APSTRACT

Applied Studies In Agribusiness And Commerce

http://www.apstract.net

Vol. 10. Number 2-3. 2016

Aberdeen, Belgorod, Belgrade, Budapest, Berlin, Cork, Debrecen, Fayetteville, Hohenheim Kazan, Kiev, Nitra, Novi-Sad, Podgorica, Prague, Stavropol, Ulan-Bator, Warsaw, Wageningen, Zagreb

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Official Periodical of the International MBA Network
in Agribusiness and Commerce AGRIMBA

Vol. 10. Number 2-3. 2016

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APPLIED STUDIES IN AGRIBUSINESS AND COMMERCE
Official Periodical of the International MBA Network in Agribusiness and Commerce:
APSTRACT®
©AGRIMBA
Editor in Chief: Dr. Johan van Ophem, Wageningen University, The Netherlands
Editorial office: University of Debrecen, Faculty of Economics and Business,
APSTRACT Ed.office Debrecen, Böszörményi út 138. H–4032
Phone/Fax: (36-52) 526-935

Executive publisher: Univesity o f Debrecen, Faculty of Economics and Business, Hungary
Publishing House: Center-Print Publishing House, Hungary – www.centerprint.hu
Typography: Opal System Graphics www.opalsystem.com

HU-ISSN 1789-221X – Electronic Version: ISSN 1789-7874

Home Page: http://www.apstract.net • E-mail: editor-apstract@agr.unideb.hu

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EDITORIAL SPECIAL ISSUE CONTRIBUTIONS TO THE UNDERSTANDING OF ISSUES WITH RESPECT TO BEHAVIOUR, FOOD, HAPPINESS AND HEALTH

by Johan van Ophem, Wim Heijman and Michel Handgraaf

This issue of *Apstract* entitled Contributions to the understanding of issues with respect to behaviour, food, happiness and health is a special one. It consists of contributions on topics and the way of research that have been or are going on at the ECH group since Gerrit Antonides became the chair holder in 2002 and his retirement in October 2016. This issue can be regarded as a *Festschrift* for him.

This particular issue gives an impression of topics and kind of research in the 2002-2016 period. In this way, it can be seen as pattern-card of the research of the group. There is great variety in the contributions in many respects. There are contributions from past and present ECH colleagues. There are contributions from other colleagues with whom Gerrit Antonides has co-operated for a long time.

There are contributions that give an impression of the kind of research work in BSc and MSc theses and there are papers from past and present PhD students. Some papers are highly empirical, whereas others are more of a theoretical nature. Some are rigorously empirical, others are essayistic publications that give an overview of the state of art in a particular field of research. Many papers address issues from a Behavourial Economics point of view. After all Gerrit Antonides is an internationally known specialist is this field. He was editor of the Journal of Economic Psychology , and president and currently board member of SABE. And, not the least, the contributions are very international in many respects.

The fifteen contributions are organised around four themes: Behaviour; Food; Allergy; and Happiness.

The Section Behaviour consists of six contributions. In the first article, Jack Knetsch provides an account of Willingness To Pay (WTP) and Willingness To Accept (WTA) as two ways to measure the value of (policy) options that lead to very different valuations. He proceeds to discuss that WTA is frequently the more appropriate measure where WTP is routinely used. He identifies several fields in which the differences between WTP and WTA are important and understudied.

The second article, by Manon de Groot and Fred van Raaij, deals with whether and how self-employed entrepreneurs manage their finances. More specifically, they investigate the role of mental budgeting and time orientation in healthy financial behaviour. They show that mental budgeting relates to worry about one's financial situation, but is not related to tax compliance.

The third article, by Natasha Stroeker, provides an account of the establishment and growing influence of behavioural economics on Dutch government policy. In an interesting twist, she then suggests the use of nudges to increase the integration of behavioural science knowledge in policy and describes how nudges can be embedded in policy.

The fourth article, by Anouk Griffioen, Jannette van Beek, Simone Lindhout and Michel Handgraaf, gives an

overview of studies that investigate psychological distance as an important variable that affects perceptions, intentions, and decision making in the environmental and health domains. They argue that differences in the effect of psychological distance can be found between studies and constructs (e.g., perceptions vs. intentions vs. behaviour) rather than between domains or between the psychological distance dimensions. In addition, they discuss potential underlying mechanisms and identify topics for future research.

In the fifth article, Rein Haagsma and Pierre van Mouche analyse studies that investigate the endowment effect using a standard choice paradigm (which they term the *standard apple-Mars experiment*) from behavioural economics. They argue that, despite the claim in the literature that neoclassical theory cannot explain the endowment effect, it is actually possible to use (a Marshallian application of) neoclassical theory to explain these standard findings, in particular in cases where consumer indifference between the options cannot be ruled out.

In the sixth article, Ynte van Dam and Hans van Trijp delve into the discrepancy between consumers' attitudes and actual sustainable behaviour. They argue that for intrinsically motivated consumers, this gap is fairly easily overcome and that the challenge lies with a-motivated individuals who need extrinsic motivation to behave sustainably. Psychological construal level theory is used as an explanation for the attitude to behaviour gap as a motivational conflict between high and low level of mental construal. They examine four types of intervention strategies that can cater for extrinsic motivation for sustainable development.

In the Section Food there are four contributions. In her article, titled 'Food and nutrition security as gendered social practice', Anke Niehof emphasizes the necessity of women empowerment to assure household food security and good nutrition of children in developing countries. In her opinion that does not mean that women are completely without power. However, improved access to critical resources would improve their household food security and their children's nutrition. Somewhat contradictory to this conclusion is the observation that, except for south east Asia, the existing gender inequalities do not visibly result in a gender gap in nutrition.

In 'Women and microcredit in rural agrarian households of Uganda: Match or mismatch between lender and borrower?' Faith Namayengo , Johan van Ophem and Gerrit Antonides show that micro-finance can play a major role in small enterprises in developing countries. They investigated the extent to which the objectives and design of a specific micro-finance program (the BRAC program) match the expectations, context and characteristics of female borrowers in a rural agrarian setting in Uganda. The clients are mainly poor subsistence farmers who derive income from diverse farming and non-farm activities. The micro-credit is mainly used to pay school fees and investments in small non-farm businesses. The result of the investigation was that the majority of borrowers was satisfied with the program and that the defaulting on loans was quite low. Finally, we may conclude that the program contributes to wellbeing of the borrowers.

The research question in 'The added value of sustainability motivations in understanding sustainable food choices' by Muriel Verain, Marleen Onwezen, Siet Sijtsema and Hans Dagevos is whether sustainability motivations contribute to sustainable food choices. The results indicate that process or sustainability motives are of added value above product motives in the understanding of consumer food choices. This paper shows that the understanding of sustainable consumption can be improved by considering sustainability motives apart from product motives. Further, it is important to take the sustainability dimension (e.g., fair trade versus environment) and the product category (e.g., meat versus fruit) into account. All in all a most useful extension of the theory on consumer choices.

Lynn Frewer, David Coles, A.M. Dijkstra, S. Kuznesof, H. Kendall, and G. Kaptan discuss in their paper 'Synthetic biology applied in the agrifood sector: societal priorities and pitfalls' several issues in this area. Synthetic biology offers potential for innovation in the agrifood sector, although concerns have been raised consumer rejection of applications will occur similar to that associated with the introduction of genetically modified foods. Risk-benefit assessment should address socio-economic, as well as health and environmental impacts. Ethical issues may be of particular relevance to the application synthetic biology, and may also resonate with societal concerns. A case-by-case analysis of relevant issues may be needed, and innovation must be driven by societal and consumer preferences as well as technological possibilities. Research into consumer and societal priorities is required early in the innovation trajectory.

The Section Allergy starts with a review of the literature by Prescilla V. Jeurink, Athanasios Damiali, Harry Wichers, and Huub F.J. Savelkoul in their contribution 'The mutual influences of man-made pollutants

and allergic manifestations'. The review provides an overview of the different types of pollution, and the health effects triggered by especially air pollution ranging from heart disease, pulmonary disease, cancer, to fatal respiratory infections. In addition, the differences in how pollution-induced effects are affecting different age-groups are discussed. Finally, the socio-economic causes and consequences (e.g. Quality of Life and Years of Life Losses versus medical care cost) of these pollution-induced diseases are debated.
Jantine Voordouw and her co-authors - Gerrit Antonides, Margaret Fox, Inma Cerecedo, Javier Zamora, Belen de la Hoz Caballer, Ewa Rokicka, Judith R. Cornelisse-Vermaat, Maciej Jewczak, Pawel Starosta, Marek Kowalski, Monika Jędrzejczak-Czechowicz, Sonia Vázquez-Cortes, Sara Cano-Escudero, Bertine M.J. Flokstra-De Blok, Anthony E.J. Dubois, Miranda Mugford, Lynn J. Frewer - assess 'The direct and indirect costs associated with food hypersensitivity in households: A study in the Netherlands, Poland, and Spain'. A self-administered postal survey was conducted (n=1558) in three counties with a treatment and a control group. It appears that the average total direct and indirect costs across all countries for families with food hypersensitive family members are not higher than for households without food hypersensitive members. However, the intangible costs for food hypersensitive individuals appear to be higher than for individuals in the control group. The results do not support the hypothesis that all food allergies incur high costs to the individual. However, being hypersensitive to foods may have a negative impact on quality of life compared to people who are not food hypersensitive
The Section Happiness contains three papers. In their contribution 'Transition economy and happiness: the Czech Republic compared with The Netherlands in the 1990- 2004 period' Johan van Ophem, Vit Kohout and Wim Heijman analyse the relationship between income and happiness in the Czech Republic, a (former) transition economy, and the Netherlands. They conclude that in the beginning of the nineties, in the period after the great change of the economic system, the Czechs were less happy than the Dutch. Further, they found that the happiness of the Czechs has been gradually increasing and is approaching the level of happiness of the Dutch in more recent times, which can be related to a decreasing gap in income and other relevant variables. In both countries happiness is positively affected by subjective health status, perceived freedom of choice over life, being married or living together and satisfaction with one's financial situation and having trust in social institutions.
In 'A note on the measurement of the relationship between happiness and GDP' Wim Heijman, Johan van Ophem and Job van Logtestijn compare the results of the measurement of the relationship between happiness and GDP in the EU based upon 'unweighted data' with results based upon 'weighted data' which are supposed to present a more realistic picture of this relationship. It appears that the latter way of measurement shows an even stronger relationship between GDP and happiness than the former.
Morris Altman addresses several issues on the diminishing returns relationship between happiness and income in his contribution 'Is there a kink in the happiness literature'. Appling some of the results of prospect theory Altman argues that even if it were true that the marginal effect of income on happiness is zero, a reduction in income would probably reduce the level of happiness, yielding a kink in the 'happiness curve'. Also, applying a target income approach to the happiness literature, one can argue that pursuing higher target income, in itself, is a means of increasing life satisfaction.
In addition, applying insights from the capabilities approach, Altman argues that increasing income is a means of purchasing the capabilities to increase individual levels of happiness through the production of public goods, such as health care and education.

Applied Studies in Agribusiness and Commerce – APSTRACT
Center-Print Publishing House, Debrecen
DOI: 10.19041/APSTRACT/2016/2-3/1

SCIENTIFIC PAPER

SOME USES, UNDERUSES, AND MISUSES OF THE FINDINGS OF DISPARITIES BETWEEN PEOPLE'S VALUATIONS OF GAINS AND LOSSES

Jack L. Knetsch

Simon Fraser University

Abstract: *The well-known behavioural finding that losses have a greater impact on people's well-being than gains, has important implications for the study of individual and collective choices, as well as the ways in which analyses are carried out -- many more than have yet been seriously considered. It also has many for analysts' use of such tools as price elasticities, discount rates, value of statistical lives, risk analysis, and the like. A greater recognition of the behavioral findings would likely lead to reductions of the biases in many present analyses.*

Findings from the relatively new, but rapidly growing, field of what has become known as behavioural economics are not only providing insights to improve economic explanations, predictions of people's choices, and policy guidance, but they continue to raise serious questions about the appropriateness of the present near total reliance on standard economics as the only acceptable guide for economic analyses. A prominent example of a behavioural finding that differs from those assumed in standard economic theory is the repeated demonstration that people commonly value many losses more, and often much more, than otherwise commensurate gains. This is likely the most widely known, and arguably the most significant, empirical result from all research in behavioural economics to date.

Except for some entitlements, such as those held for resale rather than consumption (Kahneman, Knetsch, and Thaler, 1990) and those with very close substitutes, the empirical findings from hundreds of tests reveal that for large classes of goods and services, and especially those which are frequently the subject of explicit valuations and policy choices dependent on them, are overwhelmingly inconsistent with the equivalence assumption of standard economic theory. The ratios of the maximum people are willing to pay for entitlements (the WTP measure) to the minimum sums they demand to accept a loss of the same entitlement (the WTA measure), have commonly been found to vary from around 2 to 1, to 6 or 7 to 1 – disparities much greater than that of equality expected by economists and far in excess of any explanation, such as income effects, offered by standard economic theory.

The empirical evidence of valuation disparities have been reported in the most discerning and prestigious professional journals in economics, psychology, and related fields, with increasing frequency, for well over three decades. However, applications of these findings have been, at least to some, surprisingly limited and far from uniform across fields.

With little question, the most widespread and varied use of the valuation disparity findings has been made in issues of finance – even to the extent of a wide recognition of what has become known as almost a sub-field of behavioural finance. In this area, the years have witnessed the rapid growth of often imaginative well supported research and relatively ungrudging rapid use of the findings. Applications are increasingly common in not only traditional areas of financial dealings, such as in securities trading (for example, Odean, 1998), but extensively so in areas such as retirement savings programs. An important and illustrative example of the latter is one that made explicit use of the well-known behavioural finding that people generally find a loss far more aversive than a forgone gain of equal magnitude. Rather than asking new employees how much they want to contribute to their pension scheme, which they would likely view as a loss from what they regard as their reference wage or salary, they were instead asked how much of the foregone gain of a future wage increase they would give up and have contributed to their pension fund – a less aversive forgoing of a gain rather than a loss, and one that will occur in the future rather than now. This change from a present loss to a foregone future gain resulted in a continuing nearly four-fold increase in average voluntary contributions in the initial application, with similar changes in the many applications that have been implemented in subsequent years (Thaler and Benartzi, 2004).

In nearly all fields, other than finance, such as health, transportation, and, perhaps especially, environmental economics and policy, the applications have been far fewer and have failed to generate much peer approval – indeed, nearly all published reactions are quite the opposite. There have, for example, been a series of "reviews" published in recent years on the consensus over the validity and usefulness of behavioural findings in dealing with issues related to environmental values and policy. Essentially all provide negative conclusions and little encouragement to pursue changes from what has been found acceptable before. Smith

and Moore (2010), for example, conclude:

"We have argued that the most carefully reasoned analytical arguments within the behavioural economics literature do not as yet have specific insights to offer for practical benefit-cost analysis"(p. 231).

An even more recent review reaches a similar conclusion:

"We view the current state of the behavioral welfare economics literature as an important foundation for future research, but the existing theoretical work appears to be far from ready for use in practical policy analysis" (Gillingham and Palmer, 2014, p. 28).

This is not to suggest an absence of a growing literature concerning implications in these various fields, but it is to note the relative scarcity of concomitant actions – more talk, but little else. The seemingly prudent caution to avoid the error of making use of misleading findings, that reviews and assertions such as these call for, comes, however, with a cost. It can lead to foregoing the benefits of possible missed opportunities for improvements that more accurate assessments that the evidence suggests are available with more appropriate choices of welfare measure. The question seems more an empirical one of judging the accuracy and appropriateness of the alternatives on the basis of available evidence, rather than the often suggested one of slavish consistency with standard theory. The latter perhaps exemplified by suggestions such as, "A failure to satisfy the requirements of economic theory would suggest that the appropriate preferences were not being measured" (Diamond, 1996, p.346); "When value measures are derived using models of behavior, these models should be internally consistent and be based on accepted theories of preferences, choice, and economic interactions" (Freeman, Herriges, and Kling, 2014, p.38).

The Measures and the Disparity of Valuations Between Them.

The maxims of standard economic theory define the monetary value of a welfare gain resulting from a positive change as the maximum sum a person is willing to pay for it – the amount that leaves the individual indifferent between the status quo of retaining the money and foregoing the gain, and paying the sum and obtaining it (the willingness-to-pay, or WTP, measure). The parallel, and fully as valid and correct, view of standard theory for the monetary value of a loss of welfare resulting from a negative change is the minimum sum required for a person to accept it (the willingness-to-accept, or WTA, measure). The near universal announced intention of analysts in all fields is consistent with these dictums and the findings from behavioural studies provide little or no reason to challenge these prescriptions from standard theory. Indeed, the behavioural evidence suggests instead that better assessments would result from a more consistent application of this aspect of standard theory, rather than a lesser one.

The major wedge between analysts' practice and behavioural findings is largely the subsequent inclusion in standard economics of the assumptions that an income, or wealth, effect is the sole cause of any difference between the WTP and WTA assessments of the value of a change, and that this difference can nearly always be expected to be small and of little significance or importance – "… we shall normally expect the results to be so close together that it would not matter which we choose" (Henderson, 1941, p. 121). As the income effect was thought to be the only source of any difference between the results from using the two measures, as this was assumed to be of little or no consequence, and as it is "… often easier to measure and estimate" (U.S. Environmental Protection Agency, 2000, p.61), in practice the WTP measure has become the near universal measure of choice for assessing the monetary measure of losses as well as gains.

The issue raised by the behavioural findings, again is not with the accepted monetary measures of gains and of losses, it is with the assumptions that it is only income or wealth effects that can lead to a significant disparity between the WTA and WTP measures, and that as these can be taken as inconsequential, that the use of either measure will lead to equivalent monetary valuations. It is essentially an empirical assessment of the validity of these common assumptions – and the empirical evidence is overwhelmingly at odds with the assumption of equivalence.

Tests of essentially the equivalence assumption have been carried out, with increasing frequency, for over three decades. These have included hypothetical contingent valuation studies, real exchange laboratory experiments, and particularly in recent years, field and natural experiments in which people make real choices in their day-to-day lives in circumstances that yield a true test of their WTP and WTA valuations of gains and losses. Examples of these latter studies are ones showing that people are reluctant to accept losses in securities trades and commonly sell company shares that have gained in price while continuing to hold ones that have lost value – a bias that results in substantially lower total returns (Odean, 1998); and professional golfers, who regularly compete for very substantial money prizes, were found to putt less accurately to make a gain of a one-under par, birdie, than to avoid a loss of a one-over par, bogie – resulting in higher scores and lower winnings (Pope and Schweitzer, 2011).

Around 200 earlier valuation disparity studies were summarized in a meta-analysis by Horowitz and McConnell (2002). They found that the average WTA values were 6.7 times larger than the average WTP valuations of otherwise commensurate entitlements (the median ratio of WTA to WTP was 2.6). Tuncell and Hammitt (2014) provided a similar meta-analysis of 76 generally more recent studies, which reported results from a total of 337 individual tests, and found that the overall geometric mean of the WTA/WTP ratios was 3.28. They also reported that these ratios varied widely depending on the types of goods or entitlements being valued, ranging from a high of 6.23 for values of environmental goods and services and 5.09 for those involving health and safety, to 1.56 for lotteries and 1.45 for leisure and travel – differences possibly related to perceived substitutability among the entitlements.

Reports of contrary findings of equivalence between WTA and WTP valuations, that would be consistent with

the predictions based on standard theory, have been from studies focused mainly on procedural issues in laboratory studies (for example, Plott and Zeiler, 2005 and 2007), and on the adaptability of people and the consequent elimination of disparities with people's greater experience with the choices at issue (for example, List, 2003). Overall these studies have so far only addressed a small portion of the tests that have resulted in showings of large and statistically significant disparities, and even with these the presumed contrary results appear more likely to be the result of shifts in the reference state – which is the major factor influencing valuation disparities – induced by the procedures used in the experiments rather than gain-loss equivalence (Koszegi and Rabin, 2006; and with a confirming empirical test, Knetsch and Wong, 2009). Somewhat similarly, the lack of a reluctance to trade in the observed greater exchange activity of shopkeepers and dealers, seems far more likely to be due to trading being the point of their enterprise and a sale is therefore unlikely to be seen as a loss, than it is any evidence of an adaptability premise.

A more useful explanatory suggestion for the pervasiveness of reference dependence, at least for entitlements traded in markets with well-known market prices, is that giving up a good for a sum of money lower than the known market price may induce cognitive dissonance in some people (Weaver and Frederick, 2012). This dissonance may, in turn, give rise to a reluctance to sell even if the good has little or even no value to them. While a very plausible description for some findings, it clearly applies only to the limited portion of the disparity evidence that draws on trading of goods with well-known market prices. Further, this reason for the disparity seems more in the way of explanation for a disparity rather than evidence of its absence. While the accumulated empirical evidence indicates that not all positive and negative changes of entitlements are subject to disparities in people's valuations, it clearly shows the pervasiveness of the differences and their common substantial size. The behavioural findings also demonstrate that people value many, if not most, gains and losses not in terms of their final states, or end point outcomes, as assumed in standard economic theory, but instead in terms of positive and negative changes from a neutral reference state, which may, or may not, be the status quo or determined by extant legal entitlements.

People's preference, or value, function typically in these cases does not have the usual depiction of a continuous smooth curve driven by diminishing marginal utility over greater quantity, indicating that the value of a change from some quantity A to another B, is equal to the value of a change in the other direction from B to A. In cases of a valuation disparity, it is instead more accurately depicted having a "kink" at the reference quantity, and a steeper slope in the domain of losses below, or short of, the reference quantity, and a lesser slope above, or beyond the reference quantity, as indicated in Figure 1. Given a value or utility or welfare scale on the vertical axis, a negative change in the quantity of the good from, say, the reference state, R, to L, is clearly of greater consequence or value, than a positive change of equal magnitude from the reference, R, to a quantity, G.

Gains vs. reduction of loss

An important, but largely overlooked, implication of the reference dependence of changes, is that a positive change may be a gain, if it is perceived by people as an added quantity over and above the reference quantity (a move from R to G, in Figure 1); but it can also be a reduction of a loss, if perceived by people as a move to the greater quantity level of the reference state (a move from L to R, in Figure 1). For example, people living near a body of water – a lake, a harbour, a river, or whatever – are very likely to regard the reference state of their environment as an expected or normal one without the advent of an oil or toxic waste spill. If such a spill were to occur, it can usually be safely assumed that it would be regarded as a negative change relative to the reference state, and therefore considered by them to be a loss. The monetary value of such a negative change would then be the minimum sum they would require to be as well off as they would be at the reference level of environmental quality without the spill – the WTA measure. As the reference state of a water body without an oil or toxic waste spill is unlikely to chance if such a spill occurs, the clean-up of the spill would then be regarded as a reduction, or elimination, of the consequences of the spill. The monetary measure of the value of such a change, would be the sum necessary for them to forego the clean-up that would return them back to the level of welfare they enjoyed with the reference state of the environment – the WTA to forego the change (for example, Knetsch, Riyanto, and Zong, 2012). Although the practice is overwhelmingly to use the WTP measure of the maximum sum people would be willing to pay to clean-up a spill, this will very likely understate the real welfare loss of people effected by the spill and to therefore provide often seriously biased guidance on whether or not a clean-up of a spill is economically worth undertaking.

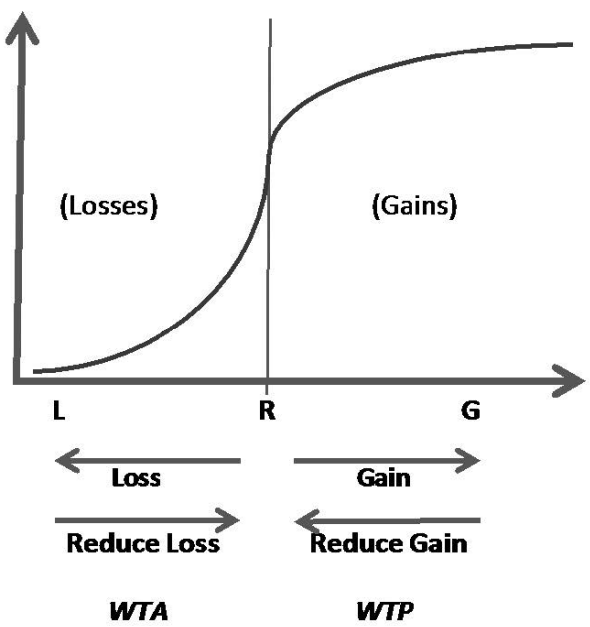

Figure 1. Reference Dependent Positive and Negative Changes.

Other cases of whether a positive change should be best treated as a gain or a reduction of a loss may also be fairly easily resolved. For example, ones such as stopping a physical assault are almost certainly to be best regarded as eliminating a loss, and not a gain from a reference of being physically beaten. They are therefore, best thought of as being worth the equivalence of the sum of money the person would demand to allow the abuse to continue. While this by itself would be an exceptional case unlikely to be of much import in reality, it is very likely illustrative of a wide range of instances that might be regarded as such. For instance, medical treatment of a child's injury or illness may be better thought of in terms of the sums people would demand to forego it – a context that may well give rise to justifications for levels of support for medical services far larger than normally thought of when considered in the usually less than appropriate ways of how much they are willing to pay for them.

The same may be the case for others in which contemplated positive changes are nearly always regarded by analysts as gains rather than reductions or eliminations of losses. Notions of "safe" may serve as the reference level for many instances in which improving safety standards are then better regarded as a reduction of a loss from that reference, rather than a gain beyond it. References of "clean" or "unpolluted" may also influence, if not dictate, people's feelings of the importance of pollution control policies – a "correction" that would call for greater levels of support for *protecting* and *improving* the environment than are prompted by the current practice centred on how much people would pay for such "gains".

Losses vs. foregone gains

An analogous distinction can be made for the case of negative changes. These can be either a loss from the reference, (a change from R to L in Figure 1); or foregoing of a gain back to the reference state (from G to R, in Figure 1). If a loss, its value is then most appropriately made in terms of the compensation people demand to accept it (to leave them indifferent between their well-being at the reference state and their equivalent level of welfare suffering the loss but with suitable monetary compensation, the WTA measure). If a reduction of a gain, but with a reference state remaining at R (in Figure 1), such as might occur with a taking away of some temporary facility or entitlement, its value is then given by the sum they would be willing to pay to remain in the gains beyond the reference state, the WTP measure (Knetsch, Riyanto, and Zong, 2012).

While valuation issues frequently arise in cases of losses, as well as with reductions of losses, changes in the gains – both gains and foregoing of gains – are likely to be frequent as well, but perhaps less likely to be of as much policy and analytical concern.

Some Implications of the Disparity in Valuations. Price elasticities

The implications of the findings of pervasive gain / loss valuation disparities go well beyond issues of welfare assessments and the like, and include a wide range of the mainstays of economic analyses. One, for example, is the estimation and interpretation of measures of the sensitivity of the response to changes in the levels of prices – commonly the estimation of price elasticities. While differing depending on markets, length of run, and the like, nearly all such analyses take as their empirical focus, observations of differing prices and the quantities demanded at these varied price levels. However, although the price level is likely a very important determinant of quantity, it is also the direction of the change that gave rise to each price that may also greatly influence the demand response. People may well regard an increase in price as a loss from a reference of an earlier or "normal" price, and consequently react more to this change by then buying much less at this "new" price, than they would if this same price resulted from a decrease in price, which they would likely regard as a gain. And as people have been shown to be more sensitive to losses than to gains, a change to the same price after a price increase is likely to prompt different purchase decisions than those following a price decrease – resulting, therefore, in different elasticity measures.

In a surprisingly rare instance in which price elasticity estimates were made separately for price-quantity observations after a price increase and after a price decrease, Putler (1992) found that the estimates for retail sales of eggs were -1.10 for observations after a price increase and -0.45 for those after a price decrease. People in this market clearly reacted more responsively to price increases than to price decreases. Here again, people were differentially more sensitive to losses than to what they regarded as gains.

Marketing studies have, over the years, taken some account of the difference in consumer response to price increases relative to price decreases, but these appear to be mostly in terms of how consumer decisions are made and as a factor to be considered in store promotions and the like, rather than in terms of estimates of elasticities to be used in guiding price policy (for example, Somervuori and Ravaja (2013). Curiously, in spite of the importance of this policy tool in fields as diverse as energy policy and medical treatment costing, in current practice little or no account appears to be taken of this potentially important factor, one that on current evidence could lead to much more accurate and useful outcomes. This may be yet another observation of the resistance to change implied by the reference effect itself.

Reference dependent changes in taxes and fees

Aside from the benefits that might attend more attention to price change in estimates of the price elasticities of private goods, there might well be a somewhat similar payoff to such greater attention to people's responses to the initial setting and changing levels of Pigouvian taxes and fees – collections

such as road tolls, pollution taxes, and penalties for delinquent income tax fillings, that are primarily implemented to change behaviours rather than to raise money for government operations and programs. Mostly anecdotal evidence suggests that initial imposition of such taxes quite commonly causes a substantial change in behaviour, at least in the short run, but subsequent changes in the tax or charge levels very often result in very modest further change. A better understanding of people's response to these taxes could well improve outcome estimates, but could also lead to a better accounting of factors that influence responses – as, for example, the increasing use of electronic road tolls that eliminate the inconvenient and traffic-slowing stopping at toll booths but do so likely at the cost of reducing the deterrent effect of the tolls – and lead to improvements in their design that would increase sensitivity and response levels.

Tradeoffs between present and future losses and gains

Another staple of economic analysis for which the disparity between valuations of gains and losses is likely to have major implications, is the discount rate that people use to trade-off present and future consumption. A discount rate is often applied, for example, to establish the present value of a future return from some facility or program, so that more informed judgments can be made of the worthwhileness of the cost incurred now to produce this return. A return of €100 in a year's time is currently worth €95.20 if discounted at 5 percent, but worth only €92.60 if discounted at 8 percent.

Establishing the appropriate discount rate to be used to estimate the present value of future costs and future benefits of various proposed projects or programs, has given rise to a long, voluminous, and rarely conclusive literature going back over many years. In all of this extensive debate, it has been widely agreed that whatever discount rate is used to calculate the present value of a future loss or gain, the same rate should be used for both. Not only has the issue of comparability of discount rates for future gains and future losses not been seriously addressed, or, often, even mentioned, but analysis practice the world over is firmly based on the same rate being applied to both. This, despite bits of seemingly persuasive empirical evidence, such as an early study provided by Thaler (1981), demonstrating that people discounted the value of future gains with a substantially higher rate than they used to discount the value of future losses. Given the extent of the evidence that people so commonly value present losses more than present gains, it seems likely that they too would value future gains and losses differently and use differing discount rates to do so.

Just as the value of an immediate gain is the maximum sum a person would be willing to pay now to receive it, the present value of a gain accruing in the future is appropriately measured by the maximum amount the individual would sacrifice now to receive an entitlement to the future benefit. The appropriate measure of a future gain is then, for most purposes, a valuation based on the willingness to pay measure. Similarly, just as the value of a loss is correctly measured by the minimum compensation demanded to accept it, the present value of a future loss imposed on an individual is the compensation that would leave the person as well off as without the change, the WTA measure.

Observations, from some studies, of people demanding more to accept a future loss than they are willing to pay for a future gain, may not, however, provide evidence of a disparity between the gain and loss discount rates. Such differences may well reflect a combination of he impacts of the gain – disparity in the valuation of the good itself, whether consumed now or in the future – and a difference in the rate at which people discount future gains and losses. This can therefore lead to incorrect conclusions that the observed differences resulted from a variation in discount rates alone. The difficulty might be illustrated with the case of the valuations of the future gain or loss of a mug. Previous studies have shown that people are willing to pay much less to acquire than they demand to give up a future mug. Observing that they would pay less to gain a future mug than they require to give up an entitlement to a future mug, may then be due to the gain-loss disparity of mug valuations, whether occurring at present or in the future, together with whether individuals use identical or different rates of discount for future gains and future losses.

This difficulty does not arise if the exchanges are made in the same metric, such as paying or receiving money now in exchange for receipt or disbursement of money in the future. With money, for example, people would presumably pay up to but no more than $10 to gain $10 and would demand at least but no less than $10 to give up $10. Therefore, any observed difference in people's willingness to pay $10 in the future and the compensation they demand to give up $10 in the future, would be due to different discount rates for gains and losses. The Thaler (1981) study, noted above, is illustrative of the relatively few that have made use of this design and as a result have provided clear evidence of the common presence of a disparity between the rates people use to discount the value of future gains and losses.

WTP/WTA for increasing and decreasing risks

Somewhat analogous implications of the discount rate difference, arise with determinations of the values people place on increases and decreases in the risks of negative outcomes (with likely symmetric implications for changes in the chances of positive outcomes). Typically, programs or activities that are seen as responsible for changing the risks for people are evaluated in terms of how much people are willing to pay for a decrease in the risks of the negative outcome – for example, the risk of health impacts from industrial pollution. The results are then commonly indiscriminately used to assess the value of increases as well as decreases in such risks.

However, here again, given present evidence, there seems to be little reason to expect people's valuations of increases in risks to be identical, or even very close, to their valuations of decreases in such risks. As increases in the risks of a negative outcome are most appropriately valued with the WTA measure, the common use of the WTP measure is likely

to systematically bias their assessments, resulting in fewer precautions and more illness and injury.

One specific, and widespread, use of people's valuations of risk changes, is in the estimation of the value of a statistical life. To the extent that valuations are made in terms of people's WTP, it likely biases the resulting estimates, and here again the guidance provides by them is likely to be distorted.

Some Conclusions

The ubiquity of behavioural findings that have important implications for individual and collective choice and decisions is becoming more widely appreciated throughout the world, though clearly not uniformly across fields or locales. In the case of people's greater weighting of the value of losses over the value of gains, research and applications are far and away more prominent in matters related to finance, including individual decisions as well as collective policies, related to pension schemes and savings, with less, and usually much less, attention being attracted in other areas such as environmental quality valuation and policy and health and safety – specifically the fields the Tuncel and Hammitt (2014) meta-analysis suggest are more likely to exhibit larger valuation disparities.

An interesting development related to this recognition of the possible uses of behavioural findings is the appearance of government and quasi-government agencies charged with finding applications of behavioural findings to improve government programs and operations. Among the most prominent, and active, is the so-called "Nudge Unit" (officially, The Behavioural Insights Team) in the U.K., which has been able to draw on many behavioural findings to implement policies and procedures that have improved government operations and outcomes across a wide spectrum of activities. One interesting characteristic of not just the U.K. unit, but of all, is that while academic discourse tends to discount results that may be statistically significant but are of seemingly little economic importance, this is often much less the case with applications that may only involve a small proportion of the target population, but if that population is in the millions or tens of millions, which it often is, the impact can indeed be significant and much worth doing (Halpern, 2015).

Another, largely yet unresolved issue, is the extent to which people from different countries and regions may react differently than people from countries where most studies were carried out – these being until very recently, largely in North America and Europe. Most people are aware that in spite of pushes from changes in communications, the growth of international trade and international tourism and visitation, the growing universality of chain store enterprise, and the large numbers of students studying in foreign schools and universities, all of which are among those pushing towards homogenization of people and their reactions to change, populations remain different in many ways. There is growing evidence that whatever their cultural and other differences, when anecdote is replaced with controlled tests, behavioural reactions to choices and changes are very largely the same. But these tests have not yet been carried out in sufficient detail and in enough locations to reach totally firm conclusion – more empirical evidence is still clearly needed, on this as on so many other issues and problems.

