variables for most of the times. As the variations in interest rate changes the cost of capital and which will consequently affect the investments, if the level of investment enhances it also increase the industrial production growth rate and simultaneously the consumer price index will be declined. The volatility of money supply makes transfer in the future strength of the variations of expected future cash flows in the country. Therefore, it is clear from results of the study that individual variation in the macroeconomic variables cause to happen variations in overall stock returns. Results of this study are consistent with previous studies of Morelli (2002) and Chinzara (2011).

CONCLUSION

From above given discussion it is inferred that different macroeconomic fundamentals have different behavior and nature of relationship also differs from factor to factor. As arbitrage pricing theory mention that multiple factors are there to determine the stock returns and influence the movement of stock indices, it is find out how variations in different macroeconomic fundamentals affect the movement of stock indices and stock returns. This study analyzed the influence of volatility in macroeconomic factors upon volatility of stock market volatility and showed the direction of relationship. This study is based upon different GARCH models and vector auto regressive models. To analyze the GARCH models a dummy was also used to check the influence of abrupt happing in economy. This dummy was ranging from 2008 to 2013 encompassing the Zardari government era and results showed that volatility in stock market and in macroeconomic variables was different in this period as it was low from other periods. Results show the existence of relationship among the volatility of stock market and volatility of macroeconomic factors analyzed through vector auto regressive models. It is shown in the results that volatility of some macroeconomic factors has relationship with variations in stock returns. Some macroeconomic factors have deterministic role for future returns in stock market but some have not. Money supply have no direct effect with movements

Table 7 Variance Decomposition

Period	S.E.	M2	CPI	EX	RI	IGP	RIR
Variance decomposition of M2							
1	0.001868	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.004183	99.95844	0.030846	0.004164	0.001968	0.000323	0.004258
3	0.006576	99.93646	0.035502	0.013863	0.002887	0.000933	0.010354
4	0.008906	99.87953	0.033197	0.055554	0.003173	0.005957	0.022586
Variance decomposition of CPI							
1	0.000859	0.003074		0.000000	0.000000	0.000000	0.000000
2	0.001880	0.285203	96.63365	3.074889	0.001137	0.000251	0.004871
3	0.003013	0.161768	96.44070	3.393617	0.001109	0.000123	0.002680
4	0.004198	0.104588	96.42064	3.468580	0.000774	0.004033	0.001381
Variance decomposition of EX							
1	0.000173	1.340124	1.707349	96.95253	0.000000	0.000000	0.000000
2	0.000352	0.843639	1.942594	97.20624	0.000824	0.003363	0.003335
3	0.000553	0.881754	1.722056	97.37004	0.002577	0.015430	0.008147
4	0.000768	0.917767	1.569459	97.46070	0.003929	0.030636	0.017512
Variance decomposition of RI							
1	0.000735	0.005552	6.42E-05	0.023957	99.97043	0.000000	0.000000
2	0.001028	0.002895	0.007935	0.034348	99.83080	0.001913	0.122106
3	0.001245	0.007523	0.009300	0.051728	99.73701	0.001500	0.192937
4	0.001421	0.022803	0.007809	0.055278	99.70086	0.002021	0.211228
Variance decomposition of IGP							
1	0.016189	0.013881	0.007979	0.005074	0.020976	99.95209	0.000000
2	0.033774	0.013160	0.002257	0.010609	0.024993	99.94894	3.76E-05
3	0.053741	0.009033	0.000933	0.015724	0.046135	99.92811	6.57E-05
4	0.074923	0.006271	0.001188	0.029315	0.082490	99.88063	0.000109
Variance decomposition of RIR							
1	0.000370	0.026128	0.147459	0.278661	0.006113	0.245994	99.29565
2	0.000832	0.097247	0.127544	0.277274	0.004491	0.227577	99.26587
3	0.001374	0.133755	0.115394	0.304153	0.004129	0.252410	99.19016
4	0.001965	0.147639	0.111467	0.343227	0.004110	0.255157	99.13840

in stock market as it is also suggested in previous studies and analyzed in this study also. It is a settlement adjusted through central bank of any state so it does not have relationship with movement of stock indices. Similarly, volatility in real interest rate does not have relationship with volatility in stock returns at any lag in vector auto regression model. But volatility in inflation measured through consumer price index proves to have significant relationship with volatility of stock returns. It shows that happening of any fluctuation in inflation also affects the movement of stock index and consequently it influences the variations of stock returns. Exports have significant relationship at some level with variations of stock indices and influence the stock returns. Exports increase the flow of money inward and improve the efficiency of central bank and consequently increase the business level in the state. So theoretically it does have relationship with movement of stock indices also. Industrial growth production measured through industrial production index also has relationship with variations in stock returns. So from this study it is inferred that volatility in different macroeconomic fundamentals exists and some of them also relationship with variations of stock returns.

This study has covered the span of fourteen years for Karachi stock market and five macroeconomic fundamentals only. It is a vast area for future research as there are many other macroeconomic variables which may be analyzed with a huge span of time to understand the nature of relationship among volatility of macroeconomic fundamentals with volatility of stock returns. There three stock exchanges in Pakistan so this study may be conducted while using stock returns from any other stock exchange other than Karachi stock exchange or it is also possible to analyze all these three stock exchanges at a time with different macroeconomic variables.

As mentioned above due to time constraint sample size is limited, it is a limited study consisted of only fourteen-year data from Karachi stock exchange and from some macroeconomic variables. This study is only limited to one stock exchange but it may be extended to more ones. This study has undertaken only a few statistical techniques to analyze the data but many others may also be used to more refine the results of study.

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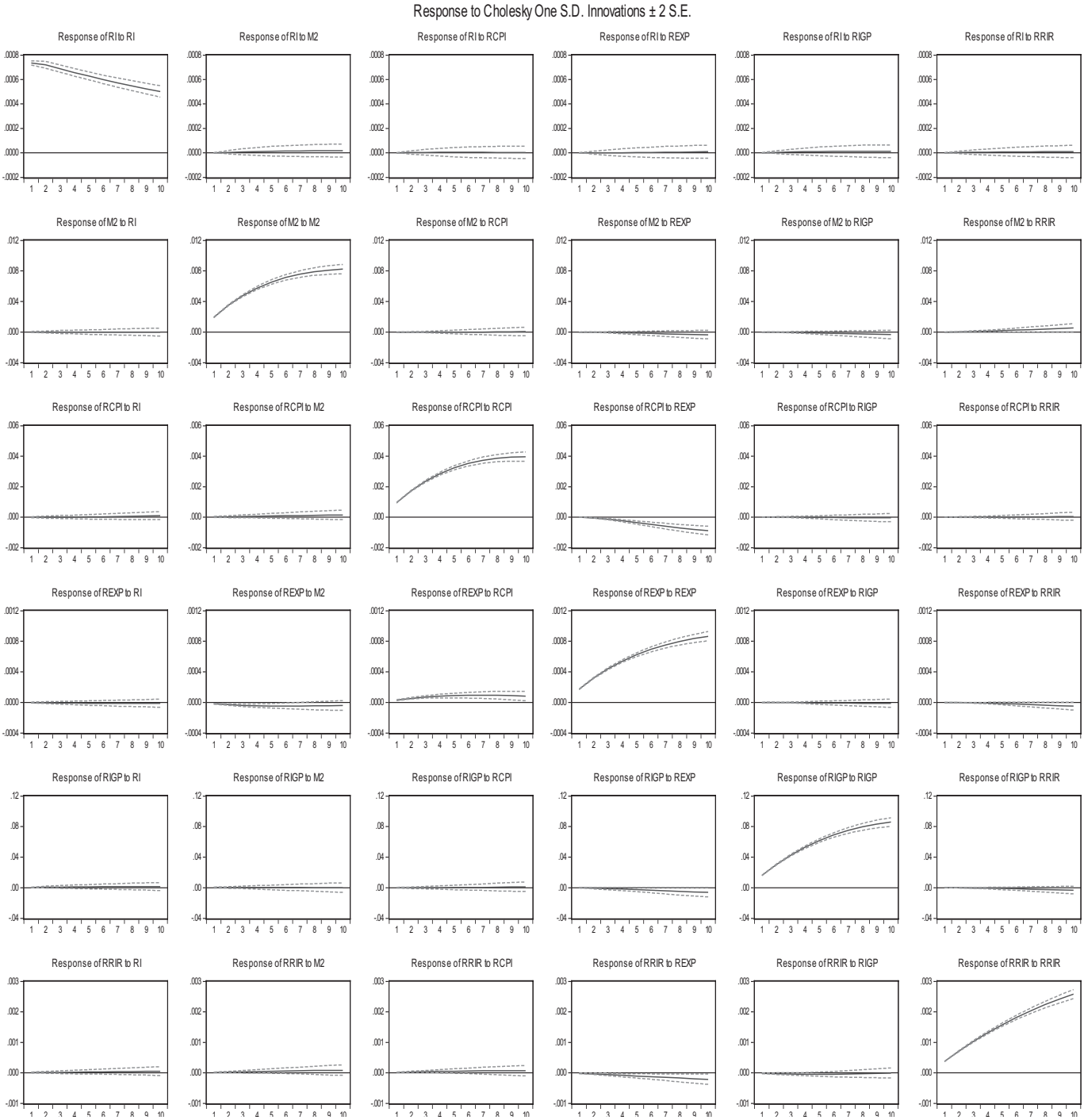
Figure 4.1


Response to Cholesky One S.D. Innovations ± 2 S.E.
Response of RI to RI
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SCIENTIFIC PAPER

STRATEGY FOR THE RESTAURANT BUSINESS IN RUSSIA IN TERMS OF SANCTIONS AND IMPORT SUBSTITUTION

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Abstract: *This article describes the situation established in August 2014 in Russia. The article considers an example of a famous restaurant «Metropol» (Moscow), taking into account the prevailing situation in Russia. The study of customer attendance, assortment and price policy towards the main products forming the restaurant's menu was conducted. As a result, recommendations were given, in order to preserve the client base and revise the assortment of dishes.*

Keywords: *restaurant business, import substitution, sanctions, embargo.*(JEL CODE: *M21*)

INTRODUCTION

For a long period catering remained one of the fastest growing sectors of the services market, outpacing the dynamics of its growth many sectors of the economy. In August 2014 the Russian Federation imposed sanctions against the import of a number of products that directly affected the work in the restaurant business, creating the most critical and uncertain conditions.

The aim of the work is to develop anti-crisis measures and new directions of the restaurant business development in terms of sanctions and import substitution.

In accordance with these tasks, the following problems were set and solved:

- to identify the features of the restaurant business development before and after August 2014;
- to examine the issues of the restaurant business in terms of sanctions and import substitution;
- to identify the specific development of the restaurant market in the economic crisis;
- to formulate crisis management recommendations.

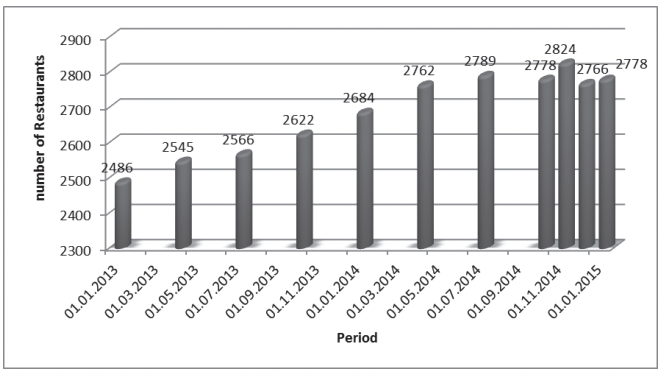
Currently there are more than 70,000 cafes, restaurants and other catering companies of different formats in Russia. From 2009 to 2013, the number of restaurants and cafes in Russia increased by 21.2% and amounted to 70.5 thousand.

Table 1. Number of restaurants and cafes, Russia, 2009-2013 (thousand)

Parameter	2009	2010	2011	2012	2013
The number of restaurants and cafes	58,2	60,4	63,7	66,7	70,5
% to previous year	-	3,8	5,5	4,7	5,7

According to data presented in Figure 1, it is seen that from January 2013 to July 2014 there is a positive trend, but in September 2014 there is evident decrease in the number of restaurants, at the same time in November 2014 was the growth, which is probably connected with the New Year holidays and investment projects.

Figure 1. How to change the number of restaurants in Moscow



Source: 2 GIS. Figures are formed based on regular monitoring conducted by call center 2 GIS.

2014 for the Russian restaurant market, as well as for the country as a whole, was rich in events.

Serious challenge to business was in August, when Russia in response to the economic sanctions from the West imposed a ban on import of agricultural products, raw materials and foodstuffs from the European Union, Norway, the USA, Canada and Australia.

Ban on import forced vendors and restaurateurs promptly to seek the replacement of banned products in Latin America, the Middle East and the CIS. Interest in Russian-made

products increased. In this case, with a substantial rise in the price restaurant owners try not to raise the prices in the menu.

Naturally, the need to replace the import of domestic food products is today the main task of the domestic agricultural sector.

In the first month after the embargo the prices of products for HoReCa (Hotel, Restaurant, Cafe) increased by 15-20%. It was a blow to the catering economy, causing serious chefs menu changes in an attempt to keep growing food cost. In autumn ruble fell, which caused a further increase in import prices.

Agriculture in modern Russia has considerable potential: over 40% of the world black soil, 20% of fresh water, the leading place in the world engaged in the production of fertilizers, more than 100 million ha of arable land, etc.

For the last 3-5 years public authorities at the federal level and in the regions of the Russian Federation took economic and legal measures aimed at strategic agricultural development, technological modernization of food processing industry, the social resettlement of rural areas. The Russian Government is currently developing a list of emergency measures on import substitution of agricultural raw materials and food products.

The EU has already estimated the losses from the import prohibition in Russia -12,000,000,000 euros.

Table 2 presents the data characterizing the dynamics of food import from 2000 to 2013.

Table 2. Food import in the Russian Federation (bln. $)

Year	2000	2005	2010	2011	2012	2013
billion $	7,4	17,4	36,4	42,5	40,2	43,5

According to the table, we can say that the dynamics is positive.

Import of food products and agricultural products in Russia for 2000-2013 years has grown about 6 times - from $ 7 billion to $ 43 billion. The Institute gave such data for Complex Strategic Studies (ICSS) in April 2014. From Table 3 we can see that import increased until 2010 - about 43% of household spending on food in 2013 accounted for imported products, whereas in 2009 it was about 40%.

Table 3 provides information on the volume of basic foodstuffs import.

Table 3. Import of basic food commodities, thousand tons

№	Foodstuffs	2000	2005	2010	2012	2013	deviation (+/-)
1.	Fresh and frozen meat	517	1340	1614	1406	1259	+742
2.	Fresh meat and frozen poultry	694	1329	688	531	500	-194
3.	Fresh and frozen fish	328	787	791	739	765	+437
4.	Milk and cream, condensed	77	314	238	163	191	+114
5.	Butter and other dairy fats	71	133	134	118	135	+64
6.	Sunflower oil	150	131	115	17	18	-132
7.	Raw sugar	4547	2893	2086	520	520	-4027
8.	white sugar	467	625	285	68	69	-398
9.	Cereals	4677	1449	444	974	1302	-3375
10.	Flour and grains	175	74	120	68	123	-52
11.	Pasta	36	79	59	81	92	+36
12.	Potato	359	103	711	461	444	+85
13.	Tomatoes	162	355	717	800	829	+667
14.	Fresh apples	367	730	1206	1279	1282	+915
15.	Fruit and vegetable juices	125	274	278	264	241	+116

According to Table 3 there is positive dynamics, but in 2012 the volume of certain types of food products compared to the year 2011 reduced, and in 2013 there is an increase. Assessing the whole period, it may be noted that the decrease in imported food has been in the following areas: poultry and fresh and frozen (-27.9%), sunflower oil (-88%), raw sugar (-89%), white sugar (-85.2%), cereals (-72.2%), flour and cereals (-29.7%).

In order to understand the development of domestic agriculture of these years, we present statistics in Table 4.

However, for the sustainable economic development, domestic agriculture requires significant amounts of money. History gives a chance to add 10-12 billion dollars to the state budget of the Russian Federation, which are expected by Russian and foreign experts to be released in connection with the prohibition of import to the Russian Federation of certain food groups.

In 2013 import of food in our country amounted to 43.5 billion dollars.

If there is a decrease in import to 12 billion dollars, that is still more than 20 billion dollars for the purchase of agricultural products business in foreign countries.

The problem is that those money should be used on the delivery of products, which will not be fully provided by domestic agricultural producers.

Restrictions on food products import means that annually the Russian food import from the EU, Norway, USA, Canada and Australia fell by $ 9.4 billion. At the same time food import from the EU should be reduced by $ 6 billion.

Table 4. Production of main food per capita, kg

№	Foodstuffs	2000	2005	2010	2012	2013	deviation (+/-)
1.	Grain	450	546	427	495	637	187
2.	Potato	233	200	148	206	211	-22
3.	Vegetables	86	80	85	102	102	16

№	Foodstuffs	2000	2005	2010	2012	2013	deviation (+/-)
4.	Meat (slaughter weight)	30	34	50	57	59	29
5.	Milk	222	218	223	222	214	-8
6.	Eggs, pieces.	234	259	284	294	288	54
Crop production in farms of all categories (million tons)							
№	Types of products	2000	2005	2010	2012	2013	
1.	Grains and legumes, including wheat rye barley corn oats buckwheat, th. rice, th. Flax, th. Sugar beet factory Sunflower Potato Vegetables	65,5 34,5 5,4 14,0 1,5 6,0 997 584 51,0 14,1 3,9 29,5 10,8	77,8 47,6 3,6 15,7 2,1 4,5 605 571 56,0 21,3 6,5 28,1 11,3	61,0 41,5 1,6 8,4 3,1 3,2 339 1061 35,2 22,3 5,3 21,1 12,1	70,9 37,7 2,1 14,0 8,2 4,0 797 1052 46,0 45,1 8,0 29,5 14,6	91,3 52,1 3,4 15,4 10,7 4,9 829 926 38,0 37,7 10,2 30,2 14,7	28,5 17,6 -2,0 1,4 9,2 -1,1 -168 342 -13,0 23,6 6,3 0,7 3,9
Livestock production in farms of all categories							
№	Types of products	2000	2005	2010	2012	2013	
1.	Meat (live weight), mln. tons	7,0	7,7	10,5	11,6	12,2	5,2
2.	Milk, mln. tons	32,3	31,1	31,8	31,8	30,7	-1,6
3.	Eggs billion units	34,1	37,1	40,6	42,0	41,3	7,2
4.	Wool, th. tons	40,3	49,0	53,5	55,3	54,4	14,1

Source: Federal State Statistics Service [Electronic source]. – Available free at: http://www.gks.ru/.

According to preliminary data, in comparison with 2013, in 2014, taking into account trade with Belarus and Kazakhstan the volume of import of agricultural products to the Russian Federation declined from $45 to $40.9 billion, Russian export of agricultural products increased from $16.7 to $19.1 billion. This idea was stated by Nikolai Fyodorov, the head of the Ministry, at a working meeting with the deputies of the State Duma and the Federation Council.

Meat import from countries that have fallen under the limit should be reduced to 867 thousand tons (7.8% of domestic consumption), fish and seafood on 457 thous. tons (13.7% of domestic consumption), milk and dairy products to 529 thous. tons (1.4% of domestic consumption), vegetables up to 916 thousand. tons (5.4% of domestic consumption), fruit on the 1600 thous. tons (14.5% of domestic consumption). (http://knoema.ru/xttujne/Limitation Russian food import/).

Table 5 provides information on countries caught in the Russian embargo.

According to Interfax Information Services Group, the EU has already estimated the losses from the prohibition of Russian food import -12,000,000,000 euros. And the Commission does not exclude the support of the World Trade Organization to cancel retaliatory sanctions of Russia.

In the federal law «On special economic measures», there is a hidden reference to Article XXI of the General Agreement on Tariffs and Trade (GATT) 1994. This article says that any country can protect its national interests and withdraw from its WTO commitments. Therefore, the application of such restrictions is not contrary to WTO rules. And the West has no reason to sue Russia.

However, even if the lawsuit is initiated, we must remember that Russia banned for a year. Such disputes to the WTO can be seen from a half to five years.

If Russia lifts the ban during the trial, the cost of trade losses will not be collected, says Sergei Lapin, an expert in the field of legal regulation of international trade.

Russia since the introduction of the food embargo (7 August 2014) significantly reduced import of certain agricultural raw materials and food.

According to the Federal Customs Service (FCS), in January 2015, has accelerated sharply decline in food import by 42% in annual terms. Only strongly reduced import of machinery and equipment (- 45% per year) in the food group import of dairy products decreased by 4.6 times, meat and offal - 4.1 times, fish - 2.4 times, alcoholic and non-alcoholic drinks - by 48.9 percent, fruit - 47 percent, cereals - by 44.5 percent, vegetables - by 40.6 percent, sugar - by 17.1 percent, vegetable oil - by 12.4 percent.

Earlier FCS gave information that since early January meat import to Russia dropped five times, and cheese - more than ten times compared to the same period last year. The largest reduction affected the import of pork, which supply in January decreased by 11 times - up to 1.73 thous. tons. Beef import fell by 2.5 times - up to 1.79 thousand. Tons of poultry meat - 1.6 times - up to 5.8 thousand tons.

Reduced supplies from abroad also affected milk production. Import of butter to Russia during the period from 1 to 26 January fell to 12.9 times compared to the same period of 2014 and amounted to 0.5 thousand tons. Import of cheese fell to 10.2 times - to 1.3 thousand tons of milk powder - 3.2 times - up to 0.7 thousand tons.

In Table 6 there are data submitted by countries that did not come under embargo, namely, their reaction to this situation.

Thanks to new partners, Russia will be able to compensate the shortfall in volume after a few months. Until that time, we have enough stocks of the European and American products.

Figure 2 shows that the embargo and price increases affected the dynamics of the visits, and from August to November there is a steady decrease in the dynamics, but in December 2014 the growth of visits covers losses from previous months - this is due to the celebration of the New Year. January had the lowest number of visits, although at this time many people to attend this kind of places. In February, there is a revival and the rise by 39% against January 2015.

Table 5. Countries hit by the Russian embargo

Country	The share of export to Russia, in terms of value	The share of export to Russia,%	Note
France	To 1.2 billion EUR	6,5%	90% of apples and pears sales which were sent to Russia, sellers are calling the embargo «a nightmare»
Ireland	70 million euros (including dairy products - 40 million, seafood - 20 and beef - 10)	-	Export to Russia up to 100 million euros is not subject to the embargo. It is also reported that last year the Irish food and drink export to Russia amounted to 232 million euros
Poland	1.3 billion EUR	7 %	Estimated loss of 500 million euros. Particular concern is expressed by apple producers
Finland	-	14 %	Of all the European countries Finland is the most Russia oriented country. Particularly difficult situation is in Valio company. Up to 25% of sales are supplies to Russia
Spain	-	-	Particularly affected are export of fruits and vegetables (68% of Spanish food export to Russia). Meanwhile damage is estimated at only 1.2 billion euros of the total export of 234 billion euros (as of 2013), i.e. 0.14%. Catalonia could export to Russia 40-50% of its fruits
United Kingdom	-	0,2 %	Manufacturers of cheese, mackerel and beef express disappointment. However, the ban does not fall on Scotch whiskey
Sweden	-	Not more than 1 %	Most of this is flour and other products, not fallen under the ban
Lithuania	-	19,1 %.	IMF considers that Lithuania will be one of the most affected by the embargo. However, it is noted that 80% of Lithuanian export to Russia are re-export, so transport companies will suffer more than manufacturers.
Netherlands	1.5 billion dollars. Of total export to 78 billion	-	Cheese producers reported about the losses. damage in the 1.5 billion euros
Germany	-	3 %	
Greece	-	-	The situation with the supply of fresh fruit is assessed as extremely grave. Greek farmers assess the damage as «catastrophic»
Denmark	12 billion euros (2.2 billion dollars)	2 %	The most difficult situation is with the export of meat (Danish export of meat reach 7.9%)
Estonia	-	to 10%, in the agricultural export - 20%	Hardest hit dairy industry (up to 24% of export went to Russia)
Romania	7 billion EUR	-	-
Portugal		0,4%	-
Croatia	15.7 billion EUR	1,5 %	-
Belgium	-	7 %	-
Hungary	-	-	Damage to the Hungarian economy by the embargo is estimated as insignificant
Slovakia	-	-	Damage is estimated at 6 million euros
Italy	706 billion EUR	-	-
Slovenia	-	-	No problems in trade with Russia
Latvia		0,7 %,	The damage from the Russian counter-sanctions amounts 55 million euros.
Czech Republic	-	-	Decline in home prices by 10-12% is expected. Expected drop in sales of 2.2 billion euros (79.1 million euros) and the reduction of 700 job places. Russian embargo will cause a loss of 300 million euros (10.7 million euros) and 130 job places
Bulgaria	-	-	Damage from the Russian embargo is estimated as insignificant. Expected fall in prices due to the appearance of products from other EU Member States that have failed to sell in Russia
Austria	-	-	Manufacturers are interested in the production of products at prices not less than 35 cents per kilogram. Previously, they were 40 cents, but now collapsed to 20. In practice this will cause problems for fruit growers
Luxembourg	-	-	The damage accounted only 5 million Euros
USA	1.2 billion dollars	1 %	The main item of export is chicken; if in the middle of 1990s, Russia's share in the export of chicken reached 40%, now it has fallen to 7%. Losses from the embargo are less than 0.1%. The United States estimated damage from the actions of Russia in the amount of $715 million
Australia	-	0,4 %	Under the embargo, Australia's export to Russia fell by 34%. According to the Ministry of Trade of this country, Russia is only the 28th importer
Canada	563 million Canadian dollars	-	Main part of export is pork.
Norway	-	-	The stock market of the country has fallen by 10%, the price of seafood by 7-8%. Norwegian producers are expected to attempt to circumvent the embargo through Chile

Source: Compiled by the author based on data from Wikipedia. (August 2014 – March 2015).

Table 6. Reaction countries not hit by embargo

Serbia	Embargo is the best chance for the Serbian economy over the last 14 years. Serbian producers cannot quickly increase export for the «huge» Russian market with the required quality and assortment. Currently, export from this country to Russia is insignificant: up to $ 185 million. For 2013 with a total food import to Russia 42 billion dollars
Macedonia	Macedonian suppliers of fruits and vegetables are already exporting some products to Russian shops
Byelorussia	Expressed its readiness to increase its export. August 11, Belarus said it would stop the export of prohibited goods in Russia through its territory. September 20 reported increased Federal Veterinary and Phytosanitary Monitoring Service (FVPMS) monitoring of Belarusian products; this is due to a sharp increase in deliveries to Belarus from countries came under Russian sanctions. In particular, the export of fish from Norway to Belarus doubled
Brazil	Up to 90 new producers of meat have received Russian Accreditation. For the last 6 months in the Brazilian export to Russia beef is in the lead
Switzerland	Attempts were made to European producers (in particular, the Spanish, Polish and German) to bypass the Russian embargo through Swiss territory. However, obtaining the appropriate registration Switzerland - a complex process. A major scandal took place in November-December 2014: FVPMS threatened Switzerland with imposition of restrictions due to the increased supply of apples «by 400 times.» Deliveries of Swiss cheese in Russia increased by 5 times
Turkey	It is expected that the country will benefit from the embargo. Signed a protocol to increase the supply, in particular, milk and honey
New Zealand	Is expected to increase sales of New Zealand cheeses
Chili	Expressed its willingness to increase export of salmon and seafood to replace import from Norway. In 2013, Russia imported from Chili 50 th. tons of salmon, and 130 thousand tons from Norway. In November 2014 Chile became the largest supplier of fish in the Russian Federation.
Faroe Islands	As for February 2015, the export of salmon from the Faroe Islands in Russia increased by seven times, with the price 25% higher
Ecuador	is going to increase the export of fish and seafood
Mauritius	is going to open its fish export to Russia. FVPMS inspection is expected of fish processing plants in this country
Egypt	Is expected to increase food export from this country. A proposal for the inclusion of Egypt in Customs Union
Tunis	Foreign Minister of this country, Mongi Hamdi, expressed readiness to increase supply, especially olive oil (olive oil does not come under the embargo)
Iceland	Deliveries of fish doubled
South Africa	Significantly increased import of fruit
Iran	Start of products deliveries in March 2015

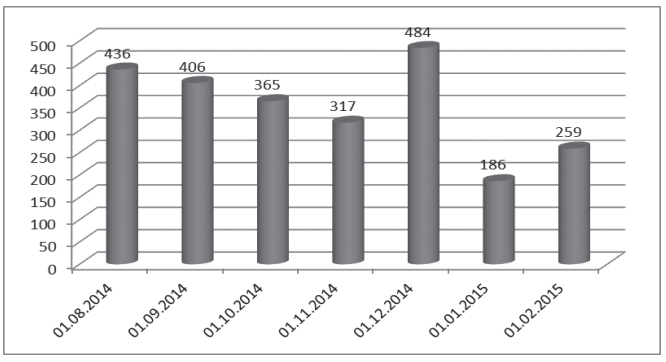
Source: Compiled by the author based on data from Wikipedia (August 2014 – March 2015).

RESULTS AND DISCUSSION

As one of control representatives of HoReCa business, we took the restaurant of Hotel "Metropol", which has become a symbol of Moscow for many foreign tourists and businesspersons. The restaurant's cuisine includes hot shop, cold shop, billet shop. The staff consists of work chef, sous-chef, 8 cooks per shift. The hall has 50 seats; depending on the season, 20 seats are added to the terrace. During the summer period, the number of people extends from 100 to 170 people a day in winter 50-60 people. The restaurant belongs to the category of premium; the average bill without drinks per person is 2500 rubles. Menu may vary depending on the season.

The Figure 2 shows the dynamics from August to February 2015.

Figure 2. Dynamics of restaurant attendance and the rate of growth / decline from August 2014 to February 2015.



Source: Compiled by the author.

The following table presents the dynamics of prices for purchased products. Estimating the price of purchased products, from figure 3a it can be seen that the highest growth rate for products such as salmon is 226.2%, beef 169.3%, cheese 161.5%.

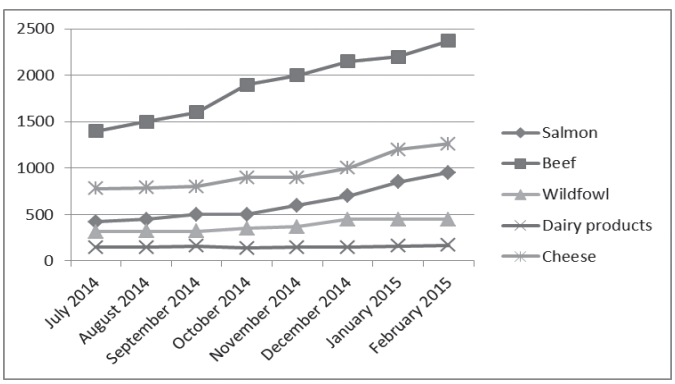
Table 7 a. Prices for products purchased by the restaurant from July 2014 to February 2015

Period	Prices for purchased products, rub. / kg				
	Salmon	Beef	Wildfowl	Dairy products	Cheese
July 2014	420	1400	315	150	780
August 2014	450	1500	320	150	790
September 2014	500	1600	320	160	800
October 2014	500	1900	350	140	900
November 2014	600	2000	370	150	900
December 2014	700	2150	450	150	1000
January 2015	850	2200	450	160	1200
February 2015	950	2370	450	170	1260
The rate of growth (decline),%	226,2	169,3	142,9	113,3	161,5

Source: Compiled by the author.

The dynamics is shown in Figure 3a.

Figure 3 a. The dynamics of the products purchased by the restaurant, rub. / kg



Source: Compiled by the author.

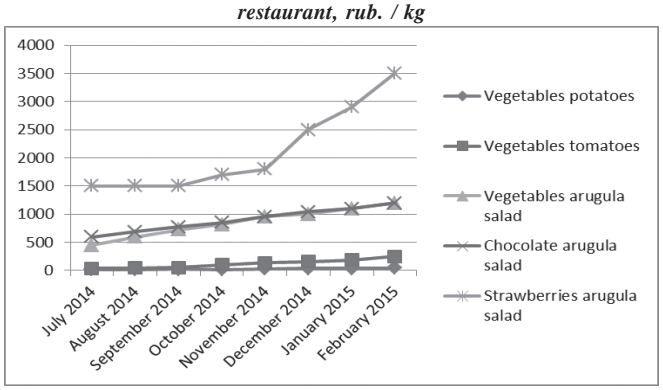
Estimating the price of purchased products, the figure shows that the highest growth rate is 625.0% for tomatoes, but also for other products, rising by more than 2 times. The dynamics is shown in Figure 3b and Table 7b.

Table 7 b. Prices for products purchased by the restaurant from July 2014 to February 2015

Period	Prices for purchased products, rub. / kg				
	vegetables potatoes	vegetables tomatoes	vegetables arugula salad	chocolate	Strawberries
July 2014	16	40	450	600	1500
August 2014	17	47	600	690	1500
September 2014	24	55	725	775	1500
October 2014	20	100	815	850	1700
November 2014	30	137	960	960	1800
December 2014	42	160	1000	1045	2500
January 2015	37	190	1100	1100	2900
February 2015	43	250	1200	1200	3500
The rate of growth (decline),%	268,7	625	266,7	200,0	233,3

Source: Compiled by the author.

Figure 3 b - The dynamics of the price of products purchased by the restaurant, rub. / kg



Source: Compiled by the author.

Due to the growth rate, there is very high trace of products consumption dynamics from July 2014 to January 2015.

Table 8 a - The number of purchased products from July 2014 to February 2015

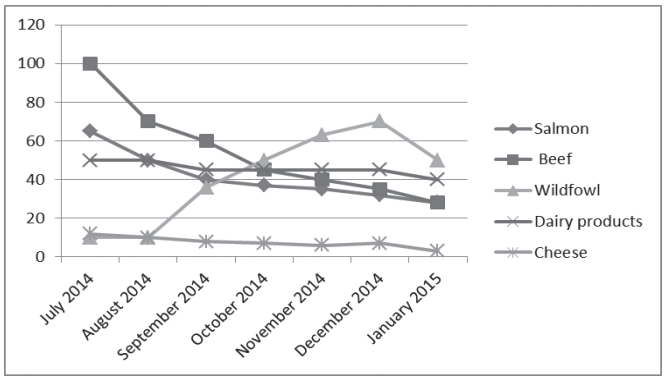
Period	**Daily consumption of the restaurant, kg**				
	Salmon	**Beef**	**Wildfowl**	**Dairy products**	**Cheese**
July 2014	65	100	10	50	12
August 2014	50	70	10	50	10
September 2014	40	60	36	45	8
October 2014	37	45	50	45	7
November 2014	35	40	63	45	6

December 2014	32	35	70	45	7
January 2015	28	28	50	40	3
The rate of growth (decline),%	43,1	28,0	500,0	80,0	25,0

Source: Compiled by the author

Evaluating the data on the number of purchased products we can see decline in procurement, except for fowl, which is currently being purchased on the local market, excluding import. You can see it in the Figure 4a.

Figure 4 a - Dynamics of products consumption, kg/day



This situation is similar for the procurement of other products, growth is observed for potatoes (20% more in January 2015 than in July 2014)

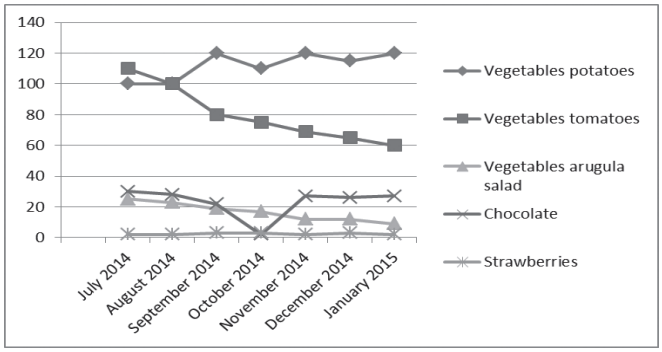
Table 8 b - The number of purchased products from July 2014 to February 2015

Period	Daily consumption of the restaurant, kg				
	Vegetables potatoes	Vegetables tomatoes	Vegetables arugula salad	Chocolate	Strawberries
July 2014	100	110	25	30	2
August 2014	100	100	23	28	2
September 2014	120	80	19	22	3
October 2014	110	75	17	2	3
November 2014	120	69	12	27	2
December 2014	115	65	12	26	3
January 2015	120	60	9	27	2
The rate of growth (decline),%	120,0	54,5	36,0	90,0	100,0

Source: Compiled by the author.

Also can be said for the procurement of other products, growth is observed for potatoes is 20% more in January 2015 than in July 2014. Graphically represented in Figure 4b.

Figure 4 b - Dynamics of products consumption, kg/day



In evaluating the overall consumption of raw materials per day, which depends on the amount of guests, ranges from 20 kg to 140 kg.

In terms of sanctions, the question of import substitution raises, but it is very difficult to replace 100% products.

The ban on import of the food from Europe became for the restaurant market an event of year. Embargo stirred up the restaurant market, having provoked general increase in prices, having destroyed the adjusted logistic chains and having forced to look for replacement to the forbidden products quickly. Having studied various resources of information on current situation, we will use poll of restaurateurs and chefs from Moscow, St. Petersburg and Kazan («FoodService») // http://www.cafe-future.ru/archive/1516/.

In research, the following questions were stated:

1. What import production and from what countries did you receive before embargo introduction? What was its share in the general purchases of your restaurants?
2. What percent of dishes in the menu «stopped» after embargo introduction?
3. Was it succeeded to find replacement to the forbidden products? With what countries and on what products do you plan to cooperate now? Did the share of the Russian products in purchases grow?
4. How did the menu of your restaurants change after embargo introduction? What dishes have you removed/plan to remove from the menu when the residues end?
5. What new dishes have appeared in the menu for the last month? What is now developed?
6. How did purchase prices at suppliers change after embargo? Did you raise the prices at restaurants? If yes, how much.
7. What advantages/ disadvantages of embargo introduction do you see? How was the ban on import of products reflected in work of your restaurants in general?

Research respondents:

1. Leonid Garbar, vice-president of StroganoffGroup (St. Petersburg).
2. Ilya Tyukov, brand chief of the Restaurant Syndicate Company (Moscow).
3. Valeria Silina, senior vice-president for marketing of Rosinterrestorants holding (Moscow).
4. Maksat Ishanov, CEO of a network of restaurants

«Two Sticks» (St. Petersburg).
5. Zufargayazov, CEO of «Tatinterrestorants» (Kazan).
6. Nikolay Mitchin, co-owner and managing partner of BeerFamilyProject (St. Petersburg).
7. Lorena Tsulaya, director of development of a network of Kruzhka restaurants (Moscow).
8. Merab Ben-Al (Elashvili), president of holding «G.M.R. Planet of Hospitality» (Moscow).
9. Alexander Kurenkov, brand chief of the MarketPlace network (St. Petersburg).
10. Oleg Lobanov, president of Korpusgroup group of companies (Moscow).

During work answers of poll participants were analyzed.

Answers on Question 1. What import production and from what countries did you receive before embargo introduction? What was its share in the general purchases of your restaurants?

Vegetables, salads	Holland
Cheeses and meat delicacies	Europe
Meat	Latin America (Argentina)

In general, it is possible to sum up the result that products were bought from the following countries: Australia, Italy, Germany, Poland, Hungary, France, Denmark, Norway, Spain, Holland, China, New Zealand, Japan, USA and Brazil.

Ordered: sausages, cheeses, exotic fruit, some vegetables, salads, berries, seafood, sauces, meat (beef, lamb) freezing.

The share in the general purchases of restaurants reached 80% of import, the share at some restaurants purchases were also the minimum 20-30%.

Answers on Question 2. What percent of dishes in the menu «stopped» after embargo introduction?

First of all most of poll participants answered that on «stop» there was a Caesar Salad, thus the rise in price increased by 3 times. According to technology Caesar salad includes such salads as Romaine lettuce, iceberg salad which gives refined taste and lightness.

As for other dishes, it is meat delicacies and cold appetizer cheese plates. In particular, it is possible to note that there is no bresaola, Parma ham, jamón, salami, hard cheeses, parmesan cheese, cheese with a mold, oysters and lobsters, an asparagus.

The Italian restaurants support fish and seafood in the menu, so on up to 10% «stopped», in some restaurants this indicator reaches 15-20%.

5-10% of dishes with a salmon «stopped»

The quantity of dishes with the use of berries (strawberry, blackberry, currant) decreased.

But in at the same time some respondents answered that there were no «stops», but the price grew.

Answers on Question 3 Was it succeeded to find replacement to the forbidden products? With what countries and on what products do you plan to cooperate now? Did the share of the Russian products in purchases grow?

Product	Country, source
Cream, sour cream, yogurt, kefir, cottage cheese	Russian Federation
Salmon and cod	Russian Federation , Murmansk
Soft cheeses from baked milk with addition of nuts, greens	Farms of the Russian Federation
Trout	Russian Federation , Karelia
Seafood and vegetables	Tunis and Morocco
Cheeses (especially parmesan)	Latin America
Blue cheese	Belarus
Salmon	Chile
Green salads	Turkey, Israel
Seafood	Southeast Asia
Beef	Argentina, Belarus
Parmesan	Uruguay
Mozzarella and ricotta	Georgia
Mutton	Belarus

In purchases, the share of the Russian and Belarusian products grew.

Restaurant business during this period works with the resolved products, the market is not ready to volumes, and quality of production is unstable. Thus, restaurateurs warn guests about quality of products.

However, the most important in the short term is to build logistics, to put shoppers, to buy and start up transport, to construct the overworking plants, to adjust sale.

Answers on Question 4. How did the menu of your restaurants change after embargo introduction? What dishes have you removed/plan to remove from the menu when the residues end?

At first the remains and stocks of some products were used. On some products, it was necessary to change technology of processing to provide the taste that was earlier by the available products. However, if the restaurants replaced some products by the similar worsened dishes and clients stopped to order them. The new lunches based on home cuisine were entered. The new menu at some restaurants decreased by 20%. The products creating esthetics is reduced, e.g. decorations made of berries. Replacement with the budgetary products is carried out: salmon is replaced by chum salmon, green salads – on fresh cabbage. A question with Caesar salad stayed. This dish is very popular; many restaurants bring him out of the menu, due to impossibility of execution.

Incorporate food rotation of dishes before introduction of embargo was once a month, now per 2-2.5 weeks.

Answers on Question 5 What new dishes have appeared in the menu for the last month? What is now developed?

Search of original and similar to taste products is carried out. The most important that unanimously many restaurateurs note that the European meat delicacy differs from Russian in constancy.

Farmer products guide some restaurants or special menus, according to the Russian traditions, became more active to use meat of duck, goose, chicken, lamb, goat's meat. Salad jewelry was replaced with fennel, parsley, green salad.

At the same time part of restaurants try to keep the menu by replacement of production and redistribution of the income and motivation.

Answers on Question 6 How did purchase prices at suppliers change after embargo? Did you raise the prices at restaurants? If yes, how much.

In the period of unstable prices for products, suppliers change the prices daily, but at restaurants such attitude towards guests isn't applicable and it is a question of social responsibility. Increase in prices for 20-30% for demand generating goods is observed.

On some positions, salads, lime, champignons, cherry, chicken the price grew twice, but behind a wave of the high prices, small recession, about 12%, is traced. All restaurateurs were affected by the price of Iceberg salad from 180 rub for kg before jump in 720 rub for kg, and it is 400%.

More increase in prices is a speculation.

Replacement of suppliers (tea, coffee) is carried out

The similar critical situation was already in experience of many restaurateurs in 2008, but knowing the fact those restaurants (public catering) is one of basic requirements, demand for such service will remain respectively. So competent managing directors consciously reduce salary approximately to 15% for their survival. In that case, mid-price segment is in favorable situation, which is filled up by the clients from a premium segment.

Answers on Questions 7. What advantages/ disadvantages of embargo introduction do you see? How was the ban on import of products reflected in work of your restaurants in general?

The positive moments are considered – return to sources, traditions. There is a possibility to develop new dishes named «special offer», after demand studying, start in the mass menu.

The situation will force to approach receipt professionally and economically that creates some kind of difficulties. Orientation to the mass consumer with various tastes is universality in a point of sales and an incentive for producers to increase quality and to expand the range.

At the same time the injurious behavior, one of the most dangerous, is observed, after all thus it is possible «to kill» the client, in that case to whom to sell? Packing and delivery leaves a «sad» mark on products distribution and logistics.

Thus, we can say that political issues affected catering industry. However, this situation is inevitable in some degree but has kind of a plus this important factor can affect the revival of «Russian cuisine».

We can only hope that soon all of these problems will be solved.

Today, the main task is to develop local products, play with the new tastes and the most advantageous is to replace the unavailable ingredients on the author made counterparts. There are hopes that the government will create the necessary favorable conditions for businesspersons and farmers in the industry.

New menu should not increase the cost of food, and in some cases even reduce without loss of palatability. Analyzing our restaurant, we can conclude the only way to keep the business is to provide high quality, while minimizing the cost of food and drinks. During development of the menu, we removed the extra meals, replaced and even deleted unpopular and economically disadvantageous ingredients. We are going back to basics - to the traditional tastes, to the products of local origin that are better absorbed by the body.

Next table shows the comparative information of the menu before and after the food policy change. The difference between the menus is a reduction of one or two meals in the new menu. During supplier countries change the price on some products in the new menu decreased, the replacement products, which did not affect customers' favorite dishes, even to some extent represents the new looks and tastes for restaurant dishes.

Table 9 provides information on the suppliers change before and after the embargo on the number of products produced by import substitution.

Table 9 - Change in supplier countries by product category

Product Categories	**Supplying countries to impose restrictions**	**Product category, after replacing the MENU**	**Supplier country after the restrictions introduction**
fish - salmon - turbot - Black cod - dorado	Norway, France	-salmon -cod - sturgeon -sibas	Tunis, Seychelles, Freshwater fish from Siberia
- meat	Australia		- New Zealand - Chile - Bryansk (Miratorg) - Belarus
- offal - liver - heart			Bryansk (Agribusiness) farmers
cheese - Parmesan, - Taleggio, - Camembert,	Italy France		Crimea Krasnodar region Moscow region South America (Argentina, Chile)
wildfowl - duck - quail	France Hungary	wildfowl - duck - quail	Tver region
dairy products - Oil - milk - sour cream - cream	Finland (Valio)		Moscow Belgorod Vologda Belarus
Fruits and vegetables	EU countries		Turkey, Egypt, Israel, Brazil

Source: Compiled by the author.

Also, in order to develop recommendations for planning effective communication requires a clear understanding of the visitors, which is directly related to the concept of the visits structure.

Table 10 illustrates types of visits to restaurants. The first type of visits that are connected with business meals, the second type is visit for spending a good time and the third type is a variant of buffet and children programs.

Table 10. Types of visits to restaurants

Types	Time period	Reasons	Order	The average bill, rubles
First	From 12 p.m to 5 p.m.	Corporate lunches Business Afternoon snack	Cold appetizer, first course, or one hot dish, hot drinks, dessert, set meals. Typically, strong drinks are not presented	1500
Second	From 5 p.m. to 11 p.m.	Dinner, enjoyable time Spending	Selection of cold appetizers, hot dishes and desserts. The presence of strong drinks	5000
Third	Nonworking days and holidays	Family meals (brunch) orders for take-away products (catering) Children's programs	Dinners for special offers with desserts. The presence of strong drinks	2500

As Table 10 illustrates the first type of visits are attracted to the company public catering casual visitors who found themselves near or invited to a business meeting. The second and third types of visits are based, as a rule, on the primaries, so when deciding plays an important role for brand restaurant enterprise. The brand helps to reduce the significance of the location of the restaurant when choosing these kinds of visits, transfers casual visitors into the category of permanent.

People get used to the lifestyle formed before the crisis, and do not want to change it. So in catering significant changes are not expected, if nothing tragic happen in the global economy.

Below is a list of global trends in catering (restaurants, cafes, pizzerias and others.), typical for this year.

1. The increase of popularity of eating chicken because it is fashionable, tasty and reasonable.
2. A significant increase in the share of vegetarian cuisine and steamed dishes.
3. Increase of the use of wholesome food made from grains.
4. Increasing share of total sales of various soups and beverages.
5. More important are bonuses (bonuses on discount card, certificates, discounts, etc.).
6. Increased attention to gourmets (preparation of non-standard recipe for soups, side dishes, etc.).
7. The formation of a steady stream of customers affected by the presence of specialties and snacks.
8. Popularity of dishes where the main ingredient is noodles. They are quickly prepared, not expensive, and taste better than the expensive masterpieces.
9. Increase of the popularity of national dishes.
10. Attendance growth of fast food restaurants, fast casual (a combination of restaurants and fast food).

All this is a tool adequate response to the changed situation in order to ensure the raw food in the restaurant business.

As for the menu changes, it is implemented in a restaurant, a number of works that are embedded in the Simple Place restaurant menu. Changing the menu helped to keep the same level of profitability and the main thing to keep customers, which are the main source of income.

CONCLUSIONS

The analysis reveals some specific features of the restaurant business. An interesting feature of the restaurant business is a dual component product of the restaurant. So, restaurant product can be divided into tangible (product) and intangible (service) components, which must meet the requirements of the market. Another feature of the restaurant services, distinguishing them from the service industry, where equipment and machines are increasingly used, is the involvement of people in the restaurant process. The human factor in the process of providing services is one of the biggest challenges of the restaurant business - quality variability and the associated lack of standardization. Thus, one of the most important components of success for catering business is the availability of qualified and well-trained staff.

Profit depends on the quality of the interaction between employees and their ability to create a certain atmosphere for customers.

Changing the menu helps to keep the same level of profitability and the main thing to keep customers - the main source of income. In the future, the development and introduction of new dishes with fish and meat products will grow and will be produced in the territory of the Russian Federation, as well as other products that are currently unclaimed in market restaurants. Nevertheless, with the given constraints it is possible that the restaurant would have to invest in farms in order to create a permanent source of raw materials.

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SCIENTIFIC PAPER

ECOLOGICAL ASPECTS OF INCREASING INTENSITY IN PEPPER FORCING WITH PRIME ATTENTION TO THE TYPE OF THE GROWING EQUIPMENT

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Abstract: *Significant amount of profit can be generated in forcing technologies by the efficient use of different elements in growing technologies, however, improving production intensity is on the agenda in the sector. Pepper forcing, as the most significant class of vegetable forcing, practically takes place under all the growing equipment widespread in our country, but there is a considerable difference in context of profitability and efficiency. This paper wonders whether the most intensive technology in pepper forcing is efficient regarding the use of forcing equipment, namely modern greenhouses, or growing under greenhouses with significantly lower investment cost is more efficient.*
The analysis represents cost-income factors and efficiency assessed on a long-term basis of different technologies via a deterministic model based on producers' data collections.
As a result of the research, economic indicators are calculated based on exact results which will help to conduct a comparative assessment of economic features in technological varieties.

Keywords: *pepper, forcing, forcing equipment, economic analysis (JEL code: Q12)*

INTRODUCTION

Horticulture is the third most important sector in the Hungarian agriculture, in addition, it ranks the first place by its export performance over a period of years [CZERVÁN, 2014]. Hungarian Central Statistical Office data confirm that vegetable growing (130-140 billion HUF/year) is considered as the most significant subsector in horticulture on the basis of its production value. During production in the vegetable sector, Hungary has comparative advantages due to its favourable agro-ecological conditions and economic-geographical location [LAKNER et al., 1997]. Timing and predictibality of growing and uniformity of products have become basic requirements under today's trade conditions. However, producers who apply traditional, free range growing technology are unable to meet these challenges and they lose competitiveness. Thus, the importance of intensive technological items in vegetable growing is taking wider dimension under current economic, trade and climatic conditions and this tendency is predicted to rise [SKENDER et al., 2011]. In an attempt to boost intensity in vegetable forcing, growing under soilless culture has greater presence. The main feature of soilless forcing is that organic or inorganic, artificial materials are used for nutrition supply and fixing instead of soil [OMBODI, 2008]. According to HOWARD [2013] possible shortcomings of the soil may be eliminated and infectious diseases from soil may be avoided by applying growing mediums. Due to this effect, good nutrition management and plant variations, inter alia, 4-10 times higher yield may be gained by growing mediums compared to soil cultures. However, the author highlights the greatest disadvantage: applying growing mediums requires higher initial capital compared to soil cultures. LIETH et al. [2008] demonstrates in his analysis that, in case of soilless and soil culture as well, irrigation systems contain units suitable for spreading water soluble fertilizer, so irrigation and the spread of nutrition can be done simultaneously. Irrigation water is one of the most vital sources for plants that can be spread precisely under growing medium.

Besides free range vegetable growing, Hungary boasts traditional vegetable forcing culture, but forcing has been characterised by continuous and drastic decrease in its territory since the change of the Hungarian regime. 'Magyar Zöldség-Gyümölcs Szakmaközi Szervezet és Terméktanács' (*Hungarian Fruit and Vegetable Interbranch Organisation*) considers that the area under forcing has decreased from 6 300 hectares to 3 700 hectares (2 600 hectares under

shelter), by half in terms of scale, in the last 25 years. Decrease in yield was only 15-20 % from 450 000 tones, a yield of 380 000 tones has been gained in the last few years [FRUITVEB, 2013]. Yield decreased on a smaller scale than the area of arable lands due to the continuous improvement in the production technology. According to BALÁZS [2000] forcing is economical in Hungary as well as abroad despite of the high establishment and operation costs of vegetable forcing equipment. Furthermore, vegetable and ornamental plant forcing is the most profitable activity these days among horticultural sectors.

Growing equipment can be divided into 3 groups. The following list represents development stages at the same time: hotbed, greenhouse and equipment covered by plastic film. The latter two can be applied for soilless growing, as appropriate [GYÚRÓS, 2008]. Greenhouses in Hungary have been built since 1955. They have dual purposes: seedling and forcing. The best known type is the co-called „gyulai blokk", which is a greenhouse with large airspace (the width of span is 3.2 m or its multiple). The main types are listed as follows: Venlo, Prins, Bolgár, Forsche, EG-2. It is responsible for forcing and seedling production in the foil sites where large airspace could provide perfect growing conditions, but due to the high establishment cost, they were scaled back after the presence of plastic tunnel. [TAKÁCSNÉ, 2013a]

From the second half of the 1950's, there was a chance to build equipment totally or partly made from plastic in vegetable forcing due to the rapid development of the plastic industry. Structures equally suitable for growing and forcing seedling can be characterised by lower establishment and operation cost, simpler and faster feasibility in comparison with hot beds and greenhouses. [GLITS et al., 2005]. Plastic tunnels and blocks with large airspace were built from the middle of the 1990's. Technological developments (hydroponics) resulted in the dynamic increase in yield especially for plants with warm tempereature requirements [LEDÓ, 2005].

Forcing technologies applied in Hungary (under greenhouse, plastic tunnel and plastic greenhouse) are in continuous development. Due to the technological developments, cutting-edge plastic covered equipment has almost, but not quite the same features as greenhouses regarding the most parameters (airspace, light transmittance). Pepper is the most significant product in vegetable forcing. 2 250 hectares are utilized by pepper forcing in Hungary, in addition, the annual export of the class is paramount [TAKÁCSNÉ, 2013b]. The size of area in Hungary under pepper forcing is remarkable at European level, as well. According to VAN SICKLE et al. [2005] only 1 200 hectares are utilized in the Netherlands, which is a superpower in vegetable forcing, while 10 000 hectares are under pepper forcing in another vegetable forcing leader, in Spain. Among the protectively grown vegetables, it is the pepper, which requires the careful selection of growing equipment because glasshouse and foil covered equipment are equally suitable for growing in horticultural aspects, unlike tomato.

THE AIMS OF THE RESEARCH

The main goal of this research is to determine whether greenhouses with quite high investment cost or plastic tunnels with relatively lower cost price is more economical in pepper forcing. According to APÁTI [2012] the term 'economical' is a very relative expression and should not be identical with 'profit' and 'profitability'. An activity is economical if it provides profit in line with the producer's expectations. The expected profit should be enough for developments, investments, sufficient reserve and ensuring the livelihoods of families in case of family businesses. The yield of current bank deposits, as a risk-free alternative investment, is considered as a minimum besides relative assessment.

The following questions should be answered as specific goals in line with the main goal:

1. What differences are there in natural expenses, annual growing and investment costs due to growing technologies in forcing equipment?
2. What is the difference between input parameters (yield, product quality, sales price, production value) as a consequence of growing equipment and growing technology?
3. How do the results of technologies, production efficiency, short and long-term profitability develop on the basis of production cost and revenue?

MATERIAL AND METHOD

This research is an economic analysis via a deterministic simulation model primarily based on primer farm data collection. It compares 'good quality' pepper forcing under greenhouse and plastic tunnel. It isn't easy to define 'good quality' because it can't be described by exact data. The growing models don't represent the average national ones, they are in the upper third part based upon yield, good product quality, and high level of expenses, great knowledge and technological discipline.

Natural expenses of total growing technologies are the base of the analysis. Each workflow involves its own labour stages and each expense of raw materials, manual and non-manual labour is taken into account. In order to analyse revenue, yields are divided and processed by months concerning size and quality. Producers' data collection for all technologies required to determine expenses and yields was completed by producers' data acquisition boards. Site visit and professional consultancy in Szentes area were the base of the data collection. It is the place in Hungary where pepper forcing is the most significant. Input data used in calculation model refer to growing farms in line with the represented technological standards, therefore, results are not amenable to draw national conclusions. Data collection was performed in large scale plants of the national average. The size of growing systems under plastic tunnel exceeds 5 000 m^2, while it is 1 hectare under greenhouse. Data collection covered 10 growing farms (8 farms under plastic tunnel, 2 under greenhouse technology) selected by high technological standards.

The prices of input materials were calculated on the basis of a price list of a retail farmers' store with significant role in the area. The total cost of manual labour of 700 HUF/hour – representing the manual cost of farms under the research - is included in the calculation models. Substantial part of the work is done by permanent labour, but temporary workers are needed at peak seasons. A wage cost of 700 HUF/hour is an average wage for permanent and temporary workers.

Monthly price data of one of the most prominent integrator organisation were the base of sales prices. In an attempt to avoid incorrect conclusions arising from annual fluctuation in producer prices, average producer prices of four years are used in the analysis. It was conducted at farm level; models don't cover overhead costs. In addition, margin requirement among income categories is the base of conclusions.

Input prices (materials, manual and non-manual labour) and the cost of production in the cost-benefit analysis reflects price levels for 2015. The price of materials is net of VAT while manual labour costs are calculated with contribution. Calculations refer to the complete scale of the business, but in order to compare technologies and bibliographic data, values at 1 m^2 were also calculated.

In addition to classic cost-benefit analyses, investment-efficiency analyses were carried out to determine long-term efficiency, in which results are assessed by dynamic indicators primarily on the basis of researches of other authors [GRAHAM-HARVEY, 2001; WARREN, 1982; ILLÉS, 2002]. The following indicators were used in the research:

- IRR (Internal Rate of Return) shows is the "annualized effective compounded return rate" or rate of return that makes the net present value of all cash flows from a particular investment equal to zero. It can also be defined as the discount rate at which the present value of all future cash flow is equal to the initial investment or, in other words, the rate at which an investment breaks even. Equivalently, the IRR of an investment is the discount rate at which the net present value of costs of the investment equals the net present value of the benefits of the investment.
- NPV is the acronym for Net Present Value. It is a calculation that compares the amount invested today to the present value of the future cash receipts from the investment. In other words, the amount invested is compared to the future cash amounts after they are discounted by a specified rate of return.
- DPP (Discounted Payback Period) is used to evaluate the time period needed for a project to bring in enough profits to recoup the initial investment. It reveals the time when revenue generated by forcing covers the potential rate of committed capital and the expenses related to investment and operation.
- PI (Profitability Index) is calculated as the ratio of the present value of the future cash flows and the initial investment in the project.

The yield of alternative investments (discount rate) and the income of nearly risk-free government securities in the analysis are investments with long-term maturity of 10-15 years, similar to the useful economic life of the production equipment. The rate of alternative investments and risk-free government securities was around 5.5 % in the last 7 years on the basis of data from Magyar Nemzeti Bank (Hungarian National Bank). Accordingly, a discount rate of 5.5 % was used in the model to measure dynamic investment-efficiency figures. The models don't recognise the residual value of growing equipment because obsolete systems are non-marketable. Therefore, it is inappropriate to use realisable residual value. In this context, useful life means that both technologies become obsolete in 15 years to the extent that it requires modernization as an investment, so it is considered as its useful life. Inflation is recognised in calculations neither at the input nor at the output market. The default assumption is that the income position of the production doesn't change substantially besides the change in output and input price level. Depreciation cost shall not be included, expenses and the impact of tax shield are not considered.

Cost-benefit and investment-efficiency analyses are accompanied by sensitivity analyses (SZŰCS [2004]). Its aim is to measure the impacts of various (as an ordinary in the average model, differ from a normal year) economic and natural environmental conditions on the results of farming so that efficiency of growing can be assessed under non-normal conditions, as well. Elasticity and critival-value approach were applied in the research. By elasticity test, factors affecting profitability are quantifiable while critical value approach shows what value means the turn point in profitability for the most significant factors affecting. As a result of the elasticity test, it is definable and comparable what changes the technologies studied can manage pertaining to factors affecting and it is identifiable which technology is more stable economically.

The tests were carried out by deterministic simulation model likewise the works of SZŐLLŐSI [2008] and APÁTI [2009]. Their input data are economic parameters appropriate to technological data. The model is capable for carrying out complex cost-benefit analysis, investment-efficiency and sensitivity analysis of growing equipment in which the impacts of changes in input, output prices, yields, investment and operation costs on results and efficiency can be measured.

RESULTS

This analysis is an economic comparison of pepper forcing equipment under plastic tunnel with intensive techology and greenhouse (both technologies are featured by relatively high level of expenses and high specific yield). The common feature of each growing equipment showed includes the use of growing mediums, automated irrigation and climate regulation. Both technologies are heated with thermal energy. Primer thermal water is used to keep the greenhouse warm while plastic tunnels are heated with thermal water deriving from greenhouse cooled down at 40 ^{0}C. The plastic tunnel studied has relatively huge airspace, plantation starts in January and production period takes place by December. The greenhouse technology studied covers production by Venlo and modern Dutch techologies where plantation starts in October and production is finished by July.

Table 1. Costs in labour stages in pepper forcing
Unit of measure: HUF/m2

Labour stages	Plastic tunnel	Greenhouse
The preparation of growing equipment	349	332
Planting	787	379
Irrigation	61	-
Nutrition management	490	351
Plant protection	252	328
Green works	401	338
Harvesting	455	681
Other works and costs	521	693
Site costs	723	913
Depreciation of growing equipment	867	1 533
Total indirect cost	4 906	5 548

Source: own edition (2016)

Based upon the data in *Table 1.* there are signicant differences regarding costs at the labour stages of both technologies. The cost driver is planting under plastic tunnel forcing. The second major cost refers to site costs including thermal water for heating and other works (waste removal, property protection) which are used as services of other companies. Site cost is a paramount item among the costs of labour stages under greenhouse production, which also includes thermal water for heating and irrigation and maintenance performed by other companies. Overall, the driver cost for both technologies is the annual depreciation of the growing equipment and its technological items, however, depreciation is not considered as a labour stage. As can be seen in *Table 1.* depreciation cost of greenhouse per m^2 exceeds 1 500 HUF (due to 200 % higher investment cost) which is 80 % higher than the depreciation cost of the plastic tunnel. The investment cost of the greenhouse is 23 000 HUF/m^2 while it is 13 000 HUF/m^2 for the plastic tunnel with huge airspace.

Table 2. The expenses of growing by nature

Expenses by nature	Plastic tunnel		Greenhouse	
	Cost (HUF/ m2)	Proportion (%)	Cost (HUF/ m2)	Proportion (%)
Cost of raw materials	2 126	43.3	1 541	27.8
Payments to the staff	1 308	26.7	1 885	34.0
Machinery and building cost	308	6.3	496	8.9
Othe indirect cost	298	6.2	93	1.7
Depreciation of growing equipment	867	17.7	1 533	27.6
Total	4 906	100.0	5 547	100,0

Source: own edition (2016)
Comment: Differences may occur in the table due to rounding

On the basis of data in *Table 2.* it can be concluded that pertaining to the technologies studied there are significant gaps between the expenses by nature. More than 40 % of the total cost (4 900 HUF/m^2) under plastic tunnel is cost of raw materials while under greenhouse payments to the staff (resulting from technological features) are predominant because this type of expense accounts for more than one-third of the total production cost (nearly 5 550 HUF/m^2). It should be also noted that cost of raw materials and payments to the staff represent high share of the total cost. Irrespectively of technology, these 2 types of expenses account for 60-70 % of the total production cost.

Table 3. Results and efficiency in pepper forcing

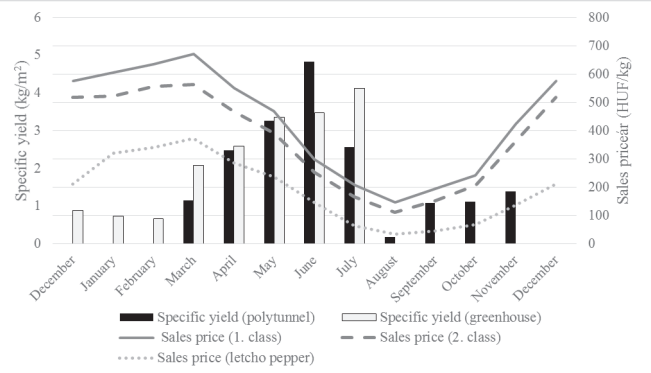
Name		Unit	Value/m2	
			Plastic tunnel	Greenhouse
Yield	- 5/8-7/12	kg	10.1	10.9
	- 4/7	kg	6.5	5.7
	- letcho pepper	kg	1.5	1.3
TOTAL YIELD		kg	18.1	17.9
Revenue	- 5/8-7/12	HUF	4 170.1	5 198.2
	- 4/7	HUF	1 740.2	1 684.4
	- letcho pepper	HUF	217.3	210.5
TOTAL REVENUE		HUF	6 127.6	7 093.1
PRODUCTION VALUE		HUF	6 127.6	7 093.1
Total indirect cost		HUF	4 906.2	5 547.0
Total operation cost		HUF	4 039.5	4 013.8
MARGIN REQUIREMENT		HUF	1 221.4	1 546.0
CASH FLOW		HUF	2 088.0	3 079.4
Direct prime cost		HUF/kg	271.4	310.0
Direct cost-profitability ratio		%	24.9	27.9
Fixed asset-profitability ratio		%	9.4	6.7

Source: own edition (2016)
Comment: Differences may occur in the table due to rounding

By studying the results of growing technologies (*Table 3.)*, it should be concluded that there is minimum difference between technologies regarding yield as the most important indicator in growing efficiency (specific yields in the analysis are in line with the results published by TOMPOS [2006]). In addition, it is also noted that higher investment and growing costs in forcing under greenhouse are in relation to 0.2 kg lower yield per $m^{2.}$ Despite, yield under greenhouse generates higher revenue (and production value) than in plastic tunnel. The common features of forced vegetables are that their sales prices are the highest when price pressure of rival products under freerange production is not prevailed. It is clear from the table that there is great difference, in yield over time, between technologies. Most of the yield under greenhouse growing is generated (during winter period when products from freerange production are not available on the

market) when sales price (irrespectively of quality category) is relatively high. On the contrary, there is no yield at all under plastic tunnel technology from December to February. Moreover, a substantial part of growing quantity is generated during summer (June, July) when sales price is the lowest in years. Unlike yield, revenue takes a more positive direction (difference is more that 1 000 HUF/m^2 under greenhouse production).

Figure 1: Trends in specific yield and sales prices



Source: own edition based on DélKerTész data

Regarding greenhouse growing, 1 000 HUF higher production value is gained per m^2 by higher indirect cost under the same yields *(Table 3.)*. Therefore, margin requirement of greenhouse forcing is 300 HUF higher per m^2 than in forcing under plastic tunnel. Under forcing in plastic tunnel, nearly the same amount of specific yield can be gained by lower investment and growing cost in comparison with forcing under greenhouse, but due to produce over time, revenue, margin requirements and production value are more favourable under greenhouse technology. Forcing in plastic tunnel performs better in indirect cost price (lower by 39 HUF) and invested return on assets (more than 2.5 % higher). Sectoral revenue of 1 546 HUF is realized under greenhouse forcing.

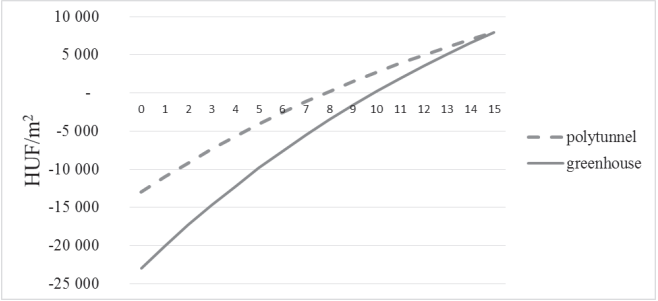
Table 4: An Investment-efficiency results of pepper forcing technologies at the end of its useful life of 15 years

Indicator	Unit	Plastic tunnel	Greenhouse
Net Present Value	HUF/ m2	7 959	7 909
Discounted Payback Period	year	8.	10.
Profitability Index	-	1.61	1.34
Internal Rate of Return	%	13.7	10.3

Source: own edition

The investment cost of the growing equipment and their technological items in the analysis differ significantly. The cost price of plastic tunnel heated is 13 000 HUF/m^2 while the investment cost of greenhouse is 23 000 HUF/ m^2. Net value shows (*Table 4.)* that how much extra profit are generated by each investment within the useful life of 15 years in addition to the calculative rate of 5.5 %. It is evident that both technologies are capable of generating the same amount of revenue on a long-basis, Net Present Value is higher merely by 50 HUF per m^2 under plastic tunnel. Positive Net Present Value indicates that both investments recover within the useful life of 15 years. Discounted Payback Period shows that investment cost of plastic tunnel forcing recovers in the 8th while it recovers in the 10th year under greenhouse (*Table 4, Figure 2.*)

Figure 2: NPV in both production equipment



Source: own edition

Internal rate of return shows the return on equity of investments (*Table 4.)*. Data demonstrate that IRR is higher than 10 % for both investments indicating that they are capable of generating much more profit under current economic environment than risk-free bank investments.

On the basis of results of investment-efficiency analysis, there isn't significant difference between pepper forcing under greenhouse and heated plastic tunnel in context of NPV, but forcing under plastic tunnel is better as regards indicators with the exception of NPV due to its lower investment cost.

Table 5. Results of elasticity test

Growing equipment	Greenhouse		Plastic tunnel	
NPV (HUF/m2)	7 909		7 959	
Factors affecting	NPV (HUF/ m2)	Elasticity (%)	NPV (HUF/m2)	Elasticity (%)
Yield	8 621	9.0%	8 574	7.7%
Average sales price	8 621	9.0%	8 574	7.7%
Quality	7 932	0.3%	7 982	0.3%
Investment cost	8 139	2.9%	8 089	1.6%
Unit cost of nutritients	7 942	0.4%	8 001	0.5%
Unit cost of plant protection substances	7 933	0.3%	7 977	0.2%
Wage	7 968	0.7%	8 083	1.6%

Source: own edition

Table 5. represents the elasticity results of production equipment. Calculated values show how a 1 % improvement in indicators affects NPV (as a value and percentage). Based upon the results, yield and sales price are the most affecting factor on efficiency in both technologies (the values of these indicators are equal because yield and sales price have the same effect on production value). Modelling change in average sales price was carried out by varying monthly sales prices

in each quality group. Quality is worth mentioning besides yield and sales price among output parameters. To stimulate improvement in quality, I cut the quantity of letcho pepper by 1 % and I distributed this 'available' yield in the first and second class in line with the relation between the quality classes. By the technique above, change in quality along with growth in yield may be eliminated which would imply wrong conclusions. A 1 % improvement in quality leads to a 0.3 % change in NPV, regardless of technology, so quality of produce cannot be classified in the most affecting indicators in terms of improvement in efficiency. It should be noted that it is relevant to those pepper forcing businesses where technological standard is outstanding because the rate of lecsópaprika exceeds 10 % only in the hottest months, when produce size is hard to be improved due to weather conditions. This rate is 2-7 % in another production period.

Investment cost is the most paramount among factors affecting input. Data in *Table 5.* show that a 1 % decrease in investment cost implies a change of more than 1.5 % in efficiency of forcing under plastic tunnel while the same amount of change generates an improvement of 3 % in NPV of greenhouse forcing.

Under current economic conditions, the purchase cost of production equipment is not likely to decrease, but based upon the results of the elasticity test, investment grants increase, or would increase, efficiency of the entire sector in a great extent as they cut the purchase cost from the producers' point of view. Among the most significant operation costs, the effect of labour cost is outstanding. Under the technologies studied, a 1 % decrease in wages generates 0.7-1.6 % improvement in NPV. Decrease isn't plausible in wages, however, decrease in public dues could contribute to more profitable production for gardeners. It might be important that wage is likely to increase worsening the economy, so the efficiency of labour might be a crucial point.

Table 6: Results of critical value approach

Factors affecting	Greenhouse			Plastic tunnel		
	Initial value	Value	Rate	Initial value	Value	Rate
Specific yield (kg/ m2)	17.9	15.9	11.1%	18.1	15.7	13.3%
Average sales price (HUF/kg)	396.0	352.0	11.1%	339.0	294.0	13.3%
Initial investment cost (HUF/ m2)	23 000.0	30 910.0	34.4%	13 000.0	20 960.0	61.0%
Wage (HUF/hour)	700.0	1 638.0	134.0%	700.0	1 147.0	64.1%

Source: own edition

Table 6. shows the results of critical value approach of the most prominent factors affecting based on the results of the elasticity test, ceteris paribus. The numbers in the table are those values at which NPV under technologies at a calculative rate of 5.5 % is zero at the end of the 15th year. In chart 'Value', the critical value of the particular factor was included while 'Rate' indicates that what sort of percentage decrease is acceptable in relation to the 'Initial value' to reach the turn point in efficiency. Data in *Table 6.* suggest that acceptable decrease (11.1-13.3 %) is relatively low for both technologies regarding average sales price. Models in the research include average yield and price, so critical values should be interpreted as an average over years. It should be noted that a decrease of 2-2.5 kg in protected pepper forcing is conceivable under extreme weather conditions in Hungary on average over years.

There is significant gap between the growing equipment in context of investment cost and wages. A 61 % growth in investment cost entails (ceteris paribus) a turn point in efficiency under plastic tunnel forcing while this rate doesn't exceed 35 % under greenhouse forcing. The critical value for the total wage cost per hour is relatively high, but it is clear that growing under greenhouse can bear growth twice more than under plastic tunnel. This is due to the fact that personal cost per 1 kilo of pepper under greenhouse is more favourable than under plastic tunnel forcing. By the results of critical value approach, there are reserves at input and output sides in both technologies studied.

CONCLUSIONS

The main goal of the research was to determine whether greenhouses with higher investment cost or plastic tunnels with relatively lower cost price are more efficient investments in pepper forcing.

The analysis shows that there isn't significant difference between technologies studied in context of the total operation cost per $m^{2,}$ but due to the high investment cost of greenhouses, the total production cost under plastic tunnels are significantly lower, by 650 HUF (43 %), than under greenhouse. Higher cost of forcing under greenhouse isn't expressed in the specific yield because it is 0.2 kg lower than forcing under plastic tunnel. However, a 950 HUF lower production cost is realised per m^2 in forcing under plastic tunnel due to sale prices because most of the yield under greenhouse is generated when sales prices are near their peak values. In conclusion, the total production cost per m^2 is 650 HUF higher while the production value per m^2 is 950 HUF higher under greenhouse growing, therefore margin requirement under greenhouse growing per m^2 is 300 HUF (risen by 21 %) higher than under plastic tunnel. Based upon a cost-benefit analysis of an average year, growing under greenhouse has more favourable income-generating capacity and its profitability is 11 % higher, however, long-term efficiency of investments studied is more favourable under plastic tunnel as the payback period of plastic tunnels and their technological items is 2 years shorter than the payback period of greenhouses. In addition, all of the dynamic investment-efficiency indicators (NPV, PI, and IRR) demonstrate that plastic tunnel forcing is more economical on a long-basis calculated with liquid asset interest. The basic reason for this is listed as follows: greenhouse in its first years of operation gains 26 % higher margin requirement, 47 % higher cash-flow, 10 % more favourable profitability and 77 % higher investment cost.

Scale is also a crucial point. Calculations were carried out with optimal scale and the figures differ significantly in technologies. Plastic tunnel sites are made up of several forcing equipment (besides modern, one-span growing equipment), calculated figures are related to each m^2 of the site. As a conclusion, scale may be minimised – in realistic limits which means at least one plastic tunnel with an average width of 7.5 m and length of 50 m -, so the initial cost of investment and the annual production cost can be kept relatively low. On the contrary, the minimum threshold of the scale operated economically is 5 000 m^2 – it cannot be reduced proportionally - due to high cost technological equipment. According to TÉGLA [2010] growing equipment heated with thermal water is the most economical, but this isn't complied with the required return on sales (24 % or higher) under a scale of 0.5 hectare. As provided above, capital enough for 0.5 hectare is needed to start economical greenhouse growing. As a conclusion -agreeing with LEDÓ [2012] plastic tunnel growing has lower establishment and operation cost compared to hot beds and greenhouses – greenhouse growing may be efficient on a short and on a long basis, however, growing equipment under plastic tunnel is more economical regarding pepper forcing due to much more favourable specific costs (investment and production). It is also backed by the results of sensitivity analysis; it is concluded that pepper forcing under plastic tunnel is less sensitive to the change in factors affecting efficiency than growing under greenhouse.

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SCIENTIFIC PAPER

HOW ECONOMIC RECESSION EFFECT THE CORPORATE PHILANTHROPY? EVIDENCE FROM PAKISTANI CORPORATE SECTOR

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Abstract: *Corporate philanthropy is a significant indicator of firm's socially responsible behavior. Researchers and managers acknowledge the immense potential of corporate philanthropy for optimizing social and economic benefits. Aligned with this view corporate sector in Pakistan is engaged in philanthropic initiatives in some form or another. This paper aims to present the response of the Pakistani corporate sector to the corporate philanthropy at the time of global economic recession 2008-2009 by analyzing the sample of Public Listed Companies (PLCs). The analysis revealed that during the global financial crisis, the economic condition of Pakistan was worsened that was already in distress, but it hasn't strongly effected the corporate philanthropy as the data shows a slight decrease in the overall volume of corporate donations in 2007 and a slight decrease in the number of companies engaged in philanthropy during 2008. The finding of the study suggests that during the global economic downturn the PLCs in Pakistan continued to show commitment towards community through corporate donations.*

Keywords: *Corporate Philanthropy, Economic Recession, Inflation. Exports, GDP Growth (JEL code: B22)*

INTRODUCTION

Corporate philanthropy is significant for both business and society. The strategic perspective of corporate philanthropy is associated with numerous economic benefits such as alleviating corporate financial performance and corporate reputation (Porter and Kramer, 2002; Brammer and Millington, 2005). This growing importance of corporate philanthropy has led to increase in the volume of donations made by the companies all across the world. Despite this fact, corporate philanthropy remains controversial as in the view of many researchers such as Friedman "The business of the business is to do business."

In the recent times the global economic crisis of 2008-2009 which, according to many economists was the most serve after the great depression of the 1930s once again challenged the very notion of corporate philanthropy. The economic recession of 2008-2009 imposed immense financial pressures on the businesses as many underwent heavy financial losses and were forced to reduce the cost. In the struggle of restoring core operations many businesses were forced to drop non-essential activities. Among the list of non-essential activities, corporate philanthropy being the most discretionary element of corporate social responsibility became more susceptible since on the activity list of the company's management it is "last in and first out" (Buchholtz, Amason, & Rutherford, 1999).

There were different studies that were conducted on the link between corporate philanthropy and economic recession but these studies were mostly conducted in the context of developed economies, however, very little is known about how the businesses in the emerging and developing economies responded to corporate philanthropy during the global economic crisis. The financial crisis that started from America spread worldwide and turned into global recession, but it had different implications for the developed and developing economies mainly due to the non-integration of financial systems of developed countries with the financial systems of under-developing countries. The financial systems in Asia were found to be stronger than the European and American financial systems, but still overall in Asian countries; unemployment increased and output decreased. So the current article is intended to present the case of developing economy of Pakistan by providing the overview of how the corporate sector in Pakistan responded to corporate philanthropy during the time of global economic recession 2008-2009 by analyzing the sample of Pakistani Public Listed Companies

(PLCs). The article consists of two sections. First section presents the review of literature on the link between corporate philanthropy and economic recession to serve the basis for further analysis. The second part presents the situation of corporate philanthropy during the global economic recession of 2008-2009 by analyzing the response of PLCs in Pakistan.

MATERIALS AND METHODS

The following section is intended to build the theoretical foundation for further analysis by explaining the concept of corporate philanthropy, economic recession and the link between the two in the light of pervious researches

Corporate Social Responsibility (CSR)

Figure 1 shows that the purpose of corporate social responsibility is to make firms sustainable in three aspects **i) Economic Aspect:** the firm's operations have direct and indirect implications for all stakeholders. The better economic performance can lead to long term sustainability of operations and continuous payment of taxes that is in the interest of all stakeholders; **ii) Social Aspect**: consideration of firm's actions that have impact on the welfare and interest of all stakeholders, including employees, customers and communities; **iii) Environmental Aspect**: reducing the negative impact of firm's operations on the environment using less material and reducing or recycling the waste that can create win-win situation for all stakeholders (Uddin, Hassan, & Tarique, 2008).

Corporate Philanthropy

As mentioned above the social aspect of CSR highlights the impact of businesses on the community. The companies are expected to support the communities in which they operate. In this regard companies engage in different social causes such as funding different charities with cash or non-cash donations and this act is referred as corporate philanthropy. Furthermore Carroll's (1991) model of corporate social responsibility can be used to explain corporate philanthropy. This model identify four types of responsibilities for business; i) Economic ii) Legal iii) Ethical and iv) philanthropy. In the order of priority first two responsibilities are the most important for business such as to generate profit and do business, according to law; third responsibility is expectation from the company that it will do business ethically, but the last responsibility is neither mandatory nor expected but is deemed desirable. It is completely at the management's discretion to decide to engage in philanthropic activities to support social causes and return something to the communities where they operate.

Recession

Lee and Shields (2011) defined recession as a period with decreased activity and economic difficulty for the majority of people. The profit of the business decreases as consumption falls, investment reduces and people start losing jobs. Due to increase in unemployment the income of household falls. The defining feature of rescission is that it affects the households and businesses by strongly affecting their decision making. According to some economist recession is unforeseen and unpredictable whereas others believe it is a predictable and inevitable result of many factors such as macroeconomics, lack of regulations for the financial systems, risky investments made by the banks or financial institutions and greed etc. (Roubini, 2011).

Economic Recession of 2008-2009

The financial crisis started in the mid of August 2007 in America and spread worldwide. The major cause of the crisis was the prime and subprime mortgages in America. The American government encouraged subprime mortgage after 2001 so that people can have ownership of their own homes (Poole, 2010). Subprime mortgage can be defined as lending money to the borrower with weak credit history or no history. This is done by providing loans for zero or minimum down payment with weak documentation and less credit checks to the borrowers. Initially the mortgage firms made millions and in some cases billions of dollars similarly the house

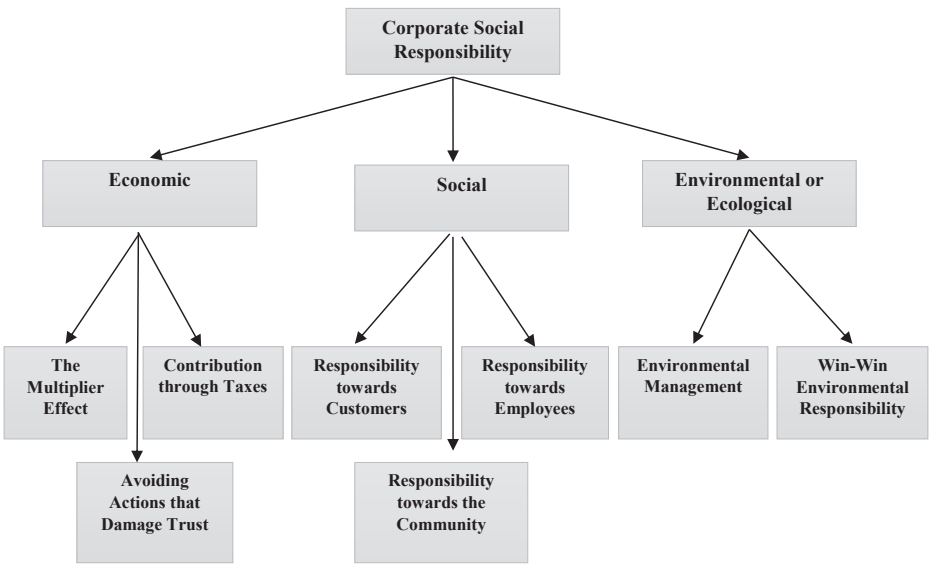


Figure 1: Three Dimensional Aspects of Corporate Social Responsibility
Source: (Uddin, Hassan, & Tarique, 2008)

owners also made money as the interest rate remained low and prices of houses begin to rise. The mortgage backed securities allowed the immature investors to transfer the risk to others (Mah-Hui, 2008). As a result the subprime mortgage was considered a safe investment as the borrower in financial distress can sell the property or refinance it to pay back loans.

But the market participant's including private firms and the federal government failed to anticipate the falling prices of houses that later on, became the major cause of the financial crisis (Poole, 2010). The situation became worsened when the two main US mortgage funds run by Bear Stearns collapsed (Mah-Hui, 2008).

Economic Recession and Corporate Philanthropy

In difficult economic times, businesses respond to CSR usually in two ways, either it is considered as an economic burden or it is used as a differentiation tool. Consistent with the first view of CSR, it can be argued that companies during the difficult financial times should reduce spending on CSR in order to save resources and should focus only on the survival of business by maximizing profit which is its primary responsibility and compromise all other social responsibilities that are not mandatory. Second view presents the other side of the coin by arguing that CSR can be used to acquire a competitive advantage to strengthen the brand name by differentiating business from its competitors and gain economic benefits. CSR can help companies survive difficult times as it can provide businesses with financial and non-financial benefits in the form of increased trust and improved corporate reputation and support from the communities where these companies operate (Branca, Pina & Catalão-Lopes, 2012; Pereira, Sousa, Maia, 2015).

The studies conducted in the context of economic recession 2008-2009 and its impact on CSR show that there was a noticeable reduction in the CSR spending of the businesses. Moreover businesses were handling CSR more strategically during the financial crisis as the companies only invested in the projects that were aligned with their core business objectives and had any future prospects for bringing financial returns. The environmental aspect of the CSR was least affected mainly due to strict legislations followed by the economic aspect, but as expected the social aspect was the most affected aspect of CSR as companies downsized dozens of employees and considerably reduced community investments such as corporate philanthropy (Klára, 2011).

Literature identify numerous factors that can affect corporate philanthropy during the economic recession, most noticeable e.g. are strategic alignment of the philanthropic activities with the company's core business, industry type and the size of the company.

Strategic Alignment: Businesses have different motivations to engage in corporate philanthropy and, most commonly cited motives are altruistic and strategic. Increasingly the businesses are becoming more strategic in corporate giving and most influential work in this regard is of Porter and Kramer (2002) who argued that if the company has a strategic orientation towards its philanthropic activities it can improve its competitive context. If the company's donations are unfocused; simply to generate goodwill without well planned business and social objectives it can add little value to the long-term business goals. The social and economic objectives of the organization are diverse but not conflicting and philanthropy can be used to converge both to improve long-term standing of the business. So the companies should identify the social causes that are aligned with the business expertise in order to create synergy between economic and social goals (Cochran, 2007).