A subsidiary conclusion on the issue of whether people act in similar ways or not is, however, in keeping with so much of what has already been found from behavioural studies, that much can almost always be done based on what has already been confirmed.

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Applied Studies in Agribusiness and Commerce – APSTRACT
Center-Print Publishing House, Debrecen
DOI: 10.19041/APSTRACT/2016/2-3/2

SCIENTIFIC PAPER

THE ROLE OF MENTAL BUDGETING IN HEALTHY FINANCIAL BEHAVIOR: A SURVEY AMONG SELF-EMPLOYED ENTREPRENEURS

I. Manon de Groot[1] – W. Fred van Raaij[2]

[1] Netherlands Tax and Customs Administration, Utrecht, The Netherlands[1]
[2] Tilburg University, Tilburg, The Netherlands

Abstract: *Self-employed entrepreneurs (without personnel) manage their business and household finances at the same time. Both domains tend to interact with each other. In this study, it is studied whether and how self-employed entrepreneurs manage their finances. More specifically, the role of mental budgeting and time orientation in healthy financial behavior is studied.*
Mental budgeting is a way to manage expenses. It entails setting budgets, making reservations on budgets, compensating after too much spending on a budget, and non-fungibility (treating money as earmarked and categorized). It can be expected that self-employed entrepreneurs using mental budgeting strategies behave in a more healthy financial manner.
Survey data were collected among self-employed people without personnel in The Netherlands. The survey contained, among others, questions about the company, time orientation, financial management, tax attitude, reported tax compliance, and concern or worry about the future. Questions were factor analyzed using principal component analyses. The resulting scales were used for further analyses. Regression analyses were performed to predict concern or worry about finances, financially restricting to and exceeding budgets, and reporting tax compliance.
In this paper, two components of time orientation are distinguished: awareness of consequences and carelessness about the future. From these components, four orientation types of self-employed people were obtained. The orientation type focusing on long-term consequences shows more healthy financial behavior, whereas the orientation type focusing on the present and less on consequences shows less healthy financial behavior. Responsible and healthy financial behavior of self-employed entrepreneurs is related to focusing on long-term consequences, using mental budgeting, and keeping one's budgets.
Aspects of mental budgeting are predicting worry about business finances. Differential effects of mental budgeting were found on restricting one's budgets, and exceeding budgets, respectively. Of two measures of future circumstances (work disability, pension), only pension measures were predicting worrying about finances. Mental budgeting was not related to tax compliance, except for fungibility. Past tax behavior is predictive of other (past) tax behaviors. Fiscal history measures prove to be correlated with present measures.

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1 The views and expressions in this paper are those of the author and do not reflect the official policy of the Netherlands Tax and Customs Administration.

INTRODUCTION

For self-employed entrepreneurs, the goal of responsible financial behavior is to continue the company, make it profitable, and to improve personal financial well-being. This contributes to society, in the sense that people with responsible financial behavior are less likely to have financial problems such as problematic debt, and are less likely to have health problems such as anxiety and depression (Gathergood, 2012a). Financial problems may also cause disagreement and conflict between partners (Kirchler, Rodler, Hölzl, & Meier, 2001). Further, worrying about financial problems takes away mental resources and may cause lower performance at work. Financial knowledge (literacy), skills, and advice from experts could improve happiness and financial well-being of the household. Financial well-being may be defined as a state of security and certainty that financial matters are well-organized and effective for attaining goals of the business and the household.

A tool for responsible financial behavior is mental budgeting, as a way to obtain an overview of and to control expenses for different budgets or expenditure categories (Antonides, De Groot, & Van Raaij, 2011). Aspects of mental budgeting were identified and used to predict financial behaviour. More specifically, in this paper, the determinants ate investigated of concern and worrying about business obligations, financially restricting to and exceeding budgets, and tax behavior for self-employed entrepreneurs without personnel.

Responsible financial behavior

Financial behavior can contribute to attaining the (life) goals of the business and the household. These goals can be: (1) that the company will not go bankrupt (preventive goal), (2) maintaining or reaching financing the continuation of the business and the household (maintenance goal), (3) financing future business and household purchases through saving and

credit, and (4) becoming wealthy (promotional goal) (Zhou & Pham, 2004). In the ideal case, responsible financial behavior is based on a financial plan for reaching life and business goals, and optimizing income and expenditure over the life cycle. Or defined even more broadly: responsible financial behavior is maximizing lifetime utility, based on trade-offs between business and household finances, between spending, saving and investing, and managing financial assets. For self-employed people, responsible financial behavior is thus based on a combination of business planning, life planning, and financial planning (Van Raaij, 2016).

The consequences of responsible financial behavior are both at the individual and the societal level. Responsible financial behavior should improve financial well-being and happiness of self-employed people and their household (Gathergood, 2012a). A societal consequence of responsible financial behavior is a lower need for assistance and financial support to solve debt problems. People without financial problems also perform better at work, because they worry less about money problems (Gathergood, 2012a).

Self-employed entrepreneurs

Self-employed people constitute a growing group of people in Dutch society. Self-employed entrepreneurs (persons who own a one-person company without personnel) usually run their business from home, such as farmers and craftsmen, or from a collective business office with facilities such as computer/IT, and secretarial services. Compared to employees, it is more likely that business and household finances of the self-employed are interrelated or sometimes even mixed-up. This implies that they may "borrow" money for business purposes from their household budget and vice versa. In other words, self-employed entrepreneurs operate in two domains: as a citizen with household finances and as an entrepreneur with business finances. Not only the borderline between the roles, 'citizen' and 'entrepreneur', may be weak. The borderline between the respective finances may be weak too, or at least less distinct and separate. Consequently, the two financial domains and associated behaviors may be more interrelated. For example, concern about money in one domain may have impact on financial behavior in the other domain.

Self-employed entrepreneurs come from all ages, different stages in life, and have different motives for being self-employed. Some self-employed are officially retired and have both pension and business income whereas others have a job as an employee and work part-time for their employer and part-time for their own business. Due to the economic crisis and job loss, more people are part-time or full-time self-employed. Between 2007 and 2016, the number of self-employed people in The Netherlands increased with 71 percent (Statistics Netherlands, 2016), from 691,855 in 2007 (65 percent of all entrepreneurs) to 1,185,170 (77 percent of all entrepreneurs) in 2016. Of all those years, the increase in the number of self-employed was highest (2 percent) in 2009. One explanation could be that in 2008, at the depth of the financial crisis, many people lost their jobs and continued as self-employed. This may explain the high increase in 2009.

Self-employed people may differ in how they pay themselves their income. Some self-employed entrepreneurs assign themselves a fixed monthly salary from their own business. For income tax reasons, this salary may be kept low so that most money remains in the company. Other self-employed entrepreneurs may mix up their business and household money. For example, if the business income is high during a period, they pay themselves more personal income than during periods when business income is low. In other words, their household income is correlated with the business income. According to economic theory, self-employed entrepreneurs should allocate their household income based on the average business income of a mid-term period (2 to 3 years). This is according to the permanent income hypothesis by Friedman (1957). This means the self-employed should save during the "fat years" in order to use their savings during the "lean years." However, the problem is that it is often difficult to predict future business income and thus the "average" allocation of money to the household.

Self-employed entrepreneurs are doing both the financial affairs of their business and their household. In both domains, self-employed people should make ends meet, pay bills and taxes in time (short-term), make reservation for the future, such as job or labor disability insurance, save for pension and retirement, and decided on business investments (long-term). Compared with employees with a fixed income, self-employed entrepreneurs are a growing but less researched group in society.

SAMPLE

The sample was drawn from a panel containing 20,000 companies in The Netherlands. For this study, two separate samples were drawn. The first subsample consisted of 1,617 self-employed entrepreneurs who had been active with their business for more than three years ('non-starters'). The second subsample consisted of 2,595 entrepreneurs with company size varying from 1 to 4 persons. It was unknown from these respondents how long they had been active with their company. People in this second subsample were screened on whether they were self-employed (no personnel) and whether they had been in business for less than three years ('starter'). If people in the second subsample did not meet these two criteria, they were not eligible for the survey and considered as 'non-sample' from the second subsample.

The total net sample consisted of 654 self-employed entrepreneurs without personnel (response rate of 16%). The sample was representative with respect to age, gender and education level. Twenty-eight percent were 'starters'. The other 72% were 'non-starters'. The mean age was 49 years, with more men (66%) than women in the sample. The low response rate was due to (1) high non-sample in the second subsample (i.e. people were not self-employed and/or not a starter) and (2) non-response in both subsamples (people who did not fill out the questionnaire). In the final sample,

only self-employed entrepreneurs without personnel have been included. The respondents answered the questionnaire by computer-assisted web interviewing (CAWI) in February-March 2013. The questionnaire took about 15 minutes to fill out.

MEASURES

The focus is on variables that are indicative of responsible ('healthy') financial behavior. These variables are: mental budgeting (restricting and exceeding financial budgets), time orientation with respect to finances, concern or worry about financial obligations, and tax behavior (both attitudinal and reported tax compliance).

Time orientation. Time orientation is usually seen as either short-term (myopia) or long-term orientation. Long-term orientation includes considering future consequences of present behavior. It also includes accounting for the future, such as saving or insuring for job/work disability and retirement (pension). Time orientation was measured by the agreement with statements such as "When I make a decision, I think about how it will affect my future", "With regard to the future one should always consider that things could go worse" and "The future will take care of itself." *(5-point Likert scales with 1=completely disagree to 5=completely agree)*.

Mental budgeting. Mental budgeting is a way to control expenses (Antonides et al., 2011). In mental budgeting, expenditure categories are distinguished, labeled, and monetary budgets are allocated to these categories. This is often done for fixed (e.g., monthly) periods, because income (of employees) usually comes in fixed (monthly) payments. Also, many expenditure categories such as rent and mortgage payments, or subscriptions are monthly payments. Generally, people try not to overspend on their monthly budgets. Mental budgeting activities were measured by statements such as "I always keep an amount of money in my bank account for unforeseen expenses", "I always reserve money for a number of expenditures" and "I always reserve money in case the tax administration requires me to pay taxes." Respondents indicated to which degree these statements applied to them *(5-point scales with 1=does not apply to me at all to 5=applies to me a lot)*.

Concern or worry about business finances. The questionnaire contained three statements about financial concern: "I worry that I cannot pay my business bills", "I worry that my business means [capital] will be depleted", and "I worry that I cannot afford business expenses." It is assumed that self-employed entrepreneurs who apply mental budgeting to control their expenses, worry less about money than people who do not apply mental budgeting. Respondents indicated to which degree the statements applied to them *(1=does not apply to me at all to 5=applies to me a lot)*.

Overdraft. Bank overdraft (being in the red) of the business account was measure by "Is your business account ever overdrawn?" *(three response options: yes, but mostly the amount is lower than my income; yes, and sometimes the amount is higher than my income; no, never)*.

Escalation of commitment. This was measured by four statements, reflecting whether people take earlier expenses into account when making financial decisions. Examples of these statements are "It often happens that I spend more money than planned" (exceeding the budget) and "When I make an investment, I set a fixed amount in advance" (restricting the budget). Respondents indicated to which degree the statements applied to them *(1=does not apply to me at all to 5=applies to me a lot)*.

Tax behavior. Tax behavior was measured by attitudes towards paying taxes, and past tax behavior. Tax attitudes (tax morale) were measured with three statements: "How important is it for you that the tax administration receives the company's tax return in time?", "How important is it for you that the tax administration receives correct and complete tax returns" and "How important is it for you that when money must be paid to the tax administration, it is paid in time?" *(1=very unimportant to 5=very important)*. Past tax behavior was measured by asking whether the tax administration had taken measures due to late payment, due to late tax filing and whether there has been a payment scheme arrangement during the past three years *(yes; no; don't know)*.

Measures for pension saving and work disability. Respondents were asked whether they had taken measures for their pension and retirement income, and measures such as taking insurance for work disability *(yes; no; don't know)*.

ANALYSIS AND RESULTS

Scale construction

All rating scale items were subjected to principal component analysis (PCA) with either varimax (orthogonal) rotation or oblimin (non-orthogonal) rotation. Varimax rotation provides non-correlated (independent) components, whereas oblimin rotation provides correlated components. For all scales, a scale index (scale score) has been calculated by taking the average of the statements that constitute the respective scales (Table 1). For all scales, higher scale scores are indicative of 'more of' what the scale intends to measure (i.e., how the scale is labeled). For example, a *higher* index score on the fungibility scale means that money is considered as *more* fungible (more "free floating" and less restricted to a budget) than for a lower index score. Likewise, a high worry score implies more worry about finances than a low score.

The principal components analysis of the time orientation statements yielded two independent components after a varimax rotation. The first component has been labeled ***awareness of consequences*** (Cronbach's alpha = .66) with four statements *with 1 = low to 5 = high awareness of consequences*:

- When I make a decision, I think about how it will affect my future.
- With regard to the future, one should always take into

account that things could go worse.
- With everything I do, I think about the immediate consequences.
- It is important for me to save some money for later.

The second component of time orientation was labeled ***carelessness about the future*** ($r = .30$, $p < .01$) and was constructed from the following two statements *with 1 = low carelessness (thus being careful) to 5 = high carelessness*:
- I think that the future will take care of itself.
- I ignore warnings about future problems, because I think that these problems will be solved automatically.

The principal components analysis of the mental budgeting statements yielded three correlated components after an oblimin rotation. The first component was ***making reservations*** (Cronbach's alpha = .81) and consisted of the following five statements *with 1 = low to 5 = high on making reservations*:
- I always keep an amount of money in my bank account for unforeseen expenses.
- I always keep an amount of money in my bank account for nondiscretionary expenses.
- When I expect a particular expenditure, I reserve money for this.
- I have reserved money for different expenditures.
- I always reserve money in case the tax authority requires me to pay an after tax.

The second component of mental budgeting was interpreted as ***compensating*** ($r = .65$, $p < .01$) and consisted of the following two statements *with 1= low to 5= high on compensating*:
- When I have too many expenses within a specific budget in a particular period, I will spend less of this budget in the remainder of the period.
- When I have too many expenses within a specific budget in a particular period, I will spend less of this budget in the next period.

The third component of mental budgeting has been labeled ***fungibility*** (Cronbach's alpha = .73). Fungibility means that money is "free floating" (only one budget) and money is not earmarked for a particular category or budget. This component was formed by the following three statements *with 1 = low to 5 = high on fungibility*.
- Sometimes I spend money reserved for a particular category on another category.
- When I am short of money for my business, I sometimes use money reserved for something else.
- I seldom spend money reserved for a particular category on another category.[1]

Oblimin rotation is non-orthogonal. This means that the three mental budgeting components are not independent of each other but correlated. The correlation between making reservations and compensating is .365 ($p < .01$). The correlation between making reservations and fungibility is –.460 ($p < .01$). The correlation between compensating and fungibility is –.084 ($p < .05$). Thus, the more people make reservations, the more they compensate, and the less they consider money as fungible. The last correlation implies that the more people use compensating strategies, the less they consider money as fungible (i.e., more non-fungible).

The component ***concern or worry about business financial obligations*** (Cronbach's alpha = .91) was constructed from the following financial concern or worry statements *with 1 = low to 5 = high on concern or worry*:
- I worry that I cannot pay my business bills.
- I worry that my financial business means will be depleted.
- I worry that I cannot afford business expenses.

The principal components analysis on the statements on escalation of commitment yielded two components. The ***financial restriction*** (and adhering to budget limits) component ($r = .30$, $p < .05$) consists of the following items *with 1 = low to 5 = high on restriction*:
- When deciding on whether to invest or not, I take previous related investments into account.
- When I make an investment decision, I set a fixed maximum amount in advance.

The ***financial exceeding*** component ($r = .48$, $p < .05$) consists of the following two statements *with 1 = low to 5 = high on exceeding*:
- It often happens that I spend more money than I planned.
- I find it hard to stop spending money on something of which I am not sure whether it will yield a gain.

The principal components analysis of the tax attitude items yielded one component ***tax morale*** (Cronbach's alpha = .88) based on the following statements *with 1 = low to 5 = high on tax morale*:
- How important is it to you that the tax authority receives the company's tax return in time?
- How important is it to you that the tax authority receives correct and complete tax returns?
- How important is it to you that when money must be paid, the tax authority receives the money in time?

Note in Table 1 that fungibility, worry about finances, and financial exceeding are relatively low in this sample. Low fungibility is a good sign, because many self-employed entrepreneurs seem to categorize and earmark their money into budgets. And the level of concern or worry about finances among the self-employed entrepreneurs is not very high. Financially exceeding limits and budgets is also low. This is an indication that many self-employed entrepreneurs adhere to their budgets. And note that awareness of consequences, making reservations, and keeping (restricting to) budgets are relatively high in this sample. Many self-employed entrepreneurs seem to think about the consequences of their behavior, many make reservations (budgets) for future contingencies, and keep their budgets.

1 Reversed coding for calculating scale scores.

	n	Mini-mum	Maxi-mum	Mean	Standard deviation
1. Aware of consequences	654	1	5	3.76	0.62
2. Careless about the future	654	1	5	2.85	0.78
3. Making reservations	654	1	5	3.66	0.84
4. Compensating	654	1	5	3.47	0.90
5. Fungibility	654	1	5	2.49	0.87
6. Concern or worry about finances	654	1	5	2.52	1.17
7. Financial restriction	654	1	5	3.60	0.87
8. Financial exceeding	654	1	5	2.09	0.85
9. Tax morale	654	1	5	4.21	0.80

Table 1. Descriptive statistics of the computed scales.

Defining orientation types

Based on the two components derived from the time orientation statements (aware of consequences and careless about the future) a new variable was computed based on individual scale scores with respect to the sample means of these two components (below or equal to the mean vs. above the mean). This yielded four orientation types (Table 2). A1 and B1 respondents have scores below or equal to the mean, whereas A2 and B2 respondents have scores above the mean. The four orientation types may be described as follows:

Type 1 respondents focus on the future, but are less aware of the consequences of their behavior and decisions. **Type 2** respondents focus on the future and are highly aware of consequences. In other words, they focus on long-term consequences. For Types 1 and 2, it is assumed that low carelessness about the future is the same as care and concern about the future. **Type 3** respondents focus less on the future and are less aware of consequences. Respondents classified as **Type 4** focus less on the future, but are highly aware of consequences. Thus, they focus more on short-term consequences.

	Awareness of consequences (A)	
Carelessness about the future (B)	**Low (A1)**	**High (A2)**
Low (B1)	**Type 1 (19%) Focus on future, and less on consequences**	**Type 2 (24%) Focus on long-term consequences**
High (B2)	**Type 3 (36%) Focus on present, and less on consequences**	**Type 4 (21%) Focus on short-term consequences**

Table 2. Four orientation types (n=654) based on awareness of consequences (A) and carelessness about the future (B).

60 Percent of the respondents are of Type 2 and Type 3 (Table 2). This concerns the well-known bipolar distinction between future-time (Type 2) *versus* present-time (Type 3) orientation. About 40 percent of the respondents are classified in the 'odd' Types 1 and 4 with focus on the future but less on consequences (Type 1) and focus on short-term consequences (Type 4), respectively. The four types are used in further analyses to check whether 'orientation type' affects financial behavior.

Financial behavior and orientation types

For each scale it was checked whether there was an effect of orientation type. Mean and standard deviations of the scores for each orientation type are given in Table 3.

Financial behavior	**Type 1**	**Type 2**	**Type 3**	**Type 4**
Making reservations	**3.49** ^{a}	**3.99** ^{b}	**3.37** ^{a}	**3.95** ^{b}
	(0.77)	**(0.76)**	**(0.86)**	**(0.73)**
Compensating	**3.41** ^{a,b}	**3.63** ^{b,c}	**3.28** ^{a}	**3.68** ^{c}
	(0.85)	**(0.92)**	**(0.85)**	**(0.92)**
Fungibility	**2.65** ^{b}	**2.18** ^{a}	**2.62** ^{b}	**2.46** ^{b}
	(0.79)	**(0.86)**	**(0.83)**	**(0.93)**
Worry about finances	**2.51**	**2.34**	**2.53**	**2.69**
	(1.14)	**(1.14)**	**(1.08)**	**(1.35)**
Financial restriction	**3.47** ^{a,b}	**3.90** ^{c}	**3.41** ^{a}	**3.70** ^{b,c}
	(0.85)	**(0.82)**	**(0.80)**	**(0.95)**
Financial exceeding	**2.16** ^{b}	**1.84** ^{a}	**2.23** ^{b}	**2.06** ^{a,b}
	(0.81)	**(0.80)**	**(0.88)**	**(0.84)**
Tax morale	**4.16** ^{a,b}	**4.36** ^{b,c}	**4.03** ^{a}	**4.39** ^{c}
	(0.80)	**(0.74)**	**(0.80)**	**(0.78)**

$^{a, b, c}$ **means with different superscripts differ significantly (rowwise)**

Table 3. Mean scores of financial behavior per orientation type (standard deviations in parentheses).

Making reservations. There is a significant main effect of orientation type on making budget reservations (F (3, 650) = 27.55, p = .000). Types 1 and 3 have significantly lower reservation scores than types 2 and 4. Thus, people focusing less on consequences make less budget reservations than people focusing more on consequences.

Compensating. There is a significant main effect of orientation type on compensating behavior (F (3, 650) = 8.20, p = .000). Type 3 respondents have significantly lower compensation scores than type 4 respondents. Both types are careless about the future. Thus, people with a low awareness of consequences show less compensation behavior than people with a high awareness of consequences.

Fungibility. The main effect of orientation type on fungibility is significant (F (3, 650) = 9.96, p = .000). Type 2 respondents have a lower fungibility score than the other three types. Thus, people who care about the future and are aware of consequences consider money as less fungible than the other three types. They adhere more to their budgets (i.e., spend according to the budget label) than the other three groups.

Concern or worry about business finances. No significant main effect has been obtained on the extent to which the four orientation types worry about their business finances (F (3, 650) = 2.17, $p < .10$). Thus, the extent to which people care about the future and are aware of the consequences of their decisions, does not affect how much they are concerned and worry about their business finances. Note that the standard deviations of worrying are higher than the standard deviations of the other scales (Table 3). There are more differences between respondents on worrying than on the other variables.

Financial restriction. The effect of the four types on financial restriction and adhering to financial limits is significant (F (3, 650) = 11.93, p = .000). Mean restriction scores are significantly higher for Type 2 than for Type 3 respondents. Thus, people who care about the future and are aware of consequences, use financial restriction (limitation) strategies more than people who do not care much about the future and the consequences.

Financial exceeding. The effect on financial exceeding is significant (F (3, 650) = 7.09, p = .000). Type 1 and Type 3 respondents, who have the highest scores, differ significantly from Type 2 respondents, who have the lowest scores. Mean scores for Types 1 and 3 do not differ significantly from each other. Thus, people who are little aware of the consequences of their decisions (regardless of whether they care about the future), exceed financial limits more than people (Type 2) who care about the future and are aware of consequences

Tax morale. There is a significant main effect of orientation type on tax morale (F (3, 650) = 8.39, p = .000). Tax morale is the lowest for Type 3 respondents and significantly lower than for Type 4 respondents. Both types are highly careless about the future. Given this, respondents who have a high awareness of the consequences of their decisions, have lower tax morale than people who have a low awareness of the consequences.

PREDICTING AND EXPLAINING HEALTHY FINANCIAL BEHAVIOR

In the following analyses, multiple regression analyses are reported in which variables/factors are identified that explain and predict indicators of responsible and healthy financial behavior. These indicators of responsible and healthy financial behavior are: concern or worry about finances, restriction of budget limits, exceeding budget limits, and tax compliance.

Predicting concern or worry about business finances

In the next analyses, a hierarchical regression analysis has been performed to test which variables are predicting concern or worry about business finances (Table 4). Five 'blocks' of variables are entered into the analysis. In *Model 1,* two knowledge variables are entered: self-reported financial knowledge and self-reported tax knowledge. The lower the values, the lower the self-assessed knowledge (*min=1, max=5*). In *Model 2*, the orientation variables (awareness of consequences and carelessness about the future) are entered. *Model 3* includes variables related to financial constraints (or lack of financial constraints) to the model: financially restricting and exceeding budget limits. *Model 4* includes measures for pension saving or work disability. In *Model 5*, the complete model, the mental budgeting variables are also entered.

In *Model 1*, both knowledge variables are negative predictors of financial concern or worry. The lower one's financial and tax knowledge, the more people worry about their business finances. However, these two variables explain only 5.1 percent of the variance. In *Model 2*, in addition to the two significant predictors of Model 1, carelessness about the future positively predicts financial concern or worry. Thus, as people care less about the future, they tend to be more concerned and worry more about their business finances. The model explains slightly more variance than the first model, namely 5.6 percent. In *Model 3*, the effect of financial knowledge disappears in favor of exceeding and overdraft, both positive predictors. As people's financial behavior is more characterized by exceeding financial limits or by more overdraft of their bank account, they are more concerned and worry more about meeting their financial business obligations. Tax knowledge remains a negative predictor of financial worry. The explained variance of this model rises to 21.5 percent. The results in *Model 4*, replicate the findings from Model 3, extended with measures taken for pension as a negative predictor. That is, people who have not taken financial measures for their retirement (pension), worry more about their business finances than people who have arranged something for their pension. Model 4 explains 22.2 percent variance in financial concern and worry. The last model, *Model 5*, demonstrates that the mental budgeting variables are significant predictors. As people tend to make fewer reservations, they worry more. Further, the more their financial behavior is characterized by compensating excessive spending, or the more they treat money as fungible (i.e., exchangeable), the more they worry about their business finances. Model 5 explains 31.4 percent of the variance.

Predictor variable	Model 1	Model 2	Model 3	Model 4	Model 5
Knowledge					
Financial knowledge	**–0.14****	**–0.14****	**–0.10**	**–0.08**	**–0.06**
Tax knowledge	**–0.12****	**–0.12****	**–0.11***	**–0.11***	**–0.13****
Time orientation					
Aware of consequences		**0.03**	**0.06**	**0.06**	**0.12****
Careless about future		**0.10****	**0.05**	**0.05**	**0.04**
Financial constraints					
Exceeding			**0.27****	**0.26****	**0.13****
Restricting			**0.05**	**0.04**	**0.07**
Overdraft (being in the red)			**0.27****	**0.28****	**0.19****
Measures taken					
For pension (0=no, 1=yes)				**–0.11****	**–0.09***
For work disability (0=no, 1=yes)				**0.04**	**0.04**
Mental budgeting					
Making reservations					**–0.15****
Compensating					**0.10***
Fungibility					**0.28****
Nagelkerke R^2	**0.051**	**0.056**	**0.215**	**0.222**	**0.314**

*** p < .05;**
**** p < .01**

Table 4. Hierarchical OLS regression analyses predicting concern or worry about business finances (beta values).

The results from this hierarchical regression analysis show that financial and tax knowledge and how people think about the future explain only a fraction (5.6%) of how much they are concerned and worry about their business finances. When variables related to how people treat financial constraints are added to the model, the explained variance increases to more than 20%. Measures taken for one's future financial situation slightly increases this to 22%. Mental budgeting skills increase the explained variance with 9% to more than 31%. Financial restrictions (constraints) and mental budgeting skills explain a lot of variance in how much people are financially concerned and worry about their business finances. To summarize the final model, Model 5: people worry more about their business finances, if tax knowledge is lower, if awareness of consequences is higher, if exceeding behavior is more prevalent, if they are in the red, if measures for pension are absent, if making reservations is less prevalent, if compensating behavior is more present, and if money is treated as more fungible.

Predicting financially restricting and exceeding budget limits

Financially exceeding budget limits is significantly related to concern and worrying about business finances (Table 4). In two next analyses, it is tested how the mental budgeting variables financial restriction and financial exceeding are related to other relevant financial behavior variables in this study. In the first analysis, the regression analysis has financial restriction as a dependent variable. In the second analysis, the regression analysis has financial exceeding as a dependent variable. In both multiple regressions, financial behavior variables are the independent variables. In Table 5, the beta values of the regression analyses are shown.

	Financial restriction	Financial exceeding
Financial knowledge	**.098**	**–.124***
Tax knowledge	**.032**	**.026**
Aware of consequences	**.107***	**–.026**
Careless about future	**–.047**	**.071**
Financial exceeding	**.022**	**—**
Financial restriction	**—**	**.020**
Overdraft (being in the red)	**.069**	**.078***
Making reservations	**.246****	**–.122***
Compensating	**.199****	**–.051**
Fungibility	**.018**	**.336****
Adjusted R^2	**.193**	**.240**

***p < .05; **p < .01**

Table 5. OLS regression results. Determinants of financial restriction and financial exceeding of budgets (beta values)

In Table 5, 'awareness of consequences', 'making reservations' and 'compensating' are significant predictors of financial restrictions. If people are more aware of consequences, make more reservations, and compensate more for earlier expenses, their financial behavior is more characterized by financial restrictions. Financial exceeding is significantly predicted by financial knowledge, overdraft (being in the red), making reservations, and fungibility. People with a low level of financial knowledge exceed their budget limits more often than people with a high level of financial knowledge. Also, people who are 'in the red' on their bank account are more likely to exceed their budgets than people who are not. Further,

people who make less reservations, tend to exceed their budgets more often than those who make more reservations. Lastly, people who consider money as more fungible, are more likely to exceed their budgets than people who do less. Note that 'making reservations' is the only variable that predicts both behaviors. Increasing financial knowledge will only affect exceeding behavior, not financially restrictive behavior.

The model of financial restriction has an adjusted R^2 of .193 and the model of financial exceeding has an adjusted $R2$ of .240. Note that because of the low $R2$s, we must be careful with the interpretation and conclusions of the results of Table 5.

Predicting reported tax compliance

As a proxy for tax compliance we take people's response (*yes, no, don't know*) whether (1) the tax administration had taken measures for late payment during the last three years, (2) the tax administration had taken measures for late filing during the last three years, and (3) whether an agreement on a payment scheme (because of late payment for taxes due) had been made in the past. For each analysis, respondents are excluded who answered 'don't know'. Three separate hierarchical regression analyses were performed.

'Blocks' of variables are entered in consecutive steps to predict the three outcome variables (Table 6). *Model 1* starts with the financial and fiscal knowledge variables as predictors. In *Model 2*, tax attitude has been added to the model. In *Model 3*, two tax compliance variables are added: whether the respondent and the tax authority have agreed on a payment schema for taxes due (yes *versus* no), and whether the tax authority had taken measures because of too late tax filing (yes *versus* no). *Model 4* includes variables regarding finances (exceeding and restricting on budgets, overdraw of bank account, and concern or worry about business finances), and *Model 5* is the complete model and includes the three mental budgeting variables.

Tables 6, 7, and 8 show the odds ratios (OR) of each predictor in relation to three outcome variables: measures taken by tax authority due to late payment, measures taken by tax authority due to late tax filing, and agreement with tax authority on a payment scheme. An OR value equal to 1 implies that the independent variable has no effect on the outcome variable. An OR value larger than 1 implies that an increase in the independent variable increases the likelihood that the event has taken place (here: that a measure has been taken). An OR value smaller than 1 implies that an increase in the independent variable decreases the likelihood that the event has taken place.

Measures taken due to late payment

In *Model 1* in Table 6, neither of the knowledge variables are significant predictors. Only 0.9 percent of the variance is explained by this model. Tax attitude is a significant predictor in *Model 2*: as tax morale increases, it is less likely that people have experienced measures taken due to late tax payment. Model 2 explains 2.9 percent of the variance. *Model 3* shows that the contribution of compliance disappears in favor of the two tax compliance variables. Having had measures taken such as a payment scheme to pay one's tax liability, and late tax filing are significant predictors of whether measures had been taken due to late payment. Explained variance increases from 2.9 to 31 percent. This implies that tax compliance adds a lot to explain late payment measures. In fact, related fiscal behavior variables explain the other fiscal behavior variable. The fiscal behavior variables are thus correlated. *Model 4* yields the same results as Model 3, including the restriction variable as significant predictor. Restricting one's expenses decreases the likelihood that a late payment measure has been taken by the tax authority. More than 36 percent of the variance is explained by this model. *Model 5* yields the same significant predictors as Model 4 with a slight increase in explained variance.

Predictor variable	Model 1	Model 2	Model 3	Model 4	Model 5
Knowledge					
Financial knowledge	.967	1.009	1.003	1.145	1.162
Tax knowledge	.826	.843	.929	1.008	.994
Tax attitude					
Tax morale		.706*	.871	.949	.970
Tax compliance					
Payment scheme (0=no, 1=yes)			5.224**	3.775**	.683**
Late tax filing (0=no, 1=yes)			0.959**	10.714**	.787**
Finances					
Exceeding				1.278	1.284
Restricting				.596**	.601**
Overdraft (being in the red)				1.519	1.401
Concern or worry about finances				1.257	1.221
Mental budgeting					
Making reservations					.776
Compensating					1.190
Fungibility					.926
Nagelkerke R^2	.009	.029	.310	.363	.367

* $p < .05$; ** $p < .01$

Table 6. Hierarchical logistic regression analyses predicting measures taken by tax authority due to late payment (0=no measure taken, 1=measure taken). Values in this table are the exponentiation of the b-coefficients, or odds-ratios (exp(b) values).

The mental budgeting variables are not significant for late payment measures. Thus, the only financial behavioral component that is predictive of a late payment measure, is the extent to which people take financial restrictions into account when making a financial decision. There is a small increase in explained variance to 36.7 percent. Fiscal history seems

to be predictive of (other) fiscal measures. Mental budgeting components do not play a role.

Measure taken due to late tax filing

In Table 7, the tax variable "measure taken by tax authority due to late filing" is explained by five models, similar to Table 6. The independent variable "late tax filing" has been replaced by "late payment." The two tax compliance variables are significant predictors of late filing. Fungibility (Model 5) has a strong positive effect on late filing. People who perceive money as flexible and do not apply mental budgeting, are more likely to file their tax declaration too late. The explained variance of Model 5 is 40.2 percent.

Predictor variable	Model 1	Model 2	Model 3	Model 4	Model 5
Knowledge					
Financial knowledge	.958	1.006	.981	.927	.862
Tax knowledge	.771	.787	.878	.885	.891
Tax attitude					
Tax morale		.671*	.818	.842	.779
Tax compliance					
Payment scheme (0=no, 1=yes)			4.127**	3.492**	3.128**
Late tax payment (0=no, 1=yes)			0.964**	1.302**	11.795**
Finances					
Exceeding				.982	.891
Restricting				1.445	1.407
Overdraft (being in the red)				1.130	1.076
Concern or worry about finances				1.360	1.187
Mental budgeting					
Making reservations					1.333
Compensating					1.321
Fungibility					2.206**
Nagelkerke R^2	.015	.037	.348	.368	.402

* $p < .05$; ** $p < .01$

Table 7. Hierarchical logistic regression analyses predicting measure taken by tax authority due to late tax filing (0=no measure taken, 1=measure taken). Values in table are the exponentiation of the b-coefficients, or odds-ratios (exp(b) values).

Payment scheme

In Table 8, the dependent variable to be explained is the payment scheme agreed with the tax authority. A payment schema will be agreed on, if the self-employed entrepreneur is unable to pay the full tax payment at the due time. Tax attitude is negatively related to payment scheme. People with low tax morale are more likely to have a payment scheme with the tax authority than people with a high tax morale. Again, the tax compliance variables are significant predictors of the payment scheme. Fungibility (Model 5) has a strong positive effect on payment scheme. Self-employed who perceive money as flexible and do not apply mental budgeting are more likely to have tax payment problems and have agreed a payment scheme with the tax authority. The explained variance of Model 5 is 34.4 percent.

Predictor variable	Model 1	Model 2	Model 3	Model 4	Model 5
Knowledge					
Financial knowledge	.948	1.010	.964	1.014	1.017
Tax knowledge	.790	.812	.918	1.004	.995
Tax attitude					
Tax morale		.595**	.645**	.683*	.690
Tax compliance					
Late tax filing (0=no, 1=yes)			.129**	.615**	.215**
Late tax payment (0=no, 1=yes)			.332**	.039**	.895**
Finances					
Exceeding				1.122	.982
Restricting				.953	1.025
Overdraft (being in the red)				1.945*	1.735
Concern or worry about finances				.533**	1.375
Mental budgeting					
Making reservations					.829
Compensating					1.120
Fungibility					1.556
Nagelkerke R^2	.013	.053	.270	.328	.344

* $p < .05$; ** $p < .01$

Table 8. Hierarchical logistic regression analyses predicting payment scheme with the tax authority (0=no payment scheme, 1=payment scheme). Values in table are the exponentiation of the b-coefficients, or odds-ratios (exp (b) values).

The multiple regression analyses of Tables 6, 7, and 8 show that tax compliance, as operationalized by measures taken by the tax authority due to late payment, is mainly predicted by whether or not other fiscal measures have been taken in the past. To a large extent, tax non-compliance is thus a kind of recidivism. Financially restricting has a negative effect (OR value $<$ 1) on late tax payment: for people who use less (more) restrictions on their budgets, it is more (less) likely that measures have been taken by the tax authority due to late tax payment. Fungibility increases the likelihood of late tax filing.

In this paper, determinants of financial behavior are studied with a special focus on the contribution of mental budgeting. All three aspects of mental budgeting (making reservations, compensating, fungibility) were significantly predictive of financial worry about business finances (Table 4). Mental budgeting aspects contributed differentially across financial restriction and financial exceeding. Financial restriction was predicted by making reservations and compensating, while financial exceeding was predicted by making reservations and fungibility (Table 5). No effects of mental budgeting have been found on tax compliance (late payment, late filing, payment scheme) (Tables 6–8). Fungibility, i.e. treating money as exchangeable, was the only significant predictor, and only predictive of late tax filing measures. Thus, self-employed who consider money to be fungible (i.e., not earmarked for specific purposes) are more likely to have had measures taken by the tax authority because of late filing. The finding that mental budgeting is hardly related to tax compliance suggests that paying taxes is obviously not a planned activity of self-employed entrepreneurs, but rather an external obligation, resulting in less mental budgeting strategies.

CONCLUSIONS AND IMPLICATIONS

Self-employed entrepreneurs without personnel do financial management both for their company and their household. Usually, they have no stable business income and often they are concerned and worry about their business finances, probably more than employees with a fixed salary.

Four types of self-employed have been formed, based on their time orientation. These four orientation types are characterized by their awareness of consequences and carelessness about the future. Type 2 people (24 percent; focus on long-term consequences) deviate in a favorable direction from the average. They make reservations, restrict their expenses and adhere to budgets (low on exceeding). They treat money as less fungible. Type 2 people are characterized by responsible and healthy financial behavior. On the other hand, Type 3 people (36 percent; focus on the present and less focus on consequences), deviate from the average in an unfavorable direction. They make fewer reservations, compensate less, restrict their expenses less, and do not adhere to their budgets (high on exceeding). They have the lowest tax compliance. Type 3 people are characterized by less responsible and less healthy financial behavior.

Self-employed entrepreneurs with less healthy financial behavior are more concerned and worry more about their business finances. It is shown that financially restricting and exceeding have different patterns with regard to financial behavior. Financial restriction is related to awareness of consequences, making reservations, and compensating. Financial exceeding is related to lower financial knowledge, making less reservations, and fungibility. Again, a responsible and healthy pattern *versus* an irresponsible and unhealthy pattern of financial behavior.

Tax compliance is mainly a function of earlier and related behavior, although financial restriction and fungibility play a role. Putting more financial restrictions on expenses makes late payment less likely, whereas treating money as more fungible makes late filing more likely.

In this study, the relationships between variables are correlational, even in the multiple regressions, and thus no conclusions can be drawn about causes and effects. For example, concern and worrying about finances may be the cause of financial behaviors (after worrying you start to improve your finances) or may be the effect of financial behaviors (due to financial behaviors you start worrying). And even more complicated, there may be an interaction between financial behaviors and concern or worry.

Responsible and healthy financial behavior is not only a function of the characteristics of the self-employed entrepreneur, but also of the market, fiscal rulings, and other situational factors. Thus, less responsible behavior cannot be attributed only to the self-employed entrepreneur. Circumstances should be taken into account before qualifying and evaluating financial behavior as healthy or unhealthy, responsible or irresponsible.

The implications of this study are relevant both for the self-employed entrepreneur, for the fiscal authorities, and for governmental policy towards more healthy, responsible and sustainable financial behavior. Self-employed entrepreneurs may improve their financial behavior by applying mental budgeting and other control measures. They may do so by (actively) learning how to make sensible reservations for future expenses, or how to treat money as less fungible (i.e., learning when is it better to earmark money and when it is not). Related to this, authorities, governmental institutes and policy makers may participate in special financial education plans. They may arrange meetings and advise self-employed entrepreneurs how to improve their financial administration and behavior in order to set and to adhere to budgets, and teach them measures how to avoid overspending. In addition to focusing on tax compliance only (timely filing, timely paying, correct reporting), the tax administration may also focus on the role of financial behavior in tax compliance and study whether financial behavior and tax compliance are related (at least the timely paying aspect), and whether (healthy) financial behavior is a prerequisite for (healthy) tax behavior.

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Applied Studies in Agribusiness and Commerce – APSTRACT
Center-Print Publishing House, Debrecen
DOI: 10.19041/APSTRACT/2016/2-3/3

SCIENTIFIC PAPER

AN OVERVIEW OF BEHAVIORAL ECONOMICS IN DUTCH POLICY MAKING. THE NEXT STEP: HOW TO NUDGE POLICY MAKERS

Natasha Els Stroeker

Panteia, Bredewater 26, Zoetermeer, the Netherlands

Abstract: *This article describes the beginning of the influence of behavioral economics on the Dutch government. This started in the period that the UK started with its Behavioral Insights Team (BIT UK). The article presents explanation of the concept "nudging" and the way this is integrated in Dutch policy. Also leading publications and examples of how behavioral economics is used in policy making are presented. The advice of the government in 2014 on how to ensure a structural integration of behavioral science knowledge in policy is part of the next step. The next step contains two main parts: 1. How to nudge policy makers and 2. Embedding nudges in policy making on four aspects: positioning, projects, performance and professionality.*

Keywords: *behavioral economics, nudging, government, Netherlands, policy making*

1. The beginning of behavioral economics in policy making

Increasing attention from the Dutch government to behavioral economics, sometimes also referred to as nudging started in 2009. This attention from the Dutch government coincided with the start of the Behavioral Insights Team in the UK (BIT UK)[1]. It is a social purpose company, jointly owned by the UK Government, Nesta (the innovation charity), and its employees. This team was the first government institution dedicated to the application of behavioral sciences with the following objectives:

- making public services more cost-effective and easier for citizens to use;
- improving outcomes by introducing a more realistic model of human behavior to policy;
- and wherever possible, enabling people to make 'better choices for themselves'

The BIT UK wrote the MINDSPACE report as a framework to facilitate the application of behavioral sciences to the policy making process[2]. This was published on the first of January 2010. In this publication the most robust effects that have been repeatedly found to have strong impacts on behavior are Messenger, Incentives, Norms, Defaults, Salience, Priming, Affect, Commitment and Ego (which together form the acronym MINDSPACE). Another model based on MINDSPACE that the BIT UK uses is the EAST-model: 'if you want to encourage a behavior, make it Easy, Attractive, Social and Timely'[3].

2. Behavioral economics and nudging

2.1 Interpretation of concepts

Traditionally policy makers use the traditional 'preek, wortel en stok' as policy interventions to change behavior. The Dutch 'preek' (sermon) refers to informative instruments to influence the social norm such as flyers or a communication campaign for the public. The Dutch 'wortel' (carrot) refers to economic instruments such as a financial compensation or a(n extra) subsidy. The Dutch 'stok' (stick) refers to regulative instruments with a compulsory character such as penalties or less financial payments. However, behavioral economics makes it possible to develop a different kind of policy interventions often referred to as nudging, while actually nudging is only a part of behavioral economics.

Behavioral economics is a collection of behavioral mechanisms that influence the behavior of an individual. A nudge is an intervention based on behavioral science knowledge, trying to change people's behavior in a predictable way without forbidding options or to influence behavior based on economic incentives. A nudge should be easy to avoid. In marketing and communication nudges have already been used for decades. A nudge can also affect people's behavior

1 http://www.behaviouralinsights.co.uk/about-us/

2 http://38r8om2xjhhl25mw24492dir.wpengine.netdna-cdn.com/wp-content/uploads/2015/07/MINDSPACE.pdf

3 http://38r8om2xjhhl25mw24492dir.wpengine.netdna-cdn.com/wp-content/uploads/2015/07/BIT-Publication-EAST_FA_WEB.pdf

without them being aware of the nudge[4].

Nudges do not influence behavior in a rational (top-down) way (Kahneman's system 2: slow, deliberative and logical) such as by means of regulations, permits, subsidies, and penalties, but by responding to unconscious processes, intrinsic motivation and heuristics (Kahneman's system 1: fast, instinctive and emotional)[5].

Nudging responds to unconscious behavioral processes and gives a 'nudge' in the right direction without coercion or exclusion of alternatives. Not the economic rationale, but the social psychological rationale explains the behavior[6].

2.2 Integrating Behavioral Economics in Dutch policy making

In the summer of 2013 the Rijksbreed Strategieberaad (government-wide strategy discussions) of the Dutch government has commissioned to organise an interdepartmental Kenniskamer Gedragswetenschappen (Knowledge Centre Behavioral Sciences, referred to in this publication as interdepartmental network of behavioral economics). In this interdepartmental network it was decided to increase the use of behavioral insights in policy making. In 2014 there has been an official reaction of the central government on leading publications of for instance the WRR, RMO and Rli concerning integrating behavioral economics in policy making (further explanation of these publications are given in paragraphs 3 and 4 of this article). In this reaction[7] the central government states that

The government aims at effective policy making. Often this policy making is intended to positively stimulate certain desired behavior and to discourage undesired behavior, for instance by laws and regulations, financial incentives or communications (see carrot, stick and sermon before). This is often based on the rational decision maker (see also publication in Basis from Stroeker and de Ruig[8]). However, the image of human beings as conscious, rational decision makers is not complete and there are circumstances in which people act and behave differently and not rationally. Choices are influenced by systematic biases of the optimal (rational) choice. People have limited self-control and part of their decision making is unconscious. In these cases habits often play an important role. Also social norms have an enormous influence on the behavior of people.

Panteia developed a conceptual model based on the findings in the MINDSPACE report. This conceptual model is called the Panteia behavior conscious policy model (see figure 1). In our Panteia model we take account of what is mentioned in this governmental reaction (2014). The main aim of the model is to improve the effectiveness of policy making, by increasing the desired behavior and decreasing the undesired behavior, so that intentional effects of the policy instruments are optimal and the money is spent efficiently. To reach this we try to understand the behavior of individuals by explaining this from three areas which are *the individual* (Incentives, Defaults, Salience, Priming, Affect and Ego of MINDSPACE), *social environment* (Messenger, Norms and Commitment of MINDSPACE) and *the physical environment* (visibility, pleasure, convenience/ease, atmosphere).

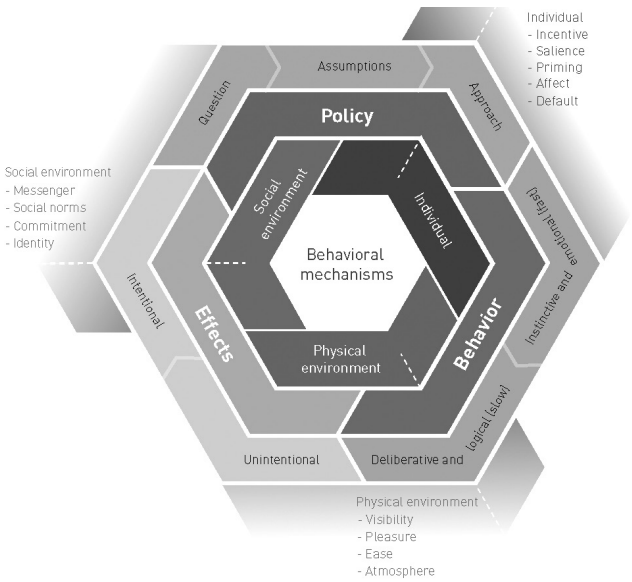

Figure 1.: The Panteia behavior conscious policy model

4 Kabinetsreactie op adviesrapporten van Rli, RMO en WRR over de benutting van gedragswetenschappelijke kennis in beleid [Government response to advice reports Rli, RMO and WRR on the use of behavioral science knowledge in policy], Ministerie van Economische Zaken, Directie Algemene Economische Politiek, AEP / 14170629, 4 december 2014.

5 Kahneman, D. (2012), Thinking, Fast and Slow. London, New York: Penguin Books.

6 Scherpenisse, J., M. van Twist, M. van der Steen, I. de Jong en N. Chin-A-Fat (2014). Nudges onderscheiden. Over de inbedding van gedragspsychologie in overheidsbeleid [Distinguishing nudges. About the embedding of behavioral psychology in government]. NSOB, Nederlandse School voor Openbaar Bestuur. Working paper van de NSOB Denktank.

7 Kabinetsreactie op adviesrapporten van Rli, RMO en WRR over de benutting van gedragswetenschappelijke kennis in beleid [Government response to advice reports Rli, RMO and WRR on the use of behavioral science knowledge in policy], Ministerie van Economische Zaken, Directie Algemene Economische Politiek, AEP / 14170629, 4 december 2014.

8 N.E. Stroeker en L.S. de Ruig, 'Afscheid van de Homo Economicus. De onbedoelde effecten van een simplistisch mensbeeld' [Farewell to the Homo Economicus. The unintended effects of a simplistic image of man kind], https://www.rug.nl/staff/j.a.harbers/basispleidooivoordualisme.pdf en Opnieuw verschenen in Symposium Special Gedragsbewust Beleid 2014, p. 9 - 13

Leading publications, developments and examples of behavioral economics in policy

In the period from 2009 and beyond some leading publications were written on the integration of behavioral economics and nudging within policy making. This started with publications of the WRR, Wetenschappelijke Raad voor het Regeringsbeleid (The Netherlands Scientific Council for Government Policy), in 2009 (The human decider) [9], 2010 (How people make choices) [10] and 2014 (Policymaking Using Behavioral Expertise) [11]. In these publications references were made to Thaler and Sunstein (2009) [12] and Kahneman (2012)[13]. Also institutions such as RMO (Raad voor Maatschappelijke Ontwikkeling, Council for Social Development) [14], Rli (Raad voor Leefomgeving en Infrastructure, Council for Environment and Infrastructure) [15], part of the Dutch ministry of Infrastructure and Environment), ZonMw[16] and Nederlandse School voor Openbaar Bestuur (NSOB, Dutch School of Public Administration)[17] wrote publications on this topic.

In this period between 2009 and 2014, the year of the official reaction of the government on publications of Rli, RMO and WRR, there are examples of actions within the central government and within the ministries such as: effective and clear names for legislation which make clear what the specific law is about. Another example concerns de Belastingdienst (tax authorities, part of the ministry of Finance). This Dutch government organisation is very active on using behavioral economics within its policy making; they are stimulating compliance of the law by using insights from behavioral economics. See for instance advice 4 in paragraph 4. Also, the ministry of Infrastructure and Environment is very active on this topic, for instance with the program 'Beter benutten' (improve use) in which the behavioral component is completely integrated in a broad approach. Scope of this project is to see who is capable of and can be motivated to change behavior [18] .

For instance the example of loaded busses (an example of 'Beter benutten'). In the past, not thinking from a behavioral point of view, an increasing number of travelers in public transport during rush hour would be solved by increasing the number of busses. Now there has been consultation between schools, the carrier and the local government to change the teaching periods at school. The result is that the students do not travel in the rush hours anymore and the buscompanies can suffice with the number of busses they used before.

Also, municipalities are getting more and more interested in using the insights from behavioral economics in their policy making[19]. Some municipalities give their employees training on nudging, so they can learn how to understand the behavior of their inhabitants and how to influence their behavior. Also, projects have been undertaken successfully to improve waste gathering in order to get clean streets and areas.

Some other relevant examples are mentioned below, to give an impression of which ministries, councils and policy organisations are involved in behavioral economics.

Research by the ministry of Social Affairs and Employment concerning the behavioral mechanisms behind the unintended effects of social security and re-integration (2012)[20].

Research by the ministry of Public health, Welfare and Sport concerning the behavioral aspects behind the choice for a certain register system for organ donation (2014)[21].

Research commissioned by ZonMw in 2015 with advice concerning research on nudging in the area of public health. Potential nudges are ordered in rank concerning effectivity, feasibility and acceptability. For instance, the distribution of free earplugs at festivals scored high on feasibility and acceptability, but less in terms of effectiveness[22] .

Research in the period 2014 – 2019 by the National Institute for Health and Environment (RIVM): the main aim is to gain knowledge and expertise on how to reach a healthy lifestyle and promote health. In order to do so there will be

9 W.L.Tiemeijer, C. Thomas & H. Prast (eds.2009) *De menselijke beslisser* [The Human Decider], Amsterdam: Amsterdam University Press.

10 W.L. Tiemeijer (2010) *Hoe mensen keuzes maken* [How People Make Choices]. Amsterdam: Amsterdam University Press.

11 WRR (2014) *Met kennis van gedrag beleid maken* [Policymaking Using Behavioral Expertise], Amsterdam: Amsterdam University Press.

12 Thaler, R.H., Sunstein, C.R. (2009), Nudge. Improving decisions about health, wealth and happiness. London: Penguin Books.

13 Kahneman, D. (2012), Thinking Fast and Slow. London, New York: Penguin Books.

14 RMO, J. (Jasper) Zuure Msc (2014). De verleiding weerstaan. Grenzen aan beïnvloeding van gedrag door de overheid [Resist the temptation. Limits to influence behavior by the government].

15 Rli (Raad voor de leefomgeving en infrastructuur) (2014). Doen en laten. Effectiever milieubeleid door mensenkennis [Do's and dont's. Effective environmental policy by human knowledge].

16 ZonMw (2015). Wetenschappelijk kader nudging in de publieke gezondheidszorg [Scientific framework nudging into the public health care]. In opdracht van ZonMw. Eindrapport (1 juli 2015). Prof. D.T.D. de Ridder en dr. M. Gillebaart, Universiteit Utrecht.

17 Scherpenisse, J., M. van Twist, M. van der Steen, I. de Jong en N. Chin-A-Fat (2014). Nudges onderscheiden. Over de inbedding van gedragspsychologie in overheidsbeleid [Distinguishing nudges. About the embedding of behavioral psychology in government]. NSOB, Nederlandse School voor Openbaar Bestuur. Working paper van de NSOB Denktank.

18 More information and examples can be found on this website: http://www.beterbenutten.nl/nieuws/410/ienm-op-big-improvement-day-anders-kijken-beter-benutten

19 Bron: http://www.vngmagazine.nl/nudging

20 http://www.gemeenteloket.minszw.nl/binaries/content/assets/Re-integratie/2012-02/Eindrap-def-jan12.pdf

21 Faun (H), M. Hollander, T. Span (Panteia) en prof. W.F. van Raaij (Tilburg University((2014). Registratiesystemen voor orgaandonatie [Registration system for organ donation]. Panteia en Universiteit Tilburg in opdracht van het ministerie van VWS, http://www.panteia.nl/Over-Panteia/projecten-en-publicaties/Overzicht-publicaties/765650141%20Registratiesystemen-voor-orgaandonatie

22 ZonMw (2015). Wetenschappelijk kader nudging in de publieke gezondheidszorg [Scientific framework nudging into the public health care]. In opdracht van ZonMw. Eindrapport (1 juli 2015). Prof. D.T.D. de Ridder en dr. M. Gillebaart, Universiteit Utrecht.

an overview of proven effective nudges in this area, best practices will be gathered in the health policy in UK and US and a network will be formed with Dutch researchers who are involved in projects on nudging and health. The outcomes will be shared in national and international networks of researchers and will be integrated in the NWO (the Dutch Organisation for Scientific Research) project Welfare Improvement through Nudging Knowledge (WINK). This NWO project is concerned with the question: is government responsible for welfare and health of its citizens or is this their own responsibility?[23]

3. Advice from the government concerning the next step

The governmental reaction in 2014[24] contained the next five advices for the next step:

Advice 1. Use knowledge from behavioral economics in the entire process of policy making

To make this more specific: ministries should start and have already started pilot projects. This happened, for example, around food wastage (ministry of Economic Affairs), waste in the area of healthcare (ministry of Health, Welfare and Sport) and promotion of tax compliance and improving energy efficiency.

Advice 2. Opt for policy making based on research and practical experience through policy evaluations (ex-post) and empirical testing in advance (ex-ante)

This can also be done by the pilots mentioned before: develop policy interventions based on ex-ante policy analyses and test these in advance. The aim of the pilots is to gather proof. This proof can be used to base new policy interventions on.

Advice 3. Be transparent on the use of nudges

Advice 4. Take care of the impact of policy on the choice pressure that people experience by making this experienced choice pressure feel 'lighter' by:

Increasing the choice skills of citizens and their self control

Recognizing that there are limits to the choice pressure that people can handle (make it easier for them to choose).

A relevant illustration of 'to make it easy' is an example of the Dutch tax authority. This authority has simplified their forms and communicates by means of the following slogan: 'We cannot make it fun, but we can make it easier'.

Advice 5. Ensure a structural integration of behavioral science knowledge in policy

One of the recommendations concerns the interdepartmental network between all ministries which is already a fact at the moment. Part of the recommendation is also to cooperate with universities. The aim is to explore, based on experiences and lessons learned from the departmental pilots, how a broad behavioral scientific perspective can be embedded in the design of ex-ante and ex-post policy evaluations.

4. The next step: embedding of nudging in policy development / making

Summarizing, there have been a lot of publications in the past few years in this area concerning the question how nudging can be applied by policy makers. Just as the five advices mentioned above these publications all ended with recommendations for the government in the expectation that this would lead to change of behavior of policy makers. However, here still seems to be a hiccup. Of course the interdepartmental network of behavioral economics within the central government has done part of its work already. There are central coordinators at each ministry who try to involve the other policy makers. But how do you reach the situation in which including behavioral economics is part of the daily routine of policy making? Or to say it in another way, how can policy makers best be encouraged and enabled to apply these insights? How are future 'nudgers' of the central government nudged themselves to apply the behavioral knowledge? Which approach could be used?

Step 1 Nudging policy makers

(1) Change the default options of policy makers. Show good practices of nudges that work in policy making. The pilots of the individual ministries are based on this idea (see advice 1).

(2) Change the associations that policy makers have with behavioral economics. Now often rather technical and academic concepts are used, such as choice architecture and behavioral analytic framework. Concepts should be used that fit better into the practice of policy making

(3) Use gamification. This could be helpful in this stage too (see figure 2)

23 http://www.nwo.nl/onderzoek-en-resultaten/onderzoeksprojecten/i/39/11439.html (period: 1-9-2014 to 31-5-2019).

24 Kabinetsreactie op adviesrapporten van Rli, RMO en WRR over de benutting van gedragswetenschappelijke kennis in beleid [Government response to advice reports Rli, RMO and WRR on the use of behavioral science knowledge in policy], Ministerie van Economische Zaken, Directie Algemene Economische Politiek, AEP / 14170629, 4 december 2014.

Figure 2. Example of the use of gamification

Step 2. Embedding nudges in policy making: positioning, projects, performance and professionality

The embedding of nudges in policy making should be done on four levels as is presented in table 1 below. First of all the question is raised where in the organisation the responsibility for nudging should be positioned. This is a very important decision which is connected to commitment from top management of the central government and the individual ministries. In the Netherlands there is a interdepartmental network for all ministries and each ministry had its own decentral approach. In some ministries there are separate nudge units or BITs, for instance within the Ministry of Economic Affairs and the Ministry of Infrastructure and Environment. For policy making there is the integrated decision-making framework (IAK). Behavioral components are part of IAK already by means of five instruments[25] but it is unclear whether these behavioral elements have an important role in actual policy making yet. These behavioral aspects are also no structural part of projects yet. There are no handbooks on this subject for policymakers yet. However, most ministries do have pilot projects, for instance on food waste and a lot of examples in the area of infrastructure and environment.

The performance of using behavioral aspects in policy making should be that the results are visible, out-in-the-open and that policy makers that have contributed to these results are rewarded ('celebrating' success). At this point in time most of the ministries are working on gathering proof for behavioral economics and the impact that including these insights into policy works to get effective policy. In practice it is sometimes still hard to get this proof.

To completely integrate behavioral economics into policy making there should be a certain degree of professionality. This subject should for instance be a structural part of the curriculum of a policy maker. This is not the case at this moment in Dutch policy making.

Table 1. Embedding of nudging in policy making on 4 levels: the 4 P's

The 4 p's	Dimensions	Some options
Positioning	• Within or outside the central government • Central versus decentral • Spread /concentrated • Network / organisation; • Within line / staff management	• Knowledge function outside of central government • Nudge-Unit (f.i. ministries of Economic Affairs and Infrastructure and Environment) • Interdepartmental network (yes) • Standard part of policy making (IAK)
Projects	• Advising / intervening • Before, during or after policy making (ex-ante, process evaluation, ex-post) • Structural / ad hoc • Evaluating	• Handbook policymakers • Evaluation concerning existing policy • Experiments / pilots (most ministries) • Important part of policy design (not yet)
Performance	• Visible / hidden • Step in policy process / independent • celebrating success / let policy makers shine • Inspire/ improve • Targeting policy / politics	• Prove that policy works • Inspire others • Realize savings / reductions • Contribute to policy aims • Strengthen citizens' options
Professionality	• Competence of each policy maker / special team • Evaluative (ex-post) / advise (ex-ante) • Science / policy • Uni-/multidisciplinary • Content/system and process	• Structural part of the curriculum of a policy maker (civil servant) • Educate a select group as 'innovators' • Experts who do test on quality • Game / checklist

Sources: NSOB report26 and https://www.pleio.nl/blog/view/28050442/met-kennis-van-gedrag-beleid-maken. The author has copied this table from the sources and has only made a translation from Dutch to English.

What can be concluded for the Dutch government from conversations with policy makers is that each ministry has its own approach. The focus in most ministries is on positioning and projects and some ministries already have results to present (performance) and success to celebrate. A part of the success can also be influenced by backing of top management: if this support is present from the beginning and there is an enthusiastic special team of policy makers responsible for behavioral economics within the ministry then the progress can be rapidly made. What could in general help is: make clear to which degree the five instruments of influencing behavior, which are part of IAK, are actually used or considered in the evaluation of the proposed policy on behavioral dimensions.

Thus, the next important steps are:

To nudge the policy makers to use the "behavioral" economics toolbox including the five instruments of the IAK.

To obtain the support of (top)management in ministries and within the entire ministry (top-down and bottom-up).

To integrate a broad behavioral scientific perspective in the design of ex-ante and ex-post evaluations.

These are important next steps to ensure a structural integration of behavioral science knowledge in policy making and evaluation.

25 https://www.kcwj.nl/kennisbank/integraal-afwegingskader-beleid-en-regelgeving/6-wat-het-beste-instrument/61/categorie%C3%ABn?cookie=yes.1457711465038-1018402371 (the five aspects are: feedback(loop), framing & labelling, behavior contract and implementation intentions, choice architecture and environmental stimuli)..

26 Scherpenisse, J., M. van Twist, M. van der Steen, I. de Jong en N. Chin-A-Fat (2014). Nudges onderscheiden. Over de inbedding van gedragspsychologie in overheidsbeleid [Distinguishing nudges. About the embedding of behavioral psychology in government]. NSOB, Nederlandse School voor Openbaar Bestuur. Working paper van de NSOB Denktank.

Applied Studies in Agribusiness and Commerce – APSTRACT
Center-Print Publishing House, Debrecen
DOI: 10.19041/APSTRACT/2016/2-3/4

SCIENTIFIC PAPER

DISTANCE MAKES THE MIND GROW BROADER: AN OVERVIEW OF PSYCHOLOGICAL DISTANCE STUDIES IN THE ENVIRONMENTAL AND HEALTH DOMAINS

Anouk M. Griffioen, Jannette van Beek, Simone N. Lindhout, and Michel J. J. Handgraaf

Economics of Consumers and Households Group, Wageningen University, The Netherlands

Abstract: *Environmental and health issues are two of the most pressing issues society faces today. People often view both environmental and health issues as psychologically distant: they believe that the problems will occur in the future, to other people, in other places and that the exact outcomes are uncertain. This paper provides an overview of studies that have investigated how the different psychological distance dimensions (viz., temporal, spatial, social and hypothetical) influence perceptions, intentions, and decision making in the environmental and health domains. This overview suggests that psychological distance indeed matters in both domains. There are indications that threat perceptions are mostly heightened when communicated or perceived as being psychologically close. However, the studies also show that a mere increase in perceived threat does not necessarily alter intentions or behavior. Moreover, with regard to the effects of psychological distance, there are neither clear differences between the environmental and the health domain nor between the four psychological distance dimensions. We discuss possible moderators that may explain the range of findings. Finally, we conclude with discussing the current stance of the literature and discuss specific research topics that are yet to be studied. As environmental and health behavior involve more than just one decision or one behavior, we suggest, for example, that future studies should investigate how psychological distance influences not only the target behavior, but related behavior as well.*

Keywords: *psychological distance, environment, health, Construal Level Theory*

Environmental and health problems are currently two of the most important global problems. Despite the severity of these problems, people often fail to act in ways that help to conserve the environment or promote their own health. Part of this failure can be ascribed to people's tendency to perceive environmental and health problems as distant in terms of time, space, social distance and hypotheticality (e.g., Carmi & Kimhi, 2015). For example, people think that sea level rise will lead to problems in the distant future, that it will happen elsewhere on the planet, that it will mainly affect other people, and that the outcomes are quite uncertain. This tendency also exists for health issues (e.g., perceptions of disease threats). As such, in the case of an epidemic disease, people have the tendency to believe that it will only happen in the future, that it is more likely to occur in other geographical areas, to other people, and, finally, that it is rather uncertain whether it will happen at all.

Within Construal Level Theory these different distance dimensions are referred to as psychological distance. According to Construal Level Theory (Liberman & Trope, 1998; Trope & Liberman, 2003) people think at higher levels of construal when the psychological distance is larger. This means that distant problems are considered at a more abstract level, whereas proximate problems are considered at a more concrete level. In other words, when thinking about what to do today, this will be far more concrete and detail-enriched as compared to thinking about the same behavior a year from now, which will focus more on the abstract, general features of the behavior. Importantly, it is likely that viewing a problem in either abstract or concrete terms results in different feelings of urgency, motivations and preferences for solutions. As a consequence, people's response to environmental and health-related issues may vary based on their perception of the problem in terms of psychological distance.

The fact that people may respond differently when problems are represented as being either psychologically close or distant is of importance when trying to stimulate pro-environmental or healthy behavior. Therefore, the aim of this paper is to provide a comprehensive (yet not exhaustive) overview of studies that have specifically examined the four psychological distance dimensions in relation to perceptions, intentions and behavior in the environmental and health domains. We discuss the similarities and differences between these two domains and elaborate upon situations in which smaller or larger psychological distance is beneficial in stimulating pro-environmental or healthy behavior. As a result of this overview, we are able to identify a number of gaps in the literature and accordingly provide recommendations for

future research. In addition, we provide suggestions for how research in the environmental and health domains can benefit from one another. We end with a discussion in which we elaborate on theoretical implications, methodological issues and practical implications.

Psychological Distance and Construal Level Theory

Construal Level Theory posits that the same action or event can be represented at different levels of abstraction (Liberman & Trope, 1998; Trope & Liberman, 2003; see also Vallacher & Wegner, 1987). A high-level construal consists of an abstract representation of an action, whereas a low-level construal consists of a concrete representation of the same action. For example, recycling paper waste can be represented abstractly as preserving the environment, but also concretely as throwing paper in the recycling bin. Thus a high-level construal focuses on the reason for performing a behavior (e.g., you are recycling paper waste, because you want to preserve the environment), whereas a low-level construal focuses on the way of performing that behavior (e.g., you are recycling by means of throwing the paper in the recycling bin). These levels of construal are most commonly distinguished as being either abstract or concrete, but there are many additional aspects on which high-level and low-level construals can be distinguished. Particularly, high-level construals correspond with simple, decontextualized, superordinate and primary features of events, whereas low-level construals correspond with complex, contextualized, subordinate and secondary features of events (Trope & Liberman, 2003).

According to Construal Level Theory, the level at which a situation will be represented can be determined by its perceived psychological distance (Trope & Liberman, 2003). For example, temporally distant events are likely to elicit abstract, high-level construals, whereas temporally close events are likely to elicit concrete, low-level construals. Next to temporal distance, spatial, social and hypothetical distance can be distinguished. Psychological distance across these four dimensions refers to when, where, to whom and whether an event occurs (Trope & Liberman, 2010). Temporal distance refers to the distance in time between the self and a situation (e.g., an event that takes place tomorrow versus an event that takes place in ten years). Spatial distance (or geographical distance) refers to the distance in space or location between the self and a situation (e.g., an event in one's city versus an event in another city). Social distance refers to the interpersonal distance between the self and others (e.g., an action with consequences for oneself versus an action with consequences for someone else). Hypothetical distance (or probability distance) refers to the distance in hypotheticality between the self and a situation (e.g., an event that certainly will happen versus an event that may possibly take place). However, there are multiple ways in which each of these distance dimensions can be defined and operationalized.