In this regard, Klára (2011) surveyed three companies and found that in the time of economic downturn, companies were having more strategic orientation towards their CSR activities and were seeking financial returns from the CSR investments instead of just improved corporate reputation. There was a significant decrease in the spending of companies in socially desirable activities. The companies were only investing in the projects that were related to their core business. Taking a strategic perspective to corporate philanthropy; companies focused mainly on building the genuine relationship with the stakeholders based on trust rather just developing the cosmetic image of generous donors.

This strategic alignment of corporate philanthropy with the core business of the company can be mutually beneficial for both society and business during the unfavorable economic conditions. Many charities are dependent on the corporate donations and cut off in such donations can be significant as in the difficult economic times companies need strong financial reasons to support such charities. Corporate philanthropy's link with corporate reputation and eventually the firm's bottom line are attractive reasons to continue supporting such social causes in difficult economic time (McCarthy, Contardo & Eckert, 2010).

Industry type: Lee, Singal & Kang (2013) categorized CSR into two parts, OR-CSR (Operations Related CSR) that include activities such as employee relations and product quality controls and Non-OR CSR (Non-Operations Related CSR) activities related to community and environment. They argued that investment in Non-OR-CSR activities such as philanthropy can be harmful to the firm's value in the time of recession. But on the other hand Osili, Ackerman and Li (2014) linked overall corporate philanthropy with macroeconomic context, they analyzed key macroeconomic indicators such as Gross Domestic Product (GDP), unemployment rate, personal consumption, S&P 500 index and recession but found no significant relationship between these indicators and corporate philanthropy. Their finding were supportive of the hypothesis that corporate contributions are counter cyclical (Levy & Shatto, 1978) which means the contributions increase in the unfavorable economic conditions. They concluded that corporate philanthropy is more sensitive to market structures, specific industry and societal needs rather than overall economic conditions.

Industry type can affect the spending on corporate philanthropy during the recession. For example Lee et al

(2013) argued that industry such as restaurants are at the risk of getting more affected by the economic downturn. Because financial performance of restaurants can be lower as the expenditure made by the customers in restaurants is discretionary in nature and can be cut off easily. In such situation the expenditure of firms on activities that are not instrumental in the firm's survival such as philanthropy can be affected.

Firm's Size: Size of the firm is another important factor that can affect corporate philanthropy during the recession. In the difficult economic times CSR of small and medium size enterprises (SMEs) is at risk of potential cut off, especially the corporate philanthropic dimension; because the CSR of SMEs is usually not fully integrated into the business processes and is carried out at the time when the business environment is comfortable (Sima & Gheorghe, 2011). Bansal, Jiang, Jung (2015), differentiated CSR into two categories i) strategic CSR and ii) tactical CSR. The tactical CSR is the social activities of the firm that are for the short term and require fewer resources and the strategic CSR is for the long term and require more resources and changes in the organizational structure In the recessionary time the larger companies with strong financial performance continue to invest in strategic CSR as they have the ability to commit resources for long term and wait for the CSR to materialize and this is not usual for the SMEs.

RESULTS AND DISCUSSION

Pakistan's economy is mainly composed of three main sectors: agriculture, industry and services. The corporate sector is an integral component of Pakistan's economy and in corporate sector Public Listed Companies (PLCs) are fundamental constituent. There are 583 public listed companies listed on a Pakistan stock exchange (formally three stock exchanges Karachi, Lahore and Islamabad merged to form a Pakistan stock exchange in 2016). PLCs can be broadly categorized into two main sectors 1) financial and 2) non-financial. The major economic groups in the financial sector include commercial banks, investment banks, insurance companies, leasing companies and mutual funds etc. The non-financial sector comprises of textile, sugar, cement, chemicals, fuel and energy etc.

Consistent with the world view of corporate philanthropy; that it is a significant indicator of firm's socially responsible behavior and having immense potential for optimizing social and economic benefits, corporate sector in Pakistan is also engaged in philanthropic initiatives in some form or another. The donations made by PLCS range from a few thousand to millions of Pakistani rupees. During the global economic recession of 2008-2009 the corporate sector in Pakistan was also affected and this situation challenged companies to continue their support for social sustainability commitments. Before discussing the response of PLCs towards corporate philanthropy during difficult economic times it is important to shortly view that how the Pakistan's economy and its corporate sector was affected by the global recession.

Pakistan is a developing economy and the global economic crisis affected economies of developing countries, mainly in the area of trade, capital inflows and investment (Ahmed and Donoghue, 2010). The Table 1 shows the snapshot of key macroeconomic indicators of Pakistan's economy for last ten years from 2005 to 2014 including the years of economic recession 2008-2010.

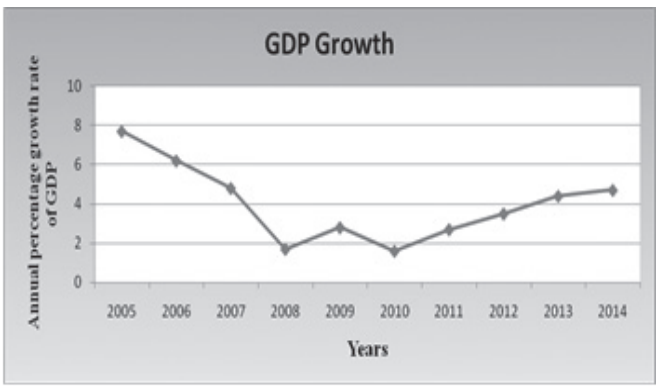
Table 1: Key Macroeconomic Indicators of Pakistan for Ten Years (2005-2014)

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
GDP growth rate	7.7	6.2	4.8	1.7	2.8	1.6	2.7	3.5	4.4	4.7
Inflation	9.1	7.9	7.6	20.3	13.6	13.9	11.9	9.7	7.7	7.2
Exports (% of GDP)	15.7	14.1	13.2	12.4	12.4	13.5	14.0	12.4	13.3	12.3
Imports (% of GDP)	19.6	21.5	19.8	23.2	19.7	19.4	19.0	20.4	20.1	18.7
Cash Deficit/ Sur-plus(% 0f GDP)	-3.2	-3.9	-3.9	-7.2	-4.6	-5.0	-6.4	-8.0	-5.2	-

Source: The World Bank (2015)

Pakistani economy was already in turmoil with weak macroeconomic indicators such as high inflation, unemployment, poverty, trade deficit and negative balance of payments (Khilji, Farrukh, Iqbal & Hameed, 2010).

Figure 2: GDP growth of Pakistan 2005-2014



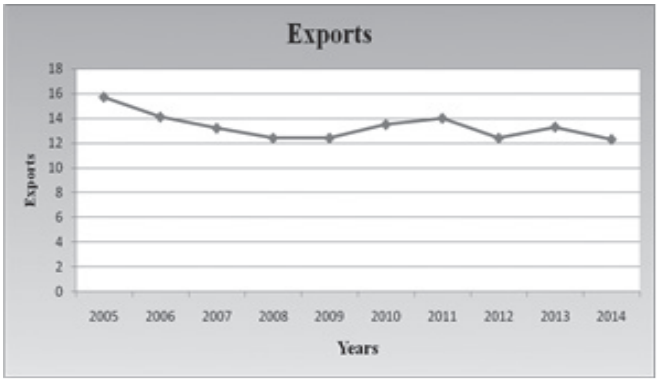
After the crisis overall macro-economic situation was worsened with low GDP, high inflation rate, low exports and fiscal deficit. GDP growth rate sharply fall from the highest 7.7 in 2005 to 1.7 in 2008 and the lowest in 1.6 in 2010.

Similarly the figure 3 shows the highest inflation in 2008 i.e. is 20.3. The prices of import significantly increased as Pakistan's major import is oil and due to economic downturn the prices of commodities were increased globally and the oil prices were no different that reached the highest.

Figure 3: Inflation in Pakistan (2005-2014)

The sky high prices of oil lead to decline in exports as shown in the figure 4 because the cost of production of the manufacturing sector increased tremendously as the major source of power generation in Pakistan is furnace oil.

Figure 4: Exports (% of GDP) of Pakistan (2005-2014)



The major impact of the crisis was on the non-financial sector in Pakistan in comparison to the non-financial sector. The manufacturing sector faced heavy loses especially the textile sector. The energy shortfall caused companies to operate below the optimum level. Beside the increase in consumption other major reason of the energy shortfall was the increased oil prices as mentioned above. Another reason for the difficulty of textile sector was the export orders. Pakistan is the major exporter of textile products in United States of America and European countries that were severely affected by the economic crisis the reduced demand lead to the decline in export orders (Khawaja, Mahmood & Qadir, 2010).

Contrary to non-financial sector the financial sector in Pakistan survived the global financial crisis with mild shock. The financial systems of US and European countries were severely affected by the crisis, but the financial systems of emerging and developing economies (EDE) such as China, India and Pakistan were not that adversely affected as that of developed economies (Husain, 2011). In case of Pakistan the policy and regulatory reforms in the 1990s, such as minimum paid up capital required and more equity in the bank served as the major shock absorber. Another reason for the survival of the financial sector of Pakistan was its non-integration with the international financial sector (Khawaja et al., 2010).

Table 2 shows the overall volume of donations made by Public Listed Companies in Pakistan for last ten years from 2005 to 2014. The data are collected from the survey reports of corporate philanthropy conducted by Pakistan Center of Philanthropy (PCP). PCP is a nonprofit organization and conducts this survey and publishes results annually.

Table 2: Total Volume of Corporate Donations in Billions (Pakistani Rupee PKR)

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Donations	1.61	2.3	1.85	2.23	2.4	3.3	3.8	4.1	4.8	5.9

Source: Pakistan Center of Philanthropy

Figure 5: Corporate Donations of PLCS in PKR

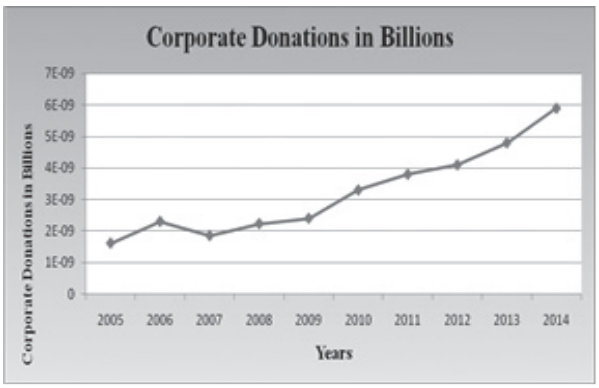


Table 3 shows the number of companies engaged in philanthropy with respective amount range from less than 1 million to more than 5 million. The participation of public listed companies in corporate philanthropy shows the lowest percentage in 2008 is 51% which is least in the last ten years i.e. 227 companies. However the total volume of donations increased in 2008. During the time of global economic crisis 2008-2009 the total volume of corporate donations shows that the number of donor companies decreased in 2008.In Pakistan the donations made by PLCS among many factors largely depend on the size of the company usually the bigger companies donate more as compared to smaller companies. In Pakistan the bigger companies contribute more generously and contribute around 80% to the overall donation volume and in 2008-2009 were no different more than 80% of the philanthropic donations in 2008 were made by the large companies. As discussed earlier firm size is an important factor that affect corporate philanthropy during difficult economic times. Large companies have more resources available at their disposal and are in a position to continue their commitment to society.

Table 3: Number of Public Listed Companies by Volume of Donations (Pakistani Rupee) from 2010 – 2014

Size of Donations	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Donations > 5 m	63	71	48	47	65	59	76	71	80	85
4m<Donations<5m	11	8	11	6	9	10	10	5	12	8
3m<Donations<4m	14	12	11	9	11	18	13	18	14	11
2m<Donations<3m	14	16	17	16	22	21	28	22	20	23
1m<Donations<2m	21	35	29	31	40	32	34	30	37	30
<1m	175	187	174	168	160	136	124	126	105	103
Total	298	329	290	227	307	276	285	272	268	260
Total sample	551	546	535	548	542	532	490	478	488	580
The total % of companies engaged in CP	54%	60%	54%	51%	57%	52%	58%	57%	55%	56%

Source: Pakistan center of corporate philanthropy

In 2008 the number of donor companies was decreased, the decrease was evident for the PLCs that donate less than one million and mostly these companies are smaller in size. Another reason in the increase in donation volume in 2008 was the companies from the financial sector, especially the commercial banks that were among the top donors. The Commercial Banking sector, which accounts for less than 5% of the public listed companies, was responsible for 10% of the total philanthropic donations generated in 2008 (Pakistan center of Philanthropy, 2008).

Figure 6: Percentage of PLCs Engaged in CP

The financial sector of Pakistan was affected mildly by the global economic recession and didn't go through financial losses as such. Corporate financial performance of firm is an important determinant of firm's corporate financial performance (Waddock and Graves, 1997). The firms with better financial performance tend to donate more so PLCs from financial sector were having better financial performance and continued supporting social commitments.

So it can be concluded that the global recession of 2008-2009 affected companies in almost all spheres, but the most susceptible sphere was the corporate philanthropy. The ever-growing financial pressure on businesses to curtail costs and increase profits was considered a threat for future of CSR. Corporate philanthropy as most discretionary element of corporate social responsibility was feared to be the first to go on the list of non-essential activities. The study was conducted to present the case of developing economy of Pakistan to explain that how corporate sector in Pakistan responded to corporate philanthropy during the global economic recession of 2008-2009. The study shows that the global recession had an adverse impact on the Pakistan's economy. But overall the PLCs that are integral part of Pakistan's economy continued to show commitment towards community through corporate donations with a slight decrease in the number of companies engaged in corporate philanthropy and followed by slight decrease in the overall volume of donations made by the companies during the recessionary years.

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SCIENTIFIC PAPER

THE IMPACTS OF ORGANIZATIONAL CULTURE, KNOWLEDGE MANAGEMENT AND EMPLOYEE ENGAGEMENT ON JOB SATISFACTION: THE CASE OF SUPPORTIVE SERVICE OFFICERS IN MONGOLIA

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Abstract: *Employee's job satisfaction is one of the main influential factors for the effectiveness of human resource development. The aim of this study is to investigate the impacts of organizational culture, knowledge management and employee engagement on job satisfaction among public officers. This research topic has been studied and is well-known in worldwide. In Mongolia, context the topic of study has been developed at low level.*

Data collected from the public-sector employees that understand to impact of job satisfaction. In the research, 213 participants participated who work in public organizations of Mongolian cities such as Ulaanbaatar, Darkhan and Erdenet and districts near to Ulaanbaatar city, including Nalaikh, Khutul, Baganuur. Therefore, the research methodology organized and used some information from statistical calculations in Mongolia.

The results showed that impact of all factors such as organizational culture, knowledge management and employee engagement had a positive relationship on job satisfaction. It means that public servants can take care of organizational culture, knowledge management and employee engagement to remain and make their employees happy, as the more satisfied employees are, the more productive they are than those who are less satisfied. This study discussed the effects of above mentioned results, the implications for theory and practice along with the limitations of the research and the implications for further research. Data were used SPSS and SmartPLS 3.0 to test the relationships between variables.

Keywords: *Mongolia, OCTAPACE, organizational culture, employee engagement, knowledge management, job satisfaction. (JEL CODE:* J01*)*

INTRODUCTION

Job satisfaction is showing positive effects on human resources in organization. Job satisfaction is one of the main influential factors for the effectiveness and success for human resource development (Ts.Bayasgalan, 2015). The number of civil servants is increasing year by year. The number of civil servants working in the governmental organization is 183.6 million. This indicates a growth of human resources in the last ten years *(http://www.1212.mn/, 2015).* Thus, we try to determine which impacts can influence of organizational culture, knowledge management and employee engagement on job satisfaction. The employees, who are satisfied with their jobs, would be responsible in their jobs, and committed to their jobs and motivated to develop their skills for the future. Many scientists agree that organizational culture is one of the main issues that may contribute to achievement of their goals in an organization. Pareek Udai (2008) identified Organizational culture OCTAPACE such as Openness, Confrontation, Trust, Authenticity, Pro-active, Autonomy, Collaboration, and Experimentation are factors of organizational culture and success (Pareek, 2008). Shurchuluu (2004) reported that "knowledge management initiatives are intended to enhance performance through the identification, capture, validation, and transfer of knowledge." The employee engagement focuses on the positive aspects of an employee's job and satisfaction or the organization. Employee engagement is a person's enthusiasm and involvement in their job (Ts.Bayasgalan, 2015). Kahn (1990) defined job engagement as the harnessing of organization members' selves to their work roles Kahn (1990).

This study is significant for considering both theoretical and practical issues in Mongolian public sectors. This study was conducted in governmental organizations and considered organizational culture OCTAPACE profile, knowledge management and employee engagement on job satisfaction in Mongolia. The employees in Mongolian health, education sectors, army systems, governmental agencies and ministries

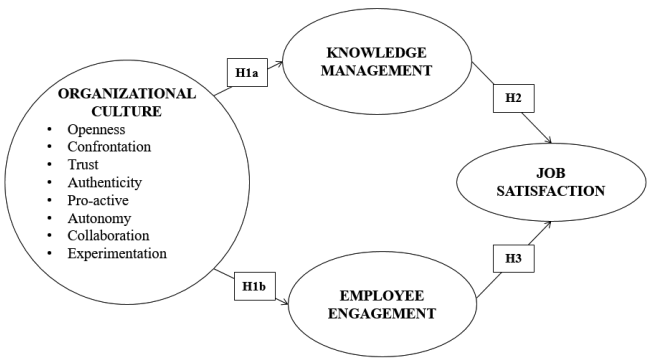
participated in this survey. It includes a diverse population of public employees, totally 213 employees participated in this study. The findings showed that all effects such as organizational culture, knowledge management and employee engagement have a positive relationship with job satisfaction in supportive service officers. It means that employees can take care more of organizational culture, knowledge management and employee engagement in order to retain and make their employees happy, as more satisfied employees are more productive than those who are less satisfied.

CONCEPTUAL FRAMEWORK AND HYPOTHESIS

This study explains how organizational culture, knowledge management and employee engagement are influential on job satisfaction. If these factors are satisfied in the workplace, employees can build effective teamwork and organization's success (Ts.Bayasgalan, 2015).

The conceptual model of factors on job satisfaction is drawn in Figure 1.

Figure 1. Conceptual model of factors on Job Satisfaction
Source: Own model



Organizational Culture OCTAPACE and Job Satisfaction

In this study, to begin the discussion on job satisfaction we needed to logically begin with a definition of job satisfaction. Hoppock (1935) offered one of the earliest definitions of job satisfaction. He described the construct as being

any number of psychological, physiological, and environmental circumstances which leads a person to express satisfaction with their job.

Bullock (1952) defined job satisfaction as an attitude which results from a balancing and summation of many specific likes and dislikes experienced in connection with the job.

According to Smith (1955) it as an employee's judgment of how well his or her job has satisfied his various needs. One of the most widely referenced definitions in organizational research is that of Locke (1969) which overall viewed job satisfaction as the pleasurable emotional state resulting from the appraisal of one's job as achieving or facilitating the achievement of one's values. He explained that values exist in relation to their perceived effects on the individuals.

Locke and Lathan (1976) went on to give a more comprehensive definition of job satisfaction as pleasurable or positive emotional state resulting from the appraisal of one's job or job experience. Job satisfaction is a result of the employee's perception of how well their job provides those things that are viewed as important.

Vroom (1982) defined job satisfaction as workers' emotional orientation toward their current job roles. Also, Schultz (1982) stated that job satisfaction is essentially the psychological disposition of people toward their work.

The most significant research study that shows the importance of job satisfaction is the Hawthorne studies (Muchinsky, 1985). Spector (1997) defined job satisfaction as the extent to which people like (satisfaction) or dislike (dissatisfaction) their jobs, he listed 14 common facets: appreciation, communication, co-workers, fringe benefits, job conditions, nature of the work, organization, personal growth, policies, procedures, promotion opportunities, recognition, security and supervision.

Maslow's (1954) traditionalist views of job satisfaction were based on his five-tier model of human needs. Maslow used the terms "physiological", "safety", "belongingness" and "love", "esteem", "self-actualization", and "self-transcendence" to describe the pattern that human motivations generally move through (Nel et al., 2004).

Therefore, we consent that job satisfaction is based on: Maslow's "Five-tier model of Human Needs", Hertzberg's "Two Factor Theory", Adam's "The Equity Theory", Vroom's "Expectancy Theory", Quarstein, McAfee and Glassman's factors such as situational characteristics and situational occurrences of job satisfaction.

Based on other studies, we summarized that job satisfaction is defined as below:

- An employee feeling positive about the job characteristics.
- Assessing the employees' intention to remain in the organization is important for the organizations.
- A factor in the contribution to organizational success.

Organizational culture is defined in terms of shared meanings - patterns of beliefs, rituals, symbols, and myths that evolve over time, serving to reduce human variability and control and shape employee behavior in organizations (Pareek 2008). The management should work developing the organizational culture that requires the culture of openness, collaboration, trust, pro-activity, autonomy, authenticity,

confrontation and experimentation, which is interconnected and essential for every organization for its development (Subramanian, 2012).

Based on these studies, we summarized that organizational culture is defined as follows:

- It supports values and behaviors of an organization.
- It is a tool to contribute to the organization.

OCTAPACE is one technique that can be used to measure the organizational culture (Ott, 1989). Organizational culture includes ethics, values, beliefs, attitudes, norms, ethos, climate, environment, and culture. It can be characterized as consisting of Openness (O), Collaboration(C), Trust (T), Authenticity (A), Pro-action (P), Autonomy (A) Confrontation(C) and Experimentation (E) and it is abbreviated as OCTAPACE (Sheetal, 2011).

These values are discussed below:

Openness: It shows the freedom of the employees to represent their internal feelings without any fear or hesitation (Yafang, 2014). Openness is most important for effective teamwork collaboration (Bayasgalan et al., 2015). Openness helps to improve communication peer to peer and free interaction among team mates.

Confrontation: This value deals with the extent employees in the organization can face change problems and work jointly with others to find a solution (Subrahmanian, 2012). The teachers responded favorably when assessed in the value of confrontation (Mufeed et al., 2007). It fosters a deeper analysis of interpersonal problems.

Trust: Rohmetra (1990) conducted a study within the banking sector. Sharma and Purang (2000) studied a survey to understand the relationship between value institutionalization and human resource development climate is transparency means telling something to the others which can be verified". It is maintaining the confidentiality of information shared by others and the company (Subrahmanian, 2012). Trust is defined as maintaining the confidentiality of information provided by others and not misusing it (Sheetal, 2014). Trust supports higher empathy, timely support and reduced stress.

Authenticity: The word "authenticity" has been taken from Greek word "authentic" which means original. Mishra and Dhar (1999) conducted a study on companies which reflected that the value of authenticity was recorded average. Authenticity is an important and critical aspect of teamwork environment. If your leader and team have established highly authentic communication opportunity ability, they are able to be building a positive teamwork environment (Ts.Bayasgalan et al., 2015). Authenticity is reflected in owing up of mistakes, improves interpersonal communication and reduces distortion in communication (Ts.Bayasgalan, 2016).

Pro-action: Mishra, Dhar and Dhar (1999) conducted a study that indicated the value of pro-activity in the banks. Pro-action means preplanning or acting in advance to deal with an expected difficulty so that the organization is ready to meet future challenges (Yadav, 2014). Pro-action contributes to take initiative, preplanning, and taking preventive action (Bayasgalan, 2015).

Autonomy: Rao, Raju and Yadav (2001) surveyed for covering financial services, consumer products, electronics, cement, and automobiles which shows that employees perceived as favorable the value of autonomy (Mufeed et al., 2007). Autonomy is using and giving freedom to plan and act in one's own sphere, develops mutual relationships reduces deferring to senior people (Subrahmanian, 2012). Autonomy is freedom. This word has been derived from the Greek word "Auto – Nomos" means law, hence autonomy is following own law. Which gives freedom to follow own governance and freedom to take decisions independently (Yadav, 2014).

Collaboration: Sarathi and Rao (1988) in their study they found that collaboration existed among the employees in an organization when the superior and the subordinate work together. Collaboration means that agents perform actions (Vivacqua et al., 2011). Also, collaboration means working together (individuals and groups) to solve problems or to get the desired goal (Yadav, 2014). Individuals, instead of solving their problems by themselves, share their concerns with one another and prepare strategies, work out plans of action, and implement them together (Mughees et al., 2013).

Experimentation: Experimentation is using and encouraging innovative approaches to solve problems, development of new product, methods, and procedures (Subramanian, 2012). Experimentation is trying the new idea or new way to solve the problem. It is the importance given to new style of working, and encouraging creativeness in the organization (Yadav, 2014). Experimentation supports feedback for improving and developing of new product and methods (Bayasgalan, 2016).

Hypothesis 1

H1: *Organizational cultures (OCTAPACE) will have a positive impact on (H1a) knowledge management and (H1b) employee engagement to get job satisfaction.*

Knowledge Management and Job Satisfaction

Wells (1938) while never using the actual term, "knowledge management" described the vision of the World Brain. Starting with the industrial era in the 1800s, we focused on transportation technologies in 1850's, communications in 1900's, computerization beginning in the 1950's, and virtualization in the early 1980's, and early efforts at personalization and profiling technologies beginning in the year 2000 (Kimiz, 2005). Polyani (1966) considered knowledge management as the key success for making continuous improvement on business units (Rahmatollah, 2013).

Knowledge management is a collaborative and integrated approach to creation, capture, access and use of an enterprise's intellectual assets (Grey, 1996). Knowledge management is the concept under which information is turned into actionable knowledge and made available effortlessly in a usable form to the people who can apply it (Patel et al., 1998). Based on other studies, we summarize knowledge management to be defined as follows:

- It is to establish the activity systems that sustain to enhance the approach, human resource assessment, shar-

ing skills of leadership.
- It implies a strong key on organizational goals, and it's influences in success of management.

Knowledge management supports job satisfaction to achieve to success. There are many scholars studied the relationship between knowledge management and job satisfaction.

Gillian (1998) studied that factors such as management and organizational culture are more influential on job satisfaction than the wage. Rad (2006) claimed that leadership affects job satisfaction; therefore, it plays a key role in job satisfaction. Mehmet et al., (2010) empirical study attempted to examine the relationship between knowledge management and job satisfaction (Mehmet,2010). Ajay (2011) analyzed how the organizational culture and organizational learning impact knowledge management and satisfaction of employees. Hamzah (2013) illustrated the impact of knowledge management on performance excellence in the organizations in terms of organizational performance and employee's satisfaction in the corporations (Hamzah, 2013).

According job satisfaction was enhanced when knowledge management was practiced in the organization. Knowledge management enhances employee satisfaction. The assumption that knowledge management practices enhance employee satisfaction found support from the data and the strength of relationship was stronger. According to the literature review, the following hypothesis was generated.

Hypothesis 2

H2: *Knowledge management will have a positive impact to get job satisfaction.*

Employee Engagement and Job Satisfaction

Employee engagement is one of the key variables in organizational success. Kahn (1990) engagement means to be psychologically as well as physically present when occupying and performing an organizational role. Goffman (1961) defined employee engagement on the basis of role behavior speculation. But, Kahn (1990) defined employee engagement as a construct that captures the variation across individuals and the amount of energy and dedication they contribute to their job (Kahn, 1990). According to the Society for Human Resource Management (2012), Employee Job Satisfaction and Engagement Survey, employees reported overall satisfaction with their current job. A closer look at the Society for Human Resource Management /SHRM/ findings sheds valuable light on the relationship between satisfaction and engagement (SHRM, 2012).

Employee engagement has implications for all areas of HRD practice: organization development, training and organizational learning, career development, performance management, and strategic change processes (Shuck et al., 2010). Harter et al., (2002) confirmed "employee satisfaction and engagement are related to meaningful business outcomes at a magnitude that is important to many organizations". Mai Ngoc et al., (2013) identified the relationship between job satisfaction and engagement of the employee. A survey delivered two exploratory factory analyses, employee job satisfaction, employee engagement and 26 items of the employee job satisfaction (Mufeed.S.A, 2001).

Employee engagement may be due to the optimism and enthusiasm with employee's experience while working in the organization. Therefore, there may be a link between impacts of engagement and job satisfaction. It is clear that employee engagement can become significant. But, there are lack of studies about the relationship between employee engagement and other factors in Mongolia. Thus, according to the literature review the following hypothesis was generated:

Hypothesis 3

H3: *Employee engagement will have a positive impact to get job satisfaction.*

As a result, we agree with the research scholars, above whose findings we utilized in our research. In addition, we tried to identify and to support my conceptual model by identifying a mediation effect such as employee engagement between organizational justice and job satisfaction. In my study, organizational culture is independent variables and job satisfaction is the dependent variable. Knowledge management and employee engagement are mediating variables. Organizational culture will influence job satisfaction through knowledge management and employee engagement.

DATA ANALYSIS AND RESULTS

Mongolia has a four type of civil servant positions which political administration, public administration, special service, and supportive service.

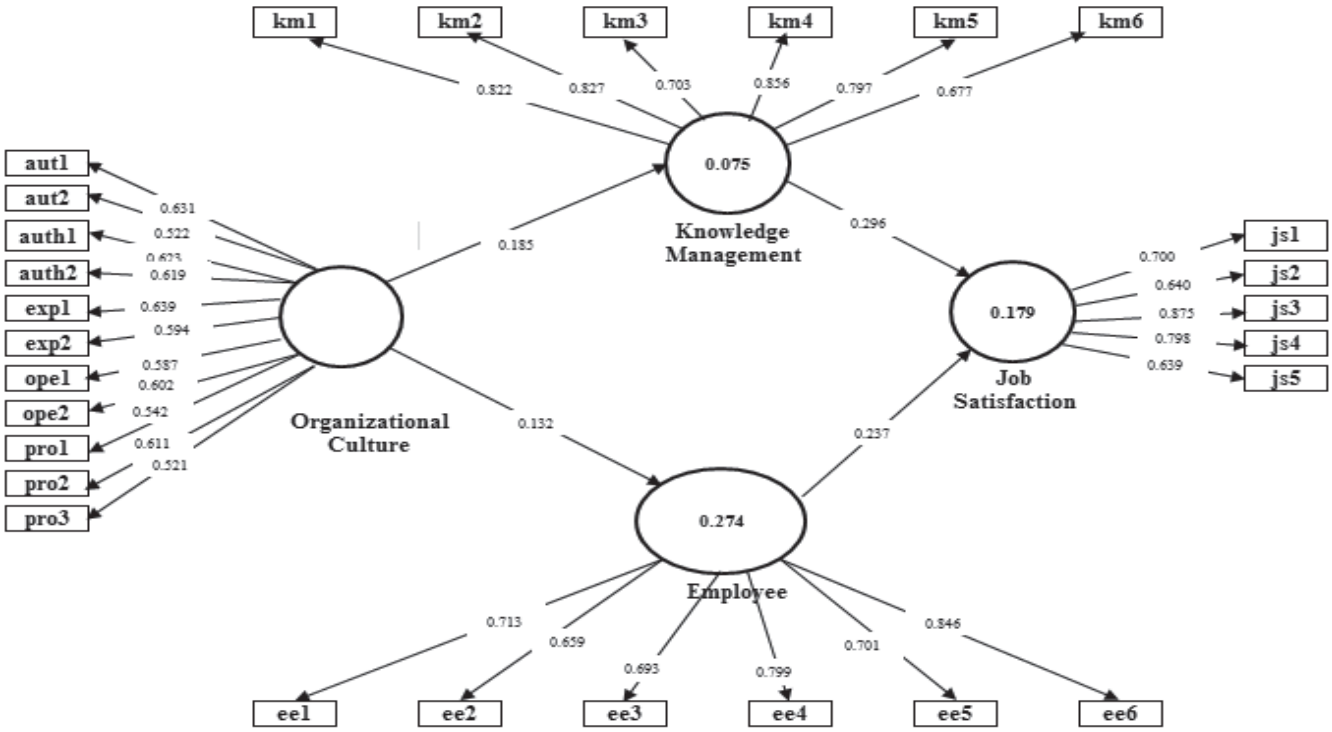
In our research, data collected from only supportive service officer that understand to impact of job satisfaction. There are 213 populations participated who work in public organizations of Mongolia cities which is Ulaanbaatar, Darkhan and Erdenet and districts near to Ulaanbaatar city, including Nalaikh, Khutul, Baganuur. Therefore, the research methodology organized and used some information from statistical calculations in Mongolia. This analysis shows the description of relationships of hypothesized model.

Table 2.1. The Respondents characteristic of Supportive Service Officers

Respondent's Characteristics		Supportive Service Officers	
		Frequency	Valid Percentage
Gender	Male	82	38.5
	Female	131	61.5
	Total	**213**	**100**
Age	18-24 years	15	7.3
	25-34 years	86	40.4
	35-44 years	44	20.5
	45-54 years	44	20.5
	More than 55 years	24	11.3
	Total	**213**	**100**
Position	Administrative officers	5	2.3
	Executive officers	148	69.5
	Assistant officers	60	28.2
	Total	**213**	**100**
Years of work	Less than 3 years	58	27.2
	3 to 6 years	37	17.4
	7 to 10 years	32	15
	More than 10 years	85	40.4
	Total	**213**	**100**
Education background	Ph.D	123	57.7
	MBA	61	28.6
	Bachelor	29	13.6
	Total	**213**	**100**

Source: Own table

Figure 2.1 Results of Structure Analysis on Supportive Service Officers in Mongolia (algorithm)



Note: ope-openness, aut- autonomy, auth- authenticity, exp- experimentation, pro- pro-action, km- knowledge management, ee-employee engagement, js-job satisfaction.

It tests the proposed structural model and hypothesized relationships between results of structure analysis on special service position. This study questionnaire was constructed and modified based on the preview of literature from the authors listed.

This study included four sections, and items in Section A of the questionnaire were organized based on respondents' characteristics of these four constructs. After the reliable questionnaires were identified and the data was entered, data analysis began. A summary of the basic demographic information is shown in *Table 2.1*

The collected data illustrates that the minority of respondents 38.5 % were men, 61.5 % were female in supportive service officers. Almost half of the respondents were 25-34 years old in in supportive service officers 40.4%.

The Supportive Service Position, the Outer loadings of 11 items measuring organizational culture ranged from 0.514 to 0.630, Cronbach's alpha of 0.821, Composite reliability **(CR)** was 0.855 and Average Variance Extracted **(AVE)** was 0.604. According to the researchers that organizational culture is including eight dimensions which openness, collaboration, trust, authenticity, pro-action, autonomy confrontation, and experimentation. However, in our research, three dimensions have not significant which Cronbach's alpha of trust, collaboration, and confrontation is between 0.40-0.48. Then we don't include these dimensions. Outer loadings of 6 items measuring knowledge management ranged from 0.677 to 0.827, and Cronbach's alpha of 0.873, CR was 0.904 and AVE was 0.784. Outer loadings of 6 items measuring employee engagement ranged from 0.659 to 0.846, Cronbach's alpha of 0.831, CR was 0.877 and AVE was 0.738. Additionally, outer loadings of 5 items measuring job satisfaction ranged from 0.639 to 0.875

Cronbach's alpha of 0.787, CR was 0.853 and AVE was 0.736. Data analysis results of support service position officer show that CR is more than 0.853 and AVE is more than 0.604. It means that all constructs have a convergent validity and reliability as shown in *Figure 2.1,* and *Table 2.2*.

All latent variables in this survey had a highly significant constructed reliability and thus these measures indicated that the measurement model is reliable. Moreover, discriminant validity was assessed to determine the external consistency of the measurement model. All items outer loadings were identified. The AVE for differences is shown in *Table 2.3*

In this section, the discriminant validity was highly achieved. The analysis shows that four considered latent constructs are all correlated with each other.

- The model suggests that knowledge management (0.075) has effect on job satisfaction (0.179), followed by OC (0.185).
- The hypothesized path relationship between organizational culture and knowledge management is significant.
- The model suggests that employee engagement (0.274) has effect on job satisfaction (0.179), followed by organizational culture (0.132).

Table 2.3 List of Items for each Construct: Supportive Service position

Items code		Factor Loading	Standard Error	T- value	Cronbach's Alpha	CR	Average Variance Extracted
Organizational culture	ope1	0.587	0.141	4.145	0.821	0.855	0.604
	ope2	0.602	0.132	4.611			
	aut1	0.630	0.125	5.061			
	aut2	0.522	0.121	4.351			
	auth1	0.623	0.111	5.602			
	auth2	0.618	0.126	4.911			
	exp1	0.587	0.117	5.484			
	exp2	0.602	0.123	4.817			
	pro1	0.514	0.125	4.321			
	pro2	0.611	0.147	4.167			
	pro3	0.521	0.141	3.705			
Knowledge management	km1	0.822	0.026	31.672	0.873	0.904	0.784
	km2	0.827	0.028	29.661			
	km3	0.703	0.044	16.109			
	km4	0.856	0.021	41.174			
	km5	0.797	0.031	25.803			
	km6	0.677	0.057	11.865			
Employee engagement	ee1	0.713	0.039	18.068	0.831	0.877	0.738
	ee2	0.659	0.057	11.637			
	ee3	0.693	0.044	15.851			
	ee4	0.799	0.031	25.657			
	ee5	0.701	0.053	13.162			
	ee6	0.846	0.028	29.709			
Job satisfaction	js1	0.7	0.066	10.597	0.787	0.853	0.736
	js2	0.64	0.076	8.453			
	js3	0.875	0.019	45.879			
	js4	0.798	0.034	23.231			
	js5	0.639	0.073	8.764			

Note: ope-openness, aut- autonomy, auth- authenticity, exp- experimentation, pro- pro-action, km- knowledge management, ee-employee engagement, js-job satisfaction.

The hypothesized path relationship between organizational culture and employee engagement is significant.

In summary, data analysis results of all four position show that CR is more than 0.809, and AVE are more than 0.604. Further, the value of AVE is more than 0.5 and CR is more than 0.6. Cronbach's alpha ranges between 0 and 1 are normality.

Table 2.4 Latent Variable Correlations for Supportive Service position

Variables	EE	JS	KM	OC
EE	1.000			
JS	0.32	1.000		
KM	0.238	0.346	1.000	
OC	0.192	0.243	0.175	1.000

\Note: ***OC:*** *Organizational Culture,* ***KM:*** *Knowledge Management;* ***EE:*** *Employee engagement;* ***JS:*** *Job satisfaction*

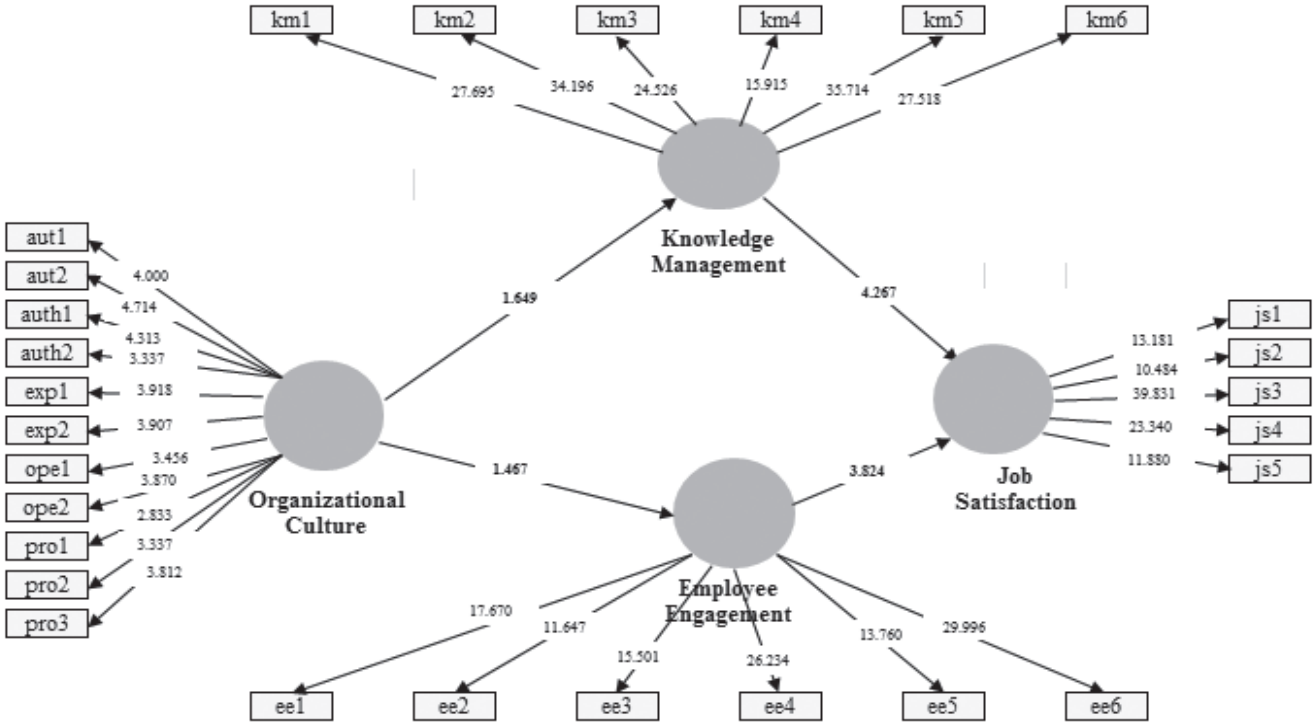
In this study, we proposed the structural model and hypothesized relationships between constructs. All of hypotheses tests were examined by the different public positions like: Supportive service position in *Table 2.5*.

Table 2.5 Estimated Path Coefficients for Supportive Service position

Hypothesis	Path	Regression weight	Standard Error	T Statistic	P-value	Remarks
H1a	Or. Cul -> Kn.Mgt	0.152	0.083	1.649	0.067	nonsupported
H1b	Or.Cul -> Em.Eng	0.135	0.079	1.467	0.035	supported
H2	Kn.Mgt -> Job.Sat	0.286	0.066	4.267	0.000	supported
H3	Em.Eng -> Job.Sat	0.252	0.062	3.824	0.000	supported

Note: Or.Cul: Organizational Culture, Kn.Mgt: Knowledge Management; Em.Eng: Employee engagement; Job.Sat: Job satisfaction.

Figure 2.2 Results of Hypothesis Testing for Supportive Service position



Note: ope-openness, aut- autonomy, auth- authenticity, exp- experimentation, pro- pro-action, km- knowledge management, ee- employee engagement, js-job satisfaction.

Mediation involves a set of causal hypotheses. This study analyzes four models of mediation analysis on supportive service officers.

Table 2.6 Bootstrap Results and Indirect Effects for Supportive Service position

Model	Path	Indirect Effects	Direct Effects	Sobel Z	Type of Mediation
1	Or.Cul→Kn. Mgt→Job.Sat	0.052	0.217	2.212	Partial Mediation
2	Or.Cul→Em. Eng→Job.Sat	0.053	0.205	1.803	Full mediation

Note: Or.Cul: Organizational Culture, Kn.Mgt: Knowledge Management; Em.Eng: Employee engagement; Job.Sat: Job satisfaction.

CONCLUSIONS

The findings showed that all impact such as organizational culture, knowledge management and employee engagement have a positive relationship with job satisfaction in supportive service officers. It means that employees can take care more of organizational culture, knowledge management and employee engagement in order to retain and make their employees happy, as more satisfied employees are more productive than those who are less satisfied.

All organizational decision maker leaders and policy makers are encouraged to consider how staff members' job satisfaction can be enhanced through reform initiatives as well as managerial changes.

Actually, four hypotheses were supported in supportive service position:

Organizational culture influenced knowledge management and employee engagement in supportive service.

Knowledge management had a positive impact to get job satisfaction in positions.

Employee engagement has been well related to job satisfaction in positions.

Our research made effort to provide future researchers with preliminary concrete evidence for carrying out further research on the impacts of organizational culture, knowledge management and employee engagement on job satisfaction.

The scope of this study involves only the public sector in Mongolia. Due to time limitation, it is recommended that future survey could be expanded to remote areas isolated areas draw the results regarding organizational culture, knowledge management and employee engagement on job satisfaction.