It is possible to manipulate psychological distance by highlighting either the close or distant aspects of certain situations, objects or events. This, in turn, influences the level of construal at which people construe these situations, objects or events. Alternatively, construal level can be manipulated directly. Examples of these manipulations are completing a thought exercise on why versus how one would engage in a certain action (Freitas, Gollwitzer, & Trope, 2004), generating superordinate categories versus subordinate examples (Fujita, Trope, Liberman, & Levin-Sagi, 2006), reading abstract versus concrete vignettes (Fujita et al., 2006), processing information globally versus locally (Wakslak & Trope, 2009), and imagining situations from a third-person perspective versus from a first-person perspective (Libby, Shaeffer, & Eibach, 2009). Such manipulations of construal level have also been studied in direct relation to environmental and health behavior. For example, studies on charitable donations to environmental causes (Obradovich & Guenther, 2016; Rabinovich, Morton, Postmes, & Verplanken, 2009) in the environmental domain and studies on exercising behavior (Sweeney & Freitas, 2014), smoking behavior (Chiou, Wu, & Chang, 2013), eating behavior and weight loss (Chang & Chiou, 2015; Park & Hedgcock, 2016; vanDellen, Sanders, & Fitzsimons, 2012) in the health domain. Generally, these studies seem to suggest that high-level construals work better in stimulating environmentally-friendly and healthy behavior. To further our understanding of Construal Level Theory we discuss studies that have specifically manipulated one of the psychological distance dimensions.

Psychological Distance in the Environmental and Health Domains

How environmental and health problems are perceived in terms of psychological distance and the associated level of construal, can greatly affect perceptions, intentions and behavior. Specifically, for both the environmental and the health domain, psychological distance plays a role in how people perceive and deal with risks, how they process information and how psychological distance ultimately influences their behavior. Notwithstanding the similarities between the domains, it is important to note that there are some distinctive differences in the way that research has been conducted in both domains. In the environmental domain, climate change in particular has gained a lot of attention in recent years, and quite some research has focused on the perception of climate change in terms of psychological distance. In contrast, the health domain has not focused on one main topic, but has rather studied psychological distance in relation to a variety of choices and behaviors. It should, therefore, be noted that these domain-specific differences in methodological approaches are also represented in the content and structure of the sections on the environmental domain on the one hand and the sections on the health domain on the other hand. Each section describes research on one of the four psychological distance dimensions in reference to the environmental and health domains and concludes with a short paragraph that combines the findings from both domains (for an overview, see Table 1).

Temporal Distance

Environment. Although climate change has received increasing interest over the past few years, it is often still perceived as an issue that is distant in time (Carmi & Kimhi, 2015). This is mostly due to the fact that climate change has long-lasting consequences and occurs slowly (Gifford et al., 2009). This makes climate change and most other environmental issues rather abstract concepts, as the consequences of current behavior are only noticeable in the future. Additionally, people have a tendency to believe that climate change consequences will actually get worse in the future (Gifford et al., 2009; Milfont, Abrahamse, & McCarthy, 2011). This suggests that people think that current climate change consequences are not as bad now as they will be in the future and this may affect their current intentions and behavior.

As people have a tendency to perceive environmental problems as temporally distant, some researchers have argued that climate change should be communicated as a present risk (van der Linden, Maibach, & Leiserowitz, 2015). This way people will feel that environmental problems are closer and may therefore increase their feelings of urgency to act. In an experiment, Bashir, Wilson, Lockwood, Chasteen, and Alisat (2014) manipulated subjective temporal distance in terms of climate change consequences by making people place a dot that represented 2020 on a timeline. In the temporally close condition participants were asked to place this dot on a timeline that ranged from now (i.e., 2010) until 2085 and in the temporally distant condition on a timeline that ranged from now until 2025. This manipulation made the year 2020 appear close in the first case and more distant in the latter case. Bashir et al. (2014) found that making future consequences of climate change feel more proximal led to more pro-environmental motivation and behavior in the following week. Participants construed climate change consequences more concretely in the temporally close condition and were therefore more willing to act in the present. In contrast, Goldsmith, Newman, and Dhar (2016) found that participants in the large temporal distance condition (viz., describing their life 'one year from now') were more willing to consider using an eco-friendly product (e.g., a household cleaner) as compared to participants in the small temporal distance condition (viz., describing their life 'tomorrow'). Moreover, participants who were asked to think about their life 'one year from now' (large temporal distance) increased their willingness to consider using an eco-friendly product significantly more when self-transcendent benefits, as compared to economic benefits, were highlighted at the same time. This study shows that other factors may interact with the level of construal. Likewise, a number of studies (e.g., Chang, Zhang, & Xie, 2015; White, MacDonnell, & Dahl, 2011) have examined the effectiveness of loss and gain messages and suggest that temporal distance can function as a moderator. More specifically, they found that proximal messages in combination with loss frames and distal messages in combination with gain frames increased recycling and purchase intentions.

These contrasting findings show that proximizing environmental issues does not always lead to positive effects. Brügger, Dessay, Devine-Write, Morton, and Pidgeon (2015) argue that three possible mechanisms may negate the positive effects of communicating climate change risks as temporally close. First of all, when environmental problems are communicated in a proximal manner, situational factors become imperative and personal values have less of an influence on actual behavior. Alternatively, when people view environmental problems in a temporally distant fashion they will think at a higher level of construal and their behavior will be guided by their personal values. When people value the environment, portraying an issue as being temporally distant may therefore be beneficial in motivating people to act in line with these values. Secondly, the proximate risks of climate change should mean something to individuals to be effective. As such, only when people care about a certain issue that is temporally close, the posed risks may motivate them to take action. Thirdly, even if these proximal risks mean something to individuals, people will only act upon the presented risks when they feel that their actions are effective, feasible and acceptable. Alternatively, when people think at a high level of construal, they may be less affected by these situational considerations and focus more on the ultimate outcome (e.g., Fujita, Eyal, Chaiken, Trope, & Liberman, 2008).

Another factor that may influence the effectiveness of presenting environmental problems as temporally close or distant are individual differences. Tangari and Smith (2012) found that future-oriented consumers evaluate energy efficient products more positively when the savings of such products were presented in the distant future instead of the near future, whereas framing savings as temporally close or distant did not affect present-oriented consumers. In another study, Tangari, Burton, and Smith (2015) investigated the effect of consumer's propensity to elaborate on potential outcomes of their product choices. Tangari et al. (2015) found that participants lower in elaboration were more likely to choose an energy efficient product when the monetary benefits were framed in a temporally proximal manner as compared to a temporally distant manner, whereas distance had less of an effect on participants high in elaboration of outcomes.

Health. Studies on temporal distance in the health domain can be divided into studies that have focused on the relation between temporal distance and risk perception and its subsequent influence on behavior, and studies that investigated how temporal distance directly affects health intentions and decisions. In a study on risk perception, White, Johnson, and Kwan (2014) manipulated the year in which a virus was discovered and asked participants to judge how dangerous the virus is as well as how much they would be willing to pay for a vaccine for that virus. They found that viruses described as originating in recent years (e.g., the year in which the study took place) were perceived as more dangerous than viruses described as originating in distant years (e.g., 25 years ago). In addition, willingness to pay for a vaccine was higher for recently discovered viruses than for earlier discovered viruses. Similarly, an intervention which led to a decrease in

perceived temporal distance increased the perceived threat of the risks of soft drink consumption and consequently resulted in lower soft drink consumption one week after the intervention (Ahn, 2015). Another study (Yan & Sengupta, 2013) investigated whether people rely on base rates (i.e., the prevalence of a disease) or case information (i.e., engagement in risky behavior, illness symptoms) when they make health risk assessments for the present or the future. The authors of this study argue that base rates provide abstract information and will therefore be used in psychologically distant situations, whereas case information is concrete and will therefore be used in psychologically close situations. Students were asked to indicate their vulnerability to osteoporosis either now (i.e., temporally close) or when they would be in their sixties (i.e., temporally distant). As expected, participants used case information when assessing their current health risk, but they used base rates when assessing their future health risk. This suggests that different types of information have to be used when persuading people to engage in preventive behavior. All in all, temporal closeness increases perceived health risks, which subsequently has effects on intentions and (preventive) behavior.

Temporal distance also has a direct influence on health intentions and decisions. For example, people have stronger intentions to donate blood in the distant future than in the near future (Choi, Park, & Oh, 2012). When people consider donating blood in the distant future, desirability probably becomes more important, which in turn increases the intention to donate blood. In contrast, when people consider donating blood in the near future, feasibility may become more important, which in turn decreases the intention to donate blood. Temporal distance has a similar effect on food choice. In a study by Laran (2010), participants were asked to make food choices for themselves or for others. It was found that choices for someone else for the future are healthier than choices for someone else for the present, which is comparable to the way in which people make intertemporal choices for themselves. However, people sometimes act rather inconsistently when making intertemporal decisions. More specifically, people often intend to make healthy choices in the future, but at the actual time of decision, the temporal distance has become small and, despite their earlier intentions, many people will switch to unhealthy alternatives (Read & van Leeuwen, 1998). In contrast, sometimes people choose consistently over time (van Beek, Handgraaf, & Antonides, 2016). This consistency (instead of variation over time) might be due to strong pre-existing individual preferences (i.e., choosing a preferred product regardless of when the choice is made), the experimental setting (i.e., being aware that one's choices are being monitored) or the identical choice presentation at both time points (i.e., excluding unintended effects of choosing in different ways at both time points). Although people may choose consistently over time in some situations, people may still want to guard themselves from possible inconsistent choices over time. In those situations, people can make pre-commitments to prevent themselves from making unhealthy decisions later in time. Trope and Fishbach (2000) investigated whether people would be willing to make such a pre-commitment and showed that people actually indicated that they would pay higher fees if they were to cancel an unpleasant but beneficial medical screening examination later in time.

Environment vs. health. The assumption that portraying issues as temporally close is beneficial has been met in studies on pro-environmental behavior (Bashir et al., 2014) and health risk perceptions (e.g., Ahn, 2015; White et al., 2014), but the generalizability of these findings should be treated with some caution. First of all, the processes underlying the way in which people make decisions when a problem is framed in a temporally close manner should be considered. As such, when problems are framed in a temporally close manner, situational cues become more important which can potentially be either inhibiting or promoting the desired behavior. Secondly, individual differences may account for how people attend to certain information. For example, communicating temporally distant benefits of pro-environmental behavior may be very effective for people who are future-oriented, but not so much for people who are present-oriented (Tangari & Smith, 2012). Thirdly, the framing of messages may also influence whether small or large temporal distance is more effective (e.g., White et al., 2011). In contrast to studies showing that smaller temporal distance is beneficial, it has also been found that larger temporal distance increased willingness to consider using eco-friendly products (Goldsmith et al., 2016) and has led to healthier choices in intertemporal decision making (Read & van Leeuwen, 1998). In the latter case, the fact that temporal distance is always very small when making an actual decision calls for different strategies to combat possible inconsistencies in intertemporal choice, by, for example, asking people to make pre-commitments (Trope & Fishbach, 2000).

Spatial Distance

Environment. Spatial distance in the environmental domain often refers to whether people think that environmental threats will affect them locally or whether environmental threats are more likely to hit other geographical areas. People have the tendency to think that the severity of environmental problems is lower in their local area, which has also been referred to as a place-serving bias (Schultz et al., 2014). This may result in people underestimating the environmental threats that may affect their local area and they may thus not take the according actions. Other environmental threats, however, are already experienced on a daily basis, such as pollution in big cities (e.g., in Beijing) and are thus spatially closer. Nonetheless, people often do not attribute environmental degradation to their individual behavior and may therefore still lack the motivation to take the appropriate action (Kollmuss & Agyeman, 2002).

Although most environmental problems seem to be perceived as spatially distant, framing messages as either spatially proximal or distant can influence behavior. Scannell and Gifford (2013) found that local messages resulted in greater

climate change engagement than not receiving a message at all, whereas climate change engagement did not differ among those who had received global messages or no message at all. The authors argue that locality may improve people's receptiveness to certain messaging and was therefore more effective in stimulating behavior change. Brügger, Morton, and Dessai (2015) argue that the effect of spatial distance on climate change may depend on what type of action is needed. They found that portraying climate change as a proximal threat (in terms of space) might be effective in promoting individual action, whereas highlighting the distant threats of climate change may be more suited in gaining support for public policy. As such, when people think at a low level of construal they place more value on the details of the specific situation and when this specific situation motivates people to take action this is beneficial. However, low level of construal thinking has also been linked to feasibility concerns (Fujita et al., 2008), which may also make people place more value on potential barriers or other feasibility concerns.

Therefore, proximal messages will not always be more effective, but it may simply relate to how people process information. In a study by Hodges (2014) participants were asked to evaluate projects that were closely located or projects that were located further away (i.e., offshore drilling). In line with Construal Level Theory, the more proximate project was evaluated more concretely and people based their evaluations on the specific, detailed information provided about this project. Support for the more distant project, however, relied on participant's underlying values and not on the provided information. This shows that people process information differently when thinking of either spatially proximal or distant objects. As such, when thinking of a project located far away, values are more indicative for the evaluations, and evaluations of the closely located project are based on the low level, detailed information provided about the project. Other studies show that both high and low level of construal approaches may actually result in a similar outcome, irrespective of whether the context or one's underlying values guide behavior. For example, Spence and Pidgeon (2010) framed sea level rise messages as being either spatially close (i.e., in Cardiff) or spatially distant (i.e., in Rome) and did not find any significant differences in terms of people's attitudes toward climate change mitigation. The authors speculate that people may actually feel too optimistic about the local impacts of climate change, and distant messages do not result in action as these issues may seem too far removed from their personal situation.

Finally, individual differences may also affect how people attend to information that is portrayed as being either proximal or distant in terms of space. Schoenefeld and McCauley (2015) examined the role of self-enhancement and self-transcendent values in relation to communicating the local or global impacts of climate change. Specifically, they looked at the effects on individuals' perception of the importance of climate change as well as their willingness to take action. They found that participants who scored high on self-transcendent values were in general more willing to engage in pro-environmental actions across all information conditions. In contrast, a reactance effect was found for participants who scored high on self-enhancement values. This reactance effect indicated that local information made these participants view climate change as less important and they were less willing to take action as compared to participants receiving no information or global information. The authors thus suggest that policy makers should be aware of the possible negative effects of communicating the local impacts of climate change.

Health. In the health domain, studies on spatial distance have involved geographical distance as well as actual physical distance (e.g., being 40 vs. 100 cm removed from an object). In a study on disease threat perception, it was hypothesized that spatial distance would be directly related to the threat that a virus causes, because the risk of infection increases as the spatial distance between oneself and the virus decreases. White et al. (2014) manipulated the location where a virus was discovered (e.g., a city close by or far away) and found that participants judged spatially close viruses as more dangerous than spatially distant viruses. Additionally, participants were willing to pay more for vaccines for spatially close viruses than for spatially distant viruses. In a study on food labelling, spatial distance was manipulated by informing participants that food products had either a local origin (i.e., spatially close) or a non-local origin (i.e., spatially distant; Merle, Herault-Fournier, & Werle, 2016). Again, a local label increased the perceived benefits of the food products for oneself (e.g., health, taste) and for others (e.g., environmental benefits) and in addition had a positive effect on purchase intentions. In another study, participants preferred larger assortments for close locations (e.g., an ice cream shop in one's city), but smaller assortments for distant locations (e.g., an ice cream shop in another city; Goodman & Malkoc, 2012). In a psychologically distant situation options seem more substitutable than in a psychologically close situation, which in turn leads to a decrease in preference for large assortments. These findings would imply, given the positive relation between assortment size and healthiness of choices (i.e., people make healthier choices from larger assortments; Sela, Berger, & Liu, 2009), that people make healthier choices for close locations than for distant locations. Taken together, these studies all suggest that spatial closeness increases perceived health risks and motivates people to make healthier choices.

Spatial distance can also be operationalized as the distance between an object and oneself (Maas, de Ridder, de Vet, & de Wit, 2012). In two studies snacks were placed at various distances from individuals (i.e., 20, 70 or 140 cm) and it was investigated whether this influenced consumption of snacks. It was found that the probability of snack intake as well as the amount of snack intake was lower in the two distant conditions than in the close condition. No significant differences in snack intake were found between the two distant conditions. These results suggest that when unhealthy food products are less accessible, because they are placed further away, it is less likely that people will consume them. However, it should be noted that perceived effort was higher when snacks were placed further away from the individual (although the design of the study did not allow for investigating the mediational role

of perceived effort), whereas perceived salience did not vary across the three distance conditions. These results seem to be in contrast with previous studies, because spatial closeness leads to unhealthier (instead of healthier) choices. However, if these results would be generalizable to healthy food products, they would be in line with previous studies. If people would also eat more from healthy food products that are placed close by than from healthy food products that are placed further away, it would still be the case that spatial closeness leads to healthier choices.

Environment vs. health. In terms of spatial distance, research seems to suggest that smaller distance is more beneficial in terms of climate change engagement (Scannell & Gifford, 2013), disease threat perception (White et al., 2014) and food choice (Merle et al., 2016). Potentially, this can be due to an appropriate risk assessment; when spatial distance is small, environmental or health threats may be more likely to occur in one's own geographical area and this may duly increase feelings of urgency to take action. In contrast to studies showing positive effects of small spatial distance, receiving policy support in the environmental domain seems to increase when messages appeal to the more global nature of climate change (Brügger et al., 2015). Interestingly, some studies also found that messages that appealed to either the local or global impacts of climate change resulted in similar outcomes, but found that people processed the information differently (e.g., Hodges, 2014). The way people process information may be the most important factor in determining intentions and behavior. As such, situational factors become imperative in spatially close situations, which is only beneficial when the context promotes environmentally-friendly or healthy behavior.

Social Distance

Environment. On the social dimension, climate change and environmental threats are often viewed as distant, which means that people think that environmental problems are more likely to affect others (Carmi & Kimhi, 2015). This larger distance on the social dimension is sometimes referred to as the optimism bias (Gifford et al., 2009), as people feel more optimistic about their own situation than about the situation of others. The optimism bias may lead to inappropriate risk assessments, as people may feel too optimistic about their own situation and this may in turn inhibit taking the appropriate action. Therefore, some researchers (e.g., van der Linden et al., 2015) have argued that environmental risks should be communicated as a personal risk to stimulate people to change their behavior.

The drawback of communicating environmental problems as a personal risk is that people may feel overwhelmed, become defensive and are actually not willing to take action (Brügger et al., 2015; Pahl, Sheppard, Boomsma, & Groves, 2014). Highlighting the benefits to others or society at large may be a suitable alternative to motivate people to take action. In an experiment on green purchase intentions, highlighting the benefits to others increased the willingness to purchase green products when abstract appeals were used at the same time (Yang, Lu, Zhu, & Su, 2015). In that same study, however, concrete and abstract appeals did not lead to different purchase intentions when benefits to self were highlighted.

Besides highlighting the benefits to self or to others, social distance can also be operationalized as appealing to either the effects on an individual (small social distance) or on a group as a whole (large social distance; Malkoc, Zauberman, & Bettman, 2010). The distinction between the effects of behavior on an individual versus a group (or others) has been linked to self-enhancement and self-transcendent values (Schwartz, 1992). Previous studies (e.g., Bolderdijk, Steg, Geller, Lehman, & Postmes, 2013; Schwartz, Bruine de Bruin, Fischhoff, & Lave, 2015) have shown that self-transcendent appeals (e.g., appealing to the environmental benefits of behavior) work better in stimulating pro-environmental behavior than self-enhancement appeals (e.g., appealing to the financial benefits of behavior). Additionally, Goldsmith et al. (2016) found that participants' willingness to consider using an eco-friendly product was highest when self-transcendent benefits were highlighted, but only when participants were in the abstract mindset condition. Even among climate change deniers, larger social distance (viz., when their behavior was presented in a way that it would benefit others) increased their willingness to act pro-environmentally (Bain, Hornsey, Bongiorno, & Jeffries, 2012). Another way in which social distance can be operationalized is by asking people to make choices either for themselves or for others. Attari (2014) asked participants for the most effective strategy to conserve water, either for themselves or for other Americans. Interestingly, participants usually chose the less effective (curtailment) strategies for themselves and the more effective (investment) strategies for others. Taken together, these findings suggest that larger social distance may be more beneficial in stimulating environmentally-friendly actions.

As noted before, the way psychological distance affects actual behavior may also depend on individual differences. Hart and Nisbet (2011) found that Democrats increased support for climate change mitigation, irrespective of whether it was presented with high or low social distance cues. For Republicans, however, low social distance cues did not affect policy support, whereas high social distance cues actually decreased Republicans' support for climate mitigation policy.

Health. Studies on social distance in the health domain can be divided into studies on risk perception and its subsequent effects on intentions and behavior, and studies on interpersonal decision making. White et al. (2014) manipulated virus names such that they referred to either socially close targets (i.e., humans) or socially distant targets (i.e., animals), even though all viruses only affected humans. This subtle manipulation of social distance resulted in differences in threat perception. Viruses with names referring to humans (e.g., Human Enterovirus) were perceived as more dangerous than viruses with names referring to animals (e.g., Nairobi Sheep Disease). Again, participants were willing to pay more for vaccines and treatments for a socially close virus than for a socially distant virus. Another study on risk perception investigated whether

people use different types of information when they make health risk assessments for themselves or for others (Yan & Sengupta, 2013). In several studies it was found that people rely on (abstract) base rates when assessing health risks for others, but use (concrete) case information when assessing their own health risks. Finally, one study investigated whether tailoring messages to the self (vs. other) is effective in order to reduce soft drink consumption (Ahn, 2015). It was found that decreasing social distance (by means of tailoring messages to the self) increased the personal relevance of the risks of soft drink consumption and consequently reduced intentions to consume soft drinks.

Studies on social distance in the health domain have also compared making food choices or medical decisions for oneself versus for someone else. For example, Laran (2010) found that food choices for others are more indulgent than food choices for oneself. This could be due to the lack of a self-control conflict when choosing for others. While individuals experience this conflict when choosing for themselves and consequently make both healthy and indulgent choices, they do not experience this conflict when choosing for others and simply make indulgent choices. With respect to medical decision making, it was found that medical decisions for others are more future-focused, whereas medical decisions for oneself are more present-focused (Peng, He, Zhang, Liu, Miao, & Xiao, 2013). The results of these studies seem to be in contrast with each other, which could probably be due to the different subdomains (food and medicine) that the studies were conducted in.

Environment vs. health. The fact that people have the tendency to be more optimistic about their own situation than about the situation of others (Gifford et al., 2009) may suggest that a smaller social distance is beneficial in stimulating pro-environmental and healthy behavior. This premise seems to hold in the health domain, as smaller social distance actually increased disease threat perception (White et al., 2014), reduced intentions to consume soft drinks (Ahn, 2015) and led to healthier food choices (Laran, 2010). In the environmental domain, smaller social distance was not necessarily more beneficial, although larger social distance did prove to have negative effects among Republicans in terms of policy support (Hart & Nisbet, 2011). Apart from this study, in the environmental domain it seems that portraying problems as more socially distant, as affecting either other people, society at large or the environment, is more effective than appealing to the self-relevant benefits of pro-environmental behavior. In the health domain, greater social distance only had a positive effect on medical decision making, as health decisions for others were found to be more future-oriented (Peng et al., 2013). The way in which social distance is manipulated in both domains is rather different, which may account for the contrasting effects. In the environmental domain, social distance mostly pertains to messages that highlight benefits to the self or to others, whereas in the health domain many studies focus on making decisions either for oneself or for someone else.

Hypothetical Distance

Environment. Similar to the other psychological distance dimensions, people often view climate change and other environmental problems as hypothetically distant (Carmi & Kimhi, 2015). This means that people perceive either the outcomes of environmental threats as uncertain or the timing of those outcomes as uncertain (McDonald, Chai, & Newell, 2015). In a survey study by Spence, Poortinga, and Pidgeon (2012) participants indicated that they were rather certain that climate change is happening, but that they are less certain about what the exact impact will be and how severe the problem actually is.

Ballard and Lewandowsky (2015) investigated how people respond to messages that highlight the uncertainty related to either the timing of the outcomes or the severity of the outcomes. They found that people who were in the time uncertain condition perceived the risk as more serious and were more likely to take action as compared to participants in the outcome uncertain condition. In other words, when people believe that climate change will happen and has some negative outcomes, but are uncertain of when it will actually happen, they will likely take some action. However, when people believe that the consequences of climate change are uncertain, for example fueled by the perceived disagreement between climate scientists, they are less likely to take action (Ding, Maibach, Zhao, Roser-Renouf, & Leiserowitz, 2011; Lewandowsky, Gignac, & Vaughan, 2013). The effect of higher uncertainty in relation to individual action may be overcome when these uncertainties are framed either positively or negatively. In a study by Morton, Rabinovich, Marshall, and Bretschneider (2011) it was found that when climate change outcomes were presented as being highly uncertain, positive framing led to higher willingness to act as compared to negative framing. In the low uncertainty condition, framing the effects of climate change either positively or negatively did not have an effect. This, again, shows that the way information is presented to people plays a major role in their willingness to act upon that information.

Moreover, there are a number of factors that complicate matters with the mere perception of uncertainty or risks related to climate change and environmental degradation. First of all, people often have difficulties with understanding climate change predictions or probabilities (Budescu, Por, & Broomell, 2012). The fact that people cannot fully grasp the implications from the predictions and probabilities may cause people to do nothing. Secondly, people have a tendency to selectively include information that is in line with their values in terms of expert communications about climate change risks. Kahan, Jenkins-Smith, and Braman (2011) assessed how "hierarchical individualists" and "egalitarian communitarians" evaluate expert opinions that indicate that climate change is either a high risk or a low risk. Specifically, they asked participants to state to what extent they thought that the author of the risk statement is an expert or not. Interestingly, 89% of the egalitarian communitarians thought the author was expert in the high risk scenario, whereas only

23% of the hierarchical individualists thought the author was expert in the high risk situation. Quite the opposite effect was found in the case the author indicates that climate change poses a low risk, where 86% of the hierarchical individualists believed that the author is an expert, whereas only 51% of the egalitarian communitarians believed that the author is expert. The aforementioned studies suggest that communications or perceptions of uncertainty are influenced by the value orientations of individuals as well as the way the information is presented to them.

Health. A few studies investigated the effect of hypothetical distance on risk perception. White et al. (2014) manipulated hypothetical distance by means of the frequency with which participants encountered the name of a virus. They found that when the name of a virus was encountered more frequently, participants perceived the virus as more dangerous and were willing to pay more for a vaccine than when the name of the virus was encountered less frequently. Another series of studies on health risk perception (Yan & Sengupta, 2013) shows that when base rates are high, but case information signals low risk, people tend to be overly optimistic about their own health risk as compared to others. Even though the hypothetical distance towards the disease is small, people do not think they are at risk. However, when base rates are low, but case information signals high risk, people tend to be overly pessimistic about their own health risk as compared to others. Even though the hypothetical distance towards the disease is large, people do think they are at risk. Together, these studies indicate that there is no straightforward relation between hypothetical distance and risk perception.

Environment vs. health. Considerably less research has been conducted on hypothetical distance as compared to the other distance dimensions in both the environmental and the health domain. As hypothetical distance involves the degree of certainty with which something will happen, it can be operationalized in many different ways. In the environmental domain it seems that when people believe that climate change consequences will affect them, but they are merely uncertain about the timing, they are willing to take action (Ballard & Lewandowsky, 2015). However, when people are uncertain about the actual consequences of climate change they are less willing to take action. In the health domain hypothetical distance has been manipulated by the frequency with which a virus is encountered (White et al., 2014) and by investigating the effects of different combinations of base rates and case information (Yan & Sengupta, 2013). As mentioned before, it is yet unclear whether smaller hypothetical distance and its effect on intentions and behavior is due to an appropriate estimate of risk or due to the level of construal.

General Discussion

In the current paper we have discussed studies that have manipulated psychological distance and measured its subsequent influence on behavior in the environmental and health domains. As can be deduced from the overview in Table 1, the effects of psychological distance on behavior in both the environmental and health domain are rather dispersed. Taken together, the results of the discussed studies suggest that there are interesting similarities between the psychological distance dimensions and between the environmental and health domains. However, some clear differences between the two domains per se are worth noting, because they may account for some of the differential findings.

First of all, environmental and health behavior differ considerably on the social dimension. Most environmental problems affect society as a whole (this is especially true for climate change). For example, when someone decides to act in an environmentally-unfriendly manner, this has some effect on many others, whereas the individual consequences of such behavior are not directly experienced and accounted for by the individual. In terms of health behavior, this is quite different, as people often feel that deciding to act in an unhealthy manner will only affect the person him or herself (later on in time). Clearly, if everyone decides to act in an unhealthy manner this has implications for society (e.g., higher healthcare costs), but compared to environmental decisions, people may feel that health decisions are more personally relevant. Secondly, psychological distance influences the perceptions of problems. Perceptions of urgency, for example, may be influenced by how far away in the future the problem is (perceived to be) located. As argued by Brügger et al. (2015), the perceived distance is only relevant when the posed threat or issue means something to the individual. Therefore, when an issue is not important to an individual at all, the perceived psychological distance will not greatly affect subsequent behavior. The fact that health issues are often perceived as being more personally relevant than environmental issues may explain why smaller psychological distance is sometimes more effective in the health domain. Thirdly, the way psychological distance is manipulated also differs in these domains and may thus account for the differential effects. Clearly some manipulations can be used in both domains (e.g., highlighting benefits now vs. later), whereas other manipulations are harder to operationalize across the domains (e.g., manipulating the physical distance of objects in centimeters). It would be interesting for future research to assess how manipulations from one domain apply to the other domain. For example, it would be interesting in the health domain to apply the hypothetical distance manipulation used in the environmental domain, by manipulating the certainty of timing or certainty of consequences of a particular problem (Ballard & Lewandowsky, 2015).

Perceptions, Intentions and Behavior

Despite the differential effects of psychological distance in the environmental and health domains, the discussed studies show some consistency among findings in relation to perceptions, intentions and behavior across both domains. To start with, in terms of perceived risks or threats of environmental and health issues, it appears that smaller psychological distance increases perceived risks. This is most clearly shown in the health domain by the study of White

et al. (2014), showing that smaller psychological distance (across all four dimensions) leads to higher threat perceptions. Unfortunately, in the environmental domain, empirical studies investigating how risk perceptions are influenced by the psychological distance dimensions are scarce. Despite missing empirical findings, many researchers have argued that communicating climate change or other environmental problems as a psychologically close problem will increase their risk perception (see van der Linden et al., 2015). Therefore, future research could specifically study how risk perceptions in the environmental domain are affected when communicating environmental problems as a psychologically close risk.

Most of the discussed studies that have looked at risk perceptions have also measured behavioral intentions (e.g., White et al., 2014) and show that intentions are positively correlated with increased threat perceptions. However, in other studies, when people are specifically asked to express their *intentions* to portray some behavior, it seems that larger psychological distance leads to the environmentally-friendly or healthy option. For example, when people are asked to make food choices that pertain to either now or later on in time, they often choose the healthier alternative later on in time (e.g., Read & van Leeuwen, 1998). In a similar vein, on the social dimension, making choices for others leads to the desirable option in respect to medical decision making (Peng et al., 2013) and green purchase intentions (Yang et al., 2015). However, for *actual behavior* the results might be quite different. For example, although someone indicates that he or she will choose the healthier option later on in time, at the moment when he or she actually has to choose between a healthy and unhealthy food option, the temporal distance has become small and he or she may still opt for the unhealthy alternative. In sum, one should be aware of the fact that increased perceptions of risks or threats may not always translate into intentions, nor will these intentions translate into behavior.

Moderating Factors

One possible explanation for the sometimes different findings with regard to the relationship between psychological distance and intentions and behavior is the existence of systematic moderators of these effects. Especially in the environmental domain, researchers have looked at individual difference factors that may moderate the effect of psychological distance on observed intentions and behavior. In the health domain this has been a less researched avenue, but we expect that the comparable results can be found in the health domain. Clearly, people who are more future-oriented are more susceptible to messages that fit their orientation (e.g., showing that temporally distant messages are more effective for future-oriented people; Tangari & Smith, 2012). Political orientation may also influence how people evaluate different messaging. For example, Hart and Nisbet (2011) found that support for climate change mitigation decreased among Republicans when social distance cues were large, whereas Democrats' support was unaffected by social distance cues. Another individual difference factor of importance seems to be how much people value their self-interest, measured by self-enhancement values, or benefits to others, measured by self-transcendent values. On the spatial distance dimension, people who score high on self-enhancement values were less willing to take action when local information was presented to them as compared to no information at all or global information (Schoenefeld & McCauley, 2015). In contrast, people who scored high on self-transcendent values were more willing to take action in general, irrespective of the type of information they were given. These studies show that psychological distance can have differential effects and even negative effects among some participants.

As suggested, individual differences can largely determine whether people act in an environmentally-friendly or healthy manner. Important to note is that the level of construal also plays a role in whether these individual differences actually matter or not. As such, theory suggests that people act more upon their inner values when they think at a high level of construal (Giacomantonio, De Dreu, Shalvi, Sligte, & Leder, 2010), and thus when the psychological distance is large. Therefore, individual differences may be more pronounced when people think at a high level of construal. To illustrate, this may mean that people who state that they do not care about the environment are more likely to act in line with this value in a psychologically distant scenario, whereas such values are of less importance when the psychological distance is small and people are more influenced by the situation itself (which may actually promote pro-environmental behavior).

Finally, different thought processes underlie people's decisions or behavior when the psychological distance is either small or large. This makes it possible that the decision-outcome or behavior is the same in both the psychologically close and distant situation, but that people come to this decision via different routes (e.g., Spence & Pidgeon, 2010). For example, Yan and Sengupta (2013) showed that people rely on case information in the temporally close situation and on base rate information in the temporally distant situation. Similarly, Hodges (2014) showed that people use detailed project information when evaluating a closely located project and rely more on their values when evaluating a distantly located project. Moreover, the framing of messages may also influence the effectiveness of psychological distance. For example, gain framed messages may work well in combination with large psychological distance, whereas loss framed messages are more effective in combination with small psychological distance (e.g., Chang et al., 2015). Therefore, the underlying decision processes are an important factor to keep in mind when designing intervention programs.

Limitations and Future Research

Most research that has been included in this overview focuses on the effects of psychological distance on specific behaviors, as most studies feature one particular behavioral outcome. However, it is as yet unclear how such interventions

affect related behaviors. This so-called 'spillover' is an important issue in both the environmental and health domain, since both environmental and health outcomes in the long term depend on a host of different behaviors. Improving one specific behavior is not useful if it leads to a deterioration in another behavior. For reducing one's environmental impact, for example, taking shorter showers may seem like a great idea, but this effect is largely undone if the money saved by saving energy is subsequently spent on buying an airplane ticket. Moreover, both environmental and health outcomes usually require behavior change over time and in different contexts, for example by changing habits. We consider it likely that a higher level of construal is helpful for positive spillover to occur to related behaviors as well as for sustained behavior change in multiple contexts. As such, research suggests that higher levels of construal can make people view the similarities between a number of behaviors and make them aware of inconsistencies of their own behavior (Trope & Liberman, 2003). For example, research shows that focusing on the environmental benefits of car sharing increased recycling behavior (Evans, Maio, Corner, Hodgetts, Ahmed, & Hahn, 2012). Besides some studies that show positive spillover effects, this hypothesis has not been extensively tested.

Additionally, most research specifically looked at manipulating one psychological distance dimension and its subsequent effect on perceptions, intentions or behavior. With the exception of the work by Laran (2010) and Goldsmith et al. (2016), most studies have not investigated how different psychological distance dimensions interact and affect behavior. From a construal level perspective this is rather interesting, as people usually need a low level of construal component to engage in certain behavior (e.g., knowing how to do something) and a high level of construal component to be motivated to engage in that behavior (e.g., knowing why to do something). According to the Theory of Planned Behavior (Ajzen, 1985), perceived behavioral control or efficacy –which is the extent to which people feel able to implement certain behaviors– is an important predictor of behavioral outcomes. It, therefore, seems that at some point in time behavioral change requires a low level of construal. However, people may also need the high level of construal component to be actually motivated and sustain in performing the behavior. One important question that arises is whether it is possible to simultaneously view a problem from a high and low level of construal. If so, this might allow for motivation and efficacy to be increased at the same time. This was effective in a study by Rabinovich, Morton, Postmes, and Verplanken (2009), as appealing to both a low and high level of construal component increased people's willingness to donate to an environmental organization. However, other research seems to suggest that only one level of construal at a time can be entertained. More specifically, when both lower and higher levels of construal are appealed to, the lower level may crowd out the higher level motivation (Fujita, Clark, & Freitas, 2013). Thus, combining different levels, for example in interventions, may not result in the desired additional effects, but may result in complex interactions between levels. More research is needed to clarify this (see e.g., Griffioen, Handgraaf, & Antonides, 2016).

This review has also revealed methodological issues within research on psychological distance. To begin with, many different manipulations and measurements have been used for psychological distance. It is likely that these different manipulations have slightly different effects on the underlying variables, but as yet it remains unclear how these effects differ. It is, for example, likely that two different manipulations of temporal distance have a slightly differential effect on feelings of urgency. This makes it difficult to compare the results of a study that uses one manipulation to the results of another study using a different manipulation and may partially explain the differential findings. A second methodological issue is the fact that construal level is not only seen as something that can be manipulated (Trope & Liberman, 2003), but also can be seen as a stable individual trait (Vallacher & Wegner, 1989). One question that automatically comes up is whether experimental manipulations of psychological distance and construal level have the same effect on people with high versus low trait construal levels. This is especially important in light of creating successful interventions, where some manipulations may only affect part of the population. However, most studies do not control for the trait-component of construal level and it remains therefore unclear how manipulations of psychological distance play out for people who have different tendencies in terms of construal level.

Practical Implications

Although we are not able to provide general recommendations on whether smaller or larger psychological distance is beneficial for stimulating environmentally-friendly or healthy behavior, this overview does provide policy makers with some tools to make informed decisions on how to design interventions. As stated, environmental and health problems are often perceived as being psychologically distant on all four dimensions (viz., temporal, spatial, social and hypothetical distance). Based on this premise, people may think of these issues in a rather abstract manner, which could be problematic when people actually have to take concrete actions here and now. The acceptance of solutions and the resulting actions people have to implement will be influenced by construal level. More specifically, lower levels of construal are probably associated with more concrete images of actions that can be taken. Such concrete solutions (e.g., take shorter showers) will be more straightforward to implement than high level solutions (e.g., save energy). Besides, whether concrete images are necessary for people to know how they should act in a certain way greatly depends on the type of behavior. It is likely that high level construals lead to consistent behavior over time and across different situations: the motivation to take shorter showers will not be very helpful at work (assuming showering does not occur there), whereas the motivation to save energy can still be implemented there. Knowledge about these effects of psychological distance and construal level are important for policy makers, since this allows them to tailor their interventions to the type of outcomes they want to achieve.

Moreover, knowledge about the effects of psychological distance and construal level will make it easier for policy makers to explain and anticipate the differences between the actions people plan to take and the actions people end up taking. In the health domain, for example, we all know that exercising is a good idea, so we plan to do it more in the future (large psychological distance), only to decide to watch TV when the moment has come to go for a run (small psychological distance). One important question that research on psychological distance may be able to address is how to make these preferences for future behavior materialize in the present. The use of commitment devices where aspirations for the future are transformed into a commitment that is costly to break is such an example (Trope & Fishbach, 2000).

Concluding remarks

Although environmental and health issues are often mentioned as examples when explaining the mechanisms underlying psychological distance and construal level (e.g., Day & Bartels, 2008; Fujita et al., 2008), studies on the four psychological distance dimensions in direct reference to environmental and health behavior are less abundant. In this paper we have discussed studies that have applied the psychological distance dimensions specifically to the environmental and health domains. In general, it seems difficult to draw conclusions about whether smaller or larger psychological distance is beneficial in the environmental and health domains. Besides some straightforward differences between the environmental and health domains, the main differences can be found between studies rather than between domains or between the psychological distance dimensions. We can conclude from the studies in this overview that people usually perceive higher risks when psychological distance is small, but that the effect of psychological distance on actual intentions and behavior is less clear cut. More research into psychological distance as a key determinant of decisions in the environment and health domains promises to yield greater insight into underlying processes and can help people to make better choices.

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Table 1
Overview of the Effects of Psychological Distance in the Environmental and Health Domains.

Psychological distance dimension	Domain	Small distance leads to...	Large distance leads to...
Temporal distance	Environment	• Increased pro-environmental motivation and behavior (Bashir et al., 2014) • Increased recycling and purchase intentions in combination with a loss frame (Chang et al., 2015; White et al., 2011) • Increased likelihood to choose energy efficient products among participants who scored lower in elaboration of outcomes (Tangari et al., 2015)	• Increased willingness to consider using eco-friendly products (Goldsmith et al., 2016) • Increased recycling and purchase intentions in combination with a gain frame (Chang et al., 2015; White et al., 2011) • Increased positive ratings of energy efficient products for future-oriented individuals (Tangari & Smith, 2012)
	Health	• Increased perceived disease threat and willingness to pay for a vaccine (White et al., 2014) • Increased perceived threat of the risks of soft drink consumption and decreased soft drink consumption (Ahn, 2015) • Use of case information for the assessment of health risks (Yan & Sengupta, 2013) • Unhealthier food choices (Read & van Leeuwen, 1998)	• Use of base rates for the assessment of health risks (Yan & Sengupta, 2013) • Increased intention to donate blood (Choi et al., 2012) • Less indulgent food choices for someone else (Laran, 2010) • Healthier food choices (Read & van Leeuwen, 1998)
Spatial distance	Environment	• Increased climate change engagement (Scannell & Gifford, 2013) • Increased individual action (Brügger et al., 2015) • Use specific, detailed information for evaluation of a project (Hodges, 2014) • A reactance effect for people who scored high on self-enhancement values in terms of willingness to act and perceived importance of climate change (Schoenefeld & McCauley, 2015)	• Increased public policy support (Brügger et al., 2015) • Use of underlying values for evaluation of a project (Hodges, 2014)
	Health	• Increased perceived disease threat and willingness to pay for a vaccine (White et al., 2014) • Increased perceived benefits of healthy food products and increased purchase intentions (Merle et al., 2016) • Increased preference for larger assortments (Goodman & Malkoc, 2012) potentially leading to healthier choices (Sela et al., 2009)	• Increased preference for smaller assortments (Goodman & Malkoc, 2012) potentially leading to unhealthier choices (Sela et al., 2009) • Decreased probability and amount of snack intake (Maas et al., 2012)
Social distance	Environment		• Increased green purchase intentions (Yang et al., 2015) • Increased car tire checks (Bolderdijk et al., 2013) • Increased sign-ups for an energy saving program (Schwartz et al., 2015) • Increased willingness to consider an eco-friendly product when in the abstract mindset condition (Goldsmith et al., 2016) • Increased willingness to act pro-environmentally among climate change deniers (Bain et al., 2012) • Increased choices for more effective water conservation strategies (Attari, 2014) • Decreased policy support among Republicans (Hart & Nisbet, 2011)
	Health	• Increased perceived disease threat and willingness to pay for a vaccine and treatment (White et al., 2014) • Use of case information for the assessment of health risks (Yan & Sengupta, 2013) • Increased perceived relevance of the risks of soft drink consumption and decreased soft drink consumption intentions (Ahn, 2015) • Present-focused medical decisions (Peng et al., 2013)	• Use of base rates for the assessment of health risks (Yan & Sengupta, 2013) • More indulgent food choices (Laran, 2010) • Future-focused medical decisions (Peng et al., 2013)
Hypothetical distance	Environment		• Increased willingness to act when outcomes were framed positively (Morton et al., 2011) • Increased perceived risk and action when timing of outcomes was uncertain (Ballard & Lewandowsky, 2015) • Decreased willingness to take action when outcomes are uncertain (Ding et al., 2011; Lewandowsky et al., 2013)
	Health	• Increased perceived disease threat and willingness to pay for a vaccine (White et al., 2014) • Underestimation of personal health risks (Yan & Sengupta, 2013)	• Overestimation of personal health risks (Yan & Sengupta, 2013)

Applied Studies in Agribusiness and Commerce – APSTRACT
Center-Print Publishing House, Debrecen
DOI: 10.19041/APSTRACT/2016/2-3/5

SCIENTIFIC PAPER

ON THE ENDOWMENT EFFECT IN `APPLE-MARS' EXPERIMENTS

R. Haagsma and P. v. Mouche

Abstract: *In this article we take a close look at a specific type of behavioural experiment that Antonides conducted to study the endowment effect. We argue that if such experiments ignore to test for the presence of persons in the sample who are indifferent between alternatives, the identification procedure for establishing an endowment effect is fallible.*

1. Introduction

With this article we seek to provide an interesting contribution to this Festschrift for professor Antonides. It deals with one of his favourite subjects: the endowment effect. This topic has received much attention in recent years because of a Nobel prize in 2002 awarded to Kahneman and Smith for their contribution to behavourial and experimental economics.[1] In brief, the endowment effect concerns the phenomenon that consumers value an article more as soon they possess it (Thaler, 1992).

Antonides conducted various experiments to study the endowment effect (Cramer and Antonides, 2011; Antonides and Cramer, 2013). Understanding the endowment effect may particularly increase our understanding of consumer behaviour. For instance, in the thesis of one of Antonides' Ph.D. students (Cramer, 2009), a goal is to obtain more insight into the presence of reference effects when consumers make food choices using the idea of the endowment effect. But Antonides was not only interested in such insights. With these experiments, he -- and in this he is not alone -- aimed also to demonstrate that standard (read: 'neoclassical') economic theory is inadequate in explaining consumer behaviour by arguing that standard theory cannot explain the results of the experiments.

In this article we take a close look at a specific type of experiment Antonides conducted to study the endowment effect. We refer to this as the standard apple-Mars experiment. In this experiment the so-called exchange fraction plays an important role and it is typically found to be less than 1/2. The literature (see below) claims that this value indicates an endowment effect and that neoclassical theory cannot explain this inequality because it would predict an exchange fraction equal to 1/2. Our aim is to examine the accuracy of these two statements. Among other things, we will show that the neoclassical prediction of the exchange fraction critically depends on how one handles consumer indifference. In particular, we will argue that, in the case in which indifference among alternatives cannot a priori be ruled out, a Marshallian application of neoclassical theory is very well able to support the less-than-1/2 exchange fraction found in the apple-Mars experiments.[2]

The organisation of the article is as follows. Section 2 describes the standard apple-Mars experiment. Section 3 provides an analysis of the experiment in the case of consumers who behave according to neoclassical theory; a short appendix contains a calculation. Section 4 defines the notion of endowment effect in the context of the standard apple-Mars experiment and reconsiders the question whether there is an endowment effect in the experiment. Section 5 discusses our results.

2. The standard apple-Mars experiment

The standard apple-Mars experiment (in the sense of Antonides) is an experiment in the real world with a group G of persons:

STANDARD APPLE-MARS EXPERIMENT. An experimenter randomly divides a large group G of persons into two subgroups G_a and G_m of nearly the same size.[3] To each person in the group G_a he gives an apple and to each person in G_m a Mars bar. Then they all get some time to examine their own article and those of their neighbours. Finally, the experimenter asks if anyone wants to trade the given article for the other type of article. He then implements the desired trades.

Concerning 'nearly the same size' we note that, given a group G, it is (in principle) possible to arrange that

$$|\#G_a - \#G_m| \leq 1, \qquad (1)$$

i.e., that the number of persons in these groups differ at most by 1 ($\#G_a$ denotes the number of persons in G_a, etc.).

1 Experimental economics is not so new as it may appear here. For instance, in the fifties Sauerman and Selten (1959) conducted experiments concerning oligopolistic situations.

2 Also other researchers have played down this assertion (e.g., Curran, 1999).

3 It is important that these groups are large as statistical considerations are used to analyse this experiment. We will not consider the question of what 'large' means here.

We can summarise the result of a standard apple-Mars experiment in a table, further to be called the experimental observation table:

TABLE 1: Structure of an experimental observation table

Group	Fraction that does not trade	Fraction that trades	Size
G_a	x_{a0}	x_{a1}	$\#G_a$
G_m	x_{m0}	x_{m1}	$\#G_m$

Here x_{a0} (x_{m0}) is the fraction of persons in G_a (G_m) that does not trade, and x_{a1} (x_{m1}) is the fraction of persons in G_a (G_m) that trades. Hence, it holds

$$x_{a0} + x_{a1} = x_{m0} + x_{m1} = 1. \qquad (2)$$

We use the symbol E for such a table. As in the real world, the persons may behave as they like as long as they choose either trade or no-trade and so restriction (2) applies. Given an experimental observation table E, the fraction of persons f_E in G that trades thus equals

$$f_E = \frac{x_{a1}\#G_a + x_{m1}\#G_m}{\#G_a + \#G_m}.$$

So in the case: $\#G_a = \#G_m$, we have $f_E = (x_{a1} + x_{m1})/2$.
A concrete example of an experimental observation table can be found in Cramer (2009, p. 25):

TABLE 2: Example of an experimental observation table

Group	Fraction that does not trade	Fraction that trades	Size
G_a	147/270	123/270	270
G_m	217/284	67/284	284

For this table we find

$$f_E = \frac{190}{554} \approx 0.34.$$

So f_E is less than 1/2.
The literature (see, e.g., Thaler, 1992; Laibson and List, 2015) states that in such experiments the neoclassical theory predicts $f_E = 1/2$. For instance, in Laibson and List (2015, p. 387) we read

> Give half of your students a mug and half of your students a (big) chocolate bar, randomizing this endowment by switching every other seat in the classroom. Let the students examine their own and their neighbors' endowments, and then ask the class who wants to trade with you for the good that they didn't receive. Fewer than a quarter of the students will take up this offer, but the traditional economic theory predicts that half of them should (Kahneman, Knetsch, and Thaler, 1990; Tversky and Kahneman, 1991).

It is not immediately clear, also after considering the references cited here, where the 'half' comes from, i.e., why neoclassical theory would lead to $f_E = 1/2$. In the next section we show that this alleged prediction of neoclassical theory is implicitly based on one or two disputable assumptions.

3. Neoclassical treatment

In this section we give a neoclassical treatment of the standard apple-Mars experiment. So consider such an experiment and suppose that all persons behave according to the postulates of neoclassical theory. Then with regard to the preferences of each person P in group G, there are precisely three possibilities: P prefers a Mars to an apple, P prefers an apple to a Mars, and P is indifferent between an apple and a Mars. Let the fraction of persons with the same preference be denoted by, respectively,

$$n_m, n_a, n_0.$$

As the groups G, G_a and G_m are large and the subgroups G_a and G_m are constructed randomly out of G, we may assume that the fractions n_m, n_a, and n_0 are the same in the subgroups G_a and G_m.
Although the apple-Mars experiment would look somewhat peculiar in the neoclassical research programme, let us now discuss how neoclassical theory would connect preferences to the decision of whether or not to trade a just received article. Therefore consider the following statements:

- If P prefers an apple, then P only trades if P received a Mars.
- If P prefers a Mars, then P only trades if P obtained an apple.
- If P is indifferent between an apple and a Mars, then P does not trade.

Statements A and B are straightforward enough implications from neoclassical theory and need no comment. Only the third statement appears to be susceptible to some debate. Note first that neoclassical theory does not discuss how persons deal with choice situations in which they are indifferent. For example, which article would a person P choose when he is indifferent between two equally expensive articles lying in the shop window? Little more can be said than that P would make his choice with probability 1/2. The choice situation in the apple-Mars experiment is even more subtle: what would P do if he is indifferent between two articles of which one is in his possession and the other is waiting in the hands of the experimenter? In the frictionless world of neoclassical theory, where any transaction cost is absent, we again have to conclude that P would make his choice with probability 1/2. However, to the practitioner of neoclassical theory, who follows Alfred Marshall's adage that theory is not the truth but an engine to discover the truth (see, e.g., Landreth and Colander, 2001, Ch. 10) and who knows that the real world is

full of little transaction costs arising from mental or physical effort, it is obvious that *P* will refuse to trade his article.
In any case, to further evaluate statement C, the analysis in the rest of this section will allow for both possibilities by assuming a probability $\gamma \in \{1/2,1\}$ that an indifferent person in the experiment does not trade. Then the (expected) fraction of persons in group G_a that trades is equal to $n_m + (1 - \gamma)n_0$ and this fraction in G_m is equal to $n_a + (1 - \gamma)n_0$. This leads to the following *neoclassical observation table:*

TABLE 3: Neoclassical observation table

Group	Fraction that does not trade	Fraction that trades	Size
G_a	$n_a + \gamma n_0$	$n_m + (1-\gamma)n_0$	$\#G_a$
G_m	$n_m + \gamma n_0$	$n_a + (1-\gamma)n_0$	$\#G_m$

A neoclassical observation table thus is completely determined by the numbers γ, $\#G_a$, $\#G_m$, n_a, n_m, and n_0. We see that, unlike in an experimental observation table, besides restriction (2) also other restrictions apply. For example, in the case $\gamma = 1$, it must hold (using the notations of Table 1) that $x_{a0} \geq x_{m1}$ (and equivalent with this, $x_{m0} \geq x_{a1}$).

Now it is a simple textbook exercise to calculate the fraction of persons that trades:

$$f_\gamma^{neo} = \frac{1 + n_0(1-2\gamma)}{2} + \frac{(\#G_a - \#G_m)(n_m - n_a)}{2\#G}$$

(see Appendix). Formula (3) is valid if *G* is large and also the subgroups G_a and G_m are large. However, the assumption that G_a and G_m are almost of the same size is not used for this result. If we make this assumption also, as required in the apple-Mars experiment, then, noting that

$$\left|\frac{(\#G_a - \#G_m)(n_m - n_a)}{2\#G}\right| \leq \frac{1}{2}\frac{|\#G_a - \#G_m|}{\#G}$$

(even $\leq \frac{1}{2\#G}$ if (1) holds), formula (3) implies $f_\gamma^{neo} \approx \frac{1+n_0(1-2\gamma)}{2}$.
Hence, if the groups are almost equally large, the fraction of persons that trades is equal to

$$f_\gamma^{neo} \approx \begin{cases} \frac{1-n_0}{2} & \text{if} \quad \gamma = 1 \\ \frac{1}{2} & \text{if} \quad \gamma = \frac{1}{2} \end{cases} \qquad (4)$$

(a strict equality holds when $\#G_a = \#G_m$). Of course, without the assumption, $f_\gamma^{neo} > 1/2$ is possible.

Therefore, the claim that neoclassical theory predicts that in the experiments half of the persons will trade implicitly assumes that either
(1) no one in the experiment is indifferent between the two articles (i.e., $n_0 = 0$) or
(2) any person who is indifferent between the two articles makes his choice with probability 1/2 (i.e., $\gamma = 1/2$).
The first assumption is an empirical hypothesis that could be tested (or organised for). If the experiment is indeed about apples and Mars bars, the outcome may well be that a large group *G* contains persons who care the same about the two (i.e., $n_0 > 0$). If there are indifferent persons, then following in the footsteps of the practitioner of neoclassical theory, and thus accepting statement C above (i.e., $\gamma = 1$), the neoclassical prediction for the standard apple-Mars experiment is

$$f^{neo} < 1/2,$$

so less than half of the persons will trade.

4. Endowment effect

We are now able to give a precise (neoclassical) definition of the endowment effect in the context of a standard apple-Mars experiment. For this we accept statement C formulated in the previous section that indifferent persons do not trade.
Suppose an experimental observation table *E* and let f_E be its associated exchange fraction. Having formula (4), we speak of an *endowment effect* if

$$f_E < \frac{1-n_0}{2}.$$

From a logical point of view, it is also possible that

$$f_E > \frac{1-n_0}{2},$$

in which case we speak of a *trade effect*.
To decide whether there is an endowment effect, we need not compare f_E with 1/2 but with $(1 - n_0) / 2$. The identification of an endowment effect thus critically requires information on n_0. If this is provided, we can conclude that an endowment (or exchange) effect obtains if f_E 'substantially' differs from $(1 - n_0) / 2$.
For illustration, let us return to the experimental observation Table 1 with exchange fraction $f_E = 0{,}34$. To establish whether this value contradicts neoclassical predictions, we have to know n_0. Since $\frac{1-0.32}{2} = 0.34$, the practitioner of neoclassical theory has a problem if n_0 substantially differs from 0.32. If n_0 is known and some test shows that it is substantially lower than 0.32, then we may conclude that there is an endowment effect. And if n_0 is substantially higher than 0.32, then there is a trade effect. Unfortunately, the conducted apple-Mars experiment does not provide information on the value of n_0 (see Cramer, 2009). Indeed, as far as we know, similar experiments on the endowment effect ignore to test for the presence of persons who are indifferent between alternatives. Some casual experiments by the second author suggest that in an apple-Mars experiment is substantially less than 0.32. So for the standard apple-Mars-trade experiment in Table 1, we cannot rule out the finding of an endowment effect.

5. Concluding remarks

We conclude that as long as experiments like the standard apple-Mars experiment ignore to test for the presence of persons who are indifferent between alternatives, the identification procedure for establishing an endowment effect is fallible. Because if there are some indifferent persons in

the sample, a Marshallian application of neoclassical theory also predicts a less-than-1/2 exchange fraction. Identifying an endowment effect then critically depends on the precise fraction of indifferent persons.

To be sure, by pointing at the role of indifferent persons in the sample we do not just want to add some analytical precision to generally accepted findings. Rather, we want to emphasize that in designing this type of experiments the researcher implicitly increases the probability that the sample will indeed contain some indifferent persons.

For illustration, suppose an experiment where subjects have to choose between a one-euro coin and a two-euro coin. Although we did not conduct such an experiment, it is safe to say that everyone will prefer the two-euro coin and so all those who received a one-euro coin will trade it for a two-euro coin. The neoclassical prediction that 50% of the subjects will trade holds (it is unlikely that the transaction cost arising from a bit mental or physical effort will exceed one euro), and there is no endowment effect. What would happen if the experiment is about the choice between a one-cent coin and a two-cent coin or between two mugs with slightly different colours? These cases probably increase the scope for finding an endowment effect, but at the same time increase the likelihood that the sample contains indifferent persons and so the neoclassical prediction of a less-than-1/2 exchange fraction applies.

Appendix: Derivation of formula (3)

Consider Table 3. In the main text we considered $\gamma = 1$ or $\gamma = 1/2$. But nothing hinders us here to allow for $\gamma \in [\frac{1}{2}, 1]$.

In total, $(n_m + (1-\gamma)n_0)\#G_a + (n_a + (1-\gamma)n_0)\#G_m$ persons want to trade. So for the fraction of persons who trade we have

$$f^{neo} = \frac{(n_m + (1-\gamma)n_0)\#G_a + (n_a + (1-\gamma)n_0)\#G_m}{\#G}.$$

With s :=#Ga – #Gm and #G = #Ga + #Gm, it follows that #Ga = (#G + s)/2 and #Gm = (#G – s)/2. With na + nm + n0 = 1, we obtain

$$f_\gamma^{neo} = \frac{(n_m + (1-\gamma)n_0)\frac{\#G+s}{2} + (n_a + (1-\gamma)n_0)\frac{\#G-s}{2}}{\#G}$$

$$= \frac{\#G(n_m + n_a) + s(n_m - n_a) + 2(1-\gamma)n_0\#G}{2\#G}$$

$$= \frac{\#G(1-n_0) + s(n_m - n_a) + 2(1-\gamma)n_0\#G}{2\#G}$$

$$= \frac{\#G(1 + n_0(1-2\gamma)) + s(n_m - n_a)}{2\#G}.$$

Thus

$$f_\gamma^{neo} = \frac{1 + n_0(1-2\gamma)}{2} + \frac{(\#G_a - \#G_m)(n_m - n_a)}{2\#G}.$$

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Applied Studies in Agribusiness and Commerce – APSTRACT
Center-Print Publishing House, Debrecen
DOI: 10.19041/APSTRACT/2016/2-3/6

SCIENTIFIC PAPER

INTERVENTIONS TO ENCOURAGE SUSTAINABLE CONSUMPTION

Ynte K. van Dam & Hans CM van Trijp

Marketing & Consumer Behaviour Group, Wageningen University

Abstract: *Sustainable consumption is hampered by a discrepancy between consumers' attitudes and their actual behaviour in the market place. Psychological construal level theory provides an explanation for the attitude to behaviour gap as a motivational conflict between high and low level of mental construal. Based on self-determination theory it is argued that this motivational conflict presupposes extrinsic motivation for sustainable behaviour. Based on self-regulatory styles, the present paper identifies and illustrates four types of intervention strategies that can cater for extrinsic motivation for sustainable development among light users. The underlying mechanisms of these interventions suggest that the transition from external to internal regulation is catalysed by social feedback.*

Keywords: *Sustainable Consumption, Construal Level Theory, Self-Determination Theory, Intervention Studies, Economic Psychology*

Introduction

In food consumption, like in many other domains of consumer behaviour, most consumers claim to consider sustainability issues important, but this does not necessarily translate into manifest sustainable consumer behaviour (Van Dam & Van Trijp, 2013). Awareness of the need for sustainable development has triggered changes in consumer attitudes, but not necessarily in consumer demand (De Barcellos, Krystallis, de Melo Saab, Kügler, & Grunert, 2011; Papaoikonomou, Ryan, & Ginieis, 2011; Vermeir & Verbeke, 2006). This discrepancy between stated importance and actual consumption confirms the need to integrate economic and psychological theories of consumer behaviour (Antonides, 1989) in order to understand the gap between sustainable attitudes and actual behaviour. As already shown in repair-or-replace decisions (Antonides, 1991), consumer behaviour is the outcome of multiple and potentially conflicting attitudes and/or goals (Laran & Janiszewski, 2009). This multitude of attitudes/goals implies that, like for almost any trait or state, people are found along a continuum of shades of green. For analytical clarity the end-points of the underlying continuum are used to denote the direction of relative differences.

Two segments in the consumer market seem hardly hindered by such goal conflicts with respect to sustainability. First, a small segment of committed sustainable consumers, responsible for the majority of sustainable consumption in the market, seems to have integrated sustainable development goals into their consumption patterns (Brown, Dury, & Holdsworth, 2009; De Ferran & Grunert, 2007; Fotopoulos, Krystallis, & Ness, 2003; Zander & Hamm, 2010). In any other context this segment could be labelled as 'heavy users', but because curtailment of consumption is a significant indicator of sustainability (Verain, Dagevos, & Antonides, 2015a) the designation 'committed sustainable consumer' is more appropriate for this market segment than 'heavy user' (Verain, Dagevos, & Antonides, 2015b). The majority of research into the motives behind the consumption of sustainable food products has focused on the motives of these committed sustainable consumers. However, studying these committed sustainable consumers to increase consumer demand has its limitations. Apart from being only a minority of consumers these committed consumers already maintain a high level of sustainable consumption that is unlikely to increase much further. Opposed to these committed sustainable consumers one may find a segment of 'honestly disengaged' (defra, 2008) consumers who do not care at all for sustainable development and who only accidentally and unintentionally purchase sustainable products (McGregor, 2008). The size of this segment is difficult to estimate, because the denial of (responsibility for) sustainability issues may be a defence mechanism that is triggered by a goal conflict (Stich & Wagner, 2012). The committed consumers endorse sustainable development and act accordingly, whereas the opposed consumers do not endorse sustainable development and also act accordingly, but for both groups the behaviour matches their sustainability goals.

Those two segments of consumers represent two distinct regulatory styles in self-determination theory (Deci & Ryan, 2000; Ryan & Deci, 2000). In terms of self-determination theory (Deci & Ryan, 2000; Vansteenkiste, Soenens, & Vandereycken, 2005) the committed sustainable consumers are intrinsically motivated by a sense of trying to do (what they perceive to be) the right thing, or by the rejection of

consumerism and capitalism (McDonald, Oates, Alevizou, Young, & Hwang, 2012). One way or another these committed sustainable consumers have adopted sustainability as 'a process of change' (WCED, 1987) in their way of life (Black & Cherrier, 2010; Verain et al., 2012). At the other end of the motivational continuum are the a-motivated consumers (Deci & Ryan, 2000; McGregor, 2008), who see no benefit at all in sustainable development. The behaviour of these a-motivated consumers can be influenced by intervention strategies that aim to increase the probability of accidental sustainable purchases, like nudging techniques (Van Kleef, Otten, & Van Trijp, 2012), or upgrading the supply through the voluntary adoption of sustainable standards by actors in the value chain (Sutton & Wimpee, 2008; Van der Linden, 2012).

Though research into sustainable consumption usually differentiates between intrinsically motivated committed sustainable consumers and a-motivated 'grey' consumers (McDonald et al., 2012), the vast majority of the market consists of light users of sustainable products who only incidentally choose sustainably (Eckhardt, Belk, & Devinney, 2010). It is particularly among this majority segment of light users of sustainable products that goal conflicts with respect to sustainable consumption manifest themselves.

Being neither intrinsically motivated nor a-motivated, this majority of consumers therefore is extrinsically motivated to pursue sustainable development (Ryan & Deci, 2000). These consumers focus on the goal of 'future generations having the ability to meet their needs' (WCED, 1987) and perceive sustainable behaviour as a necessary way to attain that goal. This goal of attaining a sustainable future is unrelated to their consumption goals. Their consumption goals are economic and typically related to hedonic and self-enhancement values (Grunert & Juhl, 1995). These consumers shop for a range of contextualised and low construal motives (Buttle, 1992), but not for the abstract and high construal motive to save the world. When they experience a conflict between sustainability goals and consumption goals (Laran & Janiszewski, 2009) the low construal motives behind their consumption determine their choice (Van Dam & Van Trijp, 2013). The interventions aimed at increasing sustainable consumption among these light users should facilitate them to cope with this conflict between economic-rational and sustainability-related goals in their consumption.

Construal level theory of psychological distance

An early study into sustainable marketing has suggested that informational ambiguity and socio-temporal dilemmas are key barriers that hinder sustainable development of global food markets (Van Dam & Apeldoorn, 1996). Construal level theory has proposed since that these barriers are different indicators of psychological distance (Liberman, Trope, & Wakslak, 2007; Trope & Liberman, 2010). Originating from research into time-dependent changes in values and expectancies (Antonides & Wunderink, 2001; Liberman & Trope, 1998), construal level theory has evolved into a general framework that forges relations between psychological distance, perception, abstraction, language, evaluation, and behaviour (Fiedler, Jung, Wänke, Alexopoulos, & de Molière, 2015).

People only can directly perceive and experience what is actually present. Thinking and feeling beyond this actual reality is possible by construing and maintaining a mental image of reality (Antonides, De Groot, & Van Raaij, 2011; Trope & Liberman, 2010). The primary function of mental construal is the creation of a mental substitute to the lack of immediate perception of a person, an object or an event. This mental construal is central to human social, emotional, and cognitive development (Bergman, 1993; Dumas & Doré, 1991; Lillard & Woolley, 2015; Peskin & Ardino, 2003). Once this function is established mental construal develops by including higher levels of abstraction into cognitive reasoning, thus allowing belief formation, categorisation, and the development of abstract, counterfactual, and moral reasoning (Fischer, 1980; Kato, Kamii, Ozaki, & Nagahiro, 2002; Marini & Case, 1994; Perry, Samuelson, Malloy, & Schiffer, 2010; Von Helversen, Mata, & Olsson, 2010). Mental construal therefore allows one to transcend the actual situation and to manipulate concepts rather than objects. Thus, people can remember the past and make predictions about the future, people can expect the actions of others and speculate how things might have been and – though none of these actually can be perceived – people can act upon psychologically distant events.

Psychological distance is the subjective experience that something is in one's proximity (proximal) or far removed (distal). Psychological distance is therefore egocentric in the most literal sense: the reference point of psychological distance is the actual self and the individual 'here and now' (Trope, Liberman, & Wakslak, 2007). Psychological distance relative to this central self is experienced along several different dimensions that have highly similar effects on mental construal (Nussbaum, Liberman, & Trope, 2006). Something or someone can be proximal or distal in a spatial, temporal, social, or certainty dimension (Todorov, Goren, & Trope, 2007). As psychological distance increases mental construal becomes more abstract or high-level, and conversely more abstract or high-level construal increases the experienced psychological distance. Therefore psychological distance tends to spill-over into other dimensions and when distance on one dimension increases the perceived distance on the other dimensions also increases (Trope & Liberman, 2010).

Mental construal is instrumental to individual reasoning and therefore implies a functional, goal congruent process of abstraction (Trope & Liberman, 2010). In this process of abstraction those features that are essential to the goal are stressed, whereas features that are incidental or irrelevant to the goal are ignored. In this way mental construal affects perception and evaluation simultaneously (Antonides, Verhoef, & Van Aalst, 2002). Mental construal determines how reality is experienced and therefore determines how someone cognitively understands and motivationally reacts to this reality. A distant outcome is, cognitively and motivationally, represented more abstract and idealistic compared to the

immediacy and feasibility of actual consumer choice. The practical differences between experiencing abstract, distant outcomes and concrete, immediate outcomes have been extensively studied in socio-temporal dilemmas, like Prisoner's Dilemma games and temporal discounting (Antonides, 1994; Antonides & Wunderink, 2001). Personal involvement with an issue or with a product by definition is incompatible with high psychological distance (Van Beek, Antonides, & Handgraaf, 2013). Therefore the effects of psychological distance only manifest themselves at low levels of personal involvement (Park & Morton, 2015; Wang & Lee, 2006) and therefore construal level theory implies strategies to increase sustainable consumption among light users in particular.

Principles of psychological distance in sustainable consumption

Sustainable development refers to possible consequences of consumption that may impact all of humanity sometime in the future, which reinforces the psychological distance and the high construal level. The informational ambiguity and the socio-temporal dilemmas that are inherent to sustainable development (Hilpert, Kranz, & Schumann, 2013; Van Dam & Apeldoorn, 1996) in terms of construal level theory cover at least three of the four dimensions of psychological distance, as they refer to uncertainty respectively to social and temporal distance (Trope & Liberman, 2010; Trope et al., 2007). Sustainable development therefore easily is experienced as psychologically distant, which raises the construal level of its mental representation into a highly abstract and elusive concept (Proulx, 2013). At this high level of abstraction sustainable development, or 'sustainability', is an umbrella construct that subsumes a variety of products and behaviours under a common goal (Van Dam & Van Trijp, 2011; Verain, Sijtsema, & Antonides, 2016). A majority of people perceive sustainable development as an abstract and distant goal that may be desirable and relevant in general, but that does not determine the immediate feasibility of their behaviour (Van Dam & Van Trijp, 2013). The acknowledgement of the distant sustainability goal does not reduce the pleasure or convenience of existing consumption patterns, nor does it reduce the sacrifice of giving up those consumption patterns. This suggests that the crux of the attitude-to-behaviour gap in sustainable consumption may not be the elusive goal of sustainable development, but the process of changing established routines that is required to reach the goal (Vansteenkiste et al., 2005). Viewing sustainable development as an abstract societal goal implies a high construal cognitive representation and high construal motivational factors. Viewing sustainable development as a process of behavioural changes requires a focus on the low construal proximal activities that lead towards that abstract goal. The cognitive and motivational differences between high construal representation and low construal representation (Table 1) result in marked shifts in perception, understanding and preference between sustainable development as a goal and sustainable development as consumer behaviour.