Finally, the results from the study may help the essential features of supervisors in detecting the things that need to be improved in the organization in order to improve the job satisfaction of their effects on organizational justice and culture and knowledge management and employee engagement.

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SCIENTIFIC PAPER

SOCIOECONOMIC DETERMINANTS OF FREQUENCY OF FISH PURCHASING AMONG TRINIDAD AND TOBAGO SHOPPERS: A BINARY LOGIT ANALYSIS

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Abstract: *As the Caribbean continues to succumb to the pressure of Non-Communicable Diseases innovative strategies are being sought to rectify the problem. Increasing the purchase and consumption of fish/seafood has great potential in this regard; however, very little empirical research appears to have been undertaken on food marketing in general and for fish in particular in the Caribbean. This study analyzed the factors that affect the frequency of fish purchasing in Trinidad and Tobago. The results of the analysis indicated that 63% of the sample are occasional purchasers of fish (purchased fish less frequently than once per week). The binary logit analysis showed that of the eight socioeconomic variables analyzed, only three were statistically significant – age, educational level attained and religion. The results suggested that persons over 35 years, more educated (tertiary level trained) and non-Christians are more probable to be regular purchasers of fish than younger, primary and secondary level educated Christians. It is hoped that marketers trying to develop strategies to gain market share in the highly competitive food market, nutritionists and others attempting to reduce the health care costs of Trinidad and Tobago and other Caribbean countries through the increased consumption of fish/seafood find these results informative.*

Keywords: *Fish, frequency of purchase, socioeconomic characteristics, Trinidad and Tobago, Binary Logit analysis.*
(JEL. Code: M31, Q13, C25)

INTRODUCTION

Fish is generally considered a rich source of easily digestible protein that also provides polyunsaturated fatty acids, vitamins, and minerals for human nutrition. As many Caribbean countries continue to succumb to rising levels of non-communicable diseases (NCDs), given the beneficial effects of a sustainable level of fish protein in the diet of the Region's people the fisheries and aquaculture sectors gained increased attention in the last few decades. The World Health Organization 2014 country profile for Trinidad and Tobago (T&T) suggests that NCDs are estimated to account for 80% of total deaths. Table 1 show that cardiovascular diseases represent the highest percent. However, the diseases reported in table 1 account for over 75% of the total deaths. With the recent knowledge provided by epidemiologic investigations indicating that the regular consumption of fish is related to a lower chance of several chronic diseases, including cardiovascular disease, an increase in fish consumption is being encouraged in many Caribbean countries. However, there appears to be little research on the drivers and barriers to fish purchase and consumption in the Caribbean Region.

Table 1: The top four causes of death in Trinidad and Tobago

Disease	Percent of Total Deaths
Cardiovascular diseases	32
Cancers	16
Other NCDs	15
Diabetes	14

Source: WHO Non-communicable Diseases Country Profiles, 2014

Previous studies on fish/seafood consumption have suggested that numerous factors influence one's decision (Can et al 2015), (Verbeke and Vackier 2005) and (Olsen 2001). As (Can et al 2015) state "Fish consumption, frequency, and preferences are affected by consumers' geographic, social and cultural characteristics". However, (Olsen et al. (2007) in a study titled "Exploring the relationship between

convenience and fish consumption: A cross-cultural study" alluded to fish as being an inconvenient food. Fish was perceived as inconvenient because of a perceived need to invest large amounts of time and effort at different stages of the provisioning process. Olsen (2003) also found that the perceived convenience of fish was related to age. Hence, ones' age and cooking skills could also impact on the frequency of fish consumption. Therefore an understanding of the multiplicity of factors that can impact both positively and negatively on fish/seafood consumption is necessary if the present consumption levels are going to be altered in the near future in the Caribbean. This study provides an insight into the puzzle regarding fish purchase and consumption for T&T.

A search of the food marketing literature reveals the use of a number of different methodologies and econometric techniques to analyze the effects of various factors on the decision to purchase fish/seafood, for example, the Theory of Planned Behavior (HIGUCHI et al. 2017) , (Nguyen and Olsen 2012) and (Verbeke and Vackier 2005) and qualitative choice models. The use of qualitative choice models to analyze the effects of various factors on the decision to purchase and consume fish/seafood dates back to the early 1990s, with studies by (Dellenberger et al. 1992), (Nayga and Capps 1995) and (Gemesaw et al. 1995). As (Peng et al., 2002a) point out the use of logistic regression (discrete choice models) has increased in the social sciences since the early 1980s as the analytical procedure became routinely available in statistical packages. Today, a number of studies can be found that have assessed different aspects of fish/seafood marketing in many developed and developing countries using this methodology, for example, (Kiziloglu and Kizilaslan, 2016), (Sayin et al. 2010), (Musaba and Namukwambi, 2011), (Ahmed et al., 2011), (Redkar and Bose, 2004) and (Al-Mazrooei et al. 2003). However, the study titled "Socio-economic determinants of consumer fish purchase in Windhoek, Namibia by (Musaba and Namukwambi, 2011) is of particular relevance here.

(Musaba and Namukwambi, 2011) used a binary logit model with the following independent variables: age, gender, education, household size, marital status and income to identify the socio-economic variables that influenced the purchase of three species of fish (Mackerel, Hake and Snoek) in Namibia. They concluded that income and household size had strong effects on the purchase of fish species. The present study uses a similar binary logit methodology to (Musaba and Namukwambi, 2011) with employment status, ethnicity and religion as additional independent variables to analyze the effect on fish purchase frequency in T&T. The research problems addressed in this study are as follows:

The identification of the percentages of regular and occasional fish purchasers in T&T; and

The socioeconomic factors that influences the frequency of fish purchasing in T&T;

MATERIALS AND METHODS

To investigate if there was a relationship between the socio-economic/demographic variables and frequency of fish purchasing by Trinidadians a questionnaire was developed and pretested in March 2016. The questionnaire consisted of two sections. Section one of the questionnaire focused on the consumers' frequency of purchase, preference of fish type (wild or farmed), likeness of common fish species, ranking of selected fish attributes, value added attributes desired and willingness to pay for them. In section one, respondents were also asked to identify their primary place of purchasing fish (supermarket, public market, landing sites, roadside stands, fish vans and specialty fish outlet). Section two attempted to gather data on the demographics of respondents, such as, age, household size, if employed, ethnicity, marital status, and highest educational level attained and income of household. Also, respondents were asked to identify if they were the primary food purchaser in the home.

Data collection was conducted in both islands, Trinidad and Tobago[1]. Questionnaires were administered to prospective respondents who were willing to participate outside supermarkets, banks, public markets and other high traffic business places. A total of 515 completed (useable) questionnaires were obtained at the end of April 2016 when data collection was completed. The collected data were analyzed using STATA 12.

The data collected was in many cases categorical; as such the analytical approach used was primarily descriptive in the first stage of the analysis. In marketing research the use of descriptive statistics is very common, and the present study used this approach to address the first research problem, that is to find the percentage of regular and occasional fish purchasers.

To identify the factors influencing the frequency of purchase (the second problem) the following binary logit model was developed:

$$\text{Logit}(Y) = \text{Natural log odds} = \ln(\pi/(1-\pi)) = \alpha + \beta X$$

Where:

Y = frequency of purchasing fish

1 = Regular purchasers – that is persons that purchased fish at least once a week

0 = Occasional purchasers – persons that did not purchased fish at least once a week

$\ln$ = the natural logarithm

π = probability that Y occurs, $\varpi(Y=1)$

α = constant

X = vector of independent variables

β = vector of coefficients to be estimated

The independent variables used in the model are:

X_1 = Age, a binary variable coded 1 = 35 years and older 0 = under 35 years;

1 The data utilized in this study are part of a larger data set collected for the Caribbean Regional Fisheries Mechanism training workshop on "Value Chain Approach in Fisheries", 18-22 July, 2016, Suriname.

X_2 = Income, a binary variable coded 1 = TT$12,001 plus monthly family income 0 = under TT$ 12,000 per month;

X_3 = Educational level attained, a binary variable coded 1 for tertiary and 0 for primary and secondary level;

X_4 = Household size, a binary variable coded 1 for 1 to 4 family members and 0 greater than 4;

X_5 = Employment status, a binary variable coded 1 employed and 0 otherwise;

X_6 = Gender, a binary variable coded 1 for male and 0 female;

X_7 = Ethnicity, a binary variable coded 1 for African decent and 0 otherwise;

X_8 = Religion, a binary variable coded 1for Christian and 0 non-Christian;

RESULTS AND DISCUSSION

Figure 1 illustrates the percentages of regular and occasional fish purchasers of the sample of respondents. As is observed from the chart occasional purchasers, (322 respondents) 63% of the sample was the dominant group, while 37% of the respondents reported purchasing fish at least once a week and were classified as regular purchasers.

Figure 1: Percentage of regular and occasional fish purchasers

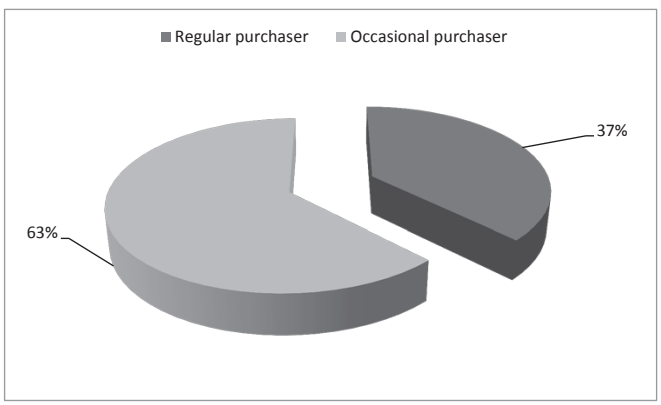

Table 2 illustrates the percentages of the independent variables used in the analysis. In the case of age over 68 % of the sample was between the 36 years and older. It is important to note that only 17% of the respondents had a monthly family income of over TT$ 12,001, which could be considered to be on the low side. The respondents could be considered well educated with 47.9% attaining tertiary level education. The majority of the households (67%) consisted of 1-4 persons, while 78% of the respondents were employed. Females accounted for 63% of the respondents, while Christians were 72%. People of African descent accounted for 48% of the respondents.

2 TT$6.79 = US$1.00 (June 2017)

Table 2: Frequencies of independent variables used in the model

Independent variables	Frequency	Percent
Age (years)		
36 and older{1}	348	67.6
35 and under{0}	167	32.4
Monthly family Income (TT$[2])		
> $12,001{1}	86	16.7
<$12,000{0}	429	83.3
Education		
Tertiary{1}	246	47.8
Primary & Secondary {0}	269	52.2
Household size (Adults and children)		
1-4{1}	343	66.6
>4{0}	172	33.4
Employment status		
Employed{1}	400	77.7
Unemployed{0}	115	22.3
Gender		
Male{1}	192	37.3
Female{0}	223	62.7
Ethnicity		
African descent{1}	247	48.0
Other{0}	268	52.0
Religion		
Christian{1}	371	72.0
Non-Christian{0}	144	28.0

N.B: {1} and {0} represent the coding of the independent variables

Table 3 illustrates the results of the binary logit analysis. The Prob > chi2 provides an indication of the usefulness of the model. If this number is less than 0.05 the model is considered acceptable. So with a likelihood ratio chi-square of -330.06 and a p-value of 0.00 the model as a whole is significantly better than a model with no predictors (the coefficients in the model are different than zero). The "pseudo R Square (0.03) however is not very high.

Of the eight independent variables analyzed in the binary model only three are statistically significant – Age, Education level attained and Religion. The β column of table 3 represents the estimated coefficients of the model, that are referred to as "log odds" The first thing to note is two of the coefficients are positive (age and education) while religion is negatively

related to being a regular purchaser of fish. As the coefficients are logarithmic expressions, the column labeled Odds Ratio is the exponentiation of these coefficients.

Table 3: Results of the binary logit choice model

Variable	β	S.E.	P>lzl	Odds Ratio
Age	0.629***	0.219	0.004	1.876
Family income	0.201	0.257	0.434	1.222
Education	0.332*	0.204	0.104	1.393
Household size	-0.031	0.200	0.876	0.969
Employment status	0.120	0.235	0.610	1.127
Gender	0.234	0.193	0.225	1.264
Ethnicity	0.277	0.198	0.163	1.319
Religion	-0.624***	0.217	0.004	0.536
Constant	-0.992***	0.336	0.003	0.371
Log likelihood	-330.06			
Number of observations	515			
LR chi2 (8)	21.17			
Prob > chi2	0.00			
Pseudo R2	0.03			

****** Significant at the 1% level, ** Significant at the 5% level, * Significant at the 10% level***

The results show that out of the significant variables the respondents' "Age" had the largest influence on the purchase frequency of fish (Odds Ratio = 1.876). With regards to the interpretation of the "odds ratio", for "Age" this is 1.876 and can be interpreted as follows: the odds of persons 35 years and older being regular purchasers of fish are 1.876 times greater than a person younger than 35 years, controlling for the other variables in the model. The other positive statistically significant variable can be interpreted in a similar manner; the odds of persons with tertiary level education being regular purchasers of fish are 1.393 times greater than persons with only primary and secondary education, controlling for the other variables in the model. In the case of religion, which is negatively related to the dependent variable, this is interpreted as follows; the odds of a Christian being a regular purchaser of fish is 0.536 times less than a non-Christian (Muslim, Hindu etc.), controlling for the other variables in the model.

Despite the Food and Agricultural Organization of the United Nations' (FAO) recent announcement that the global per capita consumption of fish has gone over twenty kilograms a year, in many countries per capita consumption is less than the required amount. Understanding the factors that affect consumption levels is imperative if consumption levels are going to be changed. This study used binary logit regression analysis in an attempt to determine the socioeconomic factors influencing fish purchase frequency, a proxy for intake levels, among shoppers in T&T. The model comprised of the following eight independent variables: age, family income, education, household size, employment status, gender, ethnicity and religion. The results from the logit regression analysis indicated that age, educational level attained and religion were statistically significant. This result is very different from (HIGUCHI et al. 2017) that found none of their socioeconomic variables to be statistically significant. Of the significant variables in the present study religion was the only variable with a negative influence. The result, with respect to age on the probability of shoppers is found to be consistent with results from (Musaba and Namukwambi, 2011). It should be noted here that gender, family income, household size, employment status and ethnicity did not have a statistically significant impact based on the results of the study. Further, gender was also found to be insignificance by (Musaba and Namukwambi, 2011), while the insignificance of ethnicity was also found by (Ahmed et al., 2011).

Self-reported purchase frequency is often used in nutrition related studies as a proxy for intake levels. The results of this study suggest there is room for fish consumption to be increased in T&T with only 38% of the shoppers classifying themselves as regular purchasers of fish. Thus marketing strategies aimed at increasing fish consumption in T&T should be specifically targeted at younger persons since age positively influences purchase. Hence the younger folks are the ones in need of coercing to increase their purchase frequency. Also, the positive influence (and statistical significance at the 10% level) of education suggests that promotional campaigns should try and target the lesser educated about the benefits of fish consumption.

Several factors might influence frequency of food and grocery shopping, of which fish is a subsector. Given the limited number of empirical studies available on food marketing in general and fish in particular, further researcher is required to gain a better understanding of the contemporary fish shopper's preferences, likes and dislikes in T&T. Of particular importance in this regard is the identification of the barriers to fish purchase and consumption by the younger generation. It is hoped that this study might encourage other researchers to explore the fascinating field of food marketing in general and fish marketing in particular in T&T and the wider Caribbean.

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SCIENTIFIC PAPER

OCCUPATIONAL CHOICE AND AGRICULTURAL LABOUR EFFICIENCY IN NIGERIA: IMPACT OF ICTS

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Abstract: *Increased labour efficiency is imperative in the developing world and particularly in Nigerian Agriculture which should be in its leaping phase. The interaction between labour efficiency and ICTs is inevitable in the realisation of the nation's agribusiness potentials. Following a vivid descriptive statistics on main occupations and access to ICTs among the Nigerian populace, this study assessed effects of ICTs on the probability that a working aged Nigerian chose agricultural occupation over non-agricultural occupations. In doing so, the study analysed the effects of access to ICTs on agricultural labour efficiency in Nigeria. Data used for the analysis were drawn from the Nigerian General Household Survey-Panel held in 2010-2011 period. Analytical framework for the study include: Logistic Regression and Multiple Regression Models. Results show that access to mobile phones, using the internet to obtain information, and using the internet to send or receive mails were significant factors of the probability that a Nigerian chose agriculture or its related activities as a main occupation. Again, access to personal computers, use of the internet for e-banking, e-learning and for reading e-newspapers had significant impact on agricultural labour efficiency in Nigeria. The study recommends that labour policies should find a place for the role of ICTs, particularly the internet.*

Keywords: *Labour, Efficiency, ICTs, Agriculture (JEL. Code:* Q12)

INTRODUCTION

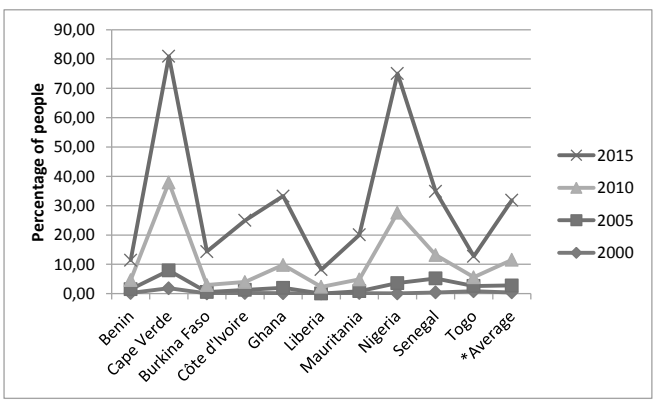
Stepping up labour efficiency which is synonymous with labour productivity in this context is imperative for economic progress in Nigeria as it is for the generality of the low income countries. Labour productivity growth is especially imperative in Nigerian agricultural sector where the nation's labour force is mainly channelled. Raising agricultural labour productivity is vital for the required change in poor agrarian economies. CHRISTIAENSEN et al. (2011) in: DORWARD (2013) enumerated some of the multiple foundational roles of agricultural revolutions that raise agricultural labour productivity can play in wider development processes. Firstly, new technologies and resources that increase labour productivity also increase food availability per worker. Because higher labour productivity lowers the cost (and hence price) of food relative to agricultural worker income and raises agricultural workers' budget surpluses after food expenditures there is increased real labour income which stimulates demand for non-food goods and services.

Increased agricultural labour productivity in Nigeria will not only address the country's need for productivity growth in itself, but it will as well release abundance of labour to other sectors of the economy, increase real income of the labour force, and motivate supply and demand of manufactured goods and services. Although there have been several development interventions with respect to increasing labour productivity, there exist big disparity between agricultural labour efficiency in Nigeria and in the developed countries. World Development Report in: GUTIERREZ (2000) shows that average agricultural GDP per worker in low income countries was US $293 (at 1987 U. S. Prices) between 1994 -1996. This statistics implied that a worker in the Netherlands produced as much in three days as an average farmer produced in low income country in one year. Given the temporal consideration, the present gap in Nigeria may not be as much as stated but the need for economic progress via increased labour efficiency in the agricultural sector is glaring. Perhaps "Labour Augmenting Technological Progress" is vital to closing Nigeria's agricultural labour efficiency gap. According to TODARO AND SMITH (2011), economic development in form of Labour Augmenting Technological Progress occurs when the quality or skills of the labour force are upgraded. That is, the productivity of an existing quantity of labour is

raised by general education, on the job-training programs, etc. Use of ICTs for example, to seek information about farming, to order or purchase farm inputs, to enhance access to finance via e-banking and e-money transfers will likely increase the productivity of the labour force. However, the question of accessibility of these ICTs to the Nigerian agricultural labour force needs to be answered. Accessibility of ICTs in developing world context seeks to expand the geographic access to ICTs of the population at large, and often for the very first time including minimum coverage, especially of remote communities, thereby allowing all citizens to "use the service, regardless of location, gender, disabilities, and other personal characteristics" (DYMOND et al. 2010 in: BARRET & SLAVOVA, 2011).

Positive move towards accessibility of ICTs is rife in Nigeria as the country is often rated as one of the fastest growing telecoms nation in the world and the fastest in Africa (NIGERIA COMMUNICATION COMMISSION (NCC), 2016). Statistical reports of INTERNATIONAL COMMUNICATION UNION (ITU) (2017) showed that the percentage of Nigerians who use the internet grew from 0.06% in 2000 to 47.44% in 2015 (Figure 1). Beginning from 2005, percentage users of internet in Nigeria far outstripped the relative average from the ten selected West African Countries depicted in figure 1. In 2015, for example the percentage of Nigerians who use the internet was 47.74% in contrast to relative average of 20.30% in the selected ten West African countries. By July 2016, 81.7% of Nigerian population were active telecoms subscribers, with the mobile segment accounting for more than 99% of subscriptions (OXFORD BUSINESS GROUP (OBG), 2017).

Figure 2: Percentage of people using the internet from 2000 to 2015 in selected West African Countries

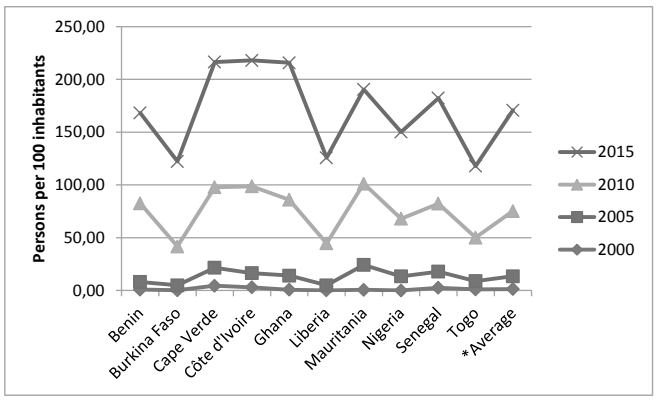


Average is the mean percentage per year for the countries depicted
Source: Authors analysis from ITU COUNTRY ICT DATA UNTIL 2015 (2017)

The rapid growth in internet users in Nigeria may be linked to increased investment in the telecoms sector. Investments made by Nigerian banks in 2004 under the Small and Medium Enterprises Investment Scheme constituted about 56% (NCC, 2005 in: URAMA & ODUH, 2012). In 2015 ICT-related activities accounted for nearly 11% of Nigerian GDP, up from 6% in 2012 and less than 1% as recently as 2001 (OBG, 2017). According to NCC report in 2017, the Nigerian telecoms contributed N1.580 trillion (US$5.18 billion) to gross domestic product (GDP) in the second quarter of 2016, or 9.8 per cent, which represents an increase of 1.0 per cent points relative to the previous quarter. Moreover, there are a few international and multilateral agencies investing in the Nigerian telecommunications industry. Such agencies include the Export-Import Bank of the US (US Exim Bank), African Export-Import Bank (AFREXIM), African Development Bank, Development Bank of South Africa and the International Finance Corporation (IFC).

Until recently, connectivity in rural areas where agriculture is domiciled was limited to slow dial-up lines. Satellite connections now make broadband access possible in these remote areas. Use of mobile phones has seen an enormous increase in recent years, especially in agrarian areas in Africa including Nigeria. Nevertheless, big differences still exist in broadband access between developed and developing countries, with Africa having only three per cent of global broadband users. Although Nigeria is reputed as fast growing telecommunication nation, it is clear from figure 2 that the growth still needs to reach its leap and bounds.

Figure 2: Mobile subscription per 100 inhabitants in some West African Countries in 2000 to 2015



****Average is the mean percentage per year for the countries depicted***
Source: Authors analysis from ITU COUNTRY ICT DATA UNTIL 2015 (2017)

Despite the rapid growth of mobile subscribers in Nigeria after 2000, it has remained below the average subscription rate among West African countries (figure2). In 2010 and 2015 for example, Nigeria had 54.66 and 82.1 subscriptions per 100 inhabitants whereas regional averages were 61.84 and 95.42 mobile subscriptions per 100 inhabitants, respectively (figure2). This study analysed the impact of ICTs on Nigerian agrarian sector, given its growths in the past two decades.

Based on the forgoing, the paper established the effects of access to ICTs on the Labour efficiency in Nigerian agricultural and agribusiness occupations. Following descriptive statistics, the preliminary analysis determine the effects of access to ICTs on the probability that a Nigerian worker chose an agricultural/agribusiness occupation in place of non-agricultural occupations.

METHODOLOGY

Nigeria was chosen as the geographic location of the study. The country is located in West Africa on the Gulf of Guinea and in the tropical zone. It lies within latitude 40° and 140° north of the equator and longitudes 30° and 140° east of the Greenwich meridian. It is bounded on the West by the Republic of Benin, on the North by the Republic of Niger and on the East by the Federal Republic of Cameroun. On the North-East border is Lake Chad which also extends into the Republic of Niger and Chad and touches the northernmost part of the Republic of Cameroun. On the South, the Nigerian coast- line is bathed by the Atlantic Ocean. The country occupies a land area of 923,768.00 square kilometres, 86.2 percent of which is agricultural land and 102,700 square kilometres was forestland as at 2007 (WORLD BANK, 2009). Nigerian population was 151.21 million (2.3 percent annual growth rate) in 2008; 78,141,389.6 was a rural population (WORLD BANK 2010 in: IFAD, 2010).

Cross sectional data were drawn from the General Household Survey-Panel (GHS) conducted in 2010/2011. The survey was conducted by the Nigerian Bureau of Statistics in conjunction with the World Bank. Amidst other important data, the survey elicited information on access to ICTs and labour. The GHS (2011) is a two-stage probability sample. In the first stage, the primary sampling units termed "enumeration areas (EAs)" were selected based on probability proportional to size of the total EAs in each state and the Federal Capital Territory giving a total of 500 EAs. In the second stage, households were selected randomly using the systematic selection of ten (10) households per EAs giving a total of 5,000 households. The final number of households at end of these wave one surveys were 4,851 with a total of 22, 990 individuals providing response to the questionnaires from which data were elicited for this analysis.

After a preliminary descriptive statistics of occupational distribution, labour variables and access to ICTs, the following logit transformation for the probability of a worker choosing agribusiness occupations in place of non-agricultural occupations was specified. The logit model is an outcome of several trials of alternative sets dependent variables measuring access to ICTs:

$$\ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \mu \quad (1)$$

Where:

$\ln\left(\frac{P_i}{1-P_i}\right)$ = natural log of the odds ratio in favour of choosing agribusiness occupations

X_1= Access to Mobile phone (1-4 ranking)

X_2 = Access to Personal computers (1= accessed, 0 =not accessed))

X_3 = Access to the internet (1-4 ranking)

X_4 = Rate of use of the internet (1=frequently, 0=not frequently))

X_5 = Used the internet to obtain information (1=yes, 0= no)

X_6 = Used the internet to obtain information (1=yes, 0= no)

X_7 = Used the internet to send/receive mails (1=yes, 0= no)

X_8 = Used the internet to send/receive instant messages (1=yes, 0= no)

X_9 = Used the internet to make/receive voice calls (1=yes, 0=no)

With most of the independent variables (access to mobile phones, access to television, access to radio, etc) having distorting impact dropped, the following linear multiple regression model used to determine the effects of ICTs on agricultural labour efficiency is specified as:

$$L=\alpha_0 + \alpha_1 Q_1 + \alpha_2 Q_2 + \alpha_3 Q_3 + \alpha_4 Q_4 + \alpha_5 Q_5 + \ell$$

Where:

L: Individual's labour earning per hour in last working year before February, 2011(in Naira)

Q_1: Rate of Internet use (1=frequently, 0= not frequently)

Q_2: Used the Internet For Electronic Banking (1=yes, 0= no)

Q_3: Used the Internet For Electronic Learning (1=yes, 0= no)

Q_4: Used the Internet to read electronic newspapers (1=yes, 0= no)

Q_5: Access to personal Computers (Ranked 1 to 4)

α_0: constant intercept.

α_1 to α_5: parameters of independent variables

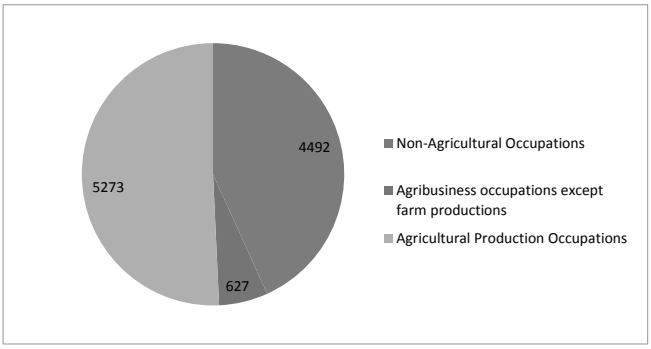
ℓ : error term

Apriori, Q_1 to $Q_5 > 0$,

RESULTS AND DISCUSSIONS

Figure 1 provides frequencies of Occupational distribution of the sampled working population in Nigeria. Out of the 22900 sampled individuals, only 10, 392 of them stated their main occupations. The figure is perhaps showing that only 45.38 percent of the population were engaged or were in their active working age. Of those who stated their occupations 5273 (50.74%) engaged in agricultural production which included crop production, animal husbandry, forestry, fishery and wildlife management.

Figure 1: Frequency Distribution of the Respondents Occupations



Approximately 0.06 percent (627) of the sampled individuals were engaged in secondary agricultural activities classified agribusiness occupations. Agribusiness involves a wide range of activities related to agricultural production including: supplies of agricultural inputs, processing of agricultural raw materials, marketing and distribution of agricultural produce/ products, etc. Contrastingly, 4492 individuals representing 42.23 percent of those who reported work status had non-agricultural activities as their main occupation.

Table 1 present frequency distribution of the respondents' access to ICTs. Precisely 69.2 percent of the workers had access to radio, 21 percent owned radios making their access to radio of highest rank. Again, 59.2 percent of the population have access to mobile phones but only 29.9 percent of them owned phones while 26.3 percent of the population accessed mobile phones through their family, friends or neighbour. Majority (41.3 percent) of the individuals did not provide information about their access to mobile phones.

On accessibility of television, 9467 of the 22900 individuals had access to television with only 2414 or 10.5 percent owning the television, 29.5 percent viewed television owned by their family member, friend or neighbour. Contrastingly, only 3.2 percent of the individuals reported access and most (2.5 percent of them accessed the internet via a paid internet café. Only very few individuals (0.3 percent) had the top ranked access to the internet by owning an internet subscription. A comparative study done in Nigeria showed that radio and mobile phone, followed by television were the most accessed and utilized ICTs among the agrarian households (CHIKAIRE et al. 2017).

The logistic regression results (table 2) unveil that access to mobile phones, and seed cost significantly (at P< 0.01) favoured the choice of agricultural occupation against non- agricultural occupation as a main source of income. Antilogarithm of the coefficient (-2.1074) of access to mobile phones was 0.121 implying that an individual leaping from one level of mobile phones accessibility to the next higher level is 0.121 time likely to choose an agricultural occupation than a non-agricultural occupation. This result also imply that if there were 1000 chances for choosing an occupation due to increased access to mobile phones in Nigeria, only 121 of those chances are likely to be allotted to the choice of agriculture. This result concord the claim of HWANG et al. (2004) that investments in ICTs have a moderately positive relationship with the share of wage employment in non-agricultural sectors. A study of South African economy further show that with development in ICTs, employment in agriculture fell by 21% from 2001 to 2012 while occupational changes among skilled agricultural workers declined by 3.9% (BHORAT et al. 2013).

Such result may be linked to the fact that often people drift from agriculture to non-agricultural sectors so long as they are informed of available opportunities. Mobile phones bridges the information gap which favours out-migration of the labour force from agriculture. Table 2 further show that although very small population had access to the internet (table 1), use of the internet had a significant (at P< 0.1) effect on the likelihood that an individual within the Nigerian population chooses agriculture or its related activity as a primary occupation.

Specifically, increased browsing of the internet for information (P=0.076< 0.10) and increased use of the internet to send or receive e-mails (P=0.064 <0.10) had significant positive relationship with the likelihood that agricultural occupation is chosen over non-agricultural occupation. The antilog of the coefficient of use of the internet for information surfing (0.7751) is 2.1708 implying that if an individual responded 'yes' to the question, "do you use the internet to surf information?"

Table 1: Frequency Distribution of Acess to ICTs by the Respondents

Had access to a radio?			Acess to Radio-Ranked by Source of Access			
	Frequency	Percent	Source of Access	Rank	Frequency	Percent
No	2,789	12.1	Business Centre	1	8	0.0
Yes	15,904	69.2	Workplace	2	11	0.0
Missing	4,297	18.7	Family member, friends or neighbour	3	10,974	47.7
Total	22,990	100	Owned	4	4,832	21.0
			Missing	None	7,165	31.3
			Total		22,990	100
Had access to mobile phone?			Acess to mobile phone-Ranked by Source of Access			
	Frequency	Percent	Source of Access	Rank	Frequency	Percent
No	5,022	21.8	Business Centre	1	570	2.5
Yes	13,621	59.2	Workplace	2	4	0
Missing	4,347	19.0	Family member, friends or neighbour	3	6,035	26.3
Total	22,990	100	Owned	4	6,883	29.9
			Missing	None	9,498	41.3
			Total		22,990	100
Had access to television?			Access to Television-Ranked by Source of Access			
	Frequency	Percent	Source of Access	Rank	Frequency	Percent
No	9,187	40	Business Centre	1	172	0.7
Yes	9,467	41.2	Workplace	2	7	0
Missing	4,336	18.9	Family member, friends or neighbour	3	6,790	29.5
Total	22,990	100	Owned	4	2,414	10.5
			Missing	None	13,607	59.2
			Total		22,990	100
Had access to the internet?			Access to the Internet-Ranked by Source of Access			
	Frequency	Percent	Source of Access	Rank	Frequency	Percent
No	17,808	77.5	Internet Café	1	573	2.5
Yes	726	3.2	Workplace	2	41	0.2
Missing	4,456	19.4	Family member, friends or neighbour	3	29	0.1
Total	22,990	100	Owned	4	76	0.3
			Missing	None	22,271	96.9
			Total		22,990	100

Source: Results of Authors Analaysis from Nigerian General Household Survey, 2011

Table 2: Logistic Regression Results: Effects of Access to ICTs on Choice of Occupation
Dependent Variable: Choice of Occupation (1=agribusiness, 0=otherwise)

Independent Variables: Access to ICT Variables	Coefficient	Standard Error	Z	P>IzI
Access to Mobile phone (1 -4 ranking)	-2.1074	0.7976	-2.64	0.008
Access to Personal computers (1= accessed, 0 =not accessed)	-0.3481	0.3988	-0.87	0.383
Access to the internet (1-4 ranking)	-0.2011	0.2252	-0.89	0.372
Rate of use of the internet (1=frequently, 0=not frequently)	-0.1981	0.4250	-0.47	0.641
Used the internet to obtain information (1=yes, 0= no)	0.7751	0.4369	1.77	0.076
Used the internet to send/receive mails (1=yes, 0= no)	0.9959	0.5369	1.85	0.064
Used the internet to send/receive instant messages (1=yes, 0= no)	-0.5625	0.4626	-1.22	0.224
Used the internet to make/receive voice calls (1=yes, 0=no)	0.1880	0.6653	0.28	0.778
Used the internet to order for goods or services (1=yes, 0=no)	-0.6702	1.0873	-0.62	0.538
Used the internet for electronic banking (1=yes, 0= No)	-1.1094	0.7816	-1.42	0.156
Used the internet for electronic learning (1=yes, 0= No)	0.354	0.4102	0.86	0.392
Used the internet to read or download newspapers (1=yes, 0 = no)	-0.4999	0.4726	-1.06	0.290
Constant	6.3919	3.1276	2.04	0.041
Log likelihood: -97.415	Number of Observations:		287	
LR Chi-Squre(12): 29.59	Prob>Chi-Square:		0.0032	
Pseudo R-Square: 0.1319				

Source: Results of Authors Analysis from Nigerian General Household Survey, 2011

(Dummied as 1) as against 'no' (dummied as 0), such individual was more than 2times likely to choose agriculture as an occupation than an individual who responded 'no' to the same question. Also, the antilog of the coefficient (0.9959) of use of internet to send or receive mails was 2.7071, that is, an individual who used the internet to send or receive mails was 2.7 times more likely to choose an agricultural occupation over non-agricultural occupations. These results gave an indication that ICTs, particularly access to the internet measured by its various usage have the capacity to contribute to agricultural growth and consequently economic progress which is earlier described as labour augmenting technological progress.

Linear multiple regression results on table 3 show that access to the internet measured by its some of its uses by the study group in the year preceding the survey had positive and significant effects on agricultural labour efficiency. Result on the table show that a worker who used the internet banking earns 517.696 Naira (US$3.372) per hour more than a worker who did not. The effect was positive and significant (P<0.05).

Similarly, a worker who used the internet to read online newspapers earned (349.394Naira or US$2.276 per hour) significantly (P<0.05) more than a worker who is indifferent about online newspapers. In contrast, a worker who used the internet for e-learning activities earned 189.802Naira (US$1.236) per hour less than a worker who did not use the internet for e-learning. This may be due to the fact that e-learning may be channelled towards new ideas or a formal online training which does not enhance productivity of the present occupation of the worker.

Finally, increased access to personal computers (ordered measure, say from being a borrower to an owner) increased agricultural labour productivity by 66.652 Naira (US$0.434) per hour. This increase is significant at 90 percent confidence interval (P<0.10). Overall, the F-value of 9.463 is significant at 99 percent confidence interval, showing that all the variables measuring access to ICTs variables accounted for 79.4 percent (Adjusted R-square = 0.794) variation in labour efficiency. These findings are not at variance with those of a macroeconomic study conducted by the AUSTRALIAN PRODUCTIVITY COMMISSION (2004). The commission found that IT-capital deepening contribution to labour productivity growth accounted for about a third of the very strong labour productivity growth of 3.2 per cent a year in the later part of the 1990s. More so, various growth accounting studies for Australia in later years showed that stronger IT-capital deepening has contributed about 2 or 3 tenths of a percentage point to acceleration in labour productivity growth. EVA HAGSTEN and SABADASH (2014) found that a 1% increase in the share of highly skilled ICT employees in a firm's labour force increase firm productivity by 0.5% in Denmark, 0.6% in Finland, 0.7% in France, 0.9% in Norway, 0.7% in Sweden and 0.4% in the United Kingdom.

Among other factors, EU-US labour productivity gap was associated with the different productivity growth rates in their telecom industries (BIAGI, 2013 IN: EUROPA, 2016). In Iranian manufacturing sector, IT had a positive and statistically significant effect on productivity (ABRI & MAHMOUDZADEH, 2015). A more recent corroborating study shows that access to ICT increased the efficiency of maize marketing efforts in Nigeria by 20.035% at 99% confidence interval. These evidences corroborate this research finding to affirm that labour efficiency in agribusinesses in Nigeria was significantly enhanced by ICTs growth. It is noteworthy that the extent of the effect of ICTs on labour efficiency varies by country and according to the industry. This is so because ICT led development requires complementary factors such as reorganization of business models, high-quality management, high-level labor and economic competitive environment (ABRI & MAHMOUDZADEH, 2015) which varies from country to countries and from one industry to another.

Table 3: Linear Multiple Regression Results: Effects of Access to ICTs on Agricultural Labour Efficiency
Dependent Variable: Agricultural Labour Efficiency (wage per hour)

Independent Variables	Coefficients (Unstandardised)	Std. Error	Coefficients (Standardised)	t-Value	Prob(t-Statistics)
Rate of Internet use (1=frequently, 0= not frquently)	55.062	101.666	0.095	0.542	0.608
Used the Internet For Electronic Banking (1=yes, 0= no)	517.696	139.943	0.57	3.699	0.01
Used the Internet For Electronic Learning (1=yes, 0= no)	-189.802	87.381	-0.356	-2.172	0.073
Used the Internet to read electronic newspapers	349.394	93.295	0.603	3.745	0.01
Access to personal Computers (Ranked 1 to 4)	66.652	28.566	0.381	2.333	0.058
Constant	53.492	78.602		0.681	0.522
R:	0.942		Standard Error Estimate:		119.092
R-Square	0.887		F-Value:		9.463
Adjusted R-Square:	0.794		Prob(F-Statistics):		0.008

Source: Results from Authors Analysis of Nigerian General Household Survey, 2011

CONCLUSION AND RECOMMENDATIONS

Moderate numbers of Nigerian workers have access to certain forms of ICTs such as radio, television and mobile phones but very few agricultural workers had access to the internet which has been growing in its presence and impact since the last two decades. Interestingly, although use of mobile phones was more likely to cause a drift away from the agricultural occupation, the use of the internet for information surfing and the use of the internet in for emails made the few individuals who had access to have a positive disposition towards agricultural occupation. More so, agricultural labour efficiency was spurred by increased use the internet for e-banking, e-newspaper reading and increased access to personal computers.

Governments is largely to support that the agricultural sector development not only investment in physical resources but also via investments in ICTs and promotion of the innovative use of ICTs, including diffusion of the internet technology within the Nigerian Agricultural sector. Scaling up the proliferation of the internet and it accessibility has the capacity to upscale existing labour productivity through human capacity building from e-information bank, e-learning facilities, and easier/faster service delivery to the labour force e-banking, e-money transfers and e-purchases, e-voice calls, etc.

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SCIENTIFIC PAPER

ASSESSING THE FINANCIAL VIABILITY OF THE FLORICULTURAL INDUSTRY IN GHANA

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Abstract: *This study determines the financial viability of the floricultural industry in Ghana using both discounting and non-discounting investment appraisal methods. The feasibility analysis suggests that large-scale floricultural firms are more profitable particularly with the production of cut flowers. However, investors with limited capital can venture into small-scale production specifically cut flowers. The conclusion is that the floriculture industry is financially viable therefore investors are encouraged to expend their resources in the industry. We recommend that the government and stakeholders need to create institutional support to enable the already established firms to further develop and attract new investors in the sector.*

Keywords: *benefit-cost ratio, financial viability, floriculture, Ghana, profitability (JEL. Code:* Q13)

INTRODUCTION

Ghana is among developing countries whose economy is driven by a single commodity. Economists argue that diversification into high-value non-traditional agricultural export is a sustainable strategy to trigger an economic transformation in these developing countries particularly, Ghana. Floriculture industry refers to the production and marketing of a wide variety of plants and planting materials which start from parental products like plant parts and cuttings to the end product for the market. The floriculture products include flowers, foliage, potted plants, garden plants, nursery stock (trees), flowering leafy, annuals, perennials, flower bulbs and tubers (UFFELEN and DEGROOT 2005). UNCTAD (2008) report shows that African countries such as Kenya, Egypt, South Africa, Uganda, and Tanzania among others are stimulating economic growth and development through the floriculture industry. Most of these African countries generate sizeable foreign earnings from the European market through the exports of the horticultural products. GEBREEYESUS and SONOBE (2012) indicated that in 2006, sub-Saharan Africa (SSA) exported about US$ 2.06 billion worth of fresh vegetables and fruits with 63% headed to the European Union (EU) market. UNCTAD (2008) further revealed that US$ 423 million worth of cut-flowers were exported from SSA to the EU market. This highlights the contribution of the floricultural industry to the economic development of the SSA countries.

LEIPOLD and MORGANTE (2013) emphasised that Kenya alone exports some US$ 400 million worth of floriculture products to the EU. This accounts for 7% of global trade in the sector. The country is ranked as 3rd world exporter of floricultural products and 1st in Africa. In addition, Kenya exports 500 mt of floricultural products to the European markets and this amounts to US$ 1.3 million earnings from the industry daily. The floriculture industry in Kenya employs over 50,000 people directly and supports several hundred thousand indirectly (KSOLL et al. 2009). Despite the good performance of the floriculture industry in Kenya, the industry is confronted with challenges including political unrest, high oil prices coupled with high transportation cost (KSOLL et al. 2009; RIKKEN, 2011). The current threat to the industry is the delay of Kenyan Government to sign the Economic Partnership Agreement with EU.