The differences between the high construal level representation of 'sustainable development as a distal concept' and the low construal level representation of 'sustainable consumption as an actual choice' easily cause a discrepancy between sustainable attitudes and actual behaviour. High construal attitudes towards sustainable development are general, gain oriented, promotion focused, and extrinsic. Low construal motives for consumption are situational, loss oriented, prevention focused, and intrinsic. People may have a coherent understanding of the broad category of sustainable products at high construal level, that does not match the complex variety of narrowly defined sustainable products at low construal level. People may hold positive attitudes towards the desirable distal goal of sustainable development at high construal level and seriously intend to act sustainably in general, while being deterred from any specific sustainable choice by the less feasible proximal implications at low construal level.

Table 1: Differences between low and high construal level representation (source: Van Dam, 2016)

Construct	Low construal	High construal
Sustainability	Process of change	Societal goal
Psychological distance	Proximal	Distal
Temporal distance	Present	Remote past or future
Hypothetical distance	Certain	Possible
Social distance	Family and friends	Strangers
Physical distance	Here	Far away
	Cognitive Factors	
Representation	Concrete, detailed, complex	Abstract, simple, coherent
	Idiosyncratic	Prototype and/or Stereotype
Reasoning	Pragmatic	Idealistic
Classification focus	Differences	Commonalities
Categorisation	Narrow	Broad
Evaluation of outcomes	Feasibility	Desirability
Evaluation of actions	Process focus (How)	Outcome focus (Why)
	Motivational Factors	
Goal focus	Situational, context-based, means	General, primary, ends
Goal pursuit	Loss oriented, prevention	Gain oriented, promotion
Motivation	Intrinsic	Extrinsic

Interventions for motivating sustainable consumption

Construal level based interventions to increase the sustainability of consumer behaviour are focused on the less involved, light user, consumers. These light users are externally motivated to behave sustainably, and (at least

partially) intrinsically motivated to consume. The extrinsic motivation for being sustainable is reinforced because, rather than as an end in itself, sustainable consumption mostly is promoted as a means to an end (De Koning, 1998). Sustainable consumption is a means to reach ecological and/or social sustainability. These light users therefore experience a dilemma between the high construal desirability of (extrinsic) sustainable development goals and the low construal (lack of intrinsic) feasibility of sustainable consumption. Various intervention strategies aim at resolving this dilemma by bridging the distance between high and low construal. These different interventions strategies are based on different (possibly implicit) assumptions about consumer motivation and have different consequences for consumer behaviour.

Extrinsic motivation explains the perceived relevance of a goal and why a goal is pursued, but it does not explain the determinance of how a goal is pursued in actual behaviour (Van Dam & Fischer, 2015; Van Dam & Van Trijp, 2013). The perceived causality of this actual goal congruent sustainable behaviour can be located outside or inside the individual. When the goal pursuit is extrinsically motivated, goal congruent behaviour can be explained by different regulatory styles (Ryan & Deci, 2000). It is generally agreed upon that these regulatory styles differ in perceived locus of causality (Deci & Ryan, 2000; Ryan & Deci, 2000; Schösler, de Boer, & Boersema, 2014; Vansteenkiste et al., 2005). External regulation and introjection are entirely or mainly dependent on external control, whereas identification and integration are mainly or entirely dependent on internal autonomy (Schmeichel & Vohs, 2009). The different regulatory styles, ranging from external regulation to internal integration, will be illustrated with four recently published intervention studies. The different assumptions about the social impact on sustainable behaviour (Culiberg & Elgaaied-Gambier, 2016; Onwezen, Antonides, & Bartels, 2013) suggest that they can be classified on a second dimension ranging from individual to social (relational) incentives (Figure 1). External regulation and integration are responses to individual rewards or punishments that reinforce overt behaviour. Introjection and identification are responses to social norms, with implications for perceived appropriateness of behaviour and self-perception respectively (Higgs, 2015; Verlegh & Candel, 1999).

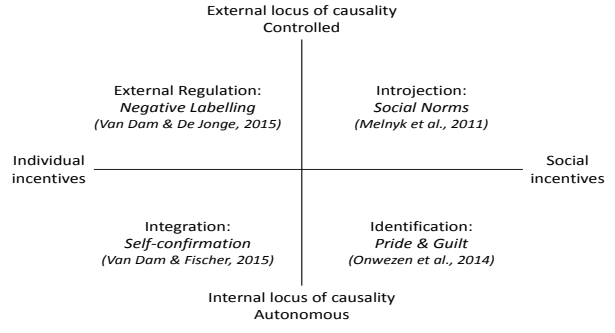

Figure 1: Regulatory styles and matching interventions classified by locus of causality and source of incentives

The four regulatory styles and matching interventions of Figure 1 are all embedded in the general assumption that consumers are extrinsically motivated to behave sustainable. The interventions therefore are aimed at consumption, in particular the purchase of sustainably or ethically produced (food) products. It should be noted that in this analysis the extrinsic motivation to behave sustainably is given and not part of the framework. Therefore an intrinsic motive for sustainable meat consumption should be based on the joy of consuming this meat e.g. for its taste. An extrinsic motive should be based on separate outcomes of the consumption, e.g. saving on a price discount or impression management.

External Regulation

External regulation of sustainable behaviour is a regulatory style where consumer behaviour is subject to an external locus of causality, and where consumers are moved by personal incentives. Consumers need external regulation of their consumption because they lack the self-control to take the distant consequences of their behaviour into consideration. They evaluate products in terms of immediate and personal incentives. Negative labelling and (the red side of) traffic light labelling are interventions that match this regulatory style. Negative labelling manipulates the reward/punishment structure of product choice in favour of sustainable choice (Van Dam & De Jonge, 2015). This intervention assumes that even though these consumers acknowledge the relevance of sustainable consumption, their choices are dependent on external cues that trigger their personal interest. Various ways of emphasising the non-sustainable character of the least sustainable product in a choice set appear to be sufficient to deter the consumer. As a result consumer preference shifts away from the most non-sustainable product and overall consumer choice becomes more sustainable (Heinzle & Wüstenhagen, 2012; Van Dam & De Jonge, 2015).

Introjection

Introjection of sustainable behaviour is a regulatory style where consumer behaviour is subject to an external locus of causality, and where consumers are moved by social incentives. Like in external regulation consumers need external regulation because they lack the self-control to take distant consequences of their behaviour into consideration. But compared to external regulation they evaluate their choice in terms of immediate social incentives. Providing information about (alleged) social norms is an intervention that matches this regulatory style. Social norms manipulate perceived social approval of product choice in favour of sustainable choice (Melnyk, Van Herpen, Fischer, & Van Trijp, 2011). Given favourable social norms consumers could increase their social status through conspicuous sustainable consumption (Griskevicius, Tybur, & Van den Bergh, 2010). Depending on the likelihood of cognitive deliberation descriptive or injunctive norms are more effective, but overall perceived social norms shift consumer choice towards more sustainable

consumption (Culiberg & Elgaaied-Gambier, 2016; Melnyk et al., 2011).

Identification

Identification with sustainable behaviour is a regulatory style where consumer behaviour is subject to an internal locus of causality, and where consumers are moved by social incentives. Contrary to the previous two styles consumers can control their immediate consumption urges in favour of distant sustainable incentives, but like introjection consumers use social comparison to evaluate their choice. The activation of guilt and pride is an intervention that matches this regulatory style. Manifest social norms activate guilt associated with non-sustainable product choice and pride associated with sustainable product choice (Onwezen, Bartels, & Antonides, 2014). Given the appropriate social norms consumers are motivated to avoid non-sustainable choices out of anticipated guilt or shame and (to a lesser degree) find pride in sustainable consumption.

Integration

Integration of sustainable behaviour is a regulatory style where consumer behaviour is subject to an internal locus of causality, and where consumers are moved by personal incentives. Consumers can control their immediate consumption urges in favour of distant sustainable incentives, and this control is subject to personal reinforcement. The activation of personal ethical norms is an intervention that matches this regulatory style. The appropriate personal norms activate intrinsic self-confirmation motives that stimulate the consumer to consume sustainably (Van Dam & Fischer, 2015). This intervention assumes that consumers endorse sustainable consumption, and that their self-control is related to their self-concept. As long as a sustainable or ethical self-concept is activated consumers reinforce their self-esteem through ethical and sustainable product choice. This reinforced self-esteem in turn may enhance their self-control, so that rather than ego-depletion successful self-control leads to ego-fulfilment (Schmeichel & Vohs, 2009).

Conclusions

Extrinsically motivated sustainable consumption covers a broad range of regulatory styles bordered by a-motivation and intrinsic motivation. Early studies into cognitive evaluation show that in many instances the use of external control to regulate behaviour undermines or prevents intrinsic motivation (Deci, 1975; Ryan & Deci, 2000). External control easily reduces a sense of autonomy and then produces counter-effective results both among intrinsically motivated and a-motivated people. When consumer autonomy is reduced this may lead to cognitive reactance, evasive behaviour, or creative compliance (Braithwaite, 2002; Brehm & Brehm, 1981; Mazis, Settle, & Leslie, 1973). Tangible rewards – but also other manifest attempts to control behaviour – diminish the autonomy and the intrinsic motivation for the desired behaviour (Deci, Ryan, & Koestner, 1999). Bad motives drive out good, and external control nurtures bad motives (Goodin, 1976; Plant, Lesser, & Taylor-Gooby, 1980).

The interventions discussed here show that external control of behaviour is not necessarily counterproductive to behavioural change. Negative labelling (Van Dam & De Jonge, 2015) and descriptive social norms (Melnyk, van Herpen, Fischer, & van Trijp, 2013; Stok, De Ridder, De Vet, & De Wit, 2014) can cause a shift towards more sustainable consumption without reducing the perceived autonomy of the consumer. Negative labelling is an effective form of external control that maintains consumers' autonomy and actually contributes to increased internal motivation and self-control for sustainable consumption, whereas positive labelling only affects intrinsically motivated committed sustainable consumers. Likewise perceived social norms of relevant social groups are effective (Culiberg & Elgaaied-Gambier, 2016), whereas general injunctive norms ('thou shalt ....') are more likely to provoke reactance and therefore may have counterproductive effects (Stok et al., 2014).

The common presentation of self-determination theory places the four regulatory styles of extrinsic motivation on a single continuum (Vansteenkiste et al., 2005). The 'external regulation' end of the continuum is most external and adjacent to a-motivation, whereas the 'integration' end is most internal and touches upon intrinsic motivation. Though the original authors of self-determination theory explicitly deny that the continuum represents stages of change (Ryan & Deci, 2000), the two dimensional representation of Figure 1 suggests that social feedback may act as a catalyst for the internalisation of regulatory styles. Adding a personal-social 'locus-of-reward' dimension reveals that the continuum from external personal regulation to internal personal integration passes through two intermediate styles that depend on social incentives. The social regulatory styles result in adapting behaviour to perceived appropriateness (introjection) due to social judgement, and aid in changing self-perception (identification) due to internalisation of social norms (Higgs, 2015). The modest impact of sustainability on consumer behaviour thus may reflect the absence of strong social norms concerning sustainable consumption. Whether behavioural economics and economic psychology are twins or stepchildren (Fetchenhauer et al., 2012), they clearly can benefit from a close friendship with economic sociology (Granovetter, 2002). The addition of a social dimension to self-regulation suggests that the subsequent regulatory styles represent increasing levels of internalisation that link a-motivation before external regulation to intrinsic motivation beyond integration.

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Applied Studies in Agribusiness and Commerce – APSTRACT
Center-Print Publishing House, Debrecen
DOI: 10.19041/APSTRACT/2016/2-3/7

SCIENTIFIC PAPER

FOOD AND NUTRITION SECURITY AS GENDERED SOCIAL PRACTICE

Anke Niehof

Wageningen School of Social Sciences (WASS), Wageningen University, Hollandseweg 1, 6706KN Wageningen, the Netherlands

Abstract: *In many parts of the world, the food security of households and the nutrition security of individual household members, in particular that of children, are still at risk, in spite of the progress made in combatting hunger at the global level. The prevailing opinion among scientists and development practioners alike is that women's empowerment is the key to household food security and good nutrition of children. Similarly, it is thought that gender inequalities manifest themselves in dietary discrimination of women resulting in their lesser access to sufficient and nutritious food. To investigate the credibility of these 'common truths', empirical evidence on women's roles in the social practices that aim at realizing household food security and good family nutrition was reviewed. It can be concluded that women definitely yield and wield power through their involvement in and responsibility for these practices, but that – at the same time – enhancing women's capabilities by improved access to critical resources would benefit their household's food security and their children's nutrition. Furthermore, except for the region of South Asia, gender inequalities do not visibly result in a gender gap in nutrition, although women's specific dietary needs in relation to pregnancy and motherhood are not always recognized.*

Keywords: *household food security, child nutrition, gender, social practices*

Introduction

A few years ago a short film was broadcasted at Dutch television by SIRE, a not-for-profit organization that aims at bringing significant social issues to the attention of the Dutch public. The film pictures a family gathered at the table for the Sunday dinner with the father standing to carve the meat. The text shows what one of the children is thinking: "Who is this man, who always cuts the meat on Sundays?" The message is about the social undesirability of invisible fathers who only on Sundays are part of family life. The fact that the father carves the meat at the Sunday meal, traditionally the best meal of the week, also highlights his role as provider or 'breadwinner'. His family is food secure and his earnings make the nice meal possible, but his work turns him into a virtually absent father during weekdays.

In a nutshell and at micro level, the film captures important themes that at the global level in specific contexts constitute urgent and inter-related social problems: food, nutrition and gender. The IFPRI annual report of 2015 comments on the situation as follows. The positive news is that the Millennium Development Goal of halving global hunger has been achieved and that during the past two decades global undernourishment has fallen from 19 percent to 11 percent (IFPRI 2015: 1). However, the report also notes that food and nutrition insecurity are not just problems of poor countries. Also in Middle Income Countries (MICs) such as India, Brazil, China, Mexico and Indonesia, "persistent or rising inequalities across wealth, gender and education add to the burden of hunger and malnutrition", resulting in child stunting alongside a rising incidence of overweight (IFPRI 2015: 15). To improve the situation, inequalities should be reduced, those relating to gender in particular: "Given the importance of gender equity in improving food security and nutrition, MICs should focus on *empowering women*" (IFPRI 2015: 17, my italics). Unequal access to good food and nutrition represents an inequality and – at the same time – reflects other social inequalities, though in different ways across the life course (Bras 2014).

In this paper I will focus on the gendered social practices which are involved in the synergistic relationship between food, nutrition and gender. In prevailing paradigms, gender inequality and food and nutrition insecurity are thought to reinforce one another in a vicious cycle with gender inequality as the propelling factor (e.g. Quisumbing et al. 1995; Ulmer 2003). In an overview article Richards et al. (2013) conclude that a large body of literature spanning twenty years provides evidence of the links between women's status and child health and nutrition. Consequently, to turn the vicious circle into a virtuous one, reducing gender inequalities by empowering women would be the obvious starting point (IFPRI 2015). Taking this line of thinking gives rise to two questions. First, in what ways would women's empowerment increase food and nutrition security for their families? The second question is whether gender inequalities in general translate into gender differences in access to good food and nutritional status, also referred to as the gender gap in food and nutrition (cf. Backstrand et al. 1997).

This paper proceeds by outlining the conceptual framework in which the main concepts are discussed and mutually related. Subsequently, relevant research findings are presented, and – at the end – a general discussion and conclusion is formulated. Narrative evidence from primary research will be used to explore the diverse empirical manifestations of the issues involved and – where possible – this evidence is linked to existing review studies.

Conceptual framework

Frame 1: Food and nutrition security

After the concept of food security was coined at the World Food Conference in 1974, for a long time it was commonly defined as access to enough food by all people at all times for an active and healthy life (Maxwell 2001). In recent years, this definition was further refined as all people having physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO 2013). The word 'access' is common to both. This goes back to the seminal work of Amartya Sen (1981) who shifted the then existing emphasis on the adequacy of food supplies to one on the capability of individuals to access food through entitlements. The FAO amendments reflect the increasing attention for nutrition security, which in the former definition was rather implicitly indicated by the phrase 'active and healthy life'. Even if people have access to sufficient food in terms of calories they can still be malnourished, because they do not get the micro-nutrients their dietary needs require. Micro-nutrient malnutrition is also referred to as 'hidden hunger'; it is increasingly recognized as a severe problem (IFPRI 2015).

The discourse summarised above and the definitions it produced are still a bit floating; the question of *whose* food and nutrition security we are talking about is not addressed. I see food security as anchored to households and nutrition security to individuals. Conceptualising households as resource-managing family-based groups that are geared towards meeting the primary and daily needs of their members (Niehof 2011), implies that for most people it is in their household that actions are undertaken and strategies deployed to meet their food needs. To be able do this, households need resources. This links food security to livelihood security. Household livelihood security is a necessary condition for household food security, although on the short term households may allocate reserves to meet their members' food needs at the expense of assets needed for livelihood generation (Balatibat 2004). Livelihood failure makes households vulnerable to shortfalls in income and food, resulting in nutrition inadequacy and poor health (Roa 2007).

Food security at household level does not automatically translate into good nutrition of the household's individual members. There are several reasons for that. First, people's dietary needs differ according to sex and age, and these different needs are not always recognized (Backstrand et al. 1996). In the second place, culturally-underpinned discriminatory practices in the intra-household distribution of food may favour men over women and boys over girls. The third reason has to do with how the food is consumed and whether the body is able to use the micro-nutrients contained in the food. For example, intestinal parasites may obstruct the uptake of iron and thereby cause anaemia. In the ways and the environment in which the food is consumed, care is an important intermediate factor. This is recognized in the UNICEF model that shows the linkages between maternal care, dietary intake and health status of children (Balatibat 2004: 42). Mothers are the caretakers of their children's food intake and may cause their children's diet to be unbalanced (Michaelsen et al. 2009). A mother's inattentiveness may jeopardize the dietary intake of her children, even in food secure households (Blijham et al. 2007). A panel study among schoolchildren in India found a significant positive association between the mothers' education and the nutritional status of their children (Dasgupta et al. 2008).

The safety of foods is also mentioned in the amended definition of food security. Water, hygiene and sanitation are important intermediate variables in food safety, because of their direct (biological contamination of food) and indirect (health status) influence on the bodily uptake of calories and micro nutrients (Bhaskaram 1999). The IFPRI report hails "the greater understanding of the role of water, sanitation and hygiene in nutrition" (IFPRI 2015: 1-2). Food safety is at risk not only when the food is biologically contaminated but also when it contains dangerous chemicals. A recent study conducted in Vietnam describes the concerns of women about the contamination of vegetables by agro-chemicals (Wertheim-Heck 2015).

Frame 2: Gender, agency and women's empowerment

Gender refers to the different, ideologically and culturally underpinned roles and positions of men and women in society. Giddens (1984: 85) called gender one of the most "all-embracing criteria of the social identity." Gender intersects with other markers of social identity such as age, class, and marital status. At these intersections gender is manifested and performed, for which resources are required. Availability of resources and women's access to these can strengthen women's agency and bargaining position in settings where gender inequalities prevail such as households, which Sen (1990) characterized as a context of both cooperation and conflict.

Elsewhere, I have described agency as "conscious action aimed at achieving certain outcomes, with the actors concerned considering the efficacy and appropriateness of their behavior in a given context that comprises the institutional and normative environment within which daily life is enacted" (Niehof 2007: 189). Agency yields and wields power. Kabeer sees agency in the positive sense ("power to") as "people's ability to make and act on their own life choices", and agency in the negative sense ("power over") "as the capacity [...] to override the agency of others." She also notes that power can operate "in the absence of explicit forms of agency", because of institutional bias (Kabeer 2005: 14). Additionally, I would

note that hegemonic (patriarchal) discourses that perpetuate inequalities also wield power, by justifying curtailment of the agency of those who are subordinated. Further, I concur with Kabeer (2005: 15) that "resources are the medium through which agency is exercised" and that "resources and agency make up people's capabilities." Merging these notions, I see women's empowerment as enhancement of their capabilities in such a way that they can better make and act on their own choices and overcome patriarchal constraints.

Connecting the two frames by social practices

If women's empowerment is the key to closing the 'gender gap' in food and nutrition and to improved household food security, then one should look at the practices that contribute to achieving food and nutrition security and assess the potential for women's enhancement of their capabilities regarding these practices. Theories of practice are gaining ground. Warde (2014: 286) lists the following emphases in theories of practices that – for more or less obvious reasons – are relevant for understanding food- and nutrition related practices: performances, praxis, practical competence, habit and routine, collectivity, shared understanding, sequence, and the material.

The first frame presented above comprises three sequential and partly overlapping clusters of practices and outcomes: livelihood generation, food security and nutrition security, all anchored to the household as the immediate context in which the relevant practices are performed. Because nutrition security is to a large extent conditioned by food security and because there can be no food security without some degree of livelihood security (Balatibat 2004), the practices involved can "be imagined to be nested" (Warde 2014: 296). In this paper, I focus on the clusters of food security and nutrition security in the sequence of nested practices to investigate the role of women's empowerment and the gender gap in food and nutrition. Drawing on the discussion above and on a model that pictures the linkages between households and the food chain (Niehof 1998: 45), Table 1 lists the relevant practices that can be identified.

Food processing and food storage practices feature in both columns. Regarding food security such practices are important for preserving food supplies, whereas in relation to nutrition security the practices should be such that quality is maintained and biological contamination avoided. Women's agency and the resources available to them (capabilities) are an essential factor in all of these practices, because in "most societies women continue to carry the responsibility for the mental and manual labor of food provision" and perform most of the food-related work (Allen and Sachs 2012: 3). The gender gap would be visible in the second column, particularly in relation to food distribution and consumption practices.

The empirical picture

Women and household food security

Food procurement is embedded in livelihood generation through backward linkages because of the resources it requires. In rural areas in many parts of the world, smallholder food crop production is the cornerstone of rural households' food security. A study conducted in the highlands of Southwestern Ethiopia (Negash and Niehof 2004) provides a good example of such linkages and women's performance at these. In this part of Ethiopia, *enset* is the staple crop. *Enset* resembles a banana plant but the edible parts are the pseudo stem and the underground corm, not the fruit. Plant materials from the pseudo stem and the corm are put in a pit and covered with leaves for fermentation. From the fermented product, called *kocho*, bread is made, which is consumed at least twice a day. Men prepare the soil and do the planting and transplanting, women do the weeding, harvesting and processing. Although in the prevailing patrilineal kinship system all land is passed on through men, husbands should prepare plots for their wives' *enset* plants in the backyard of the homestead. The women can harvest *enset* from these plots whenever they want and are expected to feed the household from their plots. They have to make sure that there is enough *kocho* for the household's food needs. To the people the number of *enset* plants and the diversity of *enset* clones a household has, signifies household food security. This is not just an emic perception; it has been noted that in Ethiopia the *enset* zones have suffered few food crises (Rahmato 1996). So, in the case of the *enset*-based food system, women are in fact the custodians of household food security, not only because of their labour but also through having a rightful claim to a plot of their own and being the decision makers on matters of harvesting, processing, and

Table 1: Key practices in food and nutrition security

Food security practices →	*Nutrition security practices*
Food procurement: • Food crop production • Buying, borrowing and exchanging food • Gathering of wild foods	Selective food procurement practices aimed at enhancing food safety
Food processing Food storage Changing the composition of the food-sharing unit	Food processing Food storage Food preparation Intra-household food distribution Food consumption and hygiene, including supervision of minors

selection of clones. All these constitute crucial capabilities.

Whether the staple is *enset*, maize, banana or rice, there always is a gendered division of labour in producing the crop. This division of labour is affected when significant numbers of adult men or women no longer contribute their share of labour, as in the case of male outmigration or in a context of HIV/AIDS. In China, the lack of male labour due to migration was found to cause problems for the wives left behind. It became difficult to find labour to plough the fields (a men's job) and the extension service was not responsive to the needs of the women who had to do the farming on their own (Yuan and Niehof 2011). In Nepal, male outmigration led to agricultural land left fallow, and among the younger generation food security became increasingly equated with having income from remittances to buy enough food instead of with having a reliable food supply from own cultivation (Gartaula et al. 2012). In sub-Saharan Africa, a negative impact of HIV/AIDS on both household food security and gender equality has been observed (Müller 2005). A study on the implications of AIDS for household food security in two districts in Uganda severely affected by the epidemic, found that "in the face of declining household incomes, non-expansion of household assets, small landholdings and other production-related constraints coupled with high AIDS prevalence levels, the capacity of households, particularly female-headed ones, to ensure sustained household food sufficiency becomes questionable" (Karuhanga 2010: 128). When families face food shortages because of AIDS, one or more child(ren) may be sent to female relatives for fostering, so that there are fewer mouths to feed and the children do not suffer. In such cases, it is women who decide on this and who make the arrangements, not only in households of single women and children (Paradza 2010) but also in households headed by men (Du Preez 2011).

The examples above show that among smallholders food production can be at risk because of labour constraints and external shocks. Such issues are not easily resolved because of their multi-faceted and poverty-based nature. Women's empowerment, in the form of better access to land, to information and to extension services, mitigates these problems to some extent, but it is not a panacea. The author of a thesis on the effects of the feminisation of agriculture caused by male labour migration in China concludes that the results "do not support the argument that men's migration and labour feminization in agriculture provide the space for women to plead for more equal gender relations with men. The unequal gender relations are re-affirmed and re-produced through this process" (Meng 2014: 163).

Wild foods, such as berries, fruits, mushrooms, specific tubers, wild honey, fish or snails, are gathered in a variety of ecosystems all around the world. Especially women and children are experienced and knowledgeable practitioners, and their gathering activities can yield a meaningful contribution to the daily menu. In rural Northeast Thailand, for example, gathered wild foods represented 50 percent of the items comprising the local diet during the rainy season and 30 percent during the dry season (Setalaphruk and Price 2007: 2).

The practice of women sending their children to a relative when they can no longer feed them shows the importance of social networks in women's strategic manoeuvring to safeguard the family's food security. In the large body of literature on the value of social capital for people's survival and advancement, an analysis of the differential effect of gender is often lacking (cf. Molyneux 2002; Franklin 2005). Regarding household food provision, however, the fact that the borrowing, exchanging, giving or receiving food is channelled through female social networks cannot be ignored. In rural Bangladesh, food borrowing is daily practice and is mainly done by women, in the virilocal extended-family homesteads particularly among the wives of the brothers sharing the homestead. Bigger rice loans may be obtained from landlords, but these have to be paid back with interest (rice or money) after harvest (Ali 2005). Among single migrant women in Accra, Ghana, obligations of and entitlements to food support are extended from the own domestic unit to local networks of women traders in the market community. The networks are underpinned by propinquity and morality, but are also bounded by ethnicity and common area of origin (Tufuor et al. 2015). Similarly, the food exchange and borrowing among the women in the Bangladesh study does not cross religious (Muslim-Hindu) lines and, among Hindu families, is constrained by caste stratification (Ali 2005).

All around the world, women play pivotal roles in food storage and processing. The Ethiopian case of the *enset* food system described above provides a good example. Among the matrilineal Minangkabau in West Sumatra, Indonesia, women have always been in charge of the rice stocks, formerly stored in the rice barn opposite the *rumah gadang*, the traditional extended-family house (van Renen 2000). In East Java, Indonesia, women maintain the *in vivo* stored cassava tubers, which are dug up, processed and prepared as staple when – in the preharvest period – rice stocks have dwindled (Solichin 1996). In Northern Mozambique, women reign over the granaries and the "food is controlled, cooked and distributed by the older women" (Arnfred 2007: 149).

Women and family nutrition

The women in the Vietnam study (Wertheim-Heck 2015) try to control food safety by making sure that the vegetables they buy and prepare are free from agro-chemicals. They do this step-wise. First, they select the site or location where they buy the vegetables based on experience and routine. Then they select a retailer or vendor whom they regard as trustworthy and, subsequently, they select the product by combining product characteristics (size, freshness, seasonality, geographical origin). Finally, at home they carefully wash the vegetables before preparing them. The author concludes: "Food safety is continuously reproduced along pre-given lines within existing behavioral routines" (Wertheim-Heck 2015: 201).

Cooking, the next practice in the sequence of relevant practices, is "almost universally coded as women's work" (Allen and Sachs (2012: 29). In Northern Mozambique,

Arnfred (2007: 149) observed cooking to be "a pride and privilege, also for the young wife." In Northern Ghana, women are judged by the quality of the soup that goes with the staple, for which they have to make sure they have the proper ingredients (vegetables and spices), from their own kitchen gardens or from the market. In extended-family households, where several women share the kitchen, the most senior woman allocates the labour and ensures that the soup is properly prepared (Pickbourne 2011). In large parts of Southeast Asia, women's iconic responsibility for feeding the family legitimates their control over the household budget and their engagement in income-generating activities (Firth 1966; Hy Van Luong 1998; Niehof 2007). A quote from a focus group discussion in the Bangladesh study shows that women can also experience this responsibility as a burden: "Men never want to know how we manage; they only want their food during meal times. At the time of a crisis we have to go hungry and feed our children and husbands", whereas men say: "The quality of a wife shows in how she can manage" (Ali 2005: 168, 169).

In the trajectory between the preparation of the food in the kitchen and its actual consumption, the way the food is distributed and the setting in which it is consumed affect the nutritional uptake by individual household members. This applies to children in particular, as illustrated by the following cases from the Philippines. In the city of La Trinidad, children come in at meal times but the mothers are unable to make the children sit down at the table and finish their plates. According to the authors, this could explain the children's vitamin A and C deficiencies (Blijham et al. 2007). In Leyte Province (Visayas), only the pre-schoolers' action radius is sufficiently within the scope of the mother's attention to enable her to control the children's food intake. This is not the case for school children, but they are less vulnerable than the younger ones. The survey data shows the mothers' level of education and nutrition knowledge to have a significant positive effect on child health. A significant effect of the source of drinking water on child morbidity was found as well (Roa 2007: 254). In a study on new communities in resettlement sites in Indonesia and the Philippines, in the Philippine site the availability of public spaces (sidewalks, basketball courts) was negatively associated with children's health. The author explains that children play with their friends in these places and, when hungry, go home to get some money to buy food from sidewalk vendors, concluding: "These children are likely to catch viruses and bacteria from these places and from the food they buy" (Quetulio Navarra 2014: 129).

A very different picture emerges from a study in two Wolayta villages in lowland South West Ethiopia, where the staple is maize. In these agricultural communities, eating together is highly valued and the mothers make sure that all children, including the little ones, get their appropriate share of the food. The author observed that "children accessed family food in an attentive, supportive and protective atmosphere, in a daily meal structure that sought to meet their needs in terms of meal frequency and timing" (Szava 2015: 427). The mothers worry about the adequacy of their children's diet. They would like to offer more diverse and rich foods but do not have the resources to do so. The author notes, however, that despite the mothers' understanding about 'good food', their efforts "focussed on the quantity of food (to make sure the children were content) rather than on its quality (the diversity and bioavailability of nutrients)" (Szava 2015: 431). In the research area, food hygiene is compromised by the proximity of livestock. At the same time, women's food preparation "was always preceded by the careful rinsing of the hand and the utensils and dishes used in cooking and serving" (Szava 2015: 436). Additionally, the women's way of handling dairy products (butter and cheese) by means of fermentation inhibits harmful bacteria and, therefore, adds to food safety.

The cases discussed above show the pivotal role of mothers in safeguarding family nutrition, especially that of children. As in the case of household food provision, also in feeding their children women rely on female support when they cannot manage on their own. A study among female household heads in Sri Lanka found that these women attach much value to childcare support from kin and the community, and that this help is channelled through female networks. The following quote illustrates this: "Looking after children on occasions and more importantly giving children food and meals is common practice amongst us" (Ruwanpura and Humphries 2004: 196). A similar pattern was found among single migrant women in Accra (Tufuor et al. 2015). Richards et al. (2013) highlight the supportive role of senior women (grandmothers) in younger women's child care practices. In the Ethiopian study discussed above (Szava 2015) the mother's mother turned out to be a much valued source of information and support regarding child nutrition and health. The women would not turn to their mother-in-law, even though in the prevailing virilocal setting she would live close by. Although the women's support system was localized and relied on sisters-in-law, neighbours and friends, women "generally avoided asking for advice of their mothers-in-law" (Szava 2015: 352). Also in the Bangladesh study (Ali 2005) sisters-in-law are part of the women's food support system and no mention is made of the mother-in-law. Hence, it could well be that the senior women who are important for child nutrition and health are maternal rather than paternal grandmothers.

The gender gap in nutrition

Gender differences in food intake and in nutritional status have been observed in many societies and are referred to as the gender gap in nutrition (Backstrand et al. 1997). In the Bangladesh study, women complain that at a time of food shortages they have to go hungry to feed their children and husband (Ali 2005), indicating dietary discrimination in favour of men. In the Wolayta households, however, the researcher observed that "gender seemed to play a lesser role in food sharing than age, and old age invited positive bias" (Szava 2015: 283). The first example points to the gender gap in nutrition, the second does not. In this section, I shall address the issue of the gender gap in nutrition.

Backstrand et al. (1997) point out that gender disparities

in nutritional status always have biological components – because of different energy needs, for example – and social components – culturally and socially underpinned gendered differences in dietary quantity and quality. The researchers collected data on the nutrition of schoolchildren in 290 households in six rural communities in Mexico. They found no evidence of dietary discrimination of girls, irrespective of household wealth, but girls did score lower on dietary quantity than boys. This is because they are less physically active than boys (playground observations), hence have lower energy needs. However, the authors warn that when diets are of poor quality, "the ability to eat more of a diet can be the difference between malnutrition and health" (Backstrand et al. 1997: 1758). This could make girls more prone to the risk of malnutrition than boys, even in the absence of dietary discrimination.

DeRose et al. (2000) did a cross-country study on the relationship between the 'female disadvantage' – gender inequalities resulting in excess female mortality – and unequal access to food. The data reveal only for South Asia "a clear pattern of male advantage reflected in anthropometric data on children" (DeRose et al. 2000: 526). This was not found for other regions, but the authors note that aggregate macro-level data may mask female disadvantage in specific settings. Also when looking at children's food intake, no overall gender differences are found. What evidence there is, "comes solely from South Asia" (DeRose et al. 2000: 527). Regarding food intake of adults, no systematic bias against women emerged from the studies, although poorer women have problems in meeting their dietary requirements when pregnant or breastfeeding. In assessing these rather unexpected findings, the authors come up with several explanations. Their final conclusion is that "discrimination against women operates through mechanisms other than calorie deprivation. Most importantly, perhaps, it operates through differential access to health care, education, and leisure" (DeRose et al. 2000: 539).