Moreover, floricultural products, particularly cut-flowers, are rapidly becoming export businesses in Ethiopia. Ethiopia is the 5th world largest flower export in the world and ranked 2nd in Africa (ZERIHUM et al. 2014). Since 2001, Ethiopia's cut-flower industry has grown by 147,000%. Thus, it increased from US $145,000 in 2001 to US $230 million in 2014 (Van RIJSWICK, 2015). The industry employs more than 85,000 workers (with 70% being women) on more over 100 farms. The success story behind Ethiopia's cut-flower industry is the strong and effective partnerships between donors, private sector and government. Ethiopian government provided good incentives to attract investors while Dutch government provided the private sector with investment grants to create a partnership between Dutch companies and Ethiopian producers (DELOITTE, 2014). Ethiopian flower industry illustrates an extraordinarily fast and successful diversification into a non-traditional export product (ZERIHUN et al. 2014). Despite the rapid growth of the Ethiopian floriculture industry, the industry is challenged with barriers including the absence of appropriate infrastructure, shortage of water and agricultural inputs (RAKESH and MESERET 2007).

Other African countries such as South Africa, Uganda, Egypt and Tanzania are also involved in export of floricultural products but at minimum quantity. Comparing Ghana's floriculture industry with that of the aforementioned African countries, it is obvious that Ghana is far behind, although Ghana has favourable environmental conditions to produce floricultural products. Strictly speaking, Ghana has more natural resources that can support floriculture business than Kenya and other floriculture producing countries. Even though the industry has potential to generate US$ 120 million revenue, it is noted that the industry generates only US$ 2.5 million. For instance, Ghana flower exported, a total of 811,800kg of cut flowers were exported in 2012 for revenue of US$ 2,026,000, while in 2013, a total of 766,090kg of flower exports brought in US$ 2,326,368. In 2010 and 2011, 422,914kg and 452,358kg of cut flowers were exported, generating US$ 1,786,898 and US$ 2,046,577, respectively (GHANA EXPORT PROMOTION, 2013).

Notwithstanding the potential of the floricultural industry to stimulate economic development in Ghana, we observed that little attention has been directed to this industry. More importantly, there is a paucity of empirical studies on floriculture industry in Ghana in particular economic related issues. To the best of our knowledge, no empirical study has been conducted to investigate the financial viability of floricultural production in the country. Therefore, the extent to which the floriculture industry is viable in the country is not yet known. This study contributes to the literature on the economics of floriculture production by providing useful information on the financial viability of Ghana's floriculture industry. A financial viability study is essential to inform investors and stakeholders about the existing opportunities in the floriculture industry. The following research questions are raised: Is the floriculture industry a viable venture to be invested in? What subsector of the floricultural industry is the most profitable? What are the opportunities and challenges that prevail in the floricultural industry?

The main purpose of the study is to determine the financial viability of floriculture industry in Ghana using both discounting and non-discounting investment appraisal methods. The study hypothesised that the floriculture industry in Ghana is financially viable. It is also expected that large-scale firms are more profitable than small scale firms. The key finding is that large scale floricultural firms are more profitable particularly with the production of cut flowers. However, investors with limited capital can also venture into small-scale production specifically cut flowers. The main conclusion drawn from the study is that the floriculture industry is financially viable**.** The paper is structured into four sections. The second section explains the methodology used to address the research objective. The key findings are synthesised in the third section. The last section provides conclusion and policy recommendations based on the key findings.

MATERIALS AND METHODS

Conceptual Framework

For the purpose of this analysis, the floriculture firms are categorised into large and small scale. The large scale firm employs a larger number of people, huge initial capital outlay and asset availability. Other underlying reasons for this classification are production capacities and land acreage. Large firms operate on 3 ha or more land area and employ more than one person to manage each sector. However, the small scale firms employ one person to handle all the activities related to all the subsectors and usually operate 1 ha or less. Estimating the cost associated with floriculture production involves start-up cost and operating cost. The start-up cost is the initial investment capital within the period of establishment (zero year). It also includes procurement of non-current assets that are expected to last more than one financial year. The benefits are the stream of revenues generated from the production of floricultural products, which are accrued from year 1. In this study, both discounting and non-discounting investment appraisal methods are employed to determine the financial viability of the floriculture industry in Ghana. The discounting approach takes into consideration the time value of money enabling better comparison of the future costs and benefits to determine the profitability of floriculture production in the long term. The discounting investment techniques used in this study include the net present value (NPV), the benefit-cost ratio (BCR) and internal rate of return (IRR).

The NPV is the present worth of net-revenue stream (net cash flows) obtained by a floricultural enterprise, where the net-revenue represents the difference between the present value of the cash inflows and cash outflows related to the floriculture enterprise. The floricultural enterprise is considered to be financially viable if the NPV is positive or zero and the enterprise is however rejected if it has negative NPV (VIVARELLI, 2004; ROGERS, 2004). BCR is a ratio of the present value of cash inflows to the present value of

cash outflows. The floriculture business is profitable if the BCR is greater than one, suggesting that the accrued revenue is higher and could defray the cost incurred and vice versa if BCR is less than one. Another profitability measure of floriculture production considering the time factor is IRR which relates the rate at which the present value of cash inflows from the investors equals the present value of cash outflows. According to GITTENGER (1982), IRR indicates that maximum interest that a business could pay for the resources used if the business is to recover its investment and operating costs and still break even. The floriculture production would be financially viable if the IRR is greater or equal to the prevailing market interest rate. Beside the discounting methods, payback period, a non-discounting technique is used to evaluate the number of years that the floriculture business will cover its initial capital investment. In other words, the payback period is the estimated length of time from the beginning of the project until the net value of the incremental production stream reaches the total amount of capital investment. A business enterprise with relatively shorter payback period is preferred most. The combination of the various investment appraisal techniques provides rigorous and better conclusion and decision regarding the financial viability of the floriculture industry.

The assumptions in this paper are based on first-hand data and information obtained from producers (stakeholders) in the floricultural industry. Current prices relating to capital items were obtained from online markets and local marketers. The total revenues and total costs were computed based on the current prices. The amount sales although projected to remain constant for the first two years is going to see a steady increase afterwards. This assumption is influenced by the fact that Ghanaians are not flower-loving people although this is gradually changing. Also, the awareness of people cultivating flowers is low and we assume that it will increase as the years go by. The pattern of demand in the country over the last decade has also influenced this assumption.

The total cost of raw materials is also held constant for the first two periods. This is based on the fact that the Government of Ghana provides certain incentives (no tax) and subsidies for producers involved in the horticultural sector (which involves floricultural products) so as to boost the sector. This decision was also influenced by the growth trends in the industry over the past decade. However, provisions have been made for any overlooked or implicit costs and these have been captured in miscellaneous expenses. A discount factor of 25% which is in line with the opportunity cost of capital on the market and also influenced by the start-up cost was used.

The major relative assumptions used in the financial analysis are presented below:

- All the amounts are quoted in Ghana Cedi (Gh₵).
- Revenues and costs are projected over a period of five (5) years.
- The average cropping and harvesting distance revolves around a three (3) month interval.
- The cropping and harvesting cycles are held at a constant cycle of three (3) months.
- Profits are ideally realized when all three (3) sectors of the industry are operated together.
- Firms operate at an "optimal level", making use of every strength and opportunity.
- Financial costs stated in the tables capture taxes and depreciations.
- Administrative expenses also take into account the wages and salaries, transportation and maintenance costs among others.
- Higher returns relative to the cost of production is attributed to the propagative, productive and regenerative nature of most floricultural products.

Source of Data and Sampling Procedure

The study was conducted in two regions of Ghana, namely, Greater Accra and Ashanti regions. Greater Accra is the capital city of Ghana. The region has a coast-line of approximately 225km. Soils in the region have low organic contents with shallow top soils which limit the capacity for crop production and the vegetation is a coastal savannah shrub interspersed with thickets. Greater Accra region also falls within the dry, coastal, equatorial climatic zone with temperatures ranging between 20° and 30° Celsius, and annual rainfall ranging between 635mm along the coast to 1,140mm in the northern parts. The region has advanced in the hospitality industry which usually patronises floriculture products. The region has one of the largest shipping harbours (Tema Harbour) and an international airport. These facilities have attracted large businesses to be established in the region.

On other hand, Ashanti region lies in the forest zone with average annual rainfall of 1,270 mm and average daily temperature of 27 degree Celsius. The region is noted for agricultural production, mineral mining and a number of tourism attraction sites (such as national parks, birds and wildlife sanctuaries, Arboretum, lakes, waterfalls and scarps). The hospitality business in this region is also strong and demand for floricultural products including flowers and lawn grasses is rising. The region is central to other parts of the country making it a strategic for transportation and distribution networks and services.

A multistage sampling procedure was employed in the study. In the first stage, Kumasi and Accra metropolis of Ashanti and Greater regions were purposively selected because most floricultural firms are concentrated in these cities. In the second stage, two (2) small scale and two (2) large-scale firms were randomly selected from each of the city. This amounts to a total sample size of eight (8) firms comprising four (4) small scale and four (4) large scale firms. All the small scale firms are private owned enterprises while one of the large-scale firms is a state-owned enterprise. Both primary and secondary data were used in the study. The primary data were collected using both structured questionnaire and interview in 2015. The questionnaire captured information on revenue and cost of producing floriculture products. The cost items captured in the questionnaire include fixed assets, bed preparation, fertiliser/manure, charcoal, weedicides, water,

raw material, black soil and labour. The secondary data were also obtained from books, journals, newspapers, magazines and the internet.

RESULTS AND DISCUSSIONS

The summary of the start-up capital which refers to the estimated costs involved in acquiring assets needed to establish a floricultural firm or enterprise is provided in Table 1. The table shows that the average start-up capital for large scale floriculture firms is Gh₵ 84,256.99 (US$ 21,604.36) while that of the small-scale firm is Gh₵ 25,536.78 (US$ 6,547.89). The mean difference of Gh₵ 58, 720.21 (US$ 15,056.464) is significant at 1%.

Table 1. Total start-up cost for large and small-scale firms

Item	Large-scale firm	Small-scale firm	Mean difference
	Amount (Gh ₵)	Amount (Gh ₵)	
Fixed assets	61,790.000	17,375.000	44,375.000***
Raw materials	15,380.000	4,751.000	10,629.000***
Fertiliser	40.250	87.500	-47.500***
Black soil	130.000	300.000	170.000***
Charcoal	30.000	-	-
Weedicides	32.000	30.000	2.000**
Tools and equipment	1,398.750	502.250	896.500***
Administrative costs	1,443.750	1,275.000	168.750***
Miscellaneous expenses	4,012.200	1,216.037	2,796.163***
Total	84,256.990	25,536.788	58,720.202***

Exchange rate: US$ 1 = Gh₵ 3.90 in 2015
***** and *** denote 10%, 5% and 1% significant levels***

The cost of fixed assets and raw materials formed the largest components of the total start-up capital for both large and small scale firms. We can be deduced that the investment outlay for the establishment of a large firm far outweighs that of the small-scale firm by a ratio of 3:1. There is no doubt that this difference can be attributed to the size and capacity of factors of production. We observed in the interview that small scale firms have limited access to loans. The rippling cause of this problem is that there is no well-defined and established insurance policy which caters for investors in the horticultural sector.

The operational costs are estimated according to the subsectors for the sake of comparison. Table 2 shows the operational expenditure for both large and small scale firms. The results indicate that the cost of raw materials constitutes the large proportion of the total production costs followed by administrative expenses for small or large scale for all the subsectors.

Table 2. Operational costs for large and small scale firms

Item	Large scale firm			Small scale firm		
	Bedded plants (Gh ₵)	Cut flowers (Gh ₵)	Potted plants (Gh ₵)	Bedded plants (Gh ₵)	Cut flowers (Gh ₵)	Potted plants (Gh ₵)
Production of bed	265	-	-			
Fertilizer/ manure	161	140	80	220	20	35
Black soil	250	45	81.7	125	35	72.5
Charcoal	-	60	120	-	-	-
Storage & preservatives	-	60	-	-	27.5	-
Pots	-	-	1033.3	-	-	-
Water	-	-	-	405	-	250
Rubbers	-	-	-	440	-	500
Breakages	-	-	-	-	-	500
Weedicides	64	64	64	27.5	11.7	25
Packaging and labelling	165	725	165	50	57.5	600
Raw materials	7560	14060	24380	5316.83	1305	9960
Administrative expenses	6575	5225	6100	2133.3	1200	1800
Financial costs	349.69	116.56	233.13	102	34	68
Miscellaneous costs	769.5	1024.8	1612.86	441	134.5	690.53
Total	16508.88	21636.92	34103.12	9362.63	2859.2	14569.03

Exchange rate : US$ 1 = Gh₵ 3.90 in 2015

The potted plant sector has the high production cost. The least cost demanding item identified is weedicides. The reason given by stakeholders is that when dealing with plants especially floricultural products nothing is treated as weed and so less resource is expended in controlling weeds. As expected in relation to size (large and small), the large-scale firms record remarkably high total operational cost with the potted plants followed by cut flowers and then bedded plants. Similarly, potted plants constitute the highest proportion of the total operational cost for small-scale firms while cut flowers have the least operational cost.

The projected operational costs for the five years represent the summation of all the three sectors of the industry which is provided in Table 3. This stems from the fact that success

of a floricultural firm is ideally based on the establishment and operation of all the three sectors. Apportionments with regards to start-up and items of depreciation are done based on the information obtained from stakeholders, degree of resource requirement and productivity of products from each sector. Based on this deduction, apportionments relating to the industry are computed in terms of ratios as bedded plants = 3/6, cut flowers = 1/6 and potted plants = 2/6. These ratios suggest that bedded plant section require relatively higher initial capital investment for both small and large scale firms. This result supports the findings of OULU (2015) indicating that production of floricultural products is capital and labour intensive.

Table 3. Operational costs for producing bedded plant, cut flowers and potted plants

Large Scale	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Costs					
Bedded Plants (Gh ₵)	16509.2	16509.2	17946.3	17175.6	17946.3
Cut Flowers(Gh ₵)	21637.4	21637.4	22680.5	22423.4	22680.5
Potted Plants(Gh ₵)	34103.1	34103.1	35810.4	35296.3	35810.4
Totals	72248.9	72249.7	76437.2	74895.3	76437.2
Small Scale					
Bedded Plants(Gh ₵)	9362.7	9362.7	10271.6	9719.1	10271.6
Cut Flowers(Gh ₵)	2859.2	2859.2	3158.9	2974.8	3158.9
Potted Plants(Gh ₵)	14569	14569	15456.6	15088.3	15456.6
Totals	26790.9	26790.9	28887.1	27782.2	28887.1

Exchange rate : US$ 1 = Gh₵ 3.90 in 2015

Revenue Generation

Table 4 provides information regarding revenue generation by small and large scale firm. The results indicate that the large-scale firms are associated with higher total revenues as compared to the small scale firms. Another noticeable fact is that the potted plant sector in the industry (small and large) shows the highest revenue of Gh₵ 45,136.70 (US$ 11,573.51) and Gh₵ 2,1250 (US$ 5,448.72), respectively. The least revenue generated sector varied among the various industries. Bedded plants and cut flowers recorded the least revenue for large scale and small firms respectively. Thus, a ranking by inspection would place the establishment of the large scale firm (ideally the potted and cut flower) over that of the small. One should also note that revenue generated does not decline and it is logical to say that the floricultural industry is a very promising industry. The revenue generation ratio from Table 4 is roughly 3:1 in favour of the large-scale firms.

Table 4. Generated revenue from bedded plant, cut flowers and potted plants

Revenue	Year 1	Year 2	Year 3	Year 4	Year 5
Large scale					
Bedded plants(Gh ₵)	31530	31530	33106.5	33106.5	33106.5
Cut flowers(Gh ₵)	41592	41592	43671.6	43671.6	43671.6
Potted plants(Gh ₵)	45136.7	45136.7	47393.5	47393.5	47393.5
Totals	118258.7	118258.7	124171.6	124171.6	124171.6
Small scale					
Bedded plants(Gh ₵)	12478.3	12478.3	13102.25	13102.25	13102.3
Cut flowers(Gh ₵)	6330.33	6330.3	6646.85	6646.9	6646.9
Potted plants(Gh ₵)	21250	21250	22312.5	22312.5	22312.5
Total	40058.63	40058.6	42061.6	42061.65	42061.7

Exchange rate: $1 = Gh₵ 3.90 in 2015

Feasibility Analysis

Table 5 presents the combination of all the discounted measures used to analyse the study. Based on the decision rules governing the discounted methods, the bedded plants sector of both large and small scale firms as per NPV would be disregarded when making an investment decision. However, it would be logical to invest in the cut flowers and potted plants of the industry. The BCR rule states that it would be feasible to undertake and run the cut flower and potted plants sectors in the industry whiles forgoing the bedded plants section. In using the IRR as a decision, all sectors having a return rate below 25% would be disregarded and overlooked. The same conclusion can be drawn here as per the rule of the other discounted methods. The mean differences of NPV, BCR and IRR for large and small scale firms are statistically significant

Table 5. Financial feasibility of large and small-scale firms

	Large-scale firms			Small-scale firms			Mean differences		
	NPV (Gh₵)	BCR	IRR%	NPV (Gh₵)	BCR	IRR%	NPV (Gh₵)	BCR	IRR%
Bedded plants	-294.54	0.997	24.7	-4236.25	0.890	7.73	3941.71*	0.107**	16.97***
Cut flowers	41357.58	1.566	142.39	5271.31	1.434	78.36	36086.27***	1.5*	63.94***
Potted plants	3134.01	1.026	30.25	10016.36	1.207	75.49	-6882.29***	-0.181*	-48.24***

****, **, and *** denote 10%, 5% and 1% significant levels***

Table 6. Summary of Profit/Loss for large and small scale firms

	Large scale			Small scale		
Year	Bedded Plants	Cut Flower	Potted Plants	Bedded Plants	Cut Flower	Potted Plants
	Gh ₵	Gh ₵	Gh ₵	Gh ₵	Gh ₵	Gh ₵
1	15021.14	19955.1	11033.55	-6608	504.67	-8545.1
2	15021.14	19955.1	11033.55	-6608	504.67	-8545.1
3	15159.89	20991.08	11583.11	-7842.13	208.56	-9298.63
4	15930.96	21248.11	12097.21	-6709.51	586.09	-8543.58
5	15159.89	20991.08	11583.12	-7842.13	208.56	-9298.63

Exchange rate: US$ 1 = Gh₵ 3.90 in 2015

at 1% level suggesting that the scale of production is critical for higher profitability of the floriculture industry.

Profit/ Loss

The profit or loss for the various sectors was determined for both large and small scale in the industry as shown in Table 6. This was computed by subtracting the total cost of production from total revenue (TR - TC). The total cost was derived by adding depreciation cost back to the cash outflows and the cash inflows were used as the total revenue derived from each sector. Table 6 indicates that it is more profitable to set up a large-scale floricultural firm operating in all the three sectors in Ghana particularly the major cities like Accra and Kumasi. Another observation made is that the cut flower sector of the large-scale firms is the most profitable while the potted plant is the least profitable.

In the case of small-scale firms, the potted plant sector recorded the highest level of losses making that sector uneconomical in a five-year span. However, investors with limited capital can venture into the small scale floriculture industry specifically the cut flower sector since the other sectors including bedded and potted plants are not profitable. Our finding is consistent with NUSRAT (2012) and SUDHAGAR (2013) which observed that higher returns are associated with production cut flowers.

SWOT Analysis

The SWOT analysis is used to analyze the strengths, weaknesses, opportunities and threats of the floral industry based on the responses from the respondents and also observations that were made during the data collection (WEBBER and LABASTE 2010 and RIKKEN, 2011). RIKKEN (2011) indicated that SWOT analysis is a qualitative starting point for any competitive strategy analysis. WEBBER and LABASTE (2010) and RIKKEN (2011) stressed that even though SWOT analysis is not precise tool, it is a good way to provide a general characterization of the current state of the industry, identify issues, and generate discussion. It is particularly useful as a neutral facilitation tool to focus an initial discussion on the perceived state of the value chain or to perform initial brainstorming on the potential opportunities and risks. Strengths, weaknesses, opportunities and threats that prevail in the floriculture industry are provided in Figure 1 and explained below:

Strengths: Ghana has a number of comparative advantages that makes it favourable choice within sub-Saharan region for investors in the floriculture industry. They include the following:

Land: Ghana has vast agricultural land available in Eastern region (Nsawam) where most of the country's floriculture production takes place. The area with endowed with small water bodies which can be used for irrigation.

Human resources: There is available labour force both skilled and unskilled that can be harnessed for expansion in the floriculture industry.

Packaging: Quality corrugated boxes and sanitary products are currently produced by a number of local companies in the packing industry for diverse business activities. The tight competition that exists in the packaging industries makes the prices of the packaging materials also competitive.

Irrigation: Drip and sprinkler irrigation materials are usually imported from Europe. However, the rising demand by high-value horticultural growers has necessitated high local production of such materials in the country which are relatively cheaper than the imported ones.

Transportation: A number of cargo airlines are available in the country to provide freight services to non-traditional exporters. Expansion of project of the Ghana's international airport suggests that more airlines can operate in the country. Ghana also has a comparative advantage in its proximity to the main EU markets, with flights to Amsterdam averaging only six hours compared to over 11 hours from other flower exporting countries.

Research: Ghana is endowed with a number of well-established research institutions that support agricultural projects with various services ranging from soil tests, crop trials, pest and disease control, and organised training for farmers. These institutions provide a range of services at competitive rates.

Financing: Ghana's finance sector is one of the most developed in Africa. With numerous banks, insurance and brokerage firms and a stock exchange that allows companies to raise long-term capital at low cost, the country's finance sector is more poised than ever to support the nation's economic development in coming years. The range of services available

includes working capital finance, project finance, and letters of credit.

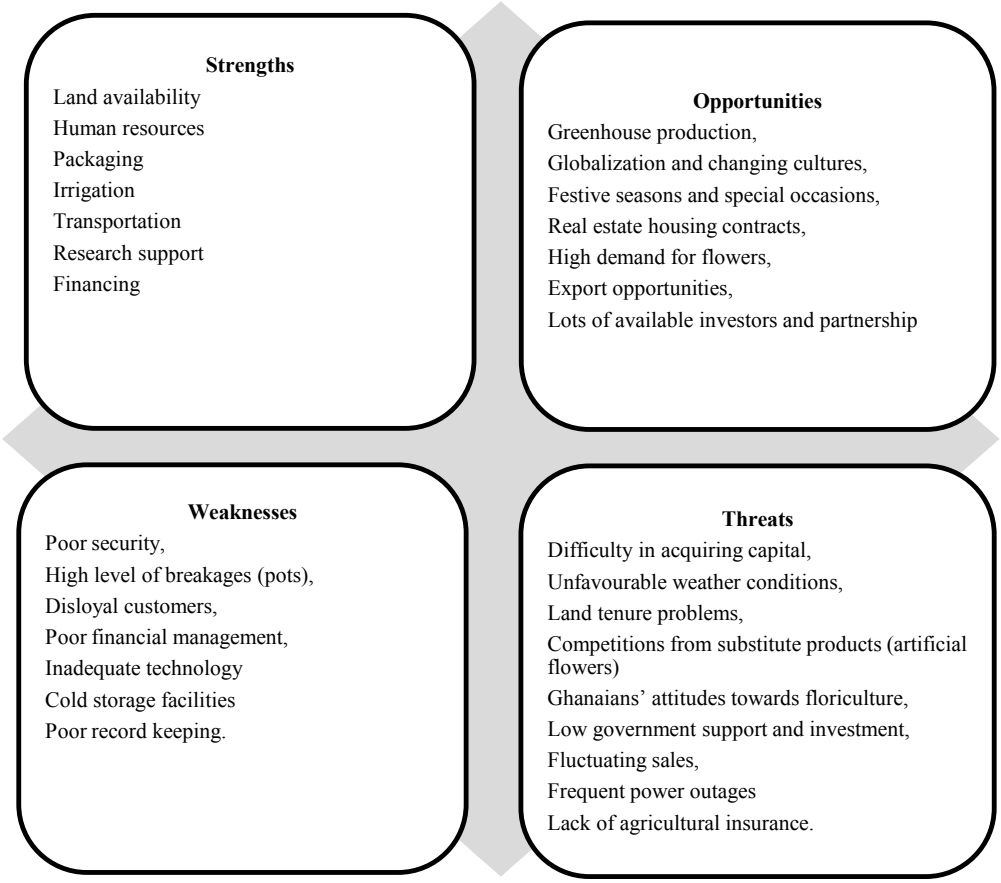
Opportunities:

Greenhouse production, globalisation and changing cultures, festive seasons and special occasions, real estate housing contracts, high demand for flowers, export opportunities, lots of available investors and partnership opportunities.

Weaknesses: Poor security, high level of breakages (pots), disloyal customers, poor financial management, inadequate technology and cold-storage facilities and poor record keeping.

Threats: Difficulty in acquiring capital, unfavourable weather conditions, land tenure problems, competitions from substitute products example artificial flowers, attitude of Ghanaians towards floriculture, low government support and investment, fluctuating sales, frequent power outages and lack of agricultural insurance.

Figure 1. SWOT analysis



CONCLUSION AND POLICY RECOMMENDATION

Some developing countries are diversifying into high-value non-traditional export including the floriculture industry. However, in Ghanaian situation, the sector is underdeveloped and numerous opportunities offered by the industry are not yet fully exploited. The reason is that there is inadequate research on economics of floriculture industry to inform investors about the extent to which the industry is profitable. Therefore, this study tended to determine the financial feasibility of the floriculture industry in Ghana using the two major cities-Accra and Kumasi as a case study. Eight (8) floricultural firms comprising four small-scale and four large-scale firms were selected from the two cities. Both discounting and non-discounting investment appraisal methods were employed to determine the financial feasibility of the floriculture industry. The combination of these two methods provides rigorous and better conclusion and decision. Three floricultural products namely, cut flowers, potted and bedded plants were considered for both small and large scale firms for the study.

The results indicate that large-scale floriculture firms require higher capital investment of Gh₵ 84,256.99 (US$ 21,604.35) while that of small scale firms is Gh₵ 25,536.79 (US$ 6,547.89). Our findings reveal that production of potted plants for both small and large scale requires higher cost as compared to cut flowers and bedded plants. However, cut flower production for small and large scale appears to be more profitable for both small and large scale. Generally, both discounting and non-discounting methods point out that large scale firms are more profitable and feasible to invest. However, investors with limited capital can venture into small-scale production specifically cut flowers. In addition, the study identified a number of opportunities available to expand the floriculture industry. These include greenhouse production, globalisation and changing cultures, festive seasons and special occasions, real estate housing contracts, large customer base, high demand for flowers, export opportunities, lots of available investors and partnership opportunities. Despite these opportunities, some challenges also exist in the industry including difficulty in acquiring capital, unfavourable weather conditions, land tenure problems, competitions from substitute products example artificial flowers and also import firms, attitude of Ghanaians towards floriculture, low government support and investment, fluctuating sales, frequent power outages and lack of agricultural insurance.

The main conclusion drawn from the study is that the floriculture industry is profitable especially the cut flowers. We, therefore, recommend that potential investors should expend resources in the floricultural industry as it has been

proven to be financially viable. Efforts must be made to promote demand for the floricultural products on the local market to boost sales. At the production side, we suggest that new technologies should be adopted by producers while government and other stakeholders provide necessary institutional support to improve the sector and attract more investors in the sector. Lastly, intensive research is also required to reveal relevant information needed by stakeholders and investors in the floriculture industry.

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SCIENTIFIC PAPER

NOTE ON SIMPLE AND LOGARITHMIC RETURN

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Abstract: *In this paper we describe and clarify the definitions and the usage of the simple and logarithmic returns for financial assets like stocks or portfolios. It can be proven that the distributions of the simple and logarithmic returns are really close to each other. Because of this fact we investigate the question whether the calculated financial risk depends on the use of simple or log returns. To show the effect of the return-type on the calculations, we consider and compare the riskiness order of stocks and portfolios. For our purposes, in the empirical study we use seven Hungarian daily stock prices and for the risk calculation we focus on the following risk measures: standard deviation, semivariance, Value at Risk and Expected Shortfall. The results clearly show that the riskiness order can depend on the use of the return type (i.e. log or simple return). Generally, often – due to missing data or the nature of the analysis – one has to use approximations. We also examine the effect of these approximations on the riskiness order of stocks and of portfolios. We found differences in the riskiness order using exact or approximated values. Therefore, we believe, if this is possible, exact values instead of approximated ones should be used for calculations. Additionally, it is important that one uses the same type of return within one study and one has to be aware of the possible instabilities when comparing return results.*

Keywords: *simple return, logarithmic return, riskiness order, stock, portfolio (JEL. Code:* C18)

INTRODUCTION

In the financial area of today an important question is: how one defines and measures the risk of financial assets such as stocks and portfolios. Furthermore, it is not enough only to measure risks they also need to be compared to help us to take decisions on different financial questions. Because of these comparability reasons one uses instead of the prices the returns of an asset.

In this paper we will be dealing with the simple and the logarithmic returns. It is self-evident and natural that these two returns are different from each other. For example Hudson considers this relationship by comparing means and concludes that the mean of the logarithmic returns is less than the mean of the simple return (computed on the same set of returns) (Hudson, 2010). We will discuss the possible correlations and differences between the two returns from an other point of view. For our purposes it is important to understand how the choice of the return-type effects the riskiness order of the considered set of assets. For example, do we consider a stock respectively a portfolio equally risky (compare to the others) using simple or logarithmic returns to calculate the risk. To answer this question we will do an empirical study.

The objective of this paper is to describe and to clarify the definitions and the usage of the simple and logarithmic returns. In the first part of the theoretical background we will state the definitions of the one- and multi-period simple and log return and we will describe the relationship between them. These definitions will be extended to portfolios in the second part of the theoretical background. The second part of the study is the empirical part. First, we would like to confirm in practice – via using Hungarian stock data – mathematical formulas, equations and results presented in the theoretical part. Second, we will answer to our main question, i.e. whether using simple or logarithmic return could have an effect on our decision.

RETURNS, THE THEORETICAL BACKGROUND

In this theoretical part of the paper we summarize the important definitions, expressions connected with simple and logarithmic returns and we clarify and establish relations between the two notions. Definitions of the following chapter are based on Tsay (Tsay, 2005) and Calafiore (Calafiore, 2014).

Asset Return

First, we will define the simple and logarithmic return of an asset. In addition we will show the most important equations and expressions connected with the topic.

a. Simple Return

The Oxford dictionary defines the return as a profit on an investment over a period of time, expressed as a proportion of the original investment. In the next paragraphs we express returns in a more mathematical framework.
In the case of asset returns let us consider a time horizon $[0,T]$. Furthermore P_0 be the price of an asset at time 0 and P_T the price of an asset at time T. If there is no cash flow in this $[0,T]$ time interval, we speak of the *one-period simple net return* and we introduce the notation $R^S_{[0,T]}[1]$. So the one-period simple net return of an asset can be defined by

$$R^S_{[0,T]}[1] := \frac{P_T - P_0}{P_0} = \frac{P_T}{P_0} - 1. \qquad (1)$$

The corresponding *one-period simple gross return* of an asset is given in terms of the simple return:

$$GrR^S_{[0,T]}[1] := 1 + R^S_{[0,T]}[1] = \frac{P_T}{P_0}. \qquad (2)$$

Later on if we speak of the simple return we think of the one-period simple net return.
For the multi-period case, let us divide the interval $[0,T]$ into n pair wise disjoint subintervals: let $t_0 := 0$ be the 0^{th} time point, $t_n := T$ be the last time point and let t_i be the time points in-between, such that $t_{i-1} < t_i$, $i = 1,\ldots,n$. According to our definition we can calculate on these subintervals the one-period simple gross return:

$$GrR^S_{[t_{i-1},t_i]}[1] = 1 + R^S_{[t_{i-1},t_i]}[1] = \frac{P_{t_i}}{P_{t_{i-1}}}$$ and thus the "return" on the whole $[0,T]$ interval must be the product of the gross returns of the subintervals. This return is called the *n-period simple gross return*:

$$\prod_{i=1}^{n} GrR^S_{[t_{i-1},t_i]}[1] = \prod_{i=1}^{n}\left(1 + R^S_{[t_{i-1},t_i]}[1]\right) = \frac{P_{t_1}}{P_{t_0}}\frac{P_{t_2}}{P_{t_1}},\ldots,\frac{P_{t_n}}{P_{t_{n-1}}} = \frac{P_{t_n}}{P_{t_0}} =: GrR^S_{[0,T]}[n]. \qquad (3)$$

We would like to add that since $t_0 = 0$ and $t_n = T$ the n-period simple gross return equals the one-period simple gross return:

$$GrR^S_{[0,T]}[n] = \frac{P_{t_n}}{P_{t_0}} = \frac{P_T}{P_0} = GrR^S_{[0,T]}[1]. \qquad (4)$$

Analogously to the one-period case, we define the *n-period simple net return* by using the n-period gross return and subtracting one:

$$\mathrm{R}^{\mathrm{S}}_{[0,\mathrm{T}]}[\mathrm{n}] := \frac{\mathrm{P}_{t_n}}{\mathrm{P}_{t_0}} - 1. \qquad (5)$$

With Equation (3) and (5) at hand one can rewrite the n-period simple gross returns by:

$$GrR^S_{[0,T]}[n] = \frac{P_{t_n}}{P_{t_0}} = 1 + R^S_{[0,T]}[n] = \prod_{i=1}^{n}\frac{P_{t_i}}{P_{t_{i-1}}}. \qquad (6)$$

b. Logarithmic Return/Continuously Compounded Return

To understand the logarithmic return, simply the log return, let us divide the interval $[0,T]$ into n equidistant intervals. In this paragraph we use the same notation as it was introduced for the multi-period simple return. Assume now, that on every $[t_{i-1},t_i]$ subinterval the return R is the same, moreover that it is the n th part of some one-period return on $[0,T]$, denoted by $R^*_{[0,T]}[1]$, i.e. $R := \frac{R^*_{[0,T]}[1]}{n}$. In this case, Equation (3) can be written as follows:

$$GrR^S_{[0,T]}[n] = \prod_{i=1}^{n}\left(1 + R^S_{[t_{i-1},t_i]}[1]\right) = (1+R)^n = \left(1 + \frac{R^*_{[0,T]}[1]}{n}\right)^n \qquad (7)$$

Since t_0 and t_n are the 0th and the last time points respectively, Equation (7) can be written as follows:

$$GrR^S_{[0,T]}[n] = \frac{1}{\mathrm{P}_0}\prod_{i=1}^{n-1}\frac{P_{t_i}}{P_{t_i}}\mathrm{P}_{\mathrm{T}} = \frac{\mathrm{P}_{\mathrm{T}}}{\mathrm{P}_0}, \qquad (8)$$

and therefore using Equation (7) and Equation (8) it holds that

$$\frac{P_T}{P_0} = \left(1 + \frac{R^*_{[0,T]}[1]}{n}\right)^n. \qquad (9)$$

Let us make the length of the $[t_{i-1},t_i]$ subintervals smaller and smaller. This means that the number of equidistant subintervals of $[0,T]$ must grow, $n \to \infty$. Hence we have to compute limits:

$$\lim_{n\to\infty}\frac{P_T}{P_0} = \lim_{n\to\infty}\left(1 + \frac{R^*_{[0,T]}[1]}{n}\right)^n, \qquad (10)$$

and therefore it follows by the definition of the exponential function that

$$\frac{P_T}{P_0} = e^{R^*_{[0,T]}[1]}. \qquad (11)$$

Since we are interested in returns, we apply the logarithm:

$$\ln\left(\frac{P_T}{P_0}\right) = R^*_{[0,T]}[1]. \quad (12)$$

The return in Equation (12) is called the one-period logarithmic return of an asset. So, we define the *one-period log return* as the logarithm of the one-period simple gross return and we use the notation $R^L_{[0,T]}[1]$:

$$R^L_{[0,T]}[1] := \ln\left(\frac{P_T}{P_0}\right) = \ln\left(1 + R^S_{[0,T]}[1]\right). \quad (13)$$

Similarly to the simple return's case, one defines the *n-period logarithmic return*:

$$R^L_{[0,T]}[n] := \ln\left(\frac{P_{t_1}}{P_{t_0}}\frac{P_{t_2}}{P_{t_1}},\ldots,\frac{P_{t_n}}{P_{t_{n-1}}}\right) = \sum_{i=1}^{n}\ln\left(\frac{P_{t_i}}{P_{i_{t-1}}}\right) = \sum_{i=1}^{n}. \quad (14)$$

We can see that in this case the n-period log return is the sum of the n one-period log returns. And this is one of the reasons why one uses the log return rather than the simple return: adding numbers close to zero is not a problem, but multiplying numbers close to zero can cause arithmetic overflow. In addition it is easier to derive the time series properties of sums than of products (Daníelsson, 2011). Analogously to the simple return's case since t_0 and t_n are the 0th and the last time points respectively:

$$R^L_{[0,T]}[1] = R^L_{[0,T]}[n]. \quad (15)$$

We would like to add, that more generally on every interval one can calculate the return. In this study we will use daily asset prices and thus daily returns. So, the considered time interval will always be one day. Therefore, the one-period simple and logarithmic return can be written as follows:

$$R^S_t := R^S_{[t-1,t]}[1] = \frac{P_t}{P_{t-1}} - 1 \quad (16)$$

and

$$R^L_t := R^L_{[t-1,t]}[1] := \ln\left(\frac{P_t}{P_{t-1}}\right). \quad (17)$$

Later in this study we will use Equation (16) and Equation (17) for the calculations and we will speak of the return at time point t. Note that one can easily see the relation between the simple and log return:

$$R^S_t = e^{R^L_t} - 1 \quad (18)$$

and

$$R^L_t = \ln\left(1 + R^S_t\right). \quad (19)$$

It can be deduced – using an approximation of the logarithm that $\ln(1+x) \approx x$, if x is near to zero – that if the simple return is near to zero it is in addition very comparable to the log return (proof follows just by substitution of x with the simple return):

$$R^L_{[t_{i-1},t_i]}[1] = \ln\left(\frac{P_{t_i}}{P_{t_{i-1}}}\right) \approx \frac{P_{t_i}}{P_{t_{i-1}}} - 1 = R^S_{[t_{i-1},t_i]}[1], \text{ if } R^S_{[t_{i-1},t_i]}[1] \approx 0. \quad (20)$$

Portfolio Return

In this section we will focus on how to calculate the simple and the logarithmic return of a portfolio. We use the following notation:

n : the number of assets in the portfolio
i : refers to the assets in the portfolio, $i = 1,\ldots,n$
S_t: the amount of money invested in the portfolio at time t
$S_{t,i}$: the amount of money invested in asset i at time t
$P_{t,i}$: the price of asset i at time t
$w_{t,i}$: relative weights of the asset i in portfolio at time t
k_i: number of asset i in portfolio

Let us consider a portfolio which consists of n assets. Using the notation above it is natural that the amount of money invested in asset i at time t can be expressed by

$$S_{t,i} = k_i P_{t,i} = w_{t,i} S_t, \quad (21)$$

and the amount of money invested in the portfolio at time t is given by

$$S_t = \sum_{i=1}^{n} S_{t,i} = \sum_{i=1}^{n} k_i P_{t,i}. \quad (22)$$

With equation (21) and (22) in hand we can express the relative weights at time t :

$$w_{t,i} = \frac{S_{t,i}}{S_t} = \frac{k_i P_{t,i}}{\sum_{i=1}^{n} k_i P_{t,i}}. \quad (23)$$

These relative weights change in time according to the asset prices. In this study later on, if we speak of weights we always think of these relative weights. Note, that the relative weights sum up to one:

$$\sum_{i=1}^{n} w_{t,i} = 1. \quad (24)$$

a. Simple Return of a Portfolio

In this section we will show how to calculate the simple return of a portfolio (denoted by R^S_t). Similarly to the simple return of an asset we can define the *simple return of a portfolio* at time t the gain (or loss) in value of the portfolio relative to the starting value, mathematically (Bacon, 2011):

$$R^S_t := \frac{S_t}{S_{t-1}} - 1. \quad (25)$$

Using the fact that the weights sum up to one and the equation $R_{t,i}^S = \frac{P_{t,i}}{P_{t-1,i}} - 1$, where $R_{t,i}^S$ is the simple return of asset i at time t, Equation (22) can be rewritten as

$$S_t = \sum_{i=1}^{n} k_i P_{t,i} = \sum_{i=1}^{n} k_i P_{t-1,i}\left(1+R_{t,i}^S\right) = \sum_{i=1}^{n} S_{t-1,i}\left(1+R_{t,i}^S\right) = \sum_{i=1}^{n} S_{t-1} w_{t-1,i}\left(1+R_{t,i}^S\right) \quad (26)$$

and thus we can express the simple return of a portfolio at time t by

$$R_t^S = \frac{S_t}{S_{t-1}} - 1 = \sum_{i=1}^{n} w_{t-1,i} R_{t,i}^S. \quad (27)$$

We can see that the portfolio simple return is the sum of the weighted simple returns of the constituents of the considered portfolio.

b. Logarithmic Return/Continuously Compounded Return of a Portfolio

The *logarithmic return of a portfolio* (denoted by R_t^L) at time t can be defined analogously to the logarithmic return of an asset:

$$R_t^L := \ln\left(\frac{S_t}{S_{t-1}}\right). \quad (28)$$

Moreover using the relation between logarithmic and simple return (see Equation (13) and Equation (27) the logarithmic return of a portfolio can be calculated in the following way:

$$R_t^L = \ln\left(\frac{S_t}{S_{t-1}}\right) = \ln\left(1+\sum_{i=1}^{n} w_{t-1,i} R_{t,i}^S\right) = \ln\left(\sum_{i=1}^{n} w_{t-1,i} e^{R_{t,i}^L}\right) \quad (29)$$

where $R_{t,i}^L$ is the log return of asset i at time t.
Unfortunately the log return of a portfolio does not have a similar convenient property as it was developed in Equation (27) for the case of the simple return, so it cannot be written as the sum of the weighted log returns of the constituents of the considered portfolio. Similarly to the return of an asset – by using the $\ln(1+x) \approx x$ approximation – one can show, that if the simple returns of a portfolio are close to zero then the simple returns and the log returns of a portfolio are similar to each other:

$$R_t^L = \ln\left(1+R_t^S\right) \approx R_t^S. \quad (30)$$

Using the assumptions that the simple returns are close to zero, and the definition of the exponential function one can nevertheless deduce the following linear approximation:

$$R_t^L \approx R_t^S = \sum_{i=1}^{n}\left(\sum_{j=0}^{\infty}\frac{\left(R_{t,i}^L\right)^j}{j!} - 1\right) w_{t-1,i} \approx \sum_{i=1}^{n}\left(\left(1+R_{t,i}^L\right)-1\right) w_{t-1,i} = \sum_{i=1}^{n} R_{t,i}^L w_{t-1,i}. \quad (31)$$

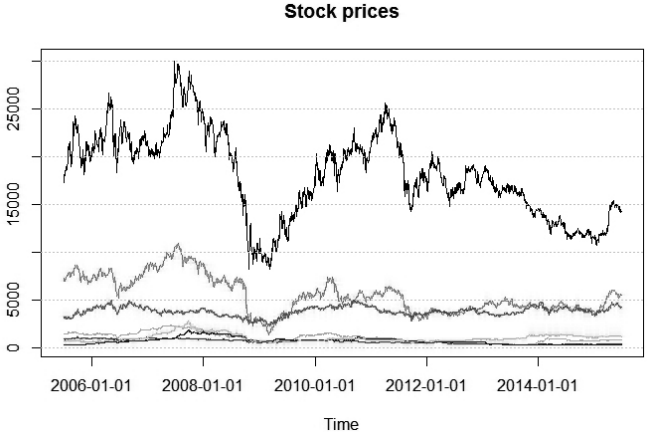
So in this case $$R_t^L \approx \sum_{i=1}^{n} R_{t,i}^L w_{t-1,i}. \quad (32)$$

EMPIRICAL STUDIES

The data

For the empirical calculation we will work with Hungarian daily stock prices between 01.07.2005 and 29.06.2015. The data was downloaded from the Budapest Stock Exchange homepage (www.bet.hu). We focus on seven stocks, namely FHB, MOL, MTELEKOM, OTP, Pannergy, Raba and Richter and analyze them in the mentioned time interval. The missing values were filled by the previous day data. To perform the analysis we use the mathematical software R.
We plot the stock prices in (Figure1), which shows that prices cannot be used for comparisons.