The studies discussed above clearly do not support an unequivocal confirmation of the existence of a gender gap in nutrition in societies where gender inequalities explicitly feature in social organization, except for the region of South Asia. However, even though women might not suffer from dietary discrimination in terms of calories, they still may have micro-nutrient deficiencies, also given their role in biological reproduction. DeRose et al. (2000: 518) conclude: "When food is part of female disadvantage, it appears to be a problem of quality (micronutrient intake) much more often than one of quantity (calorie intake)."

Discussion and conclusion

This paper is an attempt to provide answers to the pertinent question raised by Allen and Sachs (2012: 3) of how to "better understand the complicated and contradictory connections between gender and food." First, there is the issue of the role of women's empowerment. In my view, women's empowerment is always a good thing, if only for the sake of the women themselves. However, in relation to food and nutrition security women's empowerment is given an instrumentalist twist; it is allegedly good for household food security and family, especially children's, nutrition. Much in the same way as women's access to micro finance is expected to help women meet their practical gender needs for the benefit of their families (Binaté Fofana et al. 2015).

The instrumentalist approach implies an acknowledgement of women's key role in household food provision and child nutrition. This role is visible in the practices I discussed in this paper. Women wield power when they reign over the food stocks and rule the kitchen. But, do they need to be further empowered, and – if yes – in what way? Empowerment is about the "transformative forms of agency that do not simply address inequalities but are used to initiate longer-term processes of change in the structures of patriarchy" (Kabeer 2005: 16). The cases reviewed picture women as rather well empowered, i.e. having the necessary capabilities to perform their role as guardians of household food supplies and gatekeepers of family nutrition. One of the capabilities required is the ability to mobilize the female support network when needed. It is noteworthy that in a context of HIV and AIDS women's support relations in their caring for persons living with AIDS are not only mostly female but also proved to be matrilineal connections (Niehof 2015). The same might apply to female support for child nutrition, as is illustrated by the key role of the mother's mother in the Ethiopian case (Szava 2015) and by women agreeing to foster the children of their matrilineally-related female relative when requested (Paradza 2010; Du Preez 2011). Women's participation in female support networks empowers them. In the case of the female household heads in Sri Lanka, the women's female networks that had emerged in a situation of crisis were more effective than the "crumbling" traditional patriarchal support structures and were in fact undermining these (Ruwanpura and Humphries 2004: 200). Women caregivers for people living with AIDS gain authority and decision-making power, in this way generating a 'matriarchy of care' (Niehof 2015).

However, there is scope for women's empowerment. Having better and sustainable access to critical resources would enhance women's capabilities and their exercise of "transformative forms of agency" (Kabeer 2005: 16). The Wolayta women, for example, would like better gardens where they can grow vegetables to be able to provide their children with richer foods, but the proper watering that such gardens require is now constrained by lack of both water and time (Szava 2015). In this case, improving local water sources would help. The finding of Roa (2007) that the level of education and nutrition knowledge of mothers had a significant positive effect on child health suggests an empowering effect of education and access to information. Also DeRose et al. (2000) conclude that discrimination against women operates among others through differential access to education (and health care). Empowering women by education and information transcends the instrumentalist motive, because "education increases the likelihood that women will look after their own well-being along with that of their family" (Kabeer 2005: 16).

To conclude, the evidence of a diversity of detailed

empirical studies does neither reveal a consistent lack of empowerment of women that has an inhibiting effect on household food security nor does it indicate a serious gender gap in nutrition, except for South Asia. On the other hand, however, food and nutrition security are still critical issues in many parts of the world. To address these issues, empowering women by increasing their access to the resources they need, is the only way to turn vicious cycles into virtuous ones. Women cannot be circumvented in interventions aimed at enhancing household food security and child nutrition. Such interventions should start with a contextual analysis of the prevailing gender relations and inequalities, and should have a focus on meeting women's practical gender needs and facilitating women's empowerment.

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Applied Studies in Agribusiness and Commerce – APSTRACT
Center-Print Publishing House, Debrecen
DOI: 10.19041/APSTRACT/2016/2-3/8

SCIENTIFIC PAPER

THE ADDED VALUE OF SUSTAINABILITY MOTIVATIONS IN UNDERSTANDING SUSTAINABLE FOOD CHOICES

Muriel C. D. Verain[1], Marleen C. Onwezen[1], Siet J. Sijtsema[1], Hans Dagevos[1,2]

[1]Wageningen University and Research, P.O. Box 35, 6700 AA Wageningen, The Netherlands
[2]Inholland University of Applied Sciences, P.O. Box 3190, 2601 DD Delft, The Netherlands

Abstract: *Understanding consumer food choices is crucial to stimulate sustainable food consumption. Food choice motives are shown to be relevant in understanding consumer food choices. However, there is a focus on product motives, such as price and taste, whereas process motives (i.e. environmental welfare) are understudied. The current study aims to add to the existing literature by investigating the added value of sustainable process motives (environmental welfare, animal welfare and social justice) above product motives. Two on-line surveys of representative Dutch samples tested whether process motives increase the explained variance of sustainable consumption. The results indicate that sustainable process motives are of added value above product motives in the understanding of consumer food choices. In addition, product categories differ in the sustainable process motives that are most useful in explaining sustainable purchases in that category (Study 1), and different types of sustainable products (organic versus fair trade) differ in the sustainable process motives that are most useful in explaining these purchases (Study 2). In conclusion, this paper shows that understanding of sustainable consumption can be improved by considering sustainable process motives above product motives. Thereby, it is important to take the sustainability dimension (e.g., social justice versus environmental welfare) and the product category (e.g., meat versus fruit) into account.*

Keywords: *Sustainability, food, motivations, organic, fair trade*

1. Introduction

1.1 Sustainable consumption

Sustainable consumption has become a vivid and respected field of research in recent decades. This scholarly interest is reflected in special issues in various academic journals (e.g., *Journal of Industrial Ecology*; *Journal of Consumer Behaviour*; *International Journal of Consumer Studies*), edited volumes (e.g., Cohen & Murphy, 2001; Jackson, 2006; Kennedy et al., 2015; Reisch & Thøgersen, 2015), and a flood of books and scientific papers on the topic. Research on sustainable consumption has several merits. To begin with, it presents a more nuanced idea of consumption than simply as a "bad" thing, that is, primarily associated with its Latin root of "*consumere*" which means that things are being used or destroyed – quite the opposite of sustaining something as a matter of fact.

Secondly, sustainable consumption contains a broader picture of consumers than the image of the purely rational and narrowly self-interested consumer only interested in cheap and convenient products regardless of the production processes. Previous studies reveal that consumers are not only rational decision makers, but also aim to feel good about themselves and their choices (Adreoni, 1990; Onwezen, Antonides & Bartels, 2013). Consumers can, for example, take sustainable production processes, like environmental welfare, social justice and animal welfare into account during purchases (e.g., Lindeman & Väänänen, 2000; Vermeir & Verbeke, 2006). Consumers differ in how they weigh these pro-self versus sustainable values (Onwezen & Van der Weele, 2016; Onwezen & Bartels, 2011; Verain et al., 2012), but there are also differences *within* individuals, for example shown in the debates about consumers and citizens. The prototypical consumer is first and foremost price-conscious and product-oriented, while the prototypical citizen takes the consequences of his or her consumption choices on the social and physical environment into account (e.g., Schröder & McEachern, 2004). Based on this conceptual depiction of a split personality, consumers and citizens are held dichotomous. However, also here more nuanced ideas have been developed in the course of time in which a clear distinction between people as consumers and citizens is questioned or denied (Korthals, 2004; Schudson, 2007; Trentmann, 2007; Warde 2015). Taken together, there is more to consumption decisions than price tags and quantity. Consumers also take sustainable processes into account when purchasing products.

A third merit of the field of sustainable consumption is that it counterweights the focus on technological progress and innovation as the main solution to sustainable development. Although it is widely believed that technology will solve sustainability problems, various voices are raised to advocate that consumer behaviour should also be part of the

sustainability equation (Brinzan et al., 2012; Tukker & Jansen, 2006). In other words, the issue of sustainability has a clear and crucial consumption side. Therefore, consumers are not only part of the problem of unsustainability, they are also part of the solution to move towards a more sustainable future (see also some of our previous studies: De Bakker & Dagevos, 2012; Dagevos & Voordouw, 2013; Onwezen et al, 2014a; 2014b; Verain et al., 2012; Verain et al., 2015).

As consumer choices are crucial in achieving sustainability gains, sustainable food consumption has attracted the attention of a growing number of researchers (e.g., for an overview see Reisch et al., 2013). The production and consumption of food is connected with huge and acute sustainability problems ranging from animal welfare issues, to greenhouse gas emissions, land depletion, and deterioration of biodiversity, to child labour and poor working conditions. This enumeration shows the many dimensions included within the umbrella concept of sustainable food. In this paper, we define sustainable food consumption as food consumption were environmental welfare, animal welfare and social justice are respected (Aschemann-Witzel, 2015; Van Dam & van Trijp, 2011). If we want to stimulate consumers to make sustainable food choices, it is important to better understand consumers' food choice motives. The current study, therefore, aims to further understand consumer decision making for (sustainable) food consumption.

1.2 Food choice motives

Food choice motives (e.g., Steptoe et al., 1995) are often used to explore food choices, and show to be relevant in understanding consumer food choices (Sautron et al., 2015). Broadly, and based on Dagevos and Van Ophem (2013), two types of motives can be distinguished: product motives (pro-self motives) and process motives (pro-social motives). *Product motives* are related to the product and result in benefits for the self, such as the price, sensory characteristics or healthiness. *Process motives* relate to the production process and include motivations related to different dimensions of sustainability, such as environmental welfare, animal welfare and social justice. Product motives are much more researched in the literature, whereas process motives only receive attention recently (e.g., Lindeman & Väänänen, 2000; Sautron et al., 2015). Product motives, such as price and product appearance, are often used by consumers as arguments to not consume sustainable products (i.e., Aertsens et al., 2009). However, for understanding sustainable food consumption it is important to include process motives, because especially these motives refer to sustainability values. Previous studies underscore this reasoning, for example by showing that sustainable process motives are important determinants of sustainable consumption (e.g., Verain et al., 2015).

The food choice questionnaire (FCQ), developed by Steptoe and colleagues (1995), measures motives for food selection and includes the following motives: convenience, price, health, sensory appeal, weight control, natural content, mood, familiarity and ethical concern. The FCQ has been applied in numerous studies to explain consumer food choices, for example for organic foods (Chen, 2007; Lockie et al., 2004), fruit and vegetables (Pollard et al., 2002), traditional foods (Pieniak et al., 2009) and functional foods (Ares & Gambaro, 2007). Those studies show that health, sensory appearance, price and convenience are the most important motives, whereas ethical concern is of less importance. In addition, the ethical concern dimension, which comprises process motives, shows to have a low reliability. The FCQ includes a very limited number of process motives. Therefore, Lindeman and Väänänen (2000) added ethical motives to the FCQ and distinguished an ecological (consisting of animal welfare and environmental protection), political and religion-related component. The study of Lindeman and Väänänen (2000) shows that individuals distinguish between ecological, political and religion-related motives. Of these motives ecological welfare is rated as the most important ethical motive for food choice. Several more recent studies also included additional process motives to better understand sustainable food behaviour (e.g., Sautron et al., 2015; Verain et al., 2016). Despite this scholarly attention for process motives, it remains unclear what their added value is in understanding sustainable food consumption. Therefore, the current study aims to add to the understanding of sustainable food consumption, by investigating the added value of sustainable process motivations above product motivations.

1.3 Three hypotheses

Traditionally, food consumption generally and sustainable food consumption specifically are explained by product motivations. However, sustainable consumption is associated with prosocial values. In line with contemporary consumer studies, we therefore propose that process motivations that include prosocial values, such as animal welfare, social justice and environmental welfare, are also of importance in understanding sustainable food consumption (e.g., Verain et al., 2016). Therefore, our first hypothesis is:

Hypothesis 1: Sustainable process motives are of added value above product motives in explaining sustainable food behaviour.

Two categories of sustainable food consumption can be distinguished (Verain et al., 2015): a change in consumption pattern, and a shift towards sustainably produced food products. Hypotheses 2 and 3 are devoted to each of both categories respectively.

The first category includes the shift of consumption patterns towards more sustainable diets. A large body of research is conducted on how to achieve that, and consensus is reached on the importance to shift diets towards a more plant-based diet and a less animal-based diet (e.g., Health Council of the Netherlands; 2011, Joffe & Robertson, 2001; Reisch et al., 2013; Van Dooren et al., 2014; Westhoek et al., 2014). Consumption of animal-based products, such as dairy, fish, and meat, should be decreased. This can be achieved by introducing vegetarian days or by consuming smaller portions

of animal-based products for example.

The shift to more sustainable consumption patterns reveals the relevance of different product categories. Previous studies show indications that different sustainable process motives (e.g., environmental welfare, animal welfare and social justice) have a distinct impact on different product categories (e.g., Onwezen et al., 2012). Consumer motivations can differ between product categories and between animal-based and plant-based products for example. In order to better understand sustainable consumption, these differences should be taken into account. For all product categories, it is likely that sustainable process motives play a role, but the sustainability dimension (environmental welfare, animal welfare and social justice) may differ between these product categories. Animal welfare and environmental welfare are likely to play a role for animal-based products, whereas environmental welfare and social justice are more likely to play a role for fruits and preserved products that have been imported from developing countries. Therefore, we hypothesise that:

Hypothesis 2: Purchase of sustainable animal-based products can best be explained by animal welfare and environmental welfare motives, whereas purchase of sustainable plant-based products can best be explained by environmental welfare and social justice.

A second strategy towards more sustainable food consumption is the purchase of products that have been produced in a sustainable way. Examples of such products are environmental friendly products, products that consider animal welfare or fair trade products (e.g., Logatcheva, 2015). It is likely that the purchase of these different types of sustainable products can best be explained by motivations for different dimensions of sustainability (environmental welfare, animal welfare and social justice). The added value of different types of sustainable process motives may differ between organic and fair trade product choices for example. For organic food choices, we know from literature that environmental welfare, animal welfare and social justice concerns are all important motives (Honkanen et al., 2006; Lockie et al., 2002; Magnusson et al., 2003). For fair trade, literature on the underlying sustainability motivations is unavailable, but fair trade includes both environmental benefits, as producers are encouraged to improve the environmental sustainability of their products, as well as social justice (Ozcaglar-Toulouse et al., 2006). Therefore, we hypothesise the following:

Hypothesis 3: Environmental welfare, animal welfare and social justice motives are associated with organic purchases and environmental and social justice motives are associated with fair trade purchases.

2. Study 1

Study 1 aims to test whether sustainable process motives increase the explained variance of sustainable consumption above the inclusion of product motives (*H1*). Organic food purchases were used to study sustainable consumption, because the purchase of these products can be regarded as a sustainable act. We included animal-based (dairy and meat), plant-based (fruit and vegetables) and processed food (mixes and sauces; included to incorporate a full diet) to test hypothesis 2. We hypothesise that sustainable behaviour of animal-based products can best be explained by animal welfare and environmental welfare motives, whereas purchase of sustainable plant-based products can best be explained by environmental welfare and social justice (*H2*).

2.1. Method and Analyses

2.1.1 Participants

Data was collected through an online survey. Respondents were recruited by a market research agency in October 2014. The sample consisted of 1000 Dutch respondents and was nationally representative in terms of age, gender, and geographic distribution. The sample consisted of 49% males and has a mean age of 51.3 years (SD= 15.1).

2.1.2 Measures

The questionnaire included items on (a) food choice motives, (b) self-reported purchase of organic food in general and in specific product categories, (c) demographics and some other variables, since this questionnaire was part of a larger survey.

Food Choice Motives.

Respondents were asked to answer on a 10-point scale how important a range of motives are in their current food choice. The product-related motives that were included are: price, taste, health, convenience, ready to eat, appearance, weight maintenance, branded (A-brand), private label, familiar, safe, natural, portion size, pure (no or nearly no additives), traditional (craftsmanship), nearly no processing and quality. In addition, a range of sustainable process motives were included, namely animal friendly, organic, environmental friendly, country of origin, local and fair trade.

Self-reported organic purchases.

Respondents were asked to indicate which percentage of their total food purchases were organic, with answer categories 'I never buy organic food', 'less than 25% is organic', '25-49% is organic' and '50-90% is organic'. The same question is asked more specifically for meat, dairy, vegetables, fruit, and mixes and sauces.

2.1.3 Analyses

Hierarchical multiple regression analyses were performed to test whether adding sustainable process motives increases the explained variance in sustainable food behaviour. Organic purchase was the dependent variable and food choice motives were included as independent variables. We included all product motives in the first block and the sustainable process motives were included in the second block. Significance tests of the change in R square are used to test whether adding

sustainable process motives increases the explained variance. The analyses were performed for organic food choices in general and for organic food choices in specific product categories.

2.2 Results

2.2.1 Food choice motives.

Table 1 shows that the product motives explain 21.5% of the variance in self-reported organic purchases. The motives that are significantly associated with organic purchases are natural, pure, traditional and ready to eat (negative).

Adding the environmental welfare, animal welfare and social justice motives beyond the product motives significantly increases the explained variance, with 12.1% and the motives that are significantly associated with organic purchases are natural, pure, ready-to-eat (negative), organic, environmental friendly, country of origin (negative) and fair trade.

Table 1: Multiple regression analysis on organic food consumption

Food choice motives	**beta**	**t**	**F(df1, df2); $R^2/\Delta R^2$**
Block 1 private label	-.04	-1.03	
familiar	-.04	-1.12	
A-brand	-.04	-1.10	
portion size	-.02	-.61	
price	-.03	-.78	
health	-.01	-.21	
taste	.00	.03	
convenience	.00	-.08	
appearance	-.01	-.20	
natural	.25	5.16***	
weight control	.06	1.56	
safety	-.03	-.65	
pure	.18	3.77***	
handcrafted	.08	2.02*	
ready to eat	-.10	-2.82**	
low in additives	.03	.69	
promotion	-.05	-1.28	
quality	.02	.53	F(18,999)14.887; R^2=.215
Block 2 organic[1]	.43[2]	9.713***	
environmentally friendly	.10	1.988*	
country of origin	-.14	-3.551***	
regional	-.02	-.532	
animal friendly	.03	.691	
fair trade	.16	3.291**	F(24,999)20.558; ΔR^2=.121***

Note. The results show the unadjusted R2. The beta coefficients of block 1 are the coefficients without Block 2 included.05; **p<.01; ***p<.001

Food choice motives for specific products

Table 2 shows the results of the same analyses (as described above) for the specific product categories. The results reveal that for all product categories including sustainable process motives increases the explained variance (*H1* is true for all included product categories).

The findings only partially confirm hypothesis 2. Dairy and meat purchases are both, as proposed, associated with environmental welfare motives (organic), and meat consumption also shows an association with animal friendliness as proposed. However, dairy purchases are not associated with animal friendliness, and meat purchases show an unexpected association with social justice motives.

The findings regarding plant-based products also only partially confirm hypothesis 2. Fruit and vegetable purchases are both associated with environmental welfare motives, and fruit purchases are also associated with social justice motives. However, vegetables are not significantly associated with social justice motives.

Table 1: Multiple regression analysis on organic food consumption

	Dairy[1]	Meat[2]	Fruit[3]	Vegetables[3]	Mixes and sauces[1]
organic	.397***	.441***	.386***	.400***	.237***
environmentally friendly	.064	.031	.014	.023	.033
country of origin	-.086	-.130**	-0.08	-.057	.028
regional	.062	.014	.043	.011	.023
animal friendly	.046	.126**	.011	.036	.014
fair trade	.047	.101*	.133*	.078	.072
F(df1,df2) p;ΔR^2	(24,924) 12.485***; ΔR^2=.090***	(24,942) 15.287***; ΔR^2=.124***	(24,908) 11.914***; ΔR^2=.091***	(24,946) 14.417***; ΔR^2=.087***	F(24,672) 4.341***; $\Delta R2$=.040***

Note that this table only shows the included sustainable process motives (block 2) of the regression analyses. Block 1 in which the product motives are included is shown (included singularly) in Table 1, and the significant associations when block 2 is included are discussed in the notes below.

[1] *For dairy and mixes and sauces there are no significant associations for the product motives*

[2] *For meat consumption ready-to-eat (β=-.088; t=-2,582*) shows a significant association when the process motives are included.*

[3] *For fruit and vegetable consumption the motives A-brand (fruit: β=-.086; t=-2.394*; vegetables: β=-.084; t=-2.435*) and ready-to-eat (fruit: β=-.081; t=-2.257*; vegetables: β=-.110; t=-3.187**) show a significant association when the process motives are included.*

2.3 Discussion

The results of Study 1 reveal, among the first, that adding sustainable process motives is relevant to increase understanding of sustainable consumption. More specific, the results show that sustainable process motives increase the explained variance of organic purchases (*H1* confirmed). This is true for sustainable food behaviour across all included product categories.

Additionally, the results imply the relevance of specifying

different dimensions of sustainable behaviour (environment, animal welfare, social justice). Although we only partially confirm hypothesis 2, the result do show that different dimensions of sustainability are relevant for the different product groups, indicating the relevance of specifying sustainability dimensions and conducting product-specific research. The results reveal that environmental motives (organic) are relevant for understanding consumption of all specific products. This is a logical consequence for choosing organic products as a dependent variable. As proposed fair trade motives show to be relevant for fruits, but, as opposed to our hypothesis, this is not the case for vegetables. The importance of social justice is thus not confirmed for all included plant-based categories. As proposed animal welfare shows to be relevant for animal-based products (meat), though this was, against our hypothesis, not confirmed for dairy. Therefore, *H2* is only partly confirmed.

The results of Study 1 clearly indicate the relevance of sustainable process motives, though the study has a few limitations. Study 1 only included organic purchases, which might increase the impact of environmental welfare motives compared to animal welfare and social justice motives. Study 2 therefore also includes fair trade purchases. In this way we gain further insight in the importance of the three sustainability dimensions across different product labels (organic and fair trade).

Study 1 included a range of motives based on the food literature. Though the motivations were measured with different amounts of items. Additionally, one can argue that it is most relevant to show the added value of sustainable process motives beyond a vested validated scale. Study 2 therefore uses the validated Food Choice Questionnaire to explore whether adding sustainable process motives (with comparable amounts of items) increases the explained variance of sustainable purchase intentions.

3. Study 2

Study 2 aims to replicate the findings of Study 1 by using a validated measurement instrument. In addition, Study 2 explores whether different dimensions of sustainability (environmental welfare, animal welfare and social justice) differ in their added value for organic versus fair trade purchases. We hypothesis that Environmental welfare, animal welfare and social justice motives are associated with organic purchases and environmental and social justice motives are associated with fair trade purchases.

3.1 Method

3.1.1 Participants

Respondents were recruited by a research agency and completed an online questionnaire. The sample consisted of 3,748 Dutch respondents and was nationally representative in terms of age, gender, and geographic distribution. The sample consisted of 50% males, and has a mean age of 44.5 years (*SD*=15.0).

3.2.2 Measures

All selected measures were answered on seven-point scales with labelled endpoints and are described in detail below.

Food Choice Motives. We included the food-choice motives (Steptoe et al., 1995): health, convenience, sensory appeal, natural content, price, weight control, familiarity and ethical concern. Lindeman and Väänänen (2000) adapted the food choice motives such that ethical concern was divided in ecological values (environmental welfare and animal welfare), political values and religion. Based on their work we divided ecological values in environmental, animal welfare and social justice values, (see Table 3 for the included sustainable process motives). Note that Lindeman and Väänänen (2002) used only limited items to measure animal welfare and social justice. We therefore extended their work, such that we measure each dimension with multiple items. In doing so, the framework allows ‘‘direct comparisons to be made about the relative importance of dimensions (Steptoe et al., 1995, p. 269)”.

Table 3. Environmental welfare, animal welfare and social justice motives (Cronbach's alpha)

Environmental welfare (α=.910)
...has an environmentally friendly packaging.
...produced in an environmentally friendly manner.
...is produced without a minimum of Co_2 emissions. ...is organic. ...is produced without pesticides. ...is produced within the season.
Animal welfare (α=.908)
..produced with sufficient freedom of movement for animals.
...is animal friendly produced.
...produced with by free-range label.
Social justice (α=.865)
...Produced in a humane way.
...produced without child labor.
...produced without exploitation. ...is fair trade.

Each motive was measured with multiple items. Respondents rated multiple importance statements for their daily food intake on a seven-point scale with ‘completely disagree’ and ‘completely agree’ on the extremes.

Self-reported consumption. Respondents were asked to indicate how often they consumed a range of organic and fair trade products in the past two months. For organic, the included categories were fruit, vegetables, meat and dairy. For fair trade consumption, the included categories were bananas, tea, coffee and chocolate. The items were measured on seven-point scales ranging from 1=‘never’ to 7=‘daily’. These results were combined into one average score for organic food consumption and one average score for fair trade food consumption.

3.2 Results

3.2.1 Analyses

Confirmatory factor analyses were used to test whether the sustainable aspects indeed are three separate dimensions. Further analyses were performed similar to Study 1.

3.2.2 Confirmatory factor analyses.

The analyses were performed with Mplus version 6.11. The model fit indices were *RMSEA*, *SRMR*, *CFI*, and *TLI* (Kline, 2011). *RMSEA* below .06 and *SRMR* below .08 indicate a satisfactory model fit (Hu & Bentler, 1999). Finally, *CFI* and *TLI* indices of at least .90 indicate a satisfactory model fit (Bhattacherjee, 2002; Hu & Bentler, 1999). AIC, BIC and chi-square scores were used to compare models. We used chi-square difference tests, as recommended by Vandenberg and Lance (2000) to test for significant differences across models.

The results revealed that sustainability was perceived as consisting of multiple dimensions. The one-dimensional model (χ^2/df= 4980.808/104, $p<.001$; CFI=.906; TLI=.892; SRMR=.042; RMSEA=.112; AIC= 170682.929) provided a significant worse fit compared to the multi-dimensional model (in which environmental welfare, animal welfare and social justice were distinguished) (χ^2/df = 2465.330/100; $p<.001$; CFI=.955; TLI=.945; SRMR=.037; RMSEA=.079; AIC= Akaike (AIC) 168175.451) as indicated by a Chi-square difference test ($\Delta\chi2(4)=2515.478$, $p<.0001$).

3.2.3 Regression analyses consumption.

Table 4 shows that the product motives explain 12.7% of the variance in self-reported organic consumption and 5.6% of the variance in self-reported fair trade consumption.

Adding the sustainable process motives beyond the product motives significantly increases the explained variance for *organic purchases* with 5.9%. For *fair trade consumption*, adding the sustainable process motives significantly increases the explained variance with 3.0%. The results indicate that, as proposed, adding sustainable process motives significantly increases the explained variance (*H1* confirmed).

Additionally, environmental welfare and animal welfare are relevant for organic consumption, and environmental welfare, animal welfare and social justice are associated with fair trade consumption. Therefore hypothesis 3 is only partially confirmed.

3.2.4 Regression analyses specific products

Finally, we also performed the analyse for the specific products and categories meat, dairy, vegetables, fruit, bananas, coffee, tea and chocolate). The results are shown in table 5. For all products and product categories, including sustainable process motives beyond product motives shows a significant increase in explained variance. These findings confirm hypothesis 1 for the specific products and product categories.

Regarding hypothesis 2, the results show as proposed that animal-based products are associated with animal welfare and environmental welfare motives. The plant-based products show as proposed an association with environmental welfare motives, though unexpectedly not with social justice motives. These findings partially confirm hypothesis 2.

Regarding hypothesis 3, the results show, as proposed, that organic purchases are associated with environmental welfare and animal welfare (for animal-based products), whereas fair trade purchases are associated with social justice and environmental welfare. However, against our expectations, organic purchases are not associated with social justice motives. Hypotheses 3 is therefore partially confirmed.

Table 4. Hierarchical regression analyses food choice motives including sustainable motives

Food choice motives	**Beta**	**T**	**F(df1, df2); R2/ΔR2**	**Beta**	**t**	**F(df1, df2); R2/ΔR2**
	organic consumption			fair trade consumption		
Health	.07	2.90**		.03	1.41	
Price	-.12	-6.96***		-.09	-4.87***	
Weight	-.07	-3.54***		-.08	-3.66***	
Convenience	-.02	-1.17		-.05	-2.73**	
Familiarity	-.09	-1.62***		.08	4.29***	
sensory appeal	-.04	-.28*		-.08	-4.37***	
Natural	.306	16.27*	F(7,3747)77.944; R2=.127	.20	10.02***	F(7,3747)31.453; R^2=.056
Environmental welfare	.41	10.803***		.29	7.21***	
Animal welfare	.07	2.431*		-.07	-2.08***	
Social justice	-.03	-.876	F(10,3747)85.399; ΔR^2=.059***	.19	6.21***	F(10,3747)44.040 ΔR^2=.050***

**p<.05; **p<.01; ***p<.001; the results show the unadjusted R^2; The beta coefficients of block 1 are the coefficients without model 2 included.*

3.3 Discussion

Study 2 shows similar to Study 1 that sustainability motives increase the explained variance in sustainable food consumption (*H1* confirmed). Additionally, similar to Study 1 Study 2 reveals the relevance of including specific sustainability dimensions as these dimensions show to have different associations across product categories and across different product labels (organic versus fair trade).

Across different product categories, the results show that animal-based products (meat and dairy) are significantly associated with environmental welfare and animal welfare, as expected. Plant-based products (fruits and vegetables) are only significantly associated with environmental welfare motives and unexpectedly not with social justice (*H2* partly confirmed).

Across different product labels the results show that environmental welfare and animal welfare are significantly associated with organic consumption. Social justice motives are unexpectedly not associated with organic consumption. For fair trade, the results show, as proposed, a different pattern. Only environmental welfare and social justice show a significant association for the specific products (*H3* partly confirmed). The findings are discussed in detail in the general discussion.

4. General discussion

In consumer studies on food, it is customary to put emphasis on product motives that are pro-self in nature, such as taste, texture and price. At the end of the 20th century consumer concerns (Brom & Gremmen, 2000) related to process motives (as opposed to product motives), (e.g., animal welfare, environmental friendliness, fair trade, origin or transparency) received more and more attention in research as well as in society. Thus, food choices are also influenced by practices and characteristics of food production processes and the food system at large (Dagevos & van Ophem, 2013). This blossoming field of research requires an understanding of consumption beyond product qualities such as price or taste. Therefore, the objective of this study was to take the analysis of sustainable food consumption a step further by explicitly assessing how valuable sustainable process motives are for understanding sustainable food purchases, 1) in general, 2) in specific products or product categories and 3) of different product labels (organic and fair trade).

The yield of our analysis demonstrates that the inclusion of sustainability motives have added value in explaining sustainable food choices. This is the case for sustainable food purchases in general, but also for all included products and product categories and for organic as well as fair trade products. The results not only indicate that sustainability motives are important in understanding sustainable food choices, but also that different dimensions of sustainability should be distinguished, because the added value of these dimensions differs across product categories and products and between organic and fair trade products.

The findings reveal differentiations, some expected and some unexpected, across products and product categories and between different labels. Obvious enough, animal welfare issues emerge to be more relevant for animal-based food products than for plant-based food products. Though within the group of animal-based foods, the added value of animal

Table 5. Results of regression analyses (coefficients when all motives are included) for each product category of Study 2.

	organic				**fair trade**			
	meat	dairy	vegetables	fruit	bananas	coffee	tea	chocolate
Block 1 Health	-.015	.029	.026	.016	.015	-.030	-.006	-.044
Price	-.126***	-.103***	-.091***	-.098***	-.76***	-.064**	-.057**	-.070***
Weight	-.030	-.066**	-.080***	-.071***	-.080***	-.063**	-.063**	-.066**
Familiarity	-.006	-.020	-.071***	-.052**	.052**	.041*	.068***	.069***
Convenience	-.067***	-.059**	-.086***	-.064**	-.037	-.038*	-.061**	-.029
Attractiveness	-.025	-.067***	-.042*	-.046*	-.82	-.088***	-.071***	-.073***
Natural	-.040	.004	-.053	-.051	-.094**	-.078**	-.095**	-.077**
Block 2 Environmental welfare	.301***	.315***	.437***	.410***	.250***	.213***	.267***	.268***
Animal welfare	.132***	.066*	.051	.023	-.057	-.058	-.045	-.072*
Social justice	-.047	-.021	-.029	.004	.174***	.194***	.131***	.154***
Block 1 F(df1,df2) R^2	F(7, 3747) 50.766***; R^2=.087***	F(7, 3747) 59.987***; R^2=.101***	F(7, 3747) 75.487***; R^2=.124***	F(7, 3747) 63.150***; R^2=.106***	F(7, 3747) 26.305***; R^2=.047***	F(7, 3747) 22.625***; R^2=.041***	F(7, 3747) 23.551***; R^2=.042***	F(7, 3747) 23.494***; R^2=.042***
Block 2 F(df1,df2) $\Delta R2$	F(10, 3747) 55.9509***; ΔR^2=.043***	F(10, 3747) 59.950***; ΔR^2=.037***	F(10, 3747) 84.390***; ΔR^2=.060***	F(10, 3747) 70.978***; ΔR^2=.054***	F(10, 3747) 35.909***; ΔR^2=.041***	F(10, 3747) 31.992***; ΔR^2=.038***	F(10, 3747) 31.718***; ΔR^2=.036***	F(10, 3747) 32.244***; ΔR^2=.037***

**p<.05; **p<.01; ***p<.001; the results show the Unadjusted R^2 :The beta coefficients of block 1 are the coefficients without model 2 included.*

welfare motives differs between the product categories of meat and dairy. For organic dairy, environmental motives prove to be relevant, whereas animal welfare issues are not significantly important. For organic meat though, product motives, environmental welfare, animal welfare and fair trade all show to be relevant. This outcome may have to do with a different consumers' perception of the relevance of animal welfare of cows for production of milk (living cattle) and cows for meat production (slaughtered cattle). Furthermore, social justice appears to be less important for fruit and vegetables than expected. This might have to do with differences between products within the categories of fruits and vegetables, as some products often contain fair trade labels, while for other products this is not the case. Banana consumption, for example, shows to be associated with social justice, and bananas are imported products which often contain a fair trade label. Such results give reason to suggest that it is fruitful to specify different dimensions of sustainable behaviour (environmental welfare, animal welfare, social justice) for different products or product categories.

An unexpected finding is the significant positive relation between fair trade and meat purchases in the first study. This result is surprising, as meat products never have a fair trade label. Similarly, the negative significant relation between animal welfare and fair trade purchases is difficult to explain. Finally, based on the literature a positive significant relation between organic purchases and social justice motivations was expected, but this hypothesis was not confirmed. These unexpected findings are difficult to explain but might have to do with a lack of consumer understanding in the different sustainability dimensions, or the lack of motivational differentiation between the sustainability dimensions (see also van Dam & van Trijp, 2011). Therefore, it is of importance to conduct future research in consumer understanding of sustainable food products and the different dimensions and product labels.

As the results of this study indicate that sustainable process motivations have added value to product motivations in explaining sustainable food behaviour, this suggests that we have to think about rebalancing the scale of food consumption motives. The inclusion of the ethical motives by Lindeman and Väänänen (2000) may be regarded as a first step to be followed by others. Next to a renewed focus on the inclusion of process motives, we could consider the idea of bringing traditional product motives as well as process motives all back to one or two items rather than measuring various motives with different amounts of items. Doing so may be helpful to develop in the foreseeable future a more balanced and flexible scale tailored to study motivations in the context of sustainable food consumption.