Figure1: Stock prices (gray: FHB, black: MOL, red: MTELEKOM, green: OTP, purple: Pannergy, light blue: Raba, magenta: Richter)



Comparing simple and logarithmic returns

We could see in the asset and in the portfolio case that if the simple returns are close to zero then the simple and log returns are close to each other. In the first part of this empirical study we will check this theoretical fact in practice. The first price data is from 01. 07. 2005 and we consider them as price data at time $t = 1$. The last ones are from 29. 06. 2015 and we consider them as price data at time 2607. Note, that the "first" returns can be calculated on the interval $[t = 1, t = 2]$ and they are denoted by $R_{2,i}^S$ and $R_{2,i}^L$ respectively, for all the seven stocks ($i = 1, \ldots, n$).

Table 1: Basic statistics of simple returns: minimum, first quartile, median, mean, third quartile, maximum

	FHB	MOL	MTELEKOM	OTP	Pannergy	Raba	Richter
Min.	-0,178975	-0,149750	-0,118151	-0,149854	-0,802770	-0,149809	-0,900179
1st qu.	-0,011340	-0,011768	-0,009009	-0,013054	-0,007828	-0,008961	-0,009508
Median	0	0	0	0	0	0	0
Mean	0,000040	0,000183	-0,000170	0,000272	-0,000118	0,000435	-0,000062
3rd qu.	0,009742	0,011833	0,008635	0,013605	0,006466	0,008554	0,009654
Max.	0,232339	0,150583	0,123894	0,232639	0,149826	0,280193	0,094983

Source: own calculation

a. Stock returns

First we calculated the daily simple and logarithmic returns of all the individual stocks using Equation (16) and Equation (17). In order to show the results more clear we introduced two outliers in the case of the Richter and Pannergy stocks (check the minimum values). The basic statistics are summarized in Table 1 and Table 2. From these summaries we can clearly see that in both cases the returns are close to zero: the medians are zero and the interquartile ranges are relatively small. Later on in this study we will use this modified data. Comparing Table 1 and Table 2 one can say that the distributions of the simple and logarithmic returns are really close to each other.

b. Portfolio returns

Let us consider a portfolio: We assume that we own a portfolio consisting of one from all the seven stocks, i.e. $k_i = 1,\ i = 1,\ldots,7$ (see notation in the theoretical part). First we calculate the simple and the log returns of the portfolio using Equation (27) and Equation (28) respectively. The values are summarized in box plots, see (Figure 2). As we mentioned in the theoretical part, the log return and the simple return should be similar if the simple returns are close to zero (see Equation (30)). In (Figure 2) we can clearly see that in the case of our data the simple and the log returns are close to zero except one outlier in both cases. This means that the simple and a log return values are very close to each other. This conclusion could be confirmed by taking a look at (Figure 3), where the simple return of the portfolio was plotted against the log return of the same portfolio. Except one outlier all the values are lying on the 45° line.

Figure 2. Box plots of portfolio simple (left) and portfolio logarithmic return (right) values

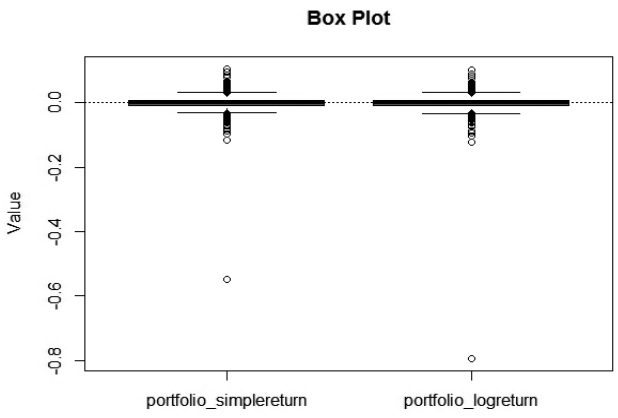
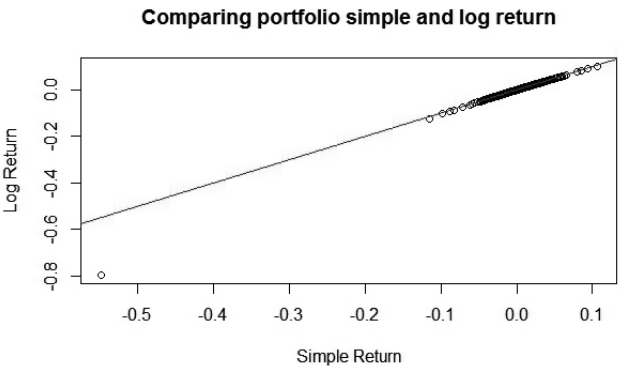


Figure 3. Comparing portfolio simple and logarithmic returns



Comparing riskiness order

From the fact, that the distributions of the stock simple and logarithmic returns are really close to each other (see section '*Comparing simple and logarithmic returns*') we may conclude that it does not depend on whether we use simple or log returns for the financial calculations. We will check this assumption using different risk measures and using the ordering method described in the introduction.

We calculate four from the most often and widely used risk measures: the standard deviation, the semivariance, the Value at Risk and the Expected Shortfall. Detailed descriptions of this risk measures one can find for example Bugár (Bugár, 2006) and Embrechts (Embrechts, 2005).

In the next step we state how to calculate these risk measures in the case of a realization of a random variable.

Let $r = (r_1,\ldots,r_n)$, where r_i is the i th return $(i = 1,\ldots,n)$ and $\overline{r}$ the average of these returns $(\overline{r} = \frac{1}{n}\sum_{i=1}^{n} r_i)$.

a. Standard Deviation

$$\sigma(r) \approx \sqrt{\frac{\sum_{i=1}^{n}(r_i - \overline{r})^2}{n-1}} \qquad (33)$$

Table 2: Basic statistics of logarithmic returns: minimum, first quartile, median, mean, third quartile, maximum

	FHB	MOL	MTELEKOM	OTP	Pannergy	Raba	Richter
Min.	-0,197201	-0,162225	-0,123734	-0,162347	-1,623385	-0,162294	-2,305382
1st qu.	-0,011404	-0,011837	-0,009050	-0,013140	-0,007859	-0,009001	-0,009553
Median	0	0	0	0	0	0	0
Mean	-0,000245	0,000075	-0,00314	-0,000089	-0,000620	0,000206	-0,000767
3rd qu.	0,009695	0,011764	0,008597	0,013513	0,006445	0,008518	0,009608
Max.	0,208914	0,140269	0116799	0,209157	0,139610	0,247011	0,090739

Source: own calculation

b. Semivariance

$$\mathrm{SV}(\mathrm{r}) \approx \frac{\sum_{i=1}^{n} \left(\min\left\{\mathrm{r_i} - \bar{\mathrm{r}}, 0\right\}\right)^2}{\mathrm{n}} \qquad (34)$$

c. Value at Risk - VaR (at α level)

$$VaR_{\alpha}(r) \approx -\hat{F}^{\leftarrow}_{\{r_1,\ldots,r_n\}}(\alpha), \qquad (35)$$

where $\hat{\mathrm{F}}_{\{\mathrm{x}_1,\ldots,\mathrm{x}_n\}}(\mathrm{x}) := \frac{1}{\mathrm{n}}\sum_{i=1}^{n} 1_{\{\mathrm{x}_i \le \mathrm{x}\}}$ is the empirical distribution

function and $1_{\{\mathrm{x}_i \le \mathrm{x}\}}$ is the indicator function of the set $\{\mathrm{x}_i \le \mathrm{x}\}$.

d. Expected Shortfall – ES (at α level)

$$ES_{\alpha}(r) \approx -\frac{\sum_{i=1}^{k} r_i^*}{k}, \qquad (36)$$

where $\mathrm{k} = \lceil \mathrm{n}\alpha \rceil = \max\{\mathrm{m} \mid \mathrm{m} < \mathrm{n}\alpha,\ \mathrm{m} \in \mathbb{N}\}$ and r_i^* is the *i* th element in the increasing order of the returns r_i: $r_1^* \le r_2^* \le \ldots \le r_n^*$.

The only risk measure which satisfies the expected properties (monotonicity, subadditivity, positive homogeneity, cash invariance/translation invariance) is the Expected Shortfall. Further discussion on this topic for example (Acerbi, 2002) and (Artzner, 1999).

a. Stocks

First we consider the stock returns and we calculate the standard deviation, the semivariance, the VaR and the ES values. They are shown in (Figure 4). The purple bars indicate the values calculated using simple returns and the blue bars indicate the values calculated using log returns. We can see that in the case of the semivariance and VaR (at both $\alpha = 0,05$ and $\alpha = 0,01$ levels) the order does not depend on the type of return. If we use the semivariance as a risk measure the riskiest stock is the Richter, followed by Pannergy, OTP, FHB, MOL, Raba and MTELEKOM. In the case of VaR, the riskiest stock is the OTP, followed by the stocks MOL, FHB, Richter, Raba, Pannergy and MTELEKOM. At $\alpha = 0,01$ level the order is the following: OTP, FHB, MOL, Raba, Pannergy, MTELEKOM, Richter.

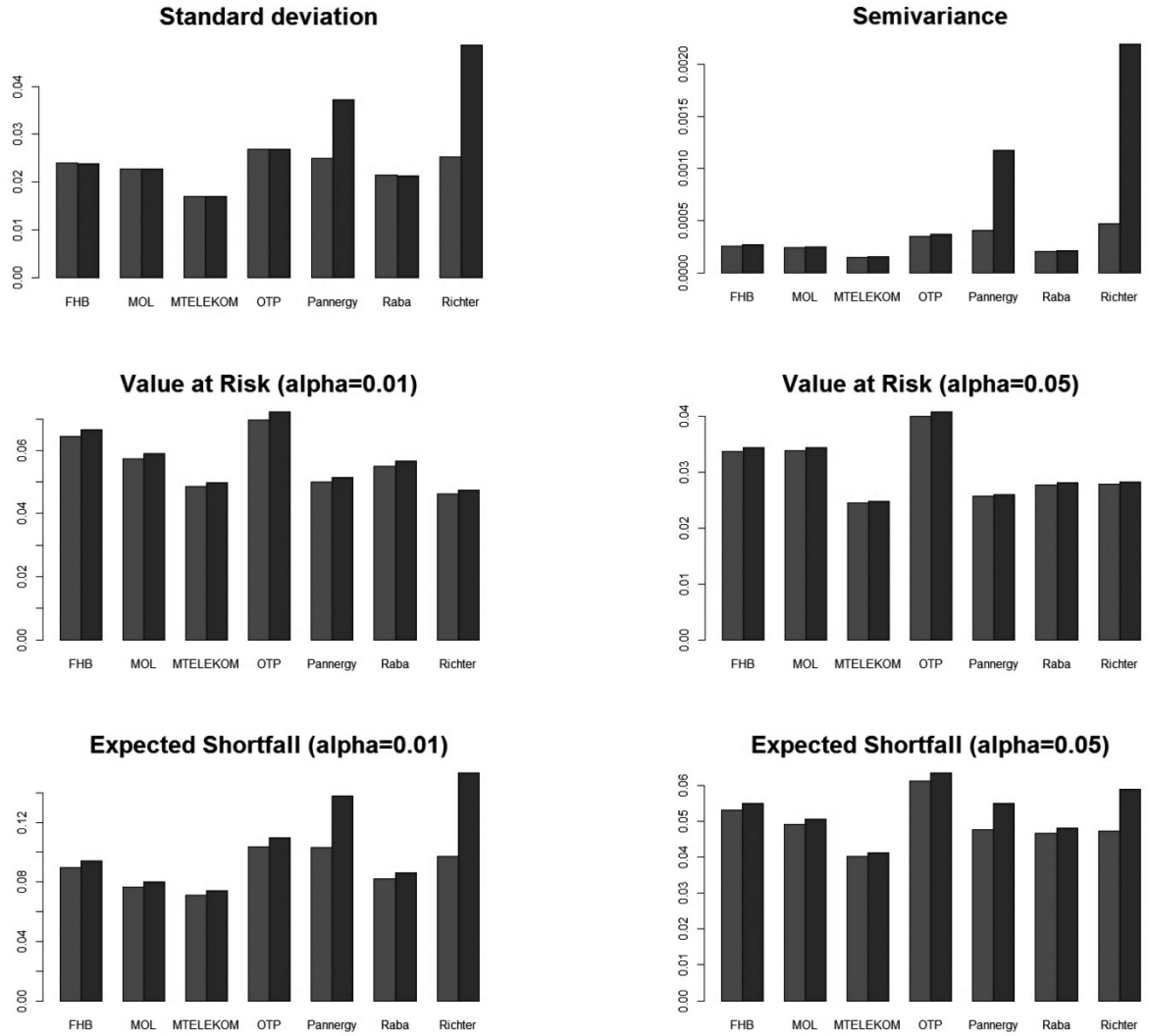
In the case of standard deviation and ES the contrary was observed: the order does depend on the type of return. Using the simple return for risk calculation the OTP stock has the highest standard deviation value. The OTP is followed by Richter, Pannergy, FHB, MOL, Raba and MTELEKOM. If we use the log return for risk calculation, then the aforementioned order changes: the riskiest is the Richter, followed by Pannergy, OTP, FHB, MOL, Raba, MTELEKOM. For example, the OTP stock what was the riskiest using simple returns, in the case of the log return is only on the 3rd place. Let us consider now the ES. At the level of 5%, using simple returns for the calculations we got the following order: OTP, FHB, MOL, Pannergy, Richter, Raba, MTELEKOM; while using log returns the order changes as follows: OTP, Richter, Pannergy, FHB, MOL, Raba, MTELEKOM. We can see, that for example the Richter stock is the second riskiest stock in the case of using log returns, but it is just on the 5th place in the case of simple returns. At the level of 1% the riskiness order also different concerning simple or log returns. In the case of simple returns the riskiest asset is the OTP, followed by Pannergy, Richter, FHB, Raba, MOL and MTELEKOM. In the case of logarithmic returns the riskiest asset is the Richter, followed by Pannergy, OTP, FHB, Raba, MOL and MTELEKOM.

This calculation shows, that despite the fact that the simple and log returns are comparable, our assumption, that the result does not depend on whether we use simple or log return seems to be not correct. We could show, that the only coherent risk measure, the Expected Shorfall, gives different riskiness orders for the same stocks depending on whether it was calculated using simple or log returns. And this can lead to different decisions.

b. Portfolios

In the case of portfolios, we consider seven portfolios, each of these portfolios consist of six distinguishing stocks (we just leave away one of the seven stocks) and we calculate the risk of all these portfolios in order to generate a “riskiness order”. To calculate the risk we consider the two most often used risk measures: the Value at Risk (see Equation (35))

Figure 4. Standard Deviation, Semivariance, VaR and ES values calculated using simple (purple bars) and logarithmic (blue bars) returns



Source: own calculation

and the Expected Shortfall (see Equation (36)) at $\alpha = 0,05$ and $\alpha = 0,01$ levels. The results are shown in Table 3. The numbers in the table show the riskiness order of the portfolio calculated by using VaR and ES in case of simple returns respective log returns at two different alpha levels. One can observe, that VaR is stable on both levels, meaning the order does not depend on the choice of return. In the case of the ES at $\alpha = 0,01$ level – similarly to the VaR – the two orders are the same. To the contrary for $\alpha = 0,05$ level: the first and the second portfolio switched positions. And our decision can be influenced by this different riskiness order.

We can clearly see from the results, that not only the type of the return, or the chosen risk measure but also the level of alpha (given the risk measure) has a decisive effect on the order, and hence on the decision. For example at $\alpha = 0,05$ level the ES measures Portfolio7 is one of the riskiest portfolio. But, in contrast, at $\alpha = 0,01$ level, Portfolio7 is the least risky portfolio from these seven portfolios.

Table 3. Riskiness order of portfolios using simple and logarithmic returns

	VaR				ES			
alpha	0,05		0,01		0,05		0,01	
return	simple	log	simple	log	simple	log	simple	log
Portfolio1	6	6	4	4	6	6	5	5
Portfolio2	2	2	2	2	2	1	1	1
Portfolio3	5	5	3	3	5	5	4	4
Portfolio4	7	7	7	7	3	3	2	2
Portfolio5	4	4	6	6	7	7	6	6
Portfolio6	3	3	5	5	4	4	3	3
Portfolio7	1	1	1	1	1	2	7	7

Using approximations

In literature one can regularly see that the relative weights are substituted by $1/n$, where n is the number of assets in the portfolio. One reason for this could be that one wants that the weights are constant in time, because the relative weights are changing in time since they are calculated from the prices (see Equation (23)). Another argument for using approximation is that in practice sometimes one does not know the asset prices (for example, a simulation result gives only returns). In the absence of the prices one cannot calculate the relative weights and in the absence of the relative weights it is not possible to calculate the portfolio return.
In this last part of our study we would like to show – using our ordering method – the effect of an approximation on the riskiness order. We will consider again the portfolios which were constructed in section '*Comparing riskiness order, Portfolios'*. To calculate the simple return of a portfolio we will use equation (27), and we will approximate the weights with $1/n$: $w_i \approx \frac{1}{n}$, $i = 1,\ldots,n$ and such that we consider an equally weighted portfolio. This approximation turns to exact equation if we consider a portfolio which consists of same number of all the assets ($k_i = k_j$, $i \neq j$, $i, j = 1,\ldots,n$) and the asset prices are the same. So, we will use the following approximation for the portfolio simple return:

$$\hat{R}_t^S = \frac{1}{n}\sum_{i=1}^{n} R_{t,i}^S. \qquad (37)$$

In the case of log returns we will consider two different approximations. For the first one we use Equation (28) and the same assumption as before: we assume that the weights are $1/n$ ($w_i = \frac{1}{n}, i = 1,\ldots,n$). Therefore:

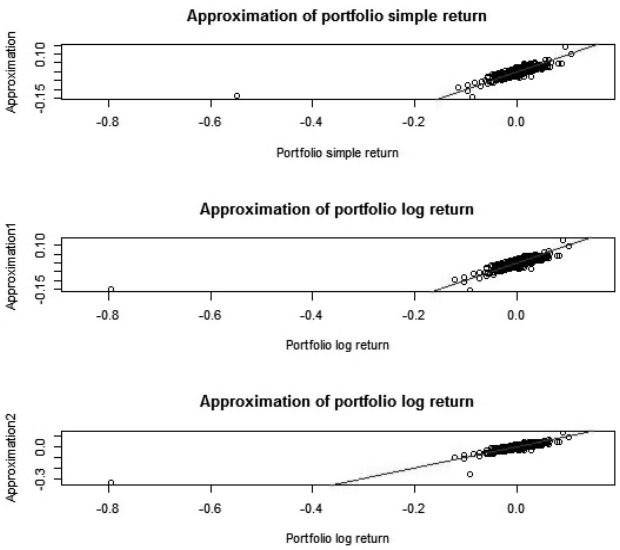
$$\hat{\mathrm{R}}_{\mathrm{t}}^{\mathrm{L}} = \ln\left(\frac{1}{n}\sum_{i=1}^{n} e^{R_{t,i}^L}\right). \qquad (38)$$

For the second approximation we will use Equation (31), which is already an approximation and as a further assumption we consider the weights equal to $1/n$ ($w_i = \frac{1}{n}, i = 1,\ldots,n$), similarly to the previous ones.
So, the second approximation for the portfolio log return can be expressed in the following way:

$$\hat{R}_t^L = \frac{1}{n}\sum_{i=1}^{n} R_{t,i}^L. \qquad (39)$$

In (Figure 5) we can see how far away the approximated values are from the exact values. The first plot shows the approximated values calculated using Equation (37), the middle one shows the approximated values evaluated using Equations (38) and the third plot shows the approximated values calculated using Equation (39). In all the three cases there is one outlier. Up to this the point clouds are still distributed along the 45° line. We may conclude from this, that using these approximations we can get similar result than using not approximated, exact return values. We would like to answer the following questions. First we will check whether the riskiness order changes if we use approximated simple or approximated logarithmic returns. Second, we will compare these orders in the case of approximated and exact simple and logarithmic returns. To calculate the risk we will use again the VaR and the ES risk measures at two different $\alpha = 0,05$ and $\alpha = 0,01$ levels.

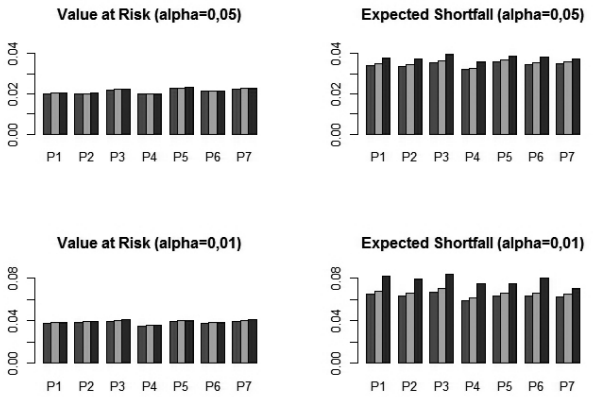
Figure 5. Approximations of portfolio simple and logarithmic returns



The results are shown in (Figure 6). P1, P2,..., P7 indicate the seven different portfolios. The purple bars stand for the risk calculated using the approximated simple return data (see Equation (37)), the orange and blue ones for the risk calculated using the approximated log return data (see Equation (38) and Equation (39) respectively). In the left column of the figure we can see the Value at Risk values and in the right column we can see the ES values. Similarly to the previous cases the VaR seems to be more stable, since the order does not depend on whether we use simple or log return. At $\alpha = 0,05$ level the riskiest portfolio is P5 followed by P7, P3, P6, P1, P2 and P4. And at $\alpha = 0,01$ level we calculated the following order: P7, P3, P5, P2, P6, P1, and P4. These orders are the same using approximated simple or one of the log return data. If we take a look at the ES values we can see that here the order of the portfolios changes depending on the type of used approximation method. At $\alpha = 0,05$ level we got the same order as in the case of the approximated simple return and the first approximation of the log return (see Equation (38)), namely: P5, P3, P7,P6, P1, P2, P4. But this is different from the order which we get if we use the second approximation of the log return (see Equation (39)), that is: P3, P5, P6, P1, P2, P7, P4. These results are also shown in the last three columns of Table 4

and Table 5, where R^L and R^S denote the simple and logarithmic returns respectively, while $\hat{R}^S$ denotes the approximated simple returns, and $\hat{R}_1^L$ (see Equation (38)) and $\hat{R}_2^L$ (see Equation (39)) the approximated log return.

Figure 6. VaR and ES values for seven portfolios using approximated data



Finally let us examine whether the type of data used has an effect on the order, i.e. whether approximated or exact data. In Table 4 we can see the results using risk measure VaR and in Table 5 we can see the results using risk measure ES. The result clearly shows a totally different riskiness order on all the cases. For example at 5% level the VaR ranked Porfolio2 on the second place using not approximated data and it is on the sixth place when measured with approximated data. It is similar in the case of ES: Portfolio2 is in the second or first place (depending on the type of the return) using not approximated data but in contrast the portfolio is on the fifth or sixth place using approximated data. Or Portfolio5 is on one hand the less riskiest portfolio if we calculate ES at alpha=0,05 level from the exact simple or logarithmic return, but on the other hand it is the riskiest portfolio if we calculate the ES at alpha=0,05 level from approximated data. Similar results have been found on the level of alpha=0,01. For example in the case of VaR Portfolio5 is on the sixth place if the value calculated from not approximated data and on the third place if the ES is calculated from approximated returns. The ES is less stable. Depending on the type of return or whether we use approximation the order can vary strongly, see for example Portfolio4 or Portfolio5.

Table 4. Order of the portfolios using the risk measure VaR on the level of alpha=5% and alpha= 1%.

	VaR									
alpha	0,05					0,01				
return	R^S	R^L	$\hat{R}^S$	$\hat{R}_1^L$	$\hat{R}_2^L$	R^S	R^L	$\hat{R}^S$	$\hat{R}_1^L$	$\hat{R}_2^L$
Portfolio1	6	6	5	5	5	4	4	6	6	6
Portfolio2	2	2	6	6	6	2	2	4	4	4
Portfolio3	5	5	3	3	3	3	3	2	2	2
Portfolio4	7	7	7	7	7	7	7	7	7	7
Portfolio5	4	4	1	1	1	6	6	3	3	3
Portfolio6	3	3	4	4	4	5	5	5	5	5
Portfolio7	1	1	2	2	2	1	1	1	1	1

Source: own calculation

Table 5. Order of the portfolios using the risk measure ES on the level of alpha=5% and alpha= 1%.

	ES									
alpha	0,05					0,01				
return	R^S	R^L	$\hat{R}^S$	$\hat{R}_1^L$	$\hat{R}_2^L$	R^S	R^L	$\hat{R}^S$	$\hat{R}_1^L$	$\hat{R}_2^L$
Portfolio1	6	6	5	5	4	5	5	2	2	2
Portfolio2	2	1	6	6	5	1	1	5	4	4
Portfolio3	5	5	2	2	1	4	4	1	1	1
Portfolio4	3	3	7	7	7	2	2	7	7	5
Portfolio5	7	7	1	1	2	6	6	4	3	6
Portfolio6	4	4	4	4	3	3	3	3	5	3
Portfolio7	1	2	3	3	6	7	7	6	6	7

Source: own calculation

SUMMARY AND CONCLUSION

In this study our goal was to clarify the notion of simple and logarithmic return and to show the differences and the connections between them. In the theoretical part we stated the definitions of the one- and the multi-period simple and logarithmic returns.

Equations - presented in the stock case – show, that the logarithmic return has an advantage against the simple return, namely that the multi-period logarithmic return can be calculated as a sum of the one-period logarithmic returns, while the multi-period simple return is the product of the one-period simple returns, which can lead to computational problems for values close to zero.

In the case of a portfolio it is important to highlight, that the portfolio weights depend on the price of stocks in the portfolio. So they change in time. In the case of an equally weighted portfolio one has to balance regularly the portfolio. It is also important to note, that the simple return of a portfolio is the sum of the weighted simple returns of the constituents of the considered portfolio. In contrast, the logarithmic

return of a portfolio can only be approximated by the sum of the weighted logarithmic returns of the constituents of the considered portfolio.

In addition we could see, that if the simple return values are close to zero, then the distribution of the simple and logarithmic returns are very near to each other. This raises the question whether the used return-type (i.e. simple or log return) has an effect on the calculations and thus on the results. In the empirical part of our study we wanted to answer this question. We were interested in whether the used return-type in the calculations results in a different riskiness order. First we compared the order in the case of the stocks. We found that while in the case of semivariance and VaR the order does not depend on the type of return, in the case of standard deviation and ES it does. After the stocks we considered portfolios. Six different portfolios were compared and ordered according to their risks. The result of our calculation shows, that the VaR does not depend on the use return-type, but in the case of the ES we got different orders in the two cases.

Furthermore, we investigated what is the effect on this order if we use approximated return values – for example we considered equal weights, which is common in practice - instead of the exact values. We have found in every case different riskiness orders, sometimes even serious differences. Therefore, we believe, if this is possible, exact values instead of approximated ones should be used for calculations.

In summary, even though the two return-type values are very similar, it is not necessary that the riskiness orders are the same. It is important that one uses the same type of return within one study and one has to be aware of the possible instabilities when comparing return results.

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SCIENTIFIC PAPER

WOMEN ON ICE – GENDER EQUALIZATION

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Abstract: *In the last decades the women started to do sports which were originally masculine (Pfister, 1990). The parity led to the slow transformation of the old-school thinking about the traditional roles of sexes (Hall, 1996). The main questions of our investigation were whether the athletes' thought of the figure skating and the ice hockey are different according to their sport or to the existing stereotypes in the Hungarian sport society. We used semi-structured interviews to gather opinions of two different gender type icy sports' top women athletes (figure skating and ice hockey) to see their viewpoints about the gender equalization. We can verify Metheny (1965) findings, that the social acceptance or refusal of women in sports on the basis of traditional features is changing slightly.*
Research questions were: Are there differences in the childhood sport socialization processes of the representatives of the two sports? What was the motivation behind their choice of sports? Are there differences in the gender identities of female athletes? What is the athletes' opinion on one another and the representatives of the other sport? Method was semi-structured in-depth interviews and the samples were the members of the Hungarian women ice hockey and figure skating national team.
According to our results family and siblings were decisive in the childhood socialization process. Early age patterns do not seem to have much influence on the selection of sport. Although among water polo/ice hockey girls there were a few tomboys. Among the ice hockey team members there were girlish girls and boyish girls as well, but among the figure skaters there were no one who was boyish. No differences can be observed in their views on gender roles concerning for example employment or housework.

Keywords: *gender, female roles, gender identity, ice hockey, figure skating (JEL. Code: Z29*)

INTRODUCTION

Gender is the variety of physical traits relating to the appearances of the two genders of human beings: masculinity and femininity. These may join with the biological sexual category (male, female or intersex), sex-based community structures (gender roles and social roles), or sexual individuality. In modern times, during the 20th century, Women fought parity in sport participation independent of the chosen sports' original tradition. After the women began to appear in masculine sports these disciplines were opened for both gender, meanwhile, thanks to sport, the gender stereotypes in society have been changed. This is a very positive phenomenon, but the old-school stereotypes exist in societies as well. Metheny (1965) defined in his theory that the social acceptance or refusal of women in sports is the basis of traditional features, but this "old" routine is changing slightly. In the last fifty years several scientists (*Postow*, 1980; *Riemer & Visio*, 2003) verified this theory. These scientists recognized that there are stereotypes behind Metheny's categories. These phenomena are the barriers of the neutralization of gender type sports. Although Metheny did not do so himself, we can categorize ice hockey as masculine based on the descriptions (body contact and occasional fighting between players) of her category.

Metheny wrote in her study about the socially lower and upper class recognized sports, so we investigated this issue in our research as well.

The primary environment of socialization is the family, and it is the first influential factor of the sport alternatives as well; the parents force their children to choose the sport which would be ideal for them. The children of the former athletes do more sport; the girls' sport socialization is more successful if their mothers were sportswomen or if they are still active in sport todays (*McPherson, James and Loy*, 1989). Furthermore the economic status and the level of the education also determines the selection of the sports or if the children do sport at all (*Velenczei and Gál*, 2011).

The world of today has been educated to think of sports in terms of genders: boys are encouraged to partake in aggressive, competitive, energetic team sports (*Schmalz and Kersetter*, 2006), while the girls seek feminine sports. Isolating sports by masculine and feminine features inspires women to accept the corporal parameters they have (*Birell*

and Theberge, 1989). The world of sports has been connected with the masculine sphere, in this atmosphere preconceptions exist against the female athletes. This tendency has been provoked and tested in the last decades; girls and women have begun to include physical strength and athletic skills into the definition of femininеness.

Figure skating is currently a feminine sport, although it was traditionally male-dominated (*Adams,* 2011). This interesting exploration caused a change in her research towards a historical investigation on how gender expropriation occurs in sports. For example, traditional stereotypes for women have gradually been shifting, and as a consequence, the sport has become an effective way to gain masculine attributes. Thing (2001) wrote about Danish female soccer, basketball and ice hockey players, where the interviewees defined aggressiveness as a key factor in victory. Ice hockey is an excellent example of a former taboo sports which is unquestionably a very tough sport. In the upper levels of ice hockey, the male and female athletes require a similar skill set; these skills are explosive strength, aggression, and full body contact. Women's ice hockey in Canada is held in similar regard to men's ice hockey, but the Canadian women did a lot for it.

These efforts resulted in a great development in the thinking; in 1998 Sport Canada announced the Gender Equity Snap Shot which focused on Canadian national teams' gender equity. But the story started in North-America with the United States Education Amendments Title IX (1972), which says that *"no person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving federal financial assistance"*. In 1974 the Department of Health Education and Welfare proposed implementing regulations, which clarified that the intercollegiate athletic activities are also donated by the governments.

Turning back to ice hockey, the fans of the women's game say that the girls play better, the speed and finesse are the same, but they play the game without violence. Now, female ice hockey players love the game for nearly the same reasons as the men. They like to take their physical strength to the edge, as well as the physical contacts during the game. Women ice hockey players feel relaxed when they enjoy the physical side of the game and are accepted more broadly on the ice than in society. This feeling gives them more freedom as well (*Gilenstam, Karp and Henriksson-Larsen*, 2007).

In the history of the summer Olympic Games, Hungary is very successfully, but the winter sports do not have enough facilities and possibilities to achieve good results. In figure skating and ice dancing we have historical traditions but women's ice hockey started only 30 years ago.

We investigated two sports which appear on the two ends of Metheny's scale in order to explore the thoughts of women in ice hockey and in figure skating about the gender stereotypes and the possibilities of gender equalization. We focused on their socializations and family backgrounds, and their motivation in selecting their given sport. During the investigation we used other indicators to observe the differences; these were the gender identities of the examined athletes and their feelings or ideas about the other sports' athletes. We also tried to see the role behavior plays in determining the sport selection in childhood, and if the gender socialization and sport socialization show a tight interaction to each other? Lastly we made an attempt to indicate the athletes' different personal standards to their mates and the opposite sports' athletes.

Gender stereotypes and sport

"*…traditional gender roles and stereotypes continue to have a strong influence on the division of roles between women and men in the home, in the workplace and in society at large, with women depicted as running the house and caring for children while men are depicted as wage-earners and protectors*" says the Report on Eliminating Gender Stereotypes in the EU (*European Parliament*, 2012).

Gender stereotypes distinct groups based on gender characteristics. Whereas gender stereotypes have been usually supposed to have undesirable meanings, they can also have positive meanings as well.

A lot of investigations run on the differences of the genders, specifically in the masculine or performance sports. The theme of gender appears also in psychological or sociological studies, and a lot of similarities are interrelated in these papers according to the personalities and social role (*Gill,* 2005; *Chalabaev et al* 2013). The ideas will get closer to each other if the newly investigated results of the gender researches are understood perfectly in the society (*Connell,* 2002). But this can be dangerous if this procedure is a degrading one, or causes unacceptable behavior from the participant; as a result, the self-valuation of the stakeholders may decrease. For example, if the mates of a strong woman are always girding at her body, she will lose her feminine outlook. In this case, there is a good solution to look at her feminine side; on one hand, to see the role of a very hard working, providing wife or mother, and on the other hand, the role of a strong, sporty female image should be reconciled.

In the elite level of sport, male competitors who seem to not be aggressive enough may be categorized "womanlike" or "queer". Denham (2009) described the man as heterosexual, characteristically aggressive under pressure and the main issue of his behavior is leadership. Also the definition of hegemonic masculinity by Connell (2009) involves the traditional gender ideals; the male is authoritative, self-governing, pokerface, severely heterosexual, unconcerned with discomfort, and there is no chance to change these core values. But beyond controversy, sport renew the leading ideas of maleness by alleviating doubts of feminization in the men's thinking (*Brod,* 1987). According to Hoberman's (2005) thoughts the women have become more and more self-governing; while the men have become ever more focused on their handsome outfits.

The norm and values of the society have shown that women who choose female sport are much more masculine than feminine. Agreeing to this stock phrase, Kimmel

(1996) described the development of the well-set women's body development as the only valued thing for the masculine world. And, if the mental stereotypes suggest to us that these kinds of women have virile behavior, we can practically think of them as men. Bem (1974) investigated this phenomenon, and wrote about the stereotypical conception of women and recognized that it is not really a conscious decision, but rather the effect of the opinion shaper ideologies.

Zimmerman and Reavill (1998) wrote that more and more girls and women are partaking in boxing, football, and wrestling. They also found, that female participation in extreme sports (inline skating, skateboarding and snowboarding) increases continually. The possible explanation of this trend is that the members of the X generation do not care about the traditional gender stereotypes.

The traditional roles of both genders have a stiff and restrictive framework which is a barrier to having a good and healthy personality, hence it would be a great deal for both gender if they choose the behavior which conforms with the situation. According to Bem's (1974) opinion the genders are not perceptible; the sexes are not independent from each other, but todays' explanations of sexual identities give us the chance to define the „social gender" better, or to categorize them into more levels.

In a modern society, the men are the trustee of the success, after a wash-out, they receive a lot of pejorative remarks, whilst by the women it is not perceptible. If the women achieve great success, this is attributable to super skills or they are only considered lucky winners. These kinds of stereotypes cause the phenomenon that if somebody does not adhere to the conventions; she/he receives a lot of negative, pejorative remarks or responses just think about a male dancer or a female shot putter. They do not try to achieve success in a masculine sport although they have enough talent to succeed in it. For these women, the only gift is to behave according to the social expectations which are not so easily attainable. If a woman breaks these social barriers, or if she is very ambitious in a sport, she just runs the risk of doing harm to her reputation or her peace of mind. Being prejudiced against a group of people is a negative or hostile attitude, based on statements with the background of not enough or inadequate information (*Aronson*, 2008). According to former mentioned investigations, anticipation and attribution plays a big role in the appearance of the stereotypes. Festinger (1957) wrote about the impulse of the stereotypes, which is a need for excuse making and frustration; inside the human being exist two inconsistent ideas about one issue. This is an intellectual disagreement which creates great unrest humans.

In the history of human activity, the investigator can split the sports into two separate worlds. These two fields are the female and male sports. One can say that there are typical male sports (combat sports), and that there are also traditionally female sports (sports with music). Following Ostrow, Jones and Spiker (1981) and Ignico (1989) ideas, there are sports for both genders, called neutral sports (tennis, table tennis). The androgynous personalities have advantage not only in the neutral sports in the adaptability of the roles; they are more interested in participating in sex atypical sports (*Bem and Lenney*, 1976). Matteo (1986) found, that the androgynous women customarily like men's sports more than the feminine women, and the androgynous men choose the womanlike sports more often than the strongly masculine guys. Contrary to this, there were absolutely no alterations between the genders from the aspect of sex roles in the appropriate or not fitting sports (Burke, 1986). In the modern, emancipated society there have also been found differences, in Salminen (1994) research the Finnish women liked the masculine sports more than the conventional female sports. While "outdated" sexual category typecasts have remained fairly persistent over the past periods, they have also been tested and provoked by many women and "women's libbers".

Sports and physical activities are the exact area in which traditional gender stereotypes have been evaluated and analyzed. Associating the traditional female gender stereotypes with the current women in sports, we can say that the female athletes are beginning to find the right roles in the sports world. The data of the national and international federations show us the phenomena that girls and women are participating in greater numbers in "traditional virile sports".

Gill's (2005) investigation dealt with high school, college, and intercollegiate athletes and non-athletes and of both sexes. He wrote that the differences between the genders are bigger among the non-athletes compared to the results of athletes regarding competitiveness and goal orientations. This study found that the sportswomen were more competitive than even the non-athlete men, and this explains why the non-athlete men are not concerned with competitive sports; but it would be more appropriate to study athletes of different gender who compete in the same or comparable sport.

As we described before, nowadays the number of women who take part in a former taboo sports for women is increasing. They participate in water polo, ice hockey, biathlon, soccer and cycling, which were strictly masculine sports until the 70's of the past century. But the women are not as performance-oriented as the boys despite having the same talent (*Kugelmann,* 2009). Kugelmann expected that this difference lies in the expression of their drives or that the women have dissimilar views, probably because of their social activity.

McClung and Blinde (2002) supposed that the participation in intercollegiate sports can influence the social feelings of the female athletes to gender concerns. The investigated athletes felt that gender discrimination exists in sports but they could not recognize it in their normal lives. The same research shows that women could play in their chosen sport as long as they were accepted by the men. Although the women could participate, the gender differences were not eliminated within the group. This phenomenon causes innovative and more refined forms of gender topics in many sports. In todays' sport the real important thing is to break the paradox that women should be better and better whilst they should maintain their femininity. Female athletes in masculine sports (boxing, body building or ice hockey) have to present themselves as women although their body shapes are pretty masculine.

There were public dialogues in the 19th (*Sandow*, 1898) and in the early 20th centuries (*Webster*, 1930) about the female uniqueness and physicality which established typecasts regarding performance and competences (*Hills,* 2006; *Kamberidou*, 2007). But in 2003 Heywood and Dworkin stated in their book, that the presence of ladylike behavior and eroticism increases women athletes' market value, which is more and more generated by the media.

And now we should ask the main questions of the gender problems in sport. If sport is so beneficial and offers advantages for men, why can't the women do it as well? Why do the men and the organizations resist offering these benefits to women as well?

Sport is traditionally hyper-masculine and the access to this world is more or less directed by men. In the last decades the women started to do sports which were originally masculine (*Pfister,* 1990; *Kirk*, 2002), and the parity on the sport field led to the slow transformation of the old-school thinking about the traditional roles (*Hall*, 1996). According to the feminist authors who were interested in sport, this was the most important step to eliminate the differences between the genders (*Guttmann,* 1991). While Epstein (2007) found that the absurd resistance concerning the women's inclusion in sport is generated by individual men and some institutions that is why the social background is very important in the children's development.

Statham (1986) recognized the difficulties of the fight against the existing sexuality patterns in the modern societies. In a community, the people expect others to behave adequately according to their gender (*Bourdieau*, 2002). It is very similar to Giddens (2008) idea, in which he stated that the biological aptitude of women is not a real obstacle, but the traditionally accepted roles of the women are. In some feminist theory (*Smith,* 1996; *Butler,* 1990) the authors described that the men think they have normal behavior, but that the women are deviant. The gender creates expectations for characters; it defines the social routine of normal life; it is an essential part of the main commune (eg. a family or a team) of the culture; and it is an entity as well (*Lorber*, 1995).

Gender and sport socialization

The gender socialization is the procedure of learning about the rules of the male/female behavior; we also study the concepts of the contemporary values and norms of both sexes. Only the conventions are the basis of these stereotypes, the human ethology and evolutional genetics have not found any gender feature which is specialized only for the women or men. The sexual identities have close contact with the differences of the genders even as the individual behavior and gender roles (*Zapico et al* 2014). According to Freud theory, there is a big influence of the penis on the maturing of youth. The girls envy the penis in the early childhood and they are inferior to their father similarly to their mothers' behavior. Mitchell and Rose (1982) wrote in their feminist theory that Freud made a very close linking between the genitals and the gender identity; in their concept the fathers have not so great an influence and disciplinarian power because the mothers are more strict regarding child rearing.

The most important revolution of the women's gender socialization was the increase in legal rights; in the 20th century the women received more and more equal legitimacy to vote or to work in the modern societies. The women could work in the same positions as men, they weren't only housewives anymore, and nowadays there are a lot of single ladies who have great carriers with international organizations. In the decision making processes, women can undertake a big role in politics, in culture and in sport too.

Connell (1995) mentioned in her theory that the children make individual experiences in the schools; there are not just masculine and feminine features, both gender qualities appear when the students compete against each other in a sport event. According to this theory, in the different societies there are different appearances of this phenomenon, but the determining factor of the effeminacy is of interest to the masculine. The society determines the gender identity, although this is a secondary effect, because the people develop their own gender identity. It seems to be fairly clear, but Collins (1990) interviewed an iron man athlete who could not exactly define masculinity although he lives an absolutely masculine life. During this interview Collins (1990) recognized that "a particular form of masculinity (to be) hegemonic means that it is culturally exalted and that its exultation stabilizes a structure of dominance and oppression in the gender order as a whole".

The sport socialization has a tight contact with the previously mentioned gender socialization, albeit the sport socialization of the girls shows weaker effects of growing up compared to the boys' sport socialization. Unfortunately, girls participate less in sport than the boys (*Vilhjalmsson and Kristjansdottir,* 2003; *Slater and Tiggemann*, 2011), so the socialization effect of sport reaches fewer girls than boys. In many societies the sport is an effective tool to form the youngsters to be feminine or masculine. The parents of a girl traditionally try to direct her to the feminine or neutral sports and with this effort they influence the attitude of their child to the chosen sport as well. But this is not the only effect on the girls; the peers, the school and the media have great impression on bequeath of the traditional gender roles (*Trolan,* 2013). On one hand the researches of the women gender identity in masculine sports show us the effects to orient the athletes towards handball, boxing or soccer; on the other hand, it shows how these sporty women do different feminine or masculine functions. Scraton, Fasting, Pfister and Bunuel (1999) observed in an international soccer investigation that all the interviewed girls were tomboys. These girls were better at collecting experiences from football than from the feminine sports. Mennesson (2000) wrote in her study about women's boxing, all the interviewed athletes remember their boyish behavior from childhood, they wore boy clothes and they played with masculine toys. The common part of the above mentioned investigations was that the influencing people were the fathers, the older brothers inside the families, or as was mentioned in same case, the

friends among the boys. These people had a very good opinion about the boyish behavior, in many times in return for the opinion of the mothers. The observations have counter meaning comparing to the result of the earlier researchers (*Snyder and Spreitzer,* 1973; *Watson,* 1975; *Hasbrook,* 1993). The boyish behavior, also the masculine identity and the obstruction to the feminine activities were the indicators of this phenomenon. There were absolutely no problems till adolescence, but after puberty the shape and outlook had been changed to more feminine.

Laqueur (2000) wrote about the social changes of the gender roles over time and accordingly about the changes of the physical outfits ideas of both gender. Reading this book we can see the development of the human body symbolism; from the most surrealistic one body scheme to the modern representation of both gender shapes. Related to the previous issue, Messner (1996) described the differences between the theoretical thoughts and the sport praxis, where the women athletes were experienced. According to Davisse and Louveau (1998) findings, female athletes should train very hard; they do this though physical contacts. Also thought to be important by the authors is that the elite female athletes should cope with the high level of aggression and tension too.

There are traditionally masculine sports where the assertion is a compulsory element (American football, ice hockey) not only an advantage. These sports assist to support the masculine identity and its social tribute (*Postow*, 1980), but the effect is weakening nowadays.

MATERIALS AND METHODS

The main purpose of our investigation was to find out what the views of the interviewed female athletes had about their own characteristics and on the other examined sports' masculine or feminine character (synchronized figure skating and ice hockey). The other purpose was to detect the differences between the views of the female athletes about the other sports' athletes, whether they are considered masculine or feminine.

Data collection and method

For data collection we conducted semi structured deep interviews. We updated and altered to the examined sports, a previously developed questionnaire prepared and used by the Author in two other studies. Earlier, two pairs of sports have been compared, one of which was considered feminine, while the other sport was considered masculine - boxing vs. rhythmic gymnastics as examples of individual sports (*Béki and Gál,* 2013) and handball vs. volleyball as examples of team sports (*Béki,* 2012). In this study we conducted a face-to-face, 60-minute long, recorded deep interviews in autumn of 2013.

The research subjects have been the complete teams (all members) of the adult National women's teams of figure skating and ice hockey (N=14 in figure skating and N=18 in ice hockey).

Demographic data: the youngest athlete of the figure skater subjects was almost 18 years old; the oldest was close upon 34 years of age, and the mean age of the total sample was 23.43 years. The youngest ice hockey player was 17 years old, the oldest was 24 years old and the mean age of total sample was 21.86 years. Most of the respondents were university or college students (94 %), the rest was employed (3%). All the investigated athletes were from bigger cities or from the capital city of Hungary. Even if some of the athletes were born in a village or in a smaller city (<10.000 inhabitants) they had moved to bigger cities at the beginning of their sports carrier.

Data analysis

We used qualitative data analysis method of the answers of the interview questions. This way we have found out how and why they had chosen their sports. We have gained a detailed description of their self-characterization, leading us to key data on feminine and masculine identification of persons and the activities people get involved in (such as types of sports). We were also interested in their opinion about their own and the other examined sports, as well as those athletes who are from these two sports.

RESULTS AND DISCUSSION

According to our results, we didn't find any differences between the feminine and masculine sport athletes' family background. We also established that the value preferences of the parents determined their children's attitude to sports. In our investigation there were parents with better and also weaker economic status in the examined sports. Comparatively, the costs of the figure skating were almost the same as we found in ice hockey.

In the last decades, the personal higher economic status allows higher prestigious sport to be participated in or to watch as a fan. We found that this statement is not true in our sample, women's ice hockey is a successful sport although the recognition is not the same compared to men's ice hockey. There are national team programs, but they are training and competing in their clubs only.

All the investigated female athletes' families had a long tradition in sport; here we could observe the meaning of the parental intention. According to our findings, the figure skaters mothers' positive attitudes to sports were very important, but they suggests their children the adequate gender type of sport. The mothers of the figure skaters were former gymnast, basketball player or ballet dancer; only one athlete's mother didn't do any sport (her father was a sportsman). All the same, almost all of the mothers (n=16) of the ice hockey players did handball previously, which is a masculine sport as well. As we could observe by the figure skaters, in each case the parents were the deciding factors in the sports selection which is absolutely understandable according to the specification of the skating; it is an early mature sport. For those athletes who do not enter to figure

skating in the optimal age range (around 3-5 years of age) would be difficult to become successful in the international venues later on. In our investigated sample we found that all players who came from another sport, they decided to choose ice hockey.

„I started figure skating, but after I saw ice hockey players and I could try this sport I loved it and I stayed there".

Observed the parental support, by the beginning of the ice hockey, the ice hockey players' parents would like to discover a new sport for their daughters in many cases. But after a few months they accepted the girls' choice.

„They were pretty afraid of ice hockey, they thought I would injure them. But after some success they accepted when they saw I found what I really want to do".

We found 5 athletes who did both sports: the first was figure skating and from there she directed herself towards ice hockey. The athletes learn all types of typical gender behavior during the sexual socialization, and the transition of the gender sport passing behavior started only entering the chosen sport. Both of the above mentioned processes have great influence on each other, the sport as a socialization tool has a bigger role in the male's upbringing than on the girls' development. The family, especially the parents, can influence the children's gender identity and their attitudes towards the sport, so the girls are directed towards the traditionally feminine or the acceptable sports.

„My parents were enthusiastic about my sport from the beginning" – a figure skater

As we wrote earlier, there are tight connections between the role playing behavior in childhood and the sport selection, so firstly we investigated the figure skaters' activities in infancy. All the same we didn't find any significant association between the infant activities and the sport selection; the children played feminine or masculine games according to the family orientation. We think that the effect of the brothers and the game options of the habitat are important influencing factors as well. In our hypothesis we supposed that the ice hockey players exhibited boyish behavior in their childhood. But during the interviews, we recognized that this is not a common phenomenon in our sample. We found womanlike and manlike behavior as well - mainly in families where a younger or older brother lives. We didn't find any „tomboys" among the investigated ice hockey players; they explained non gender stereotypical behavior they had in childish games. We found that the brother or sister influenced these activities.

We asked them about their feelings and opinions of the usual gender traditions, because in Hungary the difference between the genders appears primarily in the house work with the women spending more time with this activity. The investigated athletes were very young, most of them didn't have their own household, although according to their memories all the work types in the household were recognized by them. We asked them if the roles of their family (with their parents) are acceptable for them or if they will change the roles in their present or future family. They answered that the role models were very traditional in their family and also that they followed the seen examples; usually 80% of the house work is woman's work and only the 20% is male work.

„In my opinion the cleaning and the cooking is not only woman work, the women should work in a workplace for salary similarly to the men." – a figure skater

The ice hockey players thought that women should take responsibility to perform the household work - they only shared the work because they didn't have enough time to do them. We found the same when we asked the parental sample. It didn't have any effect on the chosen masculine sport or on their thoughts about the typical genders' role; we found the usual patriarchal thinking.

The figure skaters thought that their sport is a very feminine and special sport; the ice hockey is associated more with the men. The specialty of their sport is that only a few athletes do it. All the coaches were women as well; we found only one athlete who had a male coach. They said that the women ice hockey players are pretty aggressive, behavior which is allowed according to the rules of ice hockey. They never chose such a sport where they couldn't use their effeminacy. All the same, they thought that their sport to be a very hard sport where the trainings are very hard although it is not as popular as it can be.

On the TV channels in Hungary there were not any women ice hockey games broadcasted, so the population of Hungary could not get enough information about the games and players; contrary to this, international figure skating is widely broadcasted. We also found that the ice hockey players found their sport very positive, and they know all the specificities of ice hockey which results in negative notions about it. The players believe that ice hockey is a masculine sport, which requires a lot of technical skills and willpower to do. They don't consider their sport to be really hostile, and according to our question about the injuries, they said it is a very safe sport because of the protective equipment. They know that their sport is less acceptable as a women sport, but they like their skill (coping, fast decision making) developed by the ice hockey. These skills are very usefully in their civil life as well.

„The fans only recognized the womanlike outfit (pink gloves or helmet) on ice, the speed and the solutions of our game are the same than the boys' game." an ice hockey player

„We played with boys also, and I don't feel that the boys had another behavior towards me." an ice hockey player

To summarize, we can say that figure skaters are pretty feminine contrary to ice hockey players who were much more virile. The figure skaters criticized the ice hockey players' choice; they don't like the aggressive ice hockey and they prefer the female sports.

"The ice hockey players are harder and merely aggressive; their sport socialized them to be harder and aggressive and they can gratify their masculine passions." a figure skater

Almost all the figure skaters were repulsed by the female ice hockey players, only one skater showed sympathy with masculine sport, especially in woman's boxing.

„I don't think that they are not feminine women, they just found something interesting in those sports." a figure skater

The ice hockey players didn't agree that there are more „tomboys in their sport" than other sports, and they stated that the common behavior of the women ice hockey players is similar to other feminine sport' athletes.

They try to be feminine and sporty in their civil life, like a typical Hungarian lady. They feel that figure skating is an esthetic sport, but this is not enough for them. Concerning the figure skaters, they said that the skaters are a little bit vainglorious. As they said, the figure skaters are pretty and good looking, but their inside values are not on a high level.

„We do the trainings in the same sport facility, and if we are entering they don't receive our welcome." an ice hockey player

The investigated figure skaters had a very high opinion of the male figure skaters. Contrarily, the findings of Adams (2011) described that in some case there is big problem with boys in figure skating, it is not such a cool a sport for men. One interviewee said that the media influences this phenomenon. Male skaters of today don't have the pressure on their shoulders that their forerunners who overreacted for their choices did. According to her book, this slight change in collective perception of virility in figure skating has been aided by an increasing discernibility of gay people in the western societies. The parents who are traditional thinkers assume that the figure skating is not masculine enough, but these voices are starting to change as well.

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Currently, there are more and more women in every sport and this phenomenon creates a question about the stereotyping of the sports and the athletes of these sports. In our investigation we focused on two sports which have strong gender stereotyping in the society. In one of the most masculine winter sport, women have been participating for decades, and the former masculine, nowadays feminine, figure skating changed the gender standardization. So what about the gender stereotyping of these athletes? Is it a real question anyway?

The main questions of our investigation were whether the athletes' thought of the so called "feminine" figure skaters or the "masculine" ice hockey players as different from each other according to their sport or to the existing stereotypes in Hungary. We should take care when it comes to sport socialization, and also the circumstances of the sport selection and the societies' opinion of the gender roles. In this research we found the same activities by both sports' athletes in their childhood that is why our hypothesis was not acceptable. We also recognized that the sisters or brothers had great influence on the activities in early ages. But if we are focusing on the process of the sport selection, we can see big differences. In figure skating, in most cases, the mothers had a great influence on the choice of sport and this sport was their first sport, in ice hockey; however, it depended on their own decisions sometimes against their parent's will, and ice hockey wasn't the first sport in their sport carrier.

According to our previous thoughts we should recognized that there was no significant difference between the two sports' athletes in the gender role of the normal life. The athletes accepted the traditional, patriarchic family roles, where the tasks of the household belong to the women.

We found that sex-typified women described significantly less commitment to masculine sports in comparison with androgynous and cross-sex-typified women, which consequence verifies Matteo's (1986) results. Our main finding was that the feminine sports' athletes have been stereotyped though on the masculine sports' participants.

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SCIENTIFIC PAPER

NEW VENTURE CREATION – THE INFLUENCE OF ENTREPRENEURSHIP EDUCATION ON STUDENTS' BEHAVIOR (A LITERATURE – REVIEW BASED STUDY)

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Abstract: *Entrepreneurship brings economic growth and development through the process of venture creation. These new business enterprises have a very important and positive impact on employment generation, poverty alleviation, and socio-economic development. Entrepreneurship education influences the attitude and behavior of students to form intentions of self-employability. We have analyzed the literature to clearly understand the relationship between entrepreneurship education and intentionality and the underlying mechanisms through which entrepreneurship education impacts intentions to start new ventures. By utilizing the Theory of Planned Behavior (TPB) and Social Cognitive Theory (SCT), we propose that entrepreneurship education increases students' perceived entrepreneurial self-efficacy and perceived desirability for starting new ventures. Entrepreneurial self-efficacy and desirability in turn impact and increase students' entrepreneurial intentions for creating new ventures. Entrepreneurship Education Programs (EEPs) focusing "Education for entrepreneurship" have more influence on intentionality through self-efficacy and desirability. Comparatively, EEPs concentrating on "Education about entrepreneurship" will have less impacts on the intentionality. The study has important theoretical and practical implications for researchers, academicians, policy makers and potential entrepreneurs – the students.*

Keywords: *entrepreneurship education, behavior modification, self-efficacy, self-employability, desirability for starting new venture, Entrepreneurial Intentions (JEL. Code: A2, L6*)

INTRODUCTION

Entrepreneurship is one of the most important factors of production. Entrepreneurship is bringing economic growth and development worldwide. It fosters the creation of new-ventures thus generating economic activity, increasing employment and decreasing poverty. Behavioral modification is essential to venture creation. Ajzen's (1991) Theory of planned behavior suggests that entrepreneurship education can be used as a means of behavior modification for creating new ventures. Entrepreneurship education is an essential element of education for business schools (Kolvereid and Moen, 1997). It provides a motivation for students in building career options to think about starting their own business ventures. Students' entrepreneurial intentions may be impacted by the training, guidance and education (Henry et al., 2005). Having recognized the significance of new entrepreneurial ventures to the national economy and international community at large, the career choice and entrepreneurial intentions of students, specifically, impacted by the entrepreneurship education is a problem area and a research avenue that needs more attention. In order to explore more about this issue, it is essential to assess students' entrepreneurial intents and the subsequent impacts entrepreneurship education has on these intentions. The choice a student makes thus to establish a new business venture is at the essential part of entrepreneurship. There are times which are novel and unique in the student's life cycle of his/her career wherein the chance to start a new venture is most likely; taking into consideration one of the opening 'strategic windows' to be the 'college experience' (Harvey and Evans, 1995). However, university level students are normally considering career choices after their graduation or during the course of study. A review of a decade long of the entrepreneurship literature validates that attributes of

entrepreneurship can be predisposed through the influence of entrepreneurship education however, researchers affirmed the view that more focused research is needed in this area in the future (Gorman et al., 1997). It is widely accepted that fundamental intentions and attitudes toward behavior are determined by perception and the perception as well as attitude can be predisposed (Ajzen, 1991). Entrepreneurship education program comes out to be a good strategy that is to augment student's intentions, perceptions and the attitudes towards starting their own ventures.

The problem of whether students' involvement in entrepreneurship education influences their entrepreneurial intents is a central one. There are inferences for the policy makers, strategists, educators, scholars, researchers and the entrepreneurs themselves if entrepreneurship education is found to be determinant of early entrepreneurial intents. The intention to start a new venture may be shaped with the help of a 'triggering event' (Shapero and Sokol, 1982) the event brings change in a student's situation or future aspirations. It is likely that involvement in the entrepreneurship education program be considered a 'triggering event', principally provided that the other situational circumstances favorably prevail to support the new venture formation. In consequence, an individual's entrepreneurial intentions may surface. The supposed benefits of entrepreneurship education programs have been praised by the researchers. However, the results and effectiveness of these entrepreneurship education programs (EEP) remain untested at large (Pittaway and Cope 2007; Von Graevenitz et al., 2010).

Here is an important question: how to measure and assess the effectiveness of entrepreneurship education? One of the methods to assess and measure the effectiveness of an EEP is to measure the graduates' intentions to starting a new business – the entrepreneurial intentions or the intentions for self-employability. Intentionality is fundamental and essential element of the entrepreneurship process (Bird, 1988; Krueger, 1993). Prior research reveals that entrepreneurial behavior can best be explained and predicted by entrepreneurial intent. However, the impacts and influence of entrepreneurship educational programs on the students' entrepreneurial intent to start a new business are not clearly understood at present and it has been untested comparatively (Peterman and Kennedy, 2003; Athayde, 2009; Von Graevenitz et al., 2010). Results of the entrepreneurship education are hence not very clear, they are not consistent and are hence inconclusive. Therefore, more comprehensive research is required for better knowledge of the impact of entrepreneurship education programs and its outcomes. Many researchers have therefore called for the more systematic evaluation of entrepreneurship education programs (e.g. Fayolle et al., 2006; Von Graevenitz et al., 2010; Martin et al., 2013). This study analyzes the previous literature in this important area of research to better understand the relationship between entrepreneurship education, intentionality and the underlying mechanisms. This is an effort to propose well thought out propositions which can be tested in the future with empirical evidence.

LITERATURE REVIEW

The economic benefits of entrepreneurship include new enterprises, more jobs, new products invented and services offered. These advantages lead to economic growth which subsequently result in economic development. Schumpeter (1961) views the entrepreneur as a coordinator of manufacture and an agent of change. For him entrepreneur is an innovator. Researchers and scholars who have a similar opinion about entrepreneurship; don't consider entrepreneurship to be very significant in earlier phases of economic development – for them, entrepreneurship has much important role to play at later stages of economic development, as at the later stages, the economic growth is determined by information and the competition.. At former stages of the development and economic growth, entrepreneurship can have a less prominent role because at these stages growth is mainly driven by factor accumulation (Ács et al, 2013; Naudé, 2013).

Entrepreneurship encourages economic growth for three reasons (Burns, 2011): 1. It stimulates competition by increasing the number of enterprises. Whilst this increases growth in itself, it is a cumulative phenomenon because competition is more conducive to knowledge externalities-new ideas – than is local monopoly. And so, entrepreneurship encourages entrepreneurship. 2. It facilitates the "knowledge spillovers"– transmission of knowledge from its points of origin to other individuals or organizations. Knowledge spillover is an important mechanism underlying endogenous growth and start-ups. In other words, entrepreneurs spot opportunities and innovate. 3. It generates diversity and variety among enterprises in any location. Each enterprise is in some way different or unique and this influences economic growth. Entrepreneurship is largely recognized by government officials throughout the world not only as "a key mechanism for enhancing economic development, particularly in regions where entrepreneurial activity was once vibrant and is now lagging", but also as "a good solution because it provides a relatively non-controversial way to increase the proverbial pie, creating jobs and enhancing per capita income growth" (Shane, 2005)

For Kirzner (1973) the entrepreneur is an individual who enables change by recognizing opportunities for the profitable arbitrage (and 'disequilibrium' situations in the market). This notion of entrepreneurship has resounded amongst researchers who stress the opportunity-exploiting-for-profit nature of the entrepreneurship (Shane and Ventakaram 2000) predominantly in developing countries wherein the market disequilibrium may be common. Kanbur (1979) defined the entrepreneur as someone who 'accomplishes the manufacture function' by giving the workers' salary (certain) and assuming the risk and doubts of the manufacture.

Prior research reveals that entrepreneurship is a behavior which is planned and deliberate. It may increase the economic efficiency, helps bringing innovation and creativity to the markets, generate new jobs and increase levels of employment (Shane and Venkataraman, 2000). In the social psychology literature, the planned individual

behaviors can best be predicted by the intentions (Krueger et al., 2000). Entrepreneurship is one of such intentional and planned behaviors (Bird, 1988; Krueger and Brazeal, 1994). The intentions of an individual for starting a new business are called Entrepreneurial intention (EI). Alternatively, it is a self-recognized belief by an individual that they establish a new trade or business endeavor and deliberately plan for that in the future at some time (Thompson, 2009). Entrepreneurship intention has a very important part in the choice to create and establish any new venture (Liñán and Chen, 2009). Employment status choice models with focus on EI received great interest in the recent entrepreneurship research (e.g., Engle et al., 2010; Iakovleva et al., 2011; Karimi et al., 2014).

The theory of planned behavior, based on the theory of reasoned action (TRA) was suggested by Fishbein and Ajzen in 1975/80 (Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1980). This theory is based on three key elements, 1) the behavioral intent that relies on 2) subjective norms and 3) attitudes. The stronger are the positive attitudes toward a behavior and the stronger are the social norms toward a behavior, the stronger are the behavioral intentions. Hence if the intent is high, the person is expected to perform the specified observed behavior. Behavioral intention (BI) measures the potency of the intention to perform a specified behavior. Subjective norms (SN) describe the stress from peers or friends to conform to specific norms. Attitudes (A) consist of expectations about the consequences of performing a specified behavior. Ajzen (2005) added a third determinant of the behavioral intentions – perceived behavioral control. Perceived behavioral control have common characteristics with the Bandura`s conception of self-efficacy (Bandura, 1986) and it is a determinant of one's perceived capability to execute a particular behavior (Krueger et al., 2000). Intention models also relate to the Social Cognitive Theory (SCT). The Social Cognitive Theory was suggested by Bandura (1986). The fundamental principle of "Social Cognitive Theory is that individuals can influence their own actions" (Ratten and Ratten, 2007). The social cognitive theory suggests the frame for assessing, forecasting and altering the human behavior. The theory of planned behavior can also serve as an appropriate conceptual and methodological framework for assessing the educational interventions (Fishbein and Ajzen, 2010). Many researchers (such as Fayolle et al., 2006; Weber and Frunke, 2012; Fayolle and Gailly, 2015) recommend that the theory of the planned behavior is suitable for assessing the effectiveness of EEPs. The fundamental purpose of such an intervention is to bring a change in the entrepreneurial intentions and attitudes of the students. Theory of planned behavior is suitable for assessing this change in a systematic way. Some researchers (e.g. Fayolle et al., 2006; Souitaris et al., 2007) have used the theory of planned behavior to measure the impact of entrepreneurship education programs on entrepreneurial intent of students. Theory of planned behavior was initially applied by Krueger and Carsrud (1993) in the context of entrepreneurship in particular. They highlighted that antecedents of entrepreneurial intent as identified by the theory of planned behavior can be determined and explained by entrepreneurship education program.

Prior research reveals that entrepreneurship education has considerably strong impact and influence on the entrepreneurship intents of the students, however, it has a positive but not much significant effect on the perceived behavioral control. Empirical research supports that the entrepreneurship education has a significantly positive effect on entrepreneurial intents of the students and perceived feasibility (Peterman and Kennedy, 2003; Athayde, 2009) and entrepreneurial intent and their subjective norms, however the significant association between the entrepreneurship education and attitudes and perceived behavioral control does not exist (Souitaris et al., 2007). Entrepreneurship education is positively related to the attitude and not with subjective norms or perceived behavioral control (Walter and Dohse, 2012). Results of the entrepreneurship education are hence not very clear, they are not consistent and are inconclusive, and therefore more comprehensive research is required for better understanding of the impact of the entrepreneurship education and its results, outcomes or effects.

Most of the studies conducted on entrepreneurship education mainly focus on measuring the effectiveness of entrepreneurship education programs at tertiary levels only. Entrepreneurship must be made accessible for all students from basic education through secondary education up to the university level. Such strategy option would help eliminate poverty prevalence, solve unemployment problem, illiteracy, maternal mortality, infant mortality and reduce gender inequality (Akhuemonkhan et al 2013). It is vitally important to educate and train the students for entrepreneurship from the primary level of school. Entrepreneurship education programs can provide students with the required entrepreneurial skills. These skills enable the students to create enterprises in different areas. Here, the entrepreneurship education in fact, shifts the focus of students from employment seeking to self-employment (Ewubare, 2010).

According to Agoha (2011), the curriculum of entrepreneurship program be designed in such a way that students be able to direct their creative skills and abilities to their desired area of interest. According to research, entrepreneurship or some features and characteristics of entrepreneurship can be educated and education needs to be contemplated as one of the very important methods for developing and fostering the entrepreneurial attitudes, intents and abilities competence (Falkang and Alberti, 2000; Mitra and Matlay, 2004; Kuratko, 2005; Henry et al., 2005; Harris and Gibson, 2008; Martin et al, 2013). Because of this belief, there is lot of increase in the entrepreneurship education programs at the tertiary level in colleges and universities over the globe (Katz, 2003; Finkle and Deeds, 2001; Matlay, 2005; Kuratko, 2005). However, the impact of these entrepreneurship programs is still unexplored (Peterman and Kennedy, 2003; Bechard and Gregoire, 2005; Pittaway and Cope, 2007; Von Graevenitz et al, 2010). Furthermore, the results of prior studies are not consistent. Several of these studies reported a positive impact from entrepreneurship education programs (e.g., Peterman and Kennedy, 2003; Fayolle et al., 2006; Souitaris, et al, 2007; Athayde, 2009),

some other studies have surprisingly found that the effects are statistically insignificant or negative even (Mentoor and Friedrich, 2007; Von Graevenitz et al., 2010; Oosterbeek et al., 2010). A recent meta-analytic review conducted by Bae T.J et al. in 2014 analyzed 73 research studies on the impact of entrepreneurship education on intentions. The results were inconclusive. Many researchers have therefore called for the more systematic evaluation of entrepreneurship education programs (e.g., Fayolle et al., 2006; Von Graevenitz et al., 2010). According to Lindh (2017), the students' perceptions and attitudes are formed and shaped by the context and previous experience.

The entrepreneurship education is related with entrepreneurial self-efficacy, which may enhance entrepreneurial intentions (Zhao et al., 2005; Wilson et al., 2007). Entrepreneurial self-efficacy is a belief or confidence in one's own ability to effectively execute the variety of characters and tasks of entrepreneurship (Chen et al., 1998; De Noble et al., 1999; McGee et al., 2009). It is famously known as one of the trigger of entrepreneurial intents (Scott and Twomey, 1988; Krueger et al., 2000; Wang et al., 2002; Segal et al., 2007; Chen et al. 1998; Fitzsimmons and Douglas, 2011; De Noble e al., 1999; Douglas, 2013). When students perceive that they have sufficient knowledge and set of abilities and skills to run the business, they become confident about themselves that they can initiate and manage the business. The knowledge, skills and abilities to enhance the students' self-confidence or entrepreneurial self-efficacy is provided through an effective EEP. Hence we propose that:

Proposition 1: Entrepreneurship education will positively influence students' perceived entrepreneurial self-efficacy

Perceived desirability of starting a venture is an emotional judgment and the entrepreneurs employ such conclusion to make choices on whether or not to take action (Mitchell et al., 2002). The students' recognition of starting a new business venture as a wanted choice of their career will be possibly associated to an intent to involve in starting their own business ventures in the future at the time of possibility(Segal et al., 2005). The perceived desirability of starting a new venture is the variation between perceptions of personal desirability in starting new venture and organizationally employed. Therefore, higher levels of the perceived desirability of starting new venture actually points out that the individual is more in support of starting new venture than being employed somewhere else (Kolvereid, 1996).

It is likely that students possessing desirability for starting new venture will consider establishing their own new business ventures as a feasible career choice after the graduation. The aspiration of pursuing entrepreneurial accomplishment is dependent on motivation (McMullen and Shepherd, 2006) and it is realistic to presume that involvement in entrepreneurship education would be motivating factor for the students to consider starting a new venture as a career choice. Hence entrepreneurship education shall increase the entrepreneurial intent through students' perceived desirability for starting a new venture. It is therefore proposed:

Proposition 2: Entrepreneurship education will influence students' perceived desirability for starting new venture

Since entrepreneurial self-efficacy and perceived desirability, both are influenced by the entrepreneurship education. Consequently, the entrepreneurship education will also build in them the self-confidence or increase their level of entrepreneurial self-efficacy. The EEP does also improve the students' perceptions regarding desire to initiate their new enterprise. As discussed earlier that both desirability for starting new venture and entrepreneurial self-efficacy influence the entrepreneurial intentions. Therefore, we propose:

Proposition 3: Students' perceived desirability for starting new venture will influence their entrepreneurial intentions in such a way that it mediates the relation between entrepreneurship education and entrepreneurial intentions, and:

Proposition 4: Students' perceived entrepreneurial self-efficacy will positively influence their entrepreneurial intentions in such a way that it mediates the relation between entrepreneurship education and entrepreneurial intentions.

The entrepreneurship education provides skills, knowledge abilities needed to initiate and run the venture. Here, it is important to note that the type of entrepreneurship education matters a lot. "Education for entrepreneurship" is different from the "education about entrepreneurship." When the objective is to provide awareness and overview of entrepreneurship and how it operates or different models and theories of entrepreneurship, it is "education about entrepreneurship." It is not designed to prepare and train the students with necessary knowledge and skills to become the actual entrepreneur, rather it is focused to provide awareness about entrepreneurship as process, phenomenon or field of study. "Education for entrepreneurship" means that the Entrepreneurship Education Program is intended to equip the students with required knowledge and skills essential to creating and managing the venture. It does not only build the students' capacities for new venture creation but also builds confidence in them and motivates and encourages them to initiate the enterprise. An EEP designed 'for entrepreneurship' will enhance students' confidence or perceived self-efficacy for entrepreneurship. It will also create and nurture desire in the mind of students to start their own businesses. Or in other words, the EEP will enhance the students' perceived desirability and self-efficacy to set-up the new business venture. Therefore, we propose here that:

Proposition 5: The Entrepreneurship Education Program (EEP) designed "For Entrepreneurship" has more stronger and positive impact on the students' Entrepreneurial Intent than an EEP focused on"About Entrepreneurship"

We have conjectured this proposition because there is a dire need to discriminate among different EEPs. This is indicated by few researchers including (Agoha, 2011). As discussed earlier that the impacts of entrepreneurship education on intentionality are yet not clear among researchers, despite a large body of empirical investigations; segregation of the types of EEPs might be helpful in making conclusions. Here, we have only suggested two broad categories of EEPs: "for education" and "about entrepreneurship", more classifications and assessment of the impacts is needed however.

DISCUSSION AND CONCLUSION

Enterprise development is essential to generating business activities, reducing unemployment and for the economic development. Entrepreneurship Education motivates and stimulates the graduates to become entrepreneurs. It enhances their desirability and self-efficacy for starting the new venture. Desirability and entrepreneurial self-efficacy improved by the entrepreneurship education in turn impact the entrepreneurial intentions of the students in such a way that they intend more to become entrepreneurs. Entrepreneurship education 'for entrepreneurship' is very important. It can be managed effectively to reduce unemployment and for the economic development. An important realization here is that entrepreneurship education at all levels of schooling is essential. Unfortunately, in most of the countries, particularly, in the developing countries; entrepreneurship education is only realized at the secondary and tertiary levels of schooling. Whilst, the given importance of entrepreneurship education, it may be organized at the primary schooling levels as well.

Future research is required for further validation of the above mentioned propositions through empirical investigations. These can be tested using a pretest-posttest research designs. These propositions need to be tested at all levels of schooling i.e. primary, secondary and tertiary. Different classifications be made for the Entrepreneurship education programs and effect of these programs be tested as indicated in the proposition 5. Future research may also cover samples from different countries including developed and the developing world. Comparisons of different types of EEPs, their effectiveness and subsequent impacts on intentionality and actual entrepreneurship are important to be investigated covering samples from different cultures.

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SCIENTIFIC PAPER

INTERNATIONAL OUTLOOK: THE NOTES AND BUSINESS REPORT IN THE FRAME OF FINANCIAL REPORTING

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Abstract: *Are the accounting reports to be prepared on a yearly basis suitable for indicating problems, possibly for informing the stakeholders about the declining phase of an enterprise? The information needs of the various market operators are different thus the question is whether the management of an enterprise or possibly the owners place an emphasis on the adequate information. We examine the issue of social responsibility from a special approach in which, in addition to the corporate lifecycle models, there is a focus on the information content of the Hungarian and international accounting reports, moreover the content of the further report that is to be prepared but does not form a part of the accounting report. The aim of our research is to compare the notes and the further reports which meet the Hungarian, Rumanian, Slovakian and international standards and corroborate the quantitative data of the accounting report. By paralleling the notes and the further reports, we draw attention to the fact that one of the most important accounting principles i.e. the going concern concept, which the other principles are based on, will be (or will likely be) affected insofar as content of the enterprises' reports does not comply with the legislation. In addition to the addressees of accounting, the authors point at the issue of social responsibility based on those similarities which can be observed in the relations of the value-oriented corporate governance.*

Keywords: *accounting report, business report, IFRS, notes, international comparison (JEL. Code: M41*)

INTRODUCTION

Accounting is continuously developing in parallel to the economic development. In a well-functioning market economy, the market operators have reason to expect that objective information shall be available about the property, financial and income situation of enterprises. In order to ensure these things, it is necessary that those same economic events should be interpreted uniformly which are finally presented in the reports of enterprises. The global economic, social and environmental changes increasingly urge the corporations to take a responsible attitude to their direct and indirect environments, not only for others but for the future of corporation. It is extremely important that a corporation can recognise in time if it is not capable of increasing the value viz. this kind of situation calls for prompt intervention. In order to maintain the operability, the ability to renew and its time interval are key issues. Are the Hungarian, Romanian, Slovakian and international accounting reports to be compulsory prepared on a yearly basis suitable for indicating problems, possibly for informing the stakeholders about the declining phase of an enterprise? Through the information content of the notes forming a part of the annual report and by means of ensuring publicity, we can obtain information about the property, financial and income situation of a corporation.

However, the information needs of the various market operators are different thus the question is whether the management of an enterprise or possibly the owners place an emphasis on the adequate information. The authors point at the issue of social responsibility based on the addressees of accounting (leaders of economic organizations, employers, market operators and authorities) and those similarities which can be observed in the relations of the value-oriented corporate governance. The economic crisis has put the

lifecycle investigation of enterprises in the limelight but now the examinations already focus on recognizing the declining phase as well; the accounting reports have come to the fore by this kind of examination. We can unequivocally answer yes to the question whether the accounting reports to be compulsory prepared on a yearly basis are suitable for indicating problems. And we have to answer no to the question whether the reports to be prepared once a year are merely sufficient. The reason for this is that we do not live in a static environment. The more dynamic an economic environment is, the bigger role the matter of time plays. Due to developments in accounting and not least in technology, we can prepare up-to-date analyses from the accounting statements. For this to happen, within the company, there is a need for an essential teamwork in which the controller should play a stressed role. Typical tasks of a controller are, through the cost planning and pricing, to establish the corporate value, to assess the possible risk factors, to monitor the planned and actual data regularly, to recognise the cause-and-effect relationships and to inform the management.

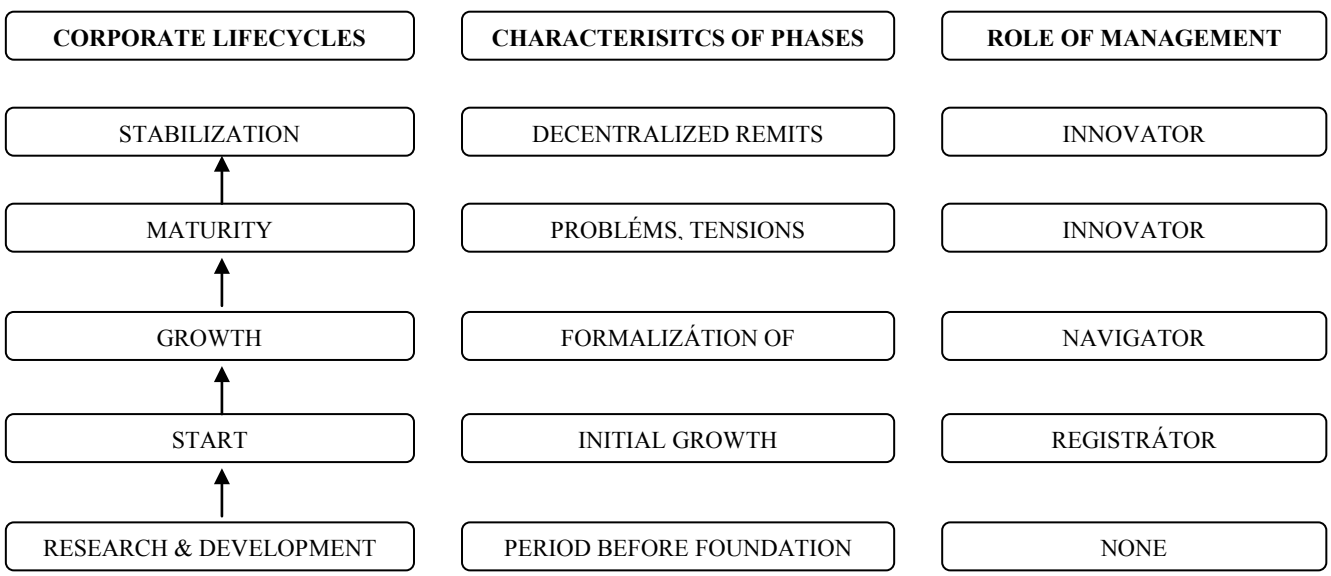
RELATIONSHIP BETWEEN CORPORATE LIFECYCLE MODELS AND MANAGEMENT ACCOUNTING

Corporate lifecycle models

The economic crisis has strongly put the enterprises into the spotlight. The enterprises have (had) to revise their strategies during which the management is (was) given a decisive role. Although, before the crisis, more and more researchers dealt with the problems of enterprises(PAKURÁR et al, 2012), particularly with the financing difficulties of small- and medium-sized undertakings, but the market challenges of nowadays increasingly prompt the companies to review their future options (SZABO et al., 2013.; VERESNÉ, 2013).. More and more firm managers were forced to think about which lifecycle his/her enterprise could be found in and what opportunity he/she had to bring his/her company forward to a more developed lifecycle by proper planning, regulation, organisational development and motivation (NAGY-TOBAK, 2016). Numerous researchers have dealt with the lifecycle model of enterprises for half a century –(ADIZES 1992, GRENIER 1998, TIMMONS 1990, HISRICH – PETERS 1991, GÖBLÖS – GÖMÖRI 2004, KUCZI 2002, KŐHEGYI 2001, SALAMONNÉ 2006) etc. – who have presented the specificities and typical characteristics of different career phases of the enterprises. In the opinion of (MISKOLCZI 2012), based on the situation assessment carried out by means of lifecycle, the management can evaluate the problems according to the corporate life phase as well as can consciously determine and prioritise the tasks when shaping an enterprise's further path of life. Albeit certain models are separately used in large scale, our experience shows that, during the practical investigations, it is worth evaluating as many models as possible for the company examined, in order to have the most comprehensive picture by various models. This picture serves as the basis of elaborating the alternatives for the further development of a given corporation (HORVATH - PAPP 2015). This treatise will set forth what role the controller plays in accomplishing the aforementioned tasks and reaching the targets.

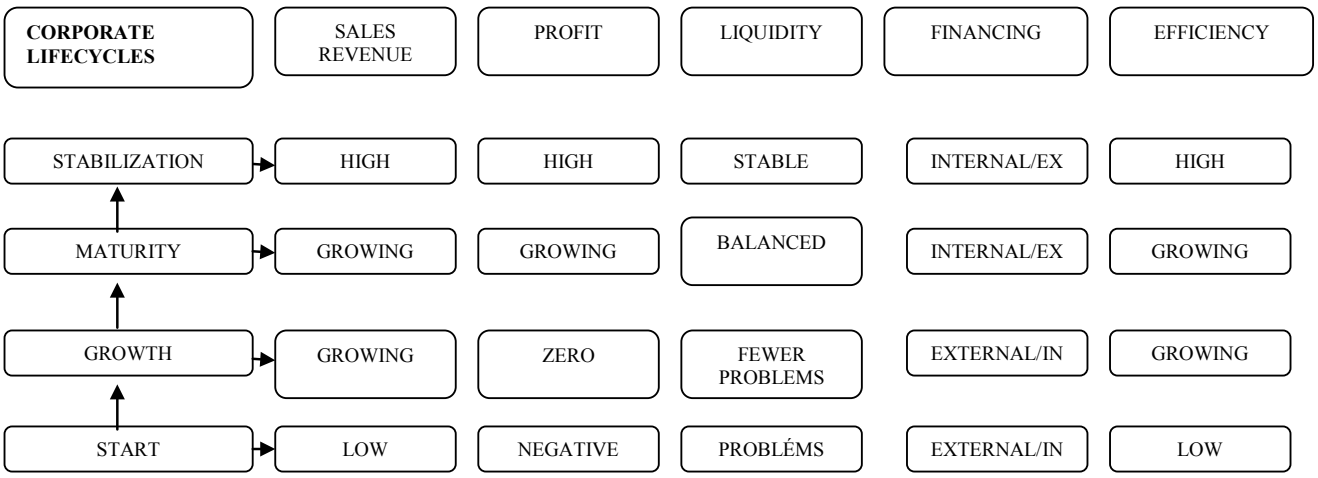
Despite the fact that (maybe) the typology of (ADIZES 1992) is the best-known, yet we rather wish to present the importance and role of management accounting in the analysis of corporate lifecycle through the model of (TIMMONS 1990). The main reason for this is that the model of Timmons is easily understandable and built on the rapidly growing enterprises thus the main characteristics can be seized well.

Figure 2: Corporate lifecycles (Timmons) and evolution of management role



Source (BÖCSKEI et al. 2011)

Figure 2: Lifecycle models and their main characteristics



Source: own editing based on specialized literature

In our opinion, the management accounting has a key role in ensuring that a corporation can reach the "top" as soon as possible and can stay there as long as possible. Information content of the management accounting has been revaluated over the years.

In his study, (TIMMONS 1990) groupped the certain eras on the basis of time, income and number of employees. He divided the lifecycle of enterprises into five phases (Figure 2): starting from the phase of research and development (1-3 years before the foundation of enterprise) through the procedures of start (1-3 years of the enterprise), growth (from the 4th to the 10th year), and maturity (from the 11th year to the 15th year) up to the phase of stabilization (period after the 15th year). According to the author, the condition of moving to the next "status" is to solve a kind of decision-making situation which is generally under the responsibility of the founder, owner or the managing director. The "start-up" or else "starting phase" means the first one or two years in the majority of cases but it can happen that this phase may extend for seven years. According to Timmons, this is by far the most risky stage which requires an exhaustive direct management, energy, entrepreneurial talent and key people. In this phase, the failure rate of enterprises is 60% according to the theory. The second phase was named 'high-growth stage'. This is the ramp-up stage of an enterprise; its period is often unlike per enterprise in the same manner as the extent of changes during the stage. At such a time, primarily the founding owners face difficulties with regard to mainly the transfer of power and decision-making authority. The enterprise then moves to the "maturity" from the ramp-up stage where the primary goal is already not the survival but the profiting perpetuance. Finally, the stage of stability closes this model which the author does not touch upon in detail.

ZSUPANEKNÉ (2008) describes that the model of Timmons is very similar to the stages of the traditional product life curve; in both cases, it can be observed that the phase of research & development is also mentioned albeit this is not part of the lifetime of a corporation as well as a product. Compared to the product life curve, it can be also mentioned as a difference that Timmons does not deal with the declining stage of the corporate life path in its description.

The owners and managers of corporations (regardless of the management level) face different decision-making situations in each stage of the corporate lifecycles. Insofar as a manager sufficiently does not deal with the numbers as well as the coherences and business processes behind the numbers then it can result in a lack of information, a series of wrong decisions and the enterprise can find itself in an unstable economic situation. The most important task is to promote the up-to-date information of managers so that they can make effective business decisions and can operate the firm successfully (TAKÁCS, 2014,;SZÓKA, 2015). In the absence of applying the management accounting, the data of financial accounting regulated by the Accounting Act are tried to utilize for decision-making support purposes. Less information can be obtained from the aforementioned data since, in one respect, those ones step forward with some delay after closing a current period, on the other hand, these data concern the past events of an enterprise.

Nowadays, the management accounting and the controlling play a bigger and bigger role, the companies take the accounting needs of the management as starting point when elaborating their accounting system, of course bearing the legal provisions in mind (HÁGEN, 2009; HÁGEN-MÉHESNÉ, 2014; MÁTÉ – KÁRPÁTI, 2015; ZÉMAN, 2016; KALMÁR et al, 2016.; MUSINSZKI, 2016., KONDOROSINÉ –ZSIDÓ, 2017.). The up-to-date information provided by the managment accounting are indispensable for the decision-making process and information supply of the managers (SISA-SZIJJÁRTÓ, 2016. BIRCEA, 2014). The criterion for introducing the management-oriented accounting system is to bring the "looking to the future" to the fore instead of/in addition to the investigation of past events.

ROLE OF REPORTS THROUGH INFORMATION CONTENT OF THE BUSINESS REPORT

Role of reports appearing in the national accounting laws

There is criticism related to the reports presented in the Accounting Law that the balance sheet and income statement contain historical data, concern a given date i.e. the balance sheet date thus the information gained is less suitable for possible rapid interventions. This is not a goal of the reports; the aim is to regulate the accounting in order to provide the market operators with a fair and value overall picture of the property, financial and income situation of the entities covered by the Accounting Law and with a view of the expected future plan and opportunities.

Among others, the business report has information content of the future plan and opportunities. By preparing the business report, the major goal is to present the property, financial and income situation of the enterprise in such way that the expected future risks are also taken into consideration in addition to the historical fact dat. With this in mind, development of the entrepreneur's business shall be reported in such way that both the financial and non-financial performance indicators shall be represented; it contributes to the presentation of a fair and true picture. This raises the question of how much it contributes to mapping the expected future risks, particularly knowing that the business report is not a part of the report however it is obligatory to prepare the business report and to acquaint the stakeholders with it.

Role of IFRS reports

The criticism related to the reports presented in the Accounting Law – according to which the reports are built on historical data and the future conceptions and plans are not presented – does not necessarily apply to the IFRS reports. Though the reports prepared according to international financial reporting standards are, as a matter of course, similarly concerning a given date i.e. the balance sheet date but the report itself strives to represent the vision of company in several places (TÓTH – DARABOS, 2016). (For instance, among others, the Assets held for sale and discontinued operations shall be included in separate rows on the asset side of the balance sheet and the related liabilities – namely the equipment or even whole activities which are held for a future sale and representing a significant order of magnitude – shall be included among the liabilities. This is to be done so that the stakeholders can be aware of the firm's future sales plan which could even entail the questioning of the going concern principle in certain cases, in case of outsourcing an activity being significant from the point of view of a company. The result obtained by the discontinued operation and the result from the sale of activity itself shall also appear in separate rows in the balance sheet and income statement.) Also, the aim of the reports has been determined in a different way: this is to provide the stakeholders and potential investors. The emphasis is placed on the usefulness. IAS 1 identifies the following parts of the financial statement:

- Statement of Financial Position
- Statement of Total Comprehensive Income
- Statement of Changes in Equity
- Notes

Table 1. The Notes and the business report (Hungary - IFRS)

Content of business report (Hungary)	Notes (Hungary)	Notes (IFRS)
– economic environment, – internal decisions influencing the expected development of the business entity Presentation of the events after balance sheet date, in particular with regard to the significant processes Presentation of establishments	*It shall contain those quantitative data and text explanations which are* – prescribed by law, and necessary for the true and fair presentation of – property and financial situation of the entrepreneur, – operating result in addition to details in the balance sheet and income statement. In the notes, the information shall be also presented that is related to the specific activities and prescribed by other legislation. *The following shall be presented:* – foreign establishments, – name and registered office of each commercial company: which is a subsidiary of the entrepreneur, that the entrepreneur manages jointly with another entrepreneur, which is an associated company of the entrepreneur, which is the entrepreneur's enterprise in other participations.	*According to the standard IAS1, the proposed order of notes is the following (Lakatos et al,, 2013):* - declaration of the financial statement's compliance with IFRS, – basis of preparing the financial statement (assessment principles and methods), special accounting policy prescriptions for the significant transactions, economic events and which are essential to interpret the financial statement, – additional information concerning all financial statement parts, in the order of presentation of statements and rows, – other disclosures including the contingent liabilities, unrecognised contractual obligations (amount of the approved dividends proposed up to approving the publication of financial statements),non-financial disclosure (e.g. address, legal form, registered office of registration, main activity, ultimate parent company). *Obligatory presentation of segments determined on the basis of standard 'IFRS 8 Operating Segments'.* *Based on IFRS 12, the following shall be published:* the nature of the investment in – subsidiaries, – joint associations (joint activity and joint enterprise as well), – associated enterprises, – structured business entities not to be consolidated , risks involved, impacts on the property, financial and income situation of the business entity.

Source: Act C of 2000 on Accounting (Hungary), IAS1, IFRS Framework

Table 2. The Notes and the business report (Romania)

Content of business report (Romania)	Notes (Romania)
Presentation of the economic environment influencing the activity and development of enterprises, by means of financial and non-financial indicators as well as additional explanations. The business report shall contain: – - expected development opportunities of the enterprise – - presentation of the research and development programs – - information regarding the reacquisition of treasury share – - presentation of establishments – - detailed description concerning the use of financial instruments.	The sum of quantitative data and text explanations which are required to understand the data in the balance sheet and income statement, the property and financial situation. Information related to the specific activities and prescribed by law shall also be presented in the notes.

Source: 1802/2015 of the Ministry of Finance

The Notes classified as notes are a much wider information source. It is not mandatory to prepare the business report, the financial statement (its parts listed above) shall be separated from other parts of the annual report since the annual report can include other statements and reports but those ones do not fall under the IFRS's. (LAKATOS et al, 2013.) There is an obligation for the business report in the Hungarian Accounting Law, namely the analysis of the business entities' performance, for which the professions of accountancy and finance have developed a wide range of indicators. Due to the need for a simple comparability to other business entities, the IFRS's have striven to unify the calculation of a sole indicator and to regulate its requirements of presentation (IAS 33); the only requirement is to calculate and present the basic and diluted indicators of the earnings per share (EPS) at the end of the income statement and in the Notes.

RELATION BETWEEN NOTES AND BUSINESS REPORT, PROVIDING A TRUE AND FAIR VIEW

By means of quantitative data and text explanations, the Hungarian accounting reports also present those items, beyond the items of the balance sheet and income statement, which are necessary for a true and fair presentation of the entrepreneur's property and financial situation as well as operating result. Whilst the notes leans on historical factual data, the business

Table 3. The Notes and the business report (Slovakia)

Content of business report (Slovakia)	Notes (Slovakia)	Notes for micro-enterprises (Slovakia)
It contains the closing of the bookkeeping period and the auditor's certificate as well as it summarizes the following information: – the company's future potential for development, – risks and uncertainties related to the company, – company's impact on the environment and employment, – characterization of the events after the balance sheet date, in particular with regard to the significant processes, – expected future improvement in the company's activity, – costs of activities related to the research and development, – information related to the reacquisition of treasury share, – proposal for distributing the profit or covering the losses, – data related to the existence of foreign establishments, – information related to the financial assets applied by the company. The business report provides a balanced and overall analysis about the company as a whole as well as it contains quantified forecasts, financial and non-financial indicators.	Information illustrated in the notes should be usable, significant, understandable, comparable and verifiable. The indicated data shall be represented not just for the current accounting period but in relation to the immediately preceding period as well. This is a summary of those quantitative data and information which are necessary to understand the information in the company's balance sheet and income statement as well as the property and financial situation. Structure of the notes: 1. Information related to the accounting unit: commercial name; registered office; date of foundation and establishment; description of economic activity; average number of employees; date of compiling the bookkeeping closing of the immediately preceding period; legal title of annual report. 2. Data related to the participation in the consolidation unit 3. Further information: – applied accounting principles and methods, – information related to the data in the balance sheet, – information related to the costs, yields and income tax, – data of off-balance-sheet accounts, – other assets and deficits, – information related to the beneficiary parties, – facts of events occurred between the balance sheet date and the date of compilation, – review of changes in equity, – cash flow statement. The statement of cash flow forms a part of the notes in each case when the bookkeeping unit is bound to get an auditor to certify the closing of bookkeeping closing.	The notes of micro-enterprises are also needed to be compiled in such way that the information described in the annexes shall be useful, significant, comparable and reliable. Structure of the notes: 1. General data: designation and registered office of legal entity or Christian and surname of natural person; data related to the consolidation unit; counted average number of employees, 2. Information related to the accepted procedures: such as assessment procedures; data related to the depreciation plan; applied accounting principles and methods, 3. Information complementing the balance sheet and income statement: information related to the unscheduled costs and yields, liabilities, treasury shares, bodies and obligations of the company. In the notes, the accounting units (micro-enterprises) can announce information beyond the content structure prescribed.

Source:Opatrenie Ministerstva financií Slovenskej republiky

report focuses on the expected opportunities and plans, in strict accordance with the structure of notes.

The strict connection between the business report and the notes is indicated by *the principle worded as a goal of the business report* according to which, by the assessment of annual report, it wishes to present the enterprise's property, financial and income situation, the course of business together with the main risks and uncertainties in such way that a true and fair picture can be provided based on both the historical factual data and the expected future data. In addition to the presentation of the business firm's establishment, it includes the representation of the firm's economic environment together with the internal decisions influencing the expected improvement. In addition to the presentation of the events become known between the balance sheet date and the preparation of balance sheet, the opportunities concerning the future also come to the fore.

In Slovakia, according to the European Union Directive 2013/34/EU to be followed form 20 July 2013, the Ministry of Finance of Slovakia enacted the Order MF/15464/2013-74 according to which the accounting entities classified as micro-enterprises are allowed to prepare a simplified bookkeeping closing. The aim of the simplification is to reduce the administrative load of the micro-enterprises. Within the meaning of that order, the structure of notes has changed as well. In accordance with the directives mentioned above, those companies are classified as micro-enterprises which do not exceed the following criteria at least in two cases until the date of compiling the bookkeeping closing: the balance sheet total is EUR 350 000, the annual turnover is EUR 700 000 as well as the average number of employees is 10 persons in the accounting period (STANLEY, 2014).

According to the legislation currently in force in Slovakia, an annual report shall be prepared by each accounting unit whose bookkeeping closing is required to be approved by an auditor (ŠKULTÉTY – KRIŠKOVÁ, 2014A). The Notes of reports according to IFRS shall be systematic in accordance with the provisions of Standard IAS1 and every item of the elements of financial statements shall be referred. Given that a large part of the reports prepared according to the IFRS is consolidated report, the presentation of interests in other business entities has also a key role among the disclosures.

RESEARCH AND EXPERIMENTAL DEVELOPMENT

Role and gravity of the research and experimental development in the national economy are shown by the fact that the costs for the research and experimental development of the current year shall be reported in detail not only in the notes but the areas of research and experimental development as well as the results obtained and expected shall be touched upon in the business report as well.

In Notes of IFRS, the separation of research and development phases, the conditions of representing the development as property element and the presentation of their fulfilment shall be touched upon.

Table 4. The Notes and the business report (Hungary - IFRS)

Content of business report (Hungary)	Notes (Hungary)	Notes (IFRS)
For the area of research and development	Research and experimental development	Costs of the research shall be debited to the result. Costs of the development shall be activated in all cases (it is not a possibility but liability). There are 5 conditions for the representation of the experimental development as an asset (whether it is feasible technically; whether there is an intention to carry out; whether the technical, financial and other conditions are available for the realization; whether there is ability to use or sell; whether it is provably able to generate profit). To present the fruition of these ones is a requirement.

Source: Act C of 2000 on Accounting (Hungary), IAS1, IFRS Framework

Under the Romanian legislation (Order 1802/2015 of the Ministry of Finance), the research and experimental development activities and the results obtained shall be reported in the business report. However, in the notes, the following items shall be generally reported in detail: the most typical investments and their historical cost, accumulated amortisation, value adjustment, net book value and the principles used during the assessment.

Table 5. The Notes and the business report (Romania)

Content of business report (Romania)	Notes (Romania)
Presentation of the research and experimental development activity	There is no explicit provision. Under legislation, the historical cost, accumulated depreciation and impairment loss shall be presented in case of the most typical investments (fixed assets).

Source: 1802/2015 of the Ministry of Finance,

According to the legislation currently in force in the Slovakian Republic, it is necessary to indicate the costs of activities related to the research and development in the annual report (ŠKULTÉTY – KRIŠKOVÁ, 2014b). The company shall report its research and experimental activity in the notes (in point F) as follow:

- costs spent on research in the current marketing year,
- non-capitalised costs spent on research and experimental development in the current marketing year,
- capitalised costs spent on research and experimental development in the current marketing year.

In case of the intangible fixed assets, the following features of the experimental development shall be indicated in the notes: capitalised value, historical cost, increment, depreciation, residual value, method/principle of assessment and value adjustment.

Table 6. The Notes and the business report (Slovakia)

Content of business report (Slovakia)	Notes (Slovakia)
Presentation of the activities related to the research and experimental developments and the costs of those ones	As a part of the intangible fixed assets, point F of the notes deals with the historical cost, increment, depreciation, residual value and value adjustment of the capitalised value of the experimental development.

Source: Opatrenie Ministerstva financií Slovenskej republiky

FINANCIAL INSTRUMENTS, RISK MANAGEMENT

In the notes of the Hungarian accounting report, the financial instruments and derivatives shall be presented in detail, with regard to the specificities, in a defined structure; among others, its expected impact on the cash flow and the results as well as change in the fair revaluation of revaluation reserve of the current year shall be expounded. In addition to the hedges, those off-balance-sheet items as well as the financial impact and business purpose of those off-balance-sheet agreements shall be also expounded whose risks and benefits are needed to be known so that the financial situation of the entrepreneur can be judged realistically. In the business report, the focus is on the utilization of financial instruments, criteria of assessment at fair value and the hedging nature of derivatives. In case of the risk management and hedge policies, the risks (price-, loan-, interest-, liquidity- and cash flow risks) shall be substantiated by quantitative data.

Due to the complexity of the topic, the financial instruments are subject to regulatory scope of more IFRS's: IAS 32 summarizes the rules concerning the presentation, IFRS 9 (formerly IAS 39) summarizes the rules concerning the representation and assessment as well as IFRS 7 summarizes the rules concerning the publication. In this case, the aim of the disclosures is to give the users of financial statements the ability to create a clear picture of the importance of financial instruments possessed by the business entity.

In the notes of the Romanian accounting report, the financial instruments and derivatives shall be presented in detail according to groups and specificities. More special attention should be paid to the determination of fair value of the above and their comparison to their net book value. Process of evaluating the financial instruments and their presentation at fair value also play a key role in the business report. Furthermore, the risk management policy of enterprises as well as the price-, interest-, liquidity- and cash flow risks shall be also touched upon in detail.

According to the Slovakian legislation, the financial instruments and their derivatives shall appear in the notes of the bookkeeping closing. Among others, the groups, distribution, features and fair value of the financial instruments as well as the principles of evaluating them are included. In case of the derivatives, beyond the general specificities, those circumstances shall be separately described which can influence the sum, time and uncertainty of the future cash flow. Appearance of the data related to the financial

Table 7. The Notes and the business report (Hungary - IFRS)

Content of business report (Hungary)	Notes (Hungary)	Notes (IFRS)
utilization of the financial instruments: – classification for investment- or trading purposes, – in case of the fair value measurement, the ranking from the point of view of assessment, – hedge or non –hedge nature of the derivatives, insofar as these ones have significant effect on the property situation.	the financial instruments': – groups, – fair value. – the derivatives' – groups, – extent (at contract value), – due date, – expected impact on the cash flow and the result (fair value). change in the revaluation reverse of the fair value measurement in the current year,	items related to the financial instruments and their groups: – disclosures related to the balance sheet – disclosures related to the income statement – other disclosures main elements of the accounting policy, hedge accounting, fair value – risks related to the financial instruments, qualitative disclosures, quantitative disclosures – handover of financial assets
risk management policy, hedge policy and: – price-, – loan-, – interest-, – liquidity-, – cash flow risks supported by quantitative data.	hedges': – efficiency, – how large loss (or profit) was counterbalanced in the result of the current year. total sum of those financial liabilities: – which are of importance from viewpoint of the assessment of financial situation but which do not appear in the balance sheet. – nature, – business purpose, – financial impacts, of off-balance-sheet items and arrangements not included in the balance sheet; the risks or benefits arising from them shall be presented in order to estimate the financial situation of the entrepreneur.	

Source: Act C of 2000 on Accounting (Hungary), IAS1, IFRS Framework

Table 8. The Notes and the business report (Romania - Slovakia)

Content of business report (Romania)	Notes (Romania)	Content of business report (Slovakia)	Notes (Slovakia)
Financial instruments: – presentation of the significant effect on the property and financial situation – presentation of the fair value measurement	Presentation of the fair value measurement of the financial instruments. Presentation of groups and specificities of the derivatives. Presentation of groups of the fixed financial assets. Presentation of the net book value and fair value of the fixed financial assets	Based on the impact on the financial and property position of the corporation, presentation of features of the financial instruments and derivatives. Description of assessment of the financial instruments and derivatives.	Groups, distribution, assessment principle and fair value of the financial instruments. Grouping and features of the derivatives as well as their impact on the future cash flow. Grouping of the fixed financial assets and short-term financial assets, their assessment principles and book values.
Presentation of the risk management policy of the enterprise. Presentation of the risks of price, interest, liquidity and cash-flow.		It provides an overall picture of the risks and uncertainties of the company's current situation. A specific requirement regulates the necessity of examining the risk management, hedging policy as well as the risks of price, loan, liquidity and cash flow. The subject of analysis can be quantified indicators as well as indicators expressed in non-monetary value.	It appears only indirectly

Source: 1802/2015 of the Ministry of Finance, Opatrenie Ministerstva financií Slovenskej republiky

instruments and their derivatives depends on size of the company preparing the notes. The annual report summarizes the influence of financial instruments and their derivatives on the property and financial situation of the company.

The business report provides a transparent picture of the company's current position, uncertainties and risks. If it is necessary for the purpose of assessing the assets, sources or financial situation of the bookkeeping unit, it is also obligatory to list the following information in the annual report (the necessity is specified by special regulations):

risk management tools, policy and methods of the company – in particular with regard to the main types and transactions and the applied policy in case of the hedging derivatives,

price risks, loan risks, liquidity risks and cash flow-related risks.

The risks are indirectly presented in the cash flow statements of notes.

EMPLOYMENT

In the course of the Hungarian accounting reporting, the obligation to provide information of employment appears both in the business report and the notes. Whilst the quantitative data dominates in the notes, the business report creates (or can create) the possibility for knowing *the employment policy of the firm*, future opportunities and the possible alternatives of the improvement. In an unfavourable economic environment, it is not certain that the companies can correctly assess the possible future and the possible targets of employment policy. ODOR et al. (2011) describes the fair and sound information providing should be primarily the social responsibility of the owner and the management.

In the IFRS report, 4 categories of the allowances can be distinguished based on the Standard IAS 19 'Employees' allowances': short-term allowances, long-term allowances, severance payments and allowances paid after the termination of employment. Amongst the disclosures, information regarding the allowances is also presented based on this kind of grouping.

Table 9. The Notes and the business report (Hungary - IFRS)

Content of business report (Hungary)	Notes (Hungary)	Notes (IFRS)
Representation of the employment policy	– Employed workers': – average statistic headcount, – recognised per staff group: payroll expenses, and other employee-related payments.	– disclosures related to short-term allowances, – disclosures related to long-term allowances, – disclosures related to severance payments, – disclosures related to allowances paid after the termination of employment

Source: Act C of 2000 on Accounting (Hungary), IASI, IFRS Framework

According to the Romanian legislation, the business report shall contain the rules regarding the employment policies of enterprises. As in the Hungarian rules, the notes

Table 10. The Notes and the business report (Romania - Slovakia)

Content of business report (Romania)	Notes (Romania)	Content of business report (Slovakia)	Notes (Slovakia)
Representation of the employment policy	– The employees' average statistic headcount of presented per staff group – Detailed presentation of the employees' payroll expenses (net wage, paid duties and contributions) – Other employee-related payments – Value of advances and loans paid for the board members and members of the management body, determination of the interest rate – Pensions and similar allowances paid for the former board members and members of the management body –	Representation of data related to employment	By quantified data, it presents: – average headcount of employees, – for the accounting closing date, number of employees and headcount of workers in managerial position, – data of liabilities related to board members and members of the management body, – obligations to and claims against the employees, – expenditures related to staff (wage, social and health deductions, advance tax and other contributions)

Source: Order 1802/2015 of the Ministry of Finance, Opatrenie Ministerstva financií Slovenskej republiky

contains numerical data regarding the average statistic number of workers, wage costs of employees and other personnel payments.

In Slovakia, the annual report points at the impact of bookkeeping unit on the employment by means of different financial and non-financial indicators. The formal requirements of employment-related information are not clearly defined but the annual report most commonly contains the clarification of information in the bookkeeping closing as well as the presentation of employment policy of the company. The notes contain the quantified values related to the employees, such as:

average number of employees of the enterprise,

number of employees to the date of compiling the bookkeeping closing as well as the number of workers in managerial positions of the total headcount.

Also, the notes provide information about the composition of liabilities related to the workers in managerial positions and about the expenditures related to the workers (wages, bonuses, social and health duties and advance tax of the employees).

ENVIRONMENTAL PROTECTION

The environmental protection strongly appears both in the notes of the Hungarian accounting report and the business report. By the regulation of provisioning, the expected future costs (non-statutory environmental-related costs) are numerically presented in the report as well, in addition to the environmental-related liabilities. Related environmental protection policy, closely related measures, their impacts and results shall be presented in the business report. Beyond the financial and economic items, the legislator markedly demonstrates the issue of responsibility as well. The environmental disasters in recent years have got the economic operators to focus on the stressed role and importance of preventive measures.

The IFRS financial statements specially do not regulate the subject of environmental protection and the disclosure requirements compulsorily do not include this subject either. The environmental-related information is presented in those other parts of the annual report which are independent of the financial statements.

Table 11. The Notes and the business report (Hungary)

Content of business report (Hungary)	Notes (Hungary)
presentation of environmental protection: – environmental policy and its set of instruments applied by the entrepreneur, – environmental actions, – results of fulfilment of the environmental-related actions, – environmental improvements: projects realized in the past or to be realized in the future and grants related to them, – environmental-related responsibility, – role of environmental determining and influencing the financial situation of the entrepreneur.	presentation of environmental protection: – tangible assets directly serving to protect the environment, – by hazard class: – hazardous waste, – substances harmful to the environment: initial and final stocks, quantitative value data of the growth and reduction of the current year, – environmental obligations, – sum of provisions for the future costs serving to protect the environment, – environmental-related costs incurred, – amount of expected costs for environmental and recovery liabilities.

Source: Act C of 2000 on Accounting (Hungary)

The environmental protection may appear in the business report of the Romanian accounting report and its notes as well. The legislation currently in force (Order 1802/2015 of the Ministry of Finance) does not regulate the detailed presentation of the environmental policies. Depending on the entrepreneurial needs, extent of the enterprise and activity area, the following items can be presented in the business report, in more or less detail: environmental policy or general environmental measures applied by the enterprises. Additionally, the notes can itemize the intangible and tangible assets directly serving to protect the environment, the environmental obligations as well as the sum of provisions for the future costs serving to protect the environment.

In Slovakia, in accordance with the legislation currently

Table 12. The Notes and the business report (Romania - Slovakia)

Content of business report (Romania)	Notes (Romania)	Content of business report (Slovakia)	Notes (Slovakia)
The detailed presentation of environmental policies is not provided by the accounting legislation currently in force. Depending on the entrepreneurial needs and the field of activity, the following things may be presented in the business report, in more or less detail: – - environmental policy applied by the enterprises – - general environmental actions.	The detailed presentation of environmental policies is not provided by the accounting legislation currently in force. Depending on the entrepreneurial needs and the field of activity, the following things may be presented in the business report, in more or less detail: – intangible and tangible assets directly serving to protect the environment (valuation, period of use, depreciation, impairment loss, accumulated amortisation, net book value) – environmental obligations, – sum of provision for the future costs serving to protect the environment.	The annual report contains the examination of activity of the company based on the impact on its environment.	The presentation liability of environmental-related features is not provided by the legislation currently in force. Depending on the activity of company, the following item may be detailed in the notes: sum of provision for the future costs serving to protect or recover the environment.

Source: Order 1802/2015 of the Ministry of Finance, Opatrenie Ministerstva financií Slovenskej republiky

in force, there is no specific regulation on the presentation of environmental-related information and data. In the business report, it is obligatory to indicate the impact of corporate activity on the environment. The business report can be enlarged with environmental-related data if it is necessary based on different individual arrangements. In the notes, the environmental-related details are presented in the course of creating the provisions. Other statistic statements contain the expenditures spent on the fixed assets purchased relating to the environmental protection, the environmental-related costs as well as the yields resulting from the environmental protection.

CONCLUSION

The global economic, social and environmental changes have increasingly urged the corporations to take a responsible attitude to their direct and indirect environments, not only for others but for the future of corporation. But, what does the employers' responsible behaviour – also known as CSR (Corporate Social Responsibility) – mean? According to the responsibility interpreted in a strategic way, the corporations shall behave responsibly towards their environment and the society as a whole. We would like to draw attention to a specific and broad interpretation of the responsibility: it shall appear in the reports and the business report which does not form a part of the report. According to these, the corporations should be able to survive in the long-term, if no then the market operators shall not be deceived. The legislators have also represented this expectation of theirs in the accounting laws of each nation, viz. that, in the going concern principle, they have enforced the suitability for the future operation and further continuation of the activity. The lawmaker handles the going concern principle with particular importance since the implementation of other principles is based on the existence of this principle. In the IFRS, this principle is a determinant so-called underlying presumption. It also means that the accounting principles cannot be applied in that case if the going concern principle does not apply. As a person entitled to represent the enterprise is obliged to sign the business report thus we have reason to hope that the social responsibility of numerous firms will also include the presentation of content "the report is socially responsible" in the near future.

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SCIENTIFIC PAPER

MBA EDUCATION AT THE UNIVERSITY OF DEBRECEN AND ITS FURTHER DEVELOPMENT TOWARDS DOUBLE DEGREE PROGRAMMES

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Abstract: *University of Debrecen is the oldest higher educational institution in continuous operation in Hungary based in the same city. MBA training at Debrecen Agricultural University was initiated by 0257-91/1 Tempus Joint European Project Grant. The project was coordinated by the Netherlands Institute for Management (RVB) Maastricht. Participating institutions include University College in Dublin, Agricultural University in Wageningen and Debrecen Agricultural University. Minimum requirements established were a BSc (or equivalent) degree, an English certificate of language proficiency and one letter of reference from work supervisors or former teachers. Application requirements included a completed application form, Curriculum vitae, a certified copy of degree(s), an official copy of language knowledge certificate, a letter of recommendation and the receipt of registration fee payment. The academic year began on 1 September 1991, and project studies were carried out in small groups. Practical experience that had been gained before enrolment was taken into account and after the successful completion of the requirements students were granted MBA degrees.*

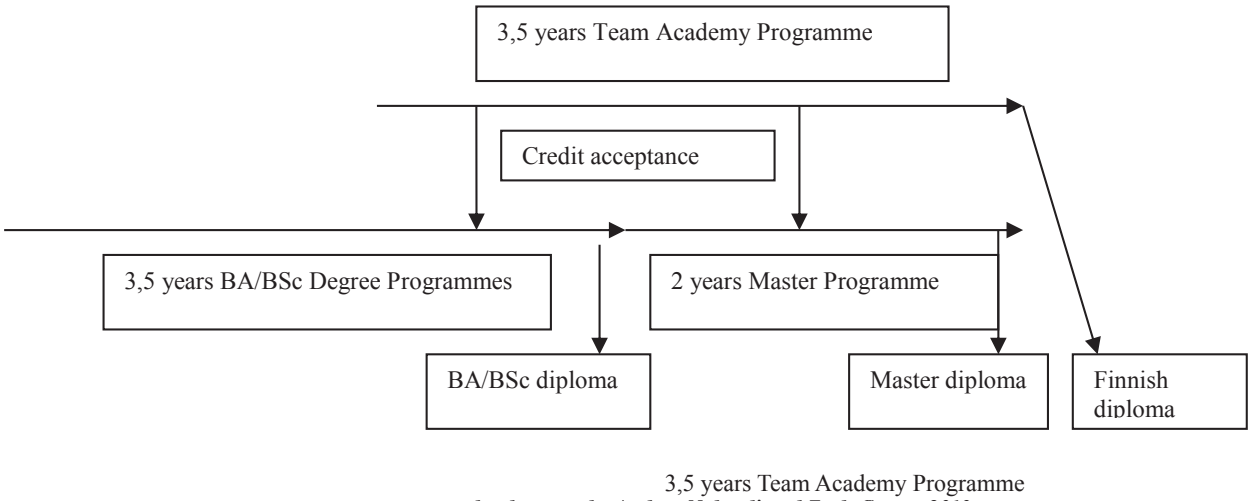
JEL CODE: I21, I25

The First Debrecen Executive MBA was intended for personnel who have at least five years experience in the management of food or at an agribusiness company, and who have been identified as potential candidates for future top level management positions. The goal of the program was to provide a global view of issues, broad perspectives and management skills on analysis of economic and policy issues relevant for food and agribusiness management with emphasis on the economic and policy environment of the region.

The First Debrecen Executive MBA course was assessed on the dynamic relationship between strategy and competition. Food, agribusiness and other cases were used to explore the development and implementation of strategies requiring the application of conceptual, analytical, problem identification, and problem solving skills to develop organizational strategy. In addition, the program allowed participants to work on a supervised research project, which involved the completion of a bibliography, the organization of materials, the selection of suitable problems, an understanding of related literature, the selection of appropriate procedures, formulation of a plan, collection and organization of data, investigating and the writing the thesis.

The University of Debrecen, Centre of Agricultural Sciences (UDCAS) has established the Postgraduate Training of Corporate Studies on 1 September 1998. This course still exists at the University. During this period, the curriculum has changed twice and its name has also changed to Postgraduate Training in Entrepreneurship. The University Council decided to continue this training in the future. It contains four specialisations: commerce and marketing management, human resource management, European studies and (Masters Business Administration) MBA. In 1998, the training started in Budapest, in a rented building managed by the International Organisation of Hungarian People, and the first graduating class received its diploma in June 2000. The total number of students receiving their diplomas was more than 100. Because of the Hungarian demographical situation and its labour market, the number of students has increased year by year. In its activities within the scope of this program, UDCAS assists in solving a social problem in Hungary, by giving a second diploma for those who cannot find gainful employment. The increased interest in this training could be related to the fact that graduated students were satisfied with the quality of the training. The aim of this training was to provide knowledge for managers in economics, domestic and international marketing, finance, human resource management and EC management, so they would be able to work as experts in different fields of business. These tendencies met the requirements of international trends. The experience of the 5 academic years verified the success of the training, as did the fact that, in Hungary, several universities and 19 private schools began to offer this kind of managerial training. Originally, students came from different parts of Hungary to Budapest to study.

Figure 1: Implementation of the Degree Programme in Entrepreneurship Development

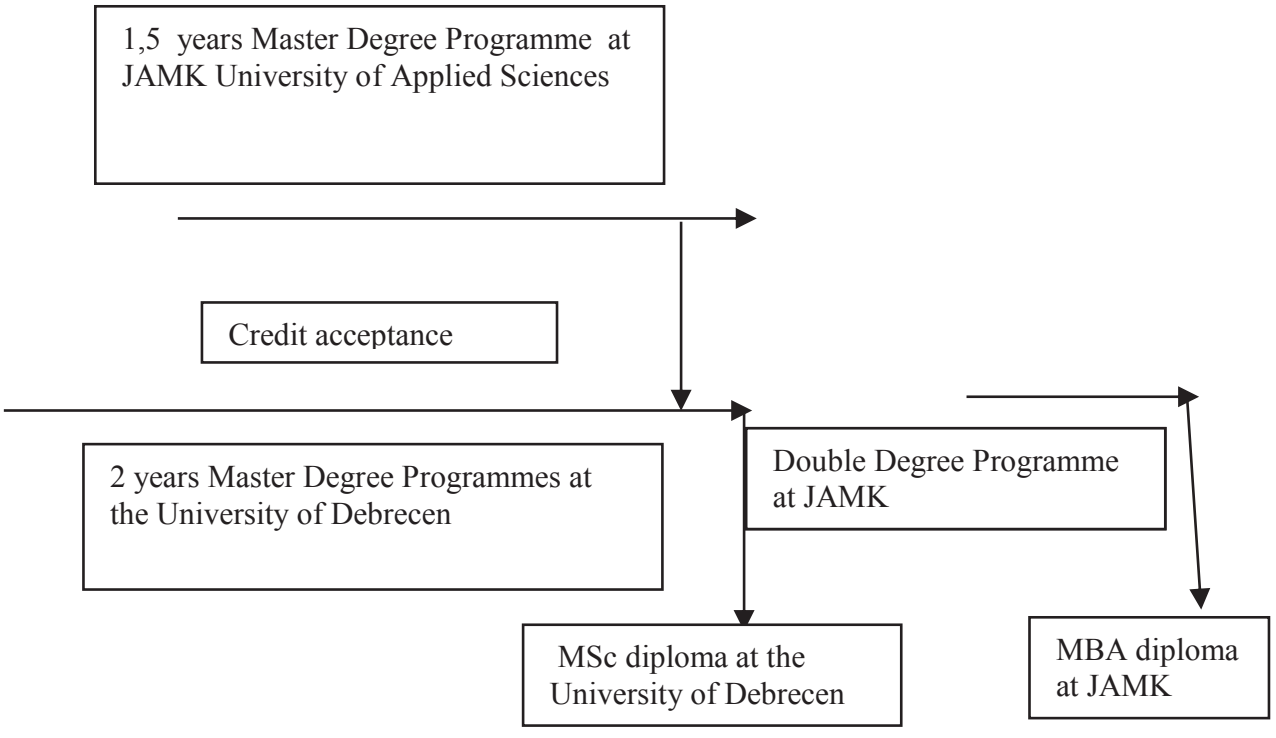


source: own development by Andras Nabradi and Zsolt Csapo, 2010

MBA education finished in 2005 in Budapest. University of Debrecen, Faculty of Agricultural Economics and Rural Development continued the oreration of the MBA Programme in Debrecen. The aim of the training was to allow for graduated experts to have suitable knowledge in economics, marketing international business, finance, human resource management and EC management, so they could find work as managers in different fields of business. Students should have been prepared to find good jobs, to modify jobs and to be able to come up to the changing requirements in the labour market.

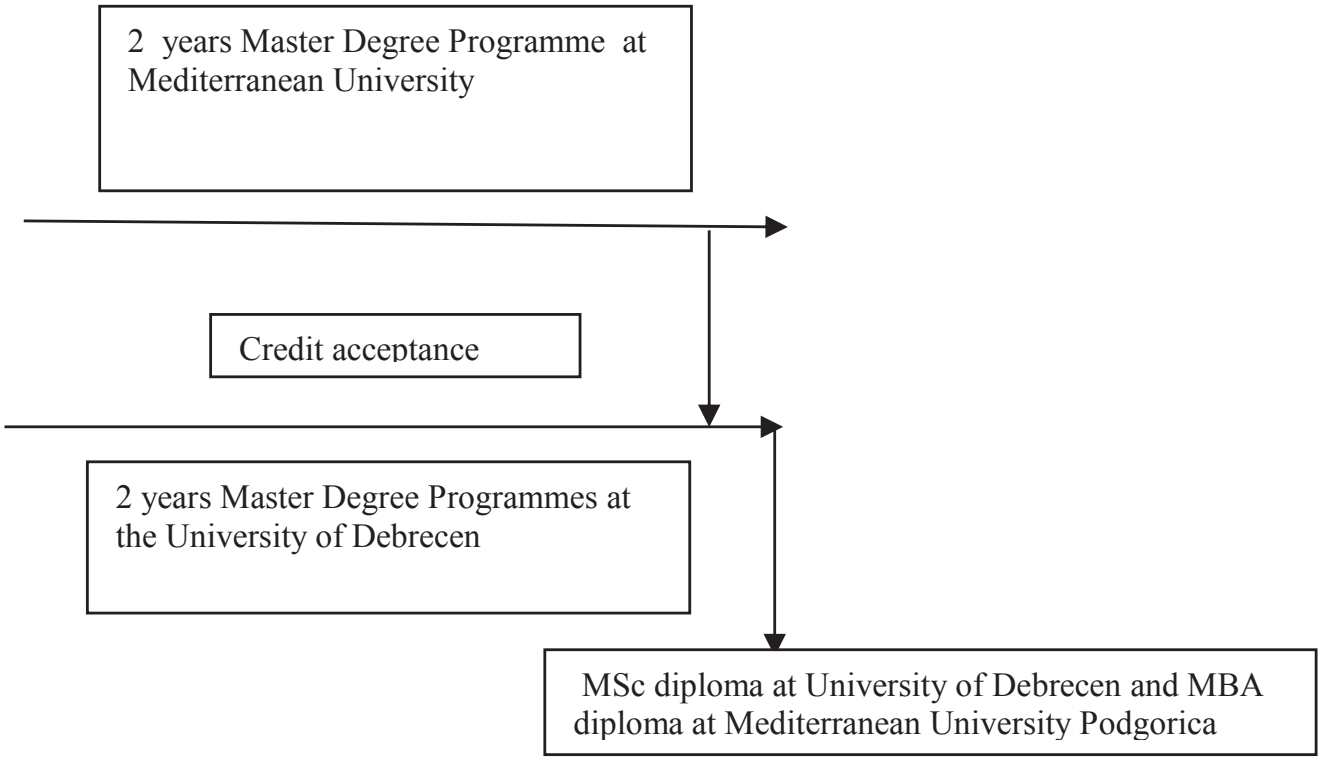
Unfortunatelly, companies in Debrecen and surronding areas could not provide enough students for the further operation of the MBA programme. In the meantime in accordance with the Bologna process, Bachelor and Master Degree Programmes have been accredited according to the Hungarian National Accreditation Board. Taking into consederation of the above mentioned facts the Faculty started

Figure 2: Existing Double Degree Programme between JAMK University of Applied Sciences and University of Debrecen



source: own development by Andras Nabradi and Zsolt Csapo, 2015

Figure 2: Double Degree Agreement between Mediterranean University Podgorica and University of Debrecen



source: own development by Andras Nabradi and Zsolt Csapo, 2016

the accreditation of "Master's Degree Programme in Business Development, MSc" in 2007. The curricula of this Master's Degree Programme covered all the subjects set up in the former AGRIMBA MBA Programme. The accreditation finished in 2008 and the first generation of students started their studies in 2009. In addition to it, the "Master's Degree Programme in Business Development, MSc" in English language has also been accredited. The interest for the new Master Programme was considerable and until now it is. The faculty management realized that the labour market requires graduated students with high problem solving ability, creative thinking etc. The Degree Programme in Entrepreneurship Development (Team Academy Programme) at the JAMK University of Applied Sciences, Jyvaskyla, Finland provided a good solution to meet the labour market requirement.

Team Academy started its operation in 1993 at JAMK University of Applied Sciences (that time named Jyvaskyla Politechnic). When students join the Team Academy, they form teams and each team establishes a business and stays together throughout the studies. The teams implement various types of projects for outside customers. A special project group, which consists of members from various teams representing the skills and knowledge required for the project, is formed for each project.

The two universities started the negotiation of a common educational model in 2009. The general Coorporation Agreement between the two universitis has been signed in November 2010. Double Degree Programme including from University of Debrecen the "Master's Degree Programme in Business Development, MSc" and from JAMK University of Applied Sciences the "Master's Degree Programme in Entrepreneurship and Business Competence (Master of Business Administration)" has been signed in April, 2011.

Structure of the integration of Team Academy Programme and the Double Degree Programme is shown in Figure 1.

Student after finishing the first two years of their bachelor studies can join to the Team Academy Programme/method. The entire Degree Programme is based on credit acceptance between BA/BSc and Master Programmes. By the end the of the 5,5 years educational period students get the basic BA/BSc diploma, the Master diploma of University of Debrecen and the Finnish MBA diploma based on the double degree agreement between the two universities. So far 22 students earned the mentioned Finnish MBA diploma.

In 2014 the Finnish Higher Education Law has ben changed. MBA type of education can be started for Bachelor graduated students after 3 years working experience. That is why the Double Degree Programme had to be modified.

The main change was that master graduates must have one more year working experience (the necessesary 2 extra years can be fullfiled within the framework of Team Academy Programme during their master studies) to be allowed to entered the Finnish Double Degree Programme. The necessary 30 credits can be fullfiled within 1 or 2 semesters depending on students.

The current existing Double Degree Agreement is show on Figure 2.

The main change was that master graduates must have one more year working experience (the necessesary 2 extra years can be fullfiled within the framework of Team Academy Programme during their master studies) to be allowed to entered the Finnish Double Degree Programme. The necessary 30 credits can be fullfiled within 1 or 2 semesters depending on students.

Next step was to extend the Double Degree Agreement on MBA level. University of Debrecen, Hungary and Mediterranean University Podgorica, Montenegro had a common TEMPUS project between 2010-2012. One of the main outcome was to introduce MBA Programme in Commerce and Marketing at the partner Mediteranean University. The project was succesful and the programme started in Montenegro. The cooperation has been further developed into Double Degree Programme in 2016 and the 2 universities are going to sign the Agreement in November 2016.

The degree programme from the University of Debrecen is “Master’s Degree Programme in Business Development, MSc” and from the Mediterranean University Podgorica, Montenegro is ”International MBA in Management, Marketing and Finance”. The Double Degree Programme uses the Team Academy method, as well.

The structure of the Double Degree Agreement is show on Figure 3.

The Double Degree Programme ensures for students from both universitites that after their 2 years of master studies they can earn 2 master degrees. The joint programme was announced by the leader of the Degree Programme in Montenegro in front of the national TV channel (Atlas TV).

Picture 1: Interview with Atlas TV in Montenegro about the Double Degree Agreement with the Dean of Montenegro Business School, Mediterranean University

source: photo with Atlas Tv, 2016 by Tunde Risko Csapone

Negotiation has been started also in Nitra within the framework our Agrimba Network to establish Finnish educational method there.

SUMMARY

University of Debrecen had and has important role establishing and operating AGRIMBA network. The professional content of the MBA Programme has been incorporated into the “Master’s Degree Programme in Business Development, MSc”. MBA education has been refreshed through Double Degree Programmes. The combination of master studies (MSc and MBA) could further be developed in the AGRIMBA Network.

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APSTRACT
Applied Studies in Agribusiness and Commerce

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Sample references are given below:

JOURNAL ARTICLE

Bowen SA. (2005): A practical model for ethical decision making in issue management and public relations, Journal of Public Relations Research 2005; 17(3): 191-216.
Harrington R. J., Ottenbacher M. C., (2008): Contradictions of traditions and change in German winemaking: an exploratory study, International Journal of Wine Business Research, Vol. 20 Iss 3 pp. 276 - 293 Permanent link to this document: http://dx.doi.org/10.1108/17511060810901073

Székely C, Pálinkás P. (2009): Agricultural Risk Management in the European Union and in the USA. Studies in Agricultural Economics. 2009; 109: 55-72. http://ageconsearch.umn.edu/bitstream/49193/2/No.%20109_4.pdf Approached May 2014.

Book
Colson JH, Armour WJ.(1986): Sports injuries and their treatment. 2nd rev ed. London: S Paul, 1986 ISBN: 978-3-16-148410-0

Weinstein L, Swartz MN. (1974): Pathologic properties of invading microorganisms. In:Sodeman WA Jr, Sodeman WA, editors. Pathologic physiology: mechanisms of disease. Philadelphia: Saunders, 1974:457-72.

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Harley NH. (1985): Comparing radon daughter dosi-metric and risk models. In: Gammage RB, Kaye SV, editors. Indoor aid and human health. Proceedings of the Seventh Life Sciences Symposium; 1984 Oct 29-31; Knoxville (TN). Chelsea (MI): Lewis, 1985:69-78.

APSTRACT

Contents

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