Related to this, it is also important to consider de level of abstraction on which motivations are formulated. The FCQ measures the importance of food choice motives on 'a typical day' (Steptoe et al., 1995), thus very general. This study shows that the added value of product motives and sustainable process motives differs across products and product categories. This might suggest that measurement of food choice motives on the level of product categories or products provides a deeper understanding of sustainable food consumption. In this research, both differences between product categories (for organic labels) and between products (fair trade labels) have been found. The aggregation of product categories into animal-based and plant-based products seems too abstract, though, because (unexpected) differences between meat and dairy and between fruits and vegetables have been found for example. The optimal measurement level needs further research (see also Verain et al., 2016).

A practical implication of this study relates to the promotion of sustainable products. First of all, sustainable process motives appear to have added value in explaining sustainable consumption. This finding suggests that it can be beneficial for retailers to focus on the sustainable character of their products. In doing so, though, it is important that they critically consider the sustainability dimension that they emphasise, because the different dimensions differ in importance for different products and product categories. Future research should be conducted to get more insights in the optimal combination of sustainability dimensions and product categories or products.

In future research it is also relevant to consider different target groups who might weigh sustainability in general and/or the different sustainability dimensions differently and might be more or less interested in sustainability for different product categories (Verain et al., 2016). Van Dam & van Trijp (2011) conclude that all sustainability attributes collapse into one single motivational dimension, but this is true for light users of sustainable food products. Future research should turn out whether these results also apply to heavy users. It might well be that for heavy users, the sustainability dimension matters more. These insights will give input for more targeted communications and interventions to promote sustainable food consumption more effectively.

In conclusion, insights in sustainable consumption can be improved by considering sustainable process motives above product motives. In that context, this paper shows that it is important to take the sustainability dimension (e.g., social justice versus environmental welfare), the product label (e.g., organic versus fair trade) and the product or product category (e.g., meat versus fruit) into account for a better understanding.

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Applied Studies in Agribusiness and Commerce – APSTRACT
Center-Print Publishing House, Debrecen
DOI: 10.19041/APSTRACT/2016/2-3/9

SCIENTIFIC PAPER

WOMEN AND MICROCREDIT IN RURAL AGRARIAN HOUSEHOLDS OF UGANDA: MATCH OR MISMATCH BETWEEN LENDER AND BORROWER?

Faith Namayengo. Johan A.C. van Ophem and Gerrit Antonides

Wageningen University, Wageningen, The Netherlands

Acknowledgements: *This work was supported by the Nuffic-Netherlands Fellowship Program. We would like to thank the following institutions and people for providing support during various stages of this manuscript preparation: BRAC Mukono Area Office, Kyambogo University, Kampala, and our team of research assistants.*

** Corresponding author: Economics of Consumers and Households Group, P.O. Box 8130, 6700 EW Wageningen. Email: faith.namayengo@wur.nl/*

Abstract: *The alignment of microfinance programs with the context and expectations of the recipients is critical for ensuring clients' satisfaction and desired program outcomes. This study sought to investigate the extent to which the objectives and design of the BRAC microfinance program match the expectations, context and characteristics of female borrowers in a rural agrarian setting in Uganda. Quantitative and qualitative methods were used to obtain socio-demographic, personality and microenterprise (ME) characteristics of existing borrowers, incoming borrowers and non-borrowers and to obtain information about the microcredit program. We found that BRAC uses a modified Grameen group-lending model to provide small, high-interest rate production loans and follows a rigorous loan processing and recovery procedure. BRAC clients are mainly poor subsistence farmers who derive income from diverse farming and non-farm activities. The major objective to borrow is to meet lump-sum monetary needs usually for school fees and for investment in informal small non-farm businesses. Many borrowers use diverse sources of funds to meet repayment obligations. Defaulting on loans is quite low. The stress caused by weekly loan repayment and resolution of lump-sum cash needs were identified as reasons for women to stop borrowing. The limited loan amounts, the diversions of loans to non-production activities, the stages of the businesses and the weekly recovery program without a grace period may limit the contribution of these loans to ME expansion and increase in income.*

Keywords: *Uganda, BRAC, rural microcredit, women.*

Introduction

Microfinance has been promoted by many national and international developmental agencies as a tool for poverty alleviation and development of poor communities (Matin *et al.*, 2002; Armendariz and Morduch, 2010; Armendáriz and Labie, 2011).The core objective of microfinance institution (MFIs) programs is to bring financial services to such resource-constrained communities. Formal institutions usually shy away from the poor because they lack collateral and because of information asymmetry and high transaction costs (Hulme and Mosley, 1996; Morduch, 2000; Matin *et al.*, 2002; Armendariz and Morduch, 2010; Armendáriz and Labie, 2011).

Women constitute a large percentage of the poor in many communities (UNDP, 1996; Fletschner, 2009). This is because financial, social and economic inequalities limit their participation in formal markets (Meyer, 2013). Yet women make significant contributions to the welfare of their families and households. They play significant roles in economic production, social reproduction, care and community activities (Oestergaard, 1992; Buvinić, 1997; Momsen, 2004; Niehof, 2004a; Niehof, 2015). They enhance their agency to seek for opportunities for personal and family welfare improvement. To diversify their livelihoods, they set up small enterprises with limited financial outlay and often low returns (Jiggins, 1989; Schreiner and Woller, 2003). Women in Uganda are no exception. They reportedly suffer from the burden of poverty and financial and social deprivation (Lakwo, 2006; Wakoko, 2004). Poverty, hunger and food deprivation are common in rural areas which rely on agricultural production as a source of livelihood (MoFPED, 2014).

Support for the poor to get out of their impoverished states is a core objective of many MFIs. Under their microcredit component, MFIs target poor micro-entrepreneurs for financial support. The support is in the form of microloans for

productive purposes, to be repaid with interest. The premise is that the loans are invested in poorly-financed microenterprises and enable borrowers to make strategic decisions for business growth and survival (Sen, 1999; Matin *et al*., 2002; Guiso *et al*., 2004). These loans are expected to increase the income from self-employment and in the long-run should lead to poverty reduction (Matin *et al*., 2002).

The performance of MFIs and benefits to the recipient depend on the characteristics of the lending program, the recipients and the general context (Cohen and Snodgrass, 1997). Program characteristics like collateral requirements and lending model (Morduch, 1999; Armendariz and Morduch, 2010; Attanasio et al., 2015), borrower characteristics like gender and education (Barrett et al., 2001; Nanayakkara and Stewart, 2015), and purpose of borrowing may influence the outcomes from borrowing.

MFIs have different ways of selecting program recipients, but many target poor women, for different reasons. Firstly, women have generally been underserved by MFIs because of different socio-cultural barriers (Meyer, 2013). Second, women play a key role in maintenance of household welfare and allocate a large proportion of their resources to this (Barnes et al., 1999; Cheston and Kuhn, 2002; Kabeer, 2005). Support to women is expected to benefit entire households. Studies have reported significant effects of borrowing on household consumption and child nutrition for female but not male clients (Pitt and Khandker, 1998; Pitt *et al*., 2003).

MFI activity in Uganda commenced and greatly expanded in the 1990s. By the end of 2009, the country had over 350,000 active MFI clients (UBOS and MoFPED, 2014). The Association of Microfinance Institutions of Uganda (AMFIU) reported 84 MFI members in 2011 (AMFIU, 2011). BRAC Uganda Microfinance Limited, commonly referred to as BRAC, is one of the largest micro-lenders in rural areas in Uganda (UBOS, 2010a). Its operations in Uganda started in 2006. In 2011, it was reported to have a loan portfolio of UGX. 31 billion (about 11million) and 107,000 active borrowers, predominantly (98.4%) women. BRAC thus works with women in rural Uganda, who play a key role in agriculture, a major sector of employment in Uganda (UBOS and UNFPA, 2014). Like other MFIs that work with underserved rural agrarian recipients, BRAC has enormous potential to contribute to agricultural production, reduction of food insecurity and rural poverty, and improvement of the lives of poor women (Meyer, 2013)

A lot has been written about the operations and contributions to poverty reduction of BRAC and other MFIs in Bangladesh (Montgomery *et al*., 1996; Pitt and Khandker, 1998; Develtere and Huybrechts, 2002; Chemin, 2008; Chemin, 2012). However, not much work has been done on MFIs in Uganda. We conducted a study to assess the contribution of microfinance support to household food security. We aim to add to the body of literature the potential of microcredit to contribute to food security improvements in resource-constrained agrarian communities. In this paper we present findings on the context and characteristics of the BRAC microfinance program in Uganda. We evaluate the characteristics of the borrowers, their reasons for borrowing, the process of loan application, loan allocation, use and repayment. The question we address is whether the BRAC program is well aligned with the characteristics and needs of the borrowers.

The remainder of the paper is organised as follows: Section two provides background information, including a description of the BRAC microfinance program. Section three provides the study design and data collection methods. Section four presents our findings including the characteristics of the BRAC microfinance program as well as comparisons of the socio-demographic and personality and microenterprise characteristics of current and in-coming borrowers, as well as for respondents who did not borrow from BRAC. We also present FGD results on the reasons for borrowing, loan allocation and use as well as the dynamics of loan repayments. In section five we present the discussion and conclusion.

2. Background

2.1 Uganda Country Profile

Uganda is a tropical country in East Africa with an estimated population of about 35 million people according to the recently concluded Uganda population and housing census (UBOS and UNFPA, 2014). The country is divided administratively into 121 districts. In 1962 Uganda obtained its independence from Great Britain. The post-independence economic growth was short-lived when between 1970 and the early 1980s, the country plunged into years of political and financial stagnation under despotic leadership (UBOS and ICF, 2012). In 1986, the National Resistance Movement took over leadership of the country and embarked on what was envisaged to be a period of growth for the country. In the late 1980s, the new government implemented the structural adjustments programmes (SAPs) of the IMF and World Bank. This included restructuring of the public sector; reduction of public spending, and privatisation of poorly performing government parastatals. Many government workers were retrenched and the role of the private sector in the development of the country gained prominence. Unfortunately one of the undesirable outcomes of the SAP was the government giving up provision of services that previously supported poor women. At the same time there was a widening gap between men and women for the control of productive resources (Kakokka, 2001). The need for women to join the informal sector by setting up small microenterprises also increased.

The government committed itself to macroeconomic stability with a resultant period of economic growth. The 1990s saw Uganda ranked among the fastest growing economies of Sub-Saharan Africa, in terms of GDP. The high inflation rate of the 1980s was brought down to less than 10% in the 1990s. By the year 2000 the country lost a substantial part of its reproductive labour force to HIV and AIDs (Karuhanga, 2008), but progress has been made in the fight against HIV to attain the current prevalence level of 7.4% (Republic of Uganda, 2014).

Between 1995 and today, the country has continued to

make economic progress, albeit at a slow rate. There has been some progress in the reduction of poverty to the current level of 19.7%. Poverty levels remain higher in rural areas, where agriculture is the mainstay of rural livelihoods (MoFPED, 2014). The country still ranks as one of the poorest in the world, with a GDP per capita of 423 in 2014 and GDP growth rate of 4.9% in 2014. Agriculture remains the major form of employment with 57% of women and 55% of men engaged in agriculture, forestry and fisheries (UBOS and UNFPA, 2014). The country has poor human development indices. The maternal mortality rate is 438, the infant mortality rate 54, the under-five mortality rate 90, and at 6.5 the total fertility rate is comparatively high as well (UBOS & ICF, 2012)

2.2 Evolution of microfinance in Uganda

After the SAPs of the late 1980s, the government of Uganda shifted focus to the private sector, particularly the financial sector, as an engine of development of the country. The financial sector was poorly performing due to poor regulation and lack of control. The government launched the financial sector reform strategy to improve efficiency in the sector. This included among others licensing of private financial institutions and liberalisation of borrowing rates and the foreign exchange market (Bategeka and Okummu, 2010).

During 1997-1999 poorly performing banks were closed. Some of these had a wide national coverage, including rural areas. The result was a sector vacuum in many parts of the country. The remaining banks struggled with defaults and remained reluctant to lend to the rural poor (Carlton *et al*., 2001; Bategeka and Okummu, 2010). The government then implemented the Financial Institutions Act to strengthen supervision of the financial sector, including MFIs. With the sector being more stable and streamlined, the first MFIs in Uganda began operations in 1990 and thrived. Rapid expansion of the sector took place in the mid-1990s. From 1997 onwards, the collaborative effort of donors, NGOs and capacity building partners, and the Bank of Uganda resulted in strengthening the MFI sector. The Association of Microenterprise Finance Institutions of Uganda (AMFIU), launched in 1997, aims at providing a platform for sharing experiences, technologies and also to work as a lobby group for MFIs. In 2000, the different stakeholders came together to synchronise operations and develop a framework of regulation and control for the sector. Coupled with the closure of the two major banks, this created opportunities for MFIs to expand (Carlton *et al*., 2001; Bategeka and Okummu, 2010). In 2003, the government passed the microfinance deposit-taking act which allowed the initial MFIs in Uganda to take deposits under regulation of the Bank of Uganda. This act enhanced collaboration among MFIs and between traditional MFIs (e.g. FAULU, PRIDE and the Uganda Microfinance Union) and formal banks that also offered microfinance services. Providers who originally offered group loans shifted to individual loans as clients complained about the rigours of weekly loan repayment meetings. Those who maintained group borrowing reduced the required minimum group size to as low as three borrowers. Individual loan requirements were also changed to more realistic forms of collateral, such as salaries, vehicle log-books, guarantors, un-registered land ownership documents, post-dated cheques, and other valuable assets (Mutesasira and Kaffu, 2003; Wright and Rippey, 2003). New products were designed to target the poorer segments of the population.

Wright *et al*. (1998) reported high drop-out rates among MFI borrowers in Uganda. They observed that because of the concentration of MFIs in urban areas many did not reach *poor clients*, but instead reached *rich* and *not-so-poor* clients. The *not-so-poor* dropped out after the 3rd and 4th cycles when larger loan sizes translated into unmanageable repayment instalments. The *poor clients* in rural areas dropped out or rested because of seasonal variations in incomes and expenditures or family emergencies that depleted the borrowed funds and led to repayment failure. The *rich* dropped out because of frustration with the obligatory weekly meetings or because they found the loans too small for their needs (Wright *et al.*, 1998). Reasons given for multiple-borrowing included the need for patch-up loans for the small amounts offered by some MFIs and the need for emergency loans to fund health and education expenditures (Wright and Rippey, 2003).

2.3 Characteristics of MFI programs and their recipients

To enable them reach their target groups efficiently and achieve good loan repayment levels, MFIs need to specify the target group characteristics (usually age and sex) and have to decide on matters like group lending versus individual lending, loan amounts, interest rates and fixed periods of loan repayments. Some MFI lend to individuals, others only to members of borrowing groups. The group lending model is widely associated with the Grameen Bank in Bangladesh. Groups of 5-20 women decide to form a borrowing group but are given individual loans. The group is responsible for repayment of the loans. When a member fails to repay, all members may then be denied subsequent loans (Morduch, 1999; Armendariz and Morduch, 2010). Group loan programs have been found to reach more women than individual loan programs. Advantages to the MFI include peer screening and monitoring, which diminishes problems of moral hazard and information asymmetry (Morduch, 1999; Niels and Lensink, 2007). This supports high repayment levels even in the absence of collateral (Ghatak, 1999; Ghatak and Guinnane, 1999). Group meetings may also function as venues for social marketing on health, nutrition, agriculture or family planning. In addition social networks are built and utilised in group sessions (Pitt *et al.*, 1999; McKernan, 2002). However, the obligatory weekly meetings and the social pressure may be a burden to the borrowers (Wright *et al.*, 1998). Hence, some MFIs have now moved away from group lending to individual lending (Meyer, 2013).

Most MFIs provide production credit, some consumption credit. Mahajan and Ramola (1996) observed that the poor usually have relatively high demand for consumption credit. However, since this is rarely offered, production loans are

used for consumption purposes. MFIs target borrowers of different characteristics regarding age, sex, and education, which may influence the outcomes of the programs. Whereas Pitt and Khandker (1998) reported positive outcomes for female borrowers, Kaboski and Townsend (2012) did not. The level of education influences outcomes positively (Attanasio *et al.*, 2015). MFIs also have different policies regarding maximum and minimum loan size (AMFIU, 2011). Loan size may influence the willingness of clients to join a program and also the outcomes of the programs. Some loans may be too small to make contributions to poverty reduction. The success of microfinance also depends on the context in which a program is implemented (Coleman, 1999; Kabeer, 2005; Chliova *et al.*, 2015). Some programs target the urban poor, others the rural poor, and some have no specific categories as long as borrower can pay (AMFIU, 2011).

2.4. Study area

Our study was conducted in the districts of Mukono and Buikwe, both located in the central region of Uganda, within the Lake Victoria basin. The districts were selected based on two criteria. The first one was the presence of BRAC microfinance activities among rural agrarian clients. The second was the MFI having expansion plans which was necessary for the identification of new borrowers for the study (see Table 1). Mukono district shares borders with Buikwe in the East. The relief, climate and fertile soils makes the area suitable for agricultural production (Mukono District Local Government, 2010).

With a population of about 599,817 people Mukono ranks seventh out of the 121 districts of Uganda, whereas Buikwe has a population of about 436,406. Most people in Mukono (73%) and Buikwe (67%) live in rural areas (UBOS and UNFPA, 2014). Over 80% of the population in both districts rely on agricultural production. Subsistence agriculture is characterised by low acreage due to increasing family sizes and land fragmentation, and by low productivity per unit area because of deteriorating soil fertility. Because of the proximity to the lake and the presence of rivers and many fish landing sites, fishing is an important economic activity in the two districts. Most fish is taken by big fish processing companies for the export market (Mukono District Local Government, 2010). Buikwe district is located 62 kilometres by road east of Kampala. It is a separate district since 2009 (UBOS and UNFPA, 2014).

3. Method

3.1 Study design and instruments

Employing a methodology sometimes referred to as the USAID/AIMS comparative cross-sectional analysis design (see Nelson *et al.*, 2004; Gaile and Foster, 1996), we compared the characteristics of existing borrowers or Old Borrowers (OB) and incoming clients or New Borrowers (NB). The latter were in their mandatory orientation period of one month and had not yet received their first loan. We expected these women to have comparable characteristics as women in the OB category (cf. Armendariz and Morduch, 2010). The selection criteria are summarised in Table 1.

Table 1: Study group criteria of selection

Groups	**Accessed microcredit**	**Criteria**
Old Borrowers (OB)	Yes	Had a microenterprise (ME). Had a running loan with BRAC. Had not borrowed from other MFI before BRAC.
New Borrowers (NB)	No	Had ME. Had joined a village organisation (VO), but were in the mandatory period of one month of orientation before getting a loan.

Tables 2a and 2b provide details of the data collected by the different data collection methods.

Table 2a: Summary of data collected in the quantitative survey

Data category	Variables of interest
Respondent socio-demographic characteristics	Respondent age, marital status, education and religion and savings.
Household information	Numbers, age, and sex composition of household members
Microcredit-related information	Loan amount, loan cycles, loan allocation and expenditure and loan-repayment.
Non-farm ME data	Type and monetary value of Mes
Crop ME data	Types of crops.
Animal ME data	Types of animals
Time preference items[1] (Adapted from:Petrocelli, 2003)	(1) I only focus on the short term; (2) I live more for the present than for the future; (3) The future will take care of itself.
Achievement motivation items[1] (Adapted from: Keinan and Kivetz, 2011, and Ray, 1980)	(1) I get restless and annoyed when I feel I am wasting time; (2) I have always worked hard to be among the best; (3) I am an ambitious person; (4) Improving my life is important to me
Risk Preference items[1] (Adopted from: Blais and Weber, 2006)	(1) I enjoy taking part in decisions with un-known outcomes; (2) I avoid activities whose outcomes are uncertain (reverse scored); (3) to gain high profits in business one should take decisions even when uncertain of the outcomes; (4) I would invest all my monthly profit in a new business venture.

1 Personality characteristics scale (1=agree strongly; 2=agree to some extent; 3=disagree to some extent; 4=disagree strongly)

Table 2b: Summary of data collected by qualitative methdos

Data category	Discussion themes
Focus group discussion data	Reasons for borrowing. Loan repayment. Group dynamics in loan repayment. Benefits of borrowing. Types of loan-funded MEs.
Key informant interview	Characteristics of the BRAC microcredit program

3.2 Organisation of the study

The original questionnaire was designed in English. To reduce inter-interviewer variation in administering the questions and for easy communication with the respondents, it was translated into Luganda (local language) by the Institute of Languages of Makerere University. Seven *Luganda*-speaking enumerators were selected, interviewed and trained. Most were B.Sc. graduates with experience in conducting surveys. During the training, enumerators also translated and back-translated the questionnaire and the result complemented the translation by the professional translators.

Initial enumerator training lasted one week. During this time, the interviewers were oriented about the study questions, objectives and data collection methods. Role-plays were used to practice how to approach and address respondents and how to introduce the study and ensure compliance. Points of emphasis during the training included respondent categorisation, themes and objectives of different sections of the questionnaire, self-introduction and introduction of the study to respondents, proceeding through the questionnaire, and the importance of getting complete data. After the training a pilot study was conducted by collecting data from 25 respondents. The data collected was then analysed to ensure its usefulness for meaningful results and analysis, especially for the open parts of the questionnaire. A few modifications were made to the questionnaire after this activity. Given that it was not easy to obtain alternative respondents especially in the NB category, these respondents were re-interviewed to obtain data that was originally missed.

3.3 Sampling and data collection procedures

All BRAC branches in Mukono and Buikwe were eligible for inclusion into the study. We purposively included BRAC branches that had expansion plans, a pre-requisite for recruitment of new borrowers (NB). In order to balance out the effect of loan period and loan cycles, we also sampled and included Village Organisations (Vos) that had existed for more than two years. BRAC branch managers and loan officers used loan sheets to aid in the selection of VOs, with typically agrarian borrowers. VOs for NBs were newly-formed VOs or had new borrowers. All women in a selected VO were eligible as respondents, except those who previously borrowed from other MFIs. NBs were enrolled in the study during the mandatory one-month orientation period. OBs were women with a running loan with BRAC and were selected from VOs in the same or neighbouring village as selected NBs. Drop-outs from OB groups were traced and interviewed to reduce drop-out bias. Karlan (2001) proposed inclusion of drop-outs in borrowing groups analyses if possible, in case they would possess unique characteristics that could lead to biased outcomes. Information about the BRAC microcredit program was obtained from FGDs with the borrowers and from key-informant interviews with BRAC loan officers, branch managers and the area manager. We got some information from BRAC loan-borrower documents, that were able to access and also attended some VO meetings to understand more about the program operations.

With the consent of the participants and after assurance of confidentiality baseline data collection was undertaken between September 2013 and March 2014. Six FGD sessions were held for OB groups and two for NBs. Each focus group comprised 8–15 participants who had not been respondents in the survey and from groups not included in the survey. Detailed notes and audio recordings were used to record the interviews. A FGD guide was used to elicit information from participants about their opinions and experiences with borrowing.

The following problems were encountered:

- Interviews were sometimes interrupted when conducted at the women's work place because they had to attend to their business clients.
- Sometimes we had to deal with husbands who had to be convinced to give room for the interview to take place and sometimes curious people who tried to listen in on the interviews.
- Respondents became uncomfortable when asked questions about their wealth and expenditures.
- Interviews lasted about two hours, which tried the patience of the respondents.

However, these problems did not affect the realisation of the study objectives. Each time we carefully explained to the respondents the objectives of some of the intrusive questions to ensure compliance and ease in response and requested non-respondents to excuse us as we conducted the study. Working together with the chairperson of the village council also helped to get support for the study.

3.4 Data operationalisation, processing and analysis

Data processing was an intensive activity of cleaning, coding, data entry and analysis. Data from the open-ended parts of the questionnaire was processed into variables that could be used in further analysis. All data were entered into IBM SPSS Statistics 22. Analysis was done using Stata.10. In order to assess the characteristics of women BRAC reaches, we analysed base-line data of 533 respondents. Of these 312 were current borrowers (OB) and 221 were in-coming borrowers (NBs). They were from 138 VOs, from seven BRAC branches in Buikwe and Mukono.

We compared OB and NB groups on socio-demographic and personality variables, including religion, marital status, age, and years of education, time preference, risk preference,

and achievement motivation. Focus group discussion data was analysed using ATLAS.ti software, to obtain the most commonly occurring issues during discussions. Principal components analysis was used to check the dimensionality of the personality characteristics. We also constructed an asset index and a housing facilities index, as a proxy for wealth using principal component analysis of data on household wealth and asset ownership. We obtained two components from our analysis. The household assets index included seven variables: numbers of tables, chairs, beds, mattresses, cell phones, hoes and radios. The housing facilities index comprised the variables of house ownership, TV ownership, presence of electricity, type of walls and the material for the floor of the houses.

4. Results

4.1 Borrowing information and characteristics of the BRAC microfinance program

In this section we present our findings on the objectives and design of the BRAC microfinance program, as obtained from our own observations and interactions with borrowers, from focus group discussions and in-depth interviews with different BRAC personnel.

The BRAC microfinance program targets poor women (20-50 years) with stable businesses to enhance the performance of their self-employment activities (agricultural or non-farm microenterprises). BRAC uses the group lending model, to provide individual loans to women who must belong to a village organisations (VO). The VOs in the study had on average 20 women. We were informed that groups above this are split. Indeed, we found groups with similar names in the same village and sometimes holding meetings at the same place, which were previously part of a bigger group.

BRAC's policy is to employ especially women in its programs. Although we observed males at higher staffing levels, all area managers, branch managers and credit officers were found to be female. When starting in a new area, a survey is done to determine the potential for new borrowers. The BRAC branch and area managers as well as credit officers (COs) are in charge of expansion of BRAC activities in new areas by fostering VO formation and registration and admission of women into the program. When a new area is deemed viable, a new branch is established. Then COs move door-to-door to inform women about the microfinance program and encourage them to form groups. New groups select their leaders (a chairperson, secretary and cashier), chose a name for the group and decide where they will hold the weekly group meetings. At the weekly meetings the group's CO explains BRAC policies and processes. After a VO is established, old members bring in new ones. For all new members there is a mandatory one-month period of orientation before receiving the first loan. A new member is introduced by a seconder into the VO and has to present herself and her motivation to join the group. Members will accept the new member based on how they judge the risk of default. On acceptance into the VO, the new member will receive three independent inspections of her home and business by the VO credit officer, the branch manager and the area manager. The inspections are meant to confirm the physical existence and location of the woman's residence and business and to assess stability and viability of the business and the woman's ability to pay the weekly instalments. When the team is satisfied the group members may sign a group resolution of admission into the group and the CO will sign the BRAC admission form. Upon admission, the new member has to produce an introduction letter from the chairperson of her village, provide three passport photographs and physically present to the group a guarantor (usually the husband) who will repay the loan in case loan recovery fails. The final step of admission occurs at the branch office, where the woman and her guarantor present themselves at a session chaired by the area manager and the woman will pay the annual registration fee.

Loan applications are guaranteed by every member of the group. Loan amounts must also be agreed upon unanimously. Authorized microloans are disbursed in cash to individual women, at the branch. At the time of the study the borrowers in the OB group had received credit on average three times. The mean amount of the first loan was UGX 358,414 ($138), while the average amount of running loans was UGX 725,000 ($278). The average number of weeks since receiving the last loan for the respondents was 20 and since receiving the first loan 97 weeks.

Loans were repayable in either 20 or 40 equal weekly instalments, at flat interest rates of 12% and 25% respectively. The instalments are paid at weekly meetings with repayments commencing one week following the receipt of the loan. Repayments are received from individual members by the VO chairperson who passes the money over to the CO for checking and bagging. At the end of the day's rounds the CO hands over all payments received to the branch cashier for banking. Women who are unable to make the week's repayment, before the meeting day may request support from VO members. In case of a member's payment failure the group chairperson and credit officer urge members to cover the payment together by pooling funds. A VO meeting may not disperse until all funds have been collected, counted and verified in front of all women. When members fail or refuse to raise the funds for a defaulting member, the loan guarantor will be contacted. If this fails as well, usually after a period of haggling and arguing, the CO may reluctantly allow the meeting to disperse and visit the defaulting member's home or continue to seek the guarantor. If all fails, the branch cashier can deduct the deficit from the CO's salary. When all points to a woman's inability to continue making her weekly repayments, her loan guarantor is heavily leaned on to repay the loan in one instalment or weekly payments until the full amount is paid. In extreme cases, property of the woman (usually some business asset) or of the guarantor may be confiscated.

We observed that credit officers were very vigilant in attending the VO meetings and hardly ever failed to turn up, even in adverse weather conditions. Borrowers also regularly attended VO meetings but resented the duration of the meetings. Especially on special market days they would

get impatient. COs and branch managers reported favourable loan repayments for initial loans and repayment difficulties with larger loans for successive loans cycles when weekly repayment amounts commensurately increase. They identified two categories of BRAC participants: the *borrower category*, consisting of women with a running loan with BRAC, and the *member* category. The latter includes the borrower category plus women who are new and did not yet borrow, and those who are 'resting'. A woman was said to be to be resting if she once belonged to a VO and had a BRAC loan, but decided not to apply for another loan (yet). Resting borrowers were eligible to borrow again. Drop-outs are women who stopped borrowing and even withdrew the security deposit (10% of the loan) that was retained for all loans as insurance against defaults. Outstanding loans of defaulters could be recovered from this deposit. BRAC has the lowest portfolio at risk (PAR) of MFIs in Uganda (Chowdhury, 2016, personal communication). At the time of the study the drop-out rate was estimated at 15-20%. The BRAC records we saw indicated presence of resting and drop-out members in different groups, especially the more mature VOs. We could not establish actual drop-out rates for it was hard for us to access borrowing sheets for most of the VOs we visited.

BRAC has no mandatory members' savings program. However the women indicated belonging to self-help Rotating Saving and Credit Associations (ROSCAs) in which they mobilised savings for loan repayment and other lump-sum payments.

4.2 Socio-demographic and personality characteristics of current (OB) and in-coming (NB) BRAC borrowers

This section presents survey data on the socio-demographic and personality characteristics of the two groups of borrowers, OB and NB.

Table 3: Socio-demographic and personality characteristics of current and in-coming borrowers

Respondent Characteristic	Sample Means		
	OB	NB	T-test
Dependency ratio	1.58	1.46	0.92
Age at first loan	35.23	33.03	2.31**
Education (Years)	7.35	7.22	0.39
Time preference score	3.48	3.36	1.46
Achievement motivation score	1.23	1.20	1.01
Risk preference	2.25	2.16	1.34
Anglican (%)	0.32	0.27	1.11
Pentecostal (%)	0.14	0.16	-0.81
Muslim (%)	0.21	0.19	0.64
Marital status (%)	0.70	0.71	-0.35
Household asset index	2.23	2.11	1.55
Housing facilities index	0.47	0.45	0.73

***** Significant p <0.05***

The only characteristic the current and in-coming borrowers differed on was age. We found that respondents aged 35 years and above were more likely to be in the OB group. Overall the majority of respondents had completed seven years of primary education. The average time preference, achievement motivation and risk preference scores indicate that both groups had a high future bias, a high need for achievement and are amostly risk neutral. The majority was married and came from households with low household asset and housing facilities indexes.

4.3 Microenterprise information

Table 4 gives the types of microenterprises for current borrowers (OB), in-coming borrowers (NB)

Table 4: Types of microenterprise for current (OB) and in-coming (NB) BRAC borrowers

Type of microenterprise (ME)	Respondent Category	N	% (Yes.)	Chi-square Value
Non-farm ME only	OB	318	41.67	0.91
	NB	221	37.56	
Agricultural ME only	OB	312	13.14	6.48**
	NB	221	6.33	
Agricultural and non-farm ME	OB	312	43.27	6.30**
	NB	221	54.30	
Animal production ME	OB	312	14.10	0.89
	NB	221	11.31	

***** Significant p <0.05***

Almost a quarter of current borrowers (OB) indicated that they exclusively practiced agriculture as a business. Of current borrowers (OB) and in-coming borrowers (NB), a considerable proportion (43% and 54%, respectively) indicated running both an agricultural and non-farm ME. The NB group had a significantly higher number of respondents who indicated owning both agricultural and non-farm MEs.

For both OB and NB we found that the majority of respondents (85% and 92%, respectively) owned some kind of non-farm ME. The self-reported monetary values of the non-farm MEs, for OB and NB groups were on average about USD300 and USD200, respectively. Four respondents reported ME values of less than USD5. The majority of respondents in the OB group (65%) were small-shop and market retailers of farm produce from their own gardens and from other farmers. Some also sold common household consumer goods. Few women (about 11%) offered semi-professional services of hair dressing and small-restaurant catering. Fifteen percent of the combined sub-sample of NB and OB were involved in production-related activities, such as crafts and liquid soap and bread making. Ten percent was involved in natural resource extraction, like brick-making, stone-quarrying and charcoal-burning. The majority of the respondents was self-employed

and did not employ others.

For both OB and NB about two thirds of respondents with agricultural microenterprises were food crop farmers. Maize and beans were the most commonly produced crops for commercial purposes. The numbers of women involved in cash crop production were negligible. Few respondents (14% and 11%, respectively) reported practicing animal husbandry as a microenterprise. Respondents who kept animals on the homestead considered these as a stock of wealth. Goats, chicken and pigs were the most commonly kept animals.

4.4 Reasons to borrow and loan repayment of borrowers

In the focus group discussions (FGD) women expressed their appreciation for BRAC enabling them to access credit, because they lacked alternative sources of credit and could not meet their lump-sum needs from their meagre incomes. However contrary to the expectation that loans would be invested in productive activities, qualitative results revealed that many borrowers invested only a fraction of the loan in their ME and used teh rest for non-business purposes such as school fees and building expenses. In the FGDs the following reasons, in order of frequency of occurrence, were mentioned: (1) pay the children's school fees; (2) recapitalise microenterprises; (3) personal development; (4) household welfare and improvement; (6) crop farming; (7) animal husbandry; (8) start a new business. This shows that non-business expenses were among the motives for acquiring credit. We asked the women whether improving food security improvement was a reason for borrowing, but they indicated it was not. They said to have adequate food from their gardens most of the time, except during the planting season. But they denied spending loan money on food purchases even then, which is reflected in the following comments:

"We cannot spend BRAC money on food purchase. But on the day I get the funds, we may buy a kilogram of meat for my children, to encourage them to support my efforts at loan repayment".

"Whenever I get a loan, I purchase a personal item for myself; could be a bag or a dress. Sometimes after a while it is all you have to show for the money you borrowed".

Education came out as an important reason for borrowing, which shows in the following comment: "Our children can now go to school without being sent back home for fees".

The borrowers indicated that they worked to repay their loans, harder than before borrowing and harder than women who did not borrow. They found the BRAC policy of loan repayment starting in the week after borrowing too tight. To comply, some borrowers kept a part of the received loans to make repayments in the weeks just after borrowing. The majority indicated to have more than one source of income, to ensure funds for loan repayment. From the FGDs it transpired that indeed most women practiced some kind of trade. We got comments like:

"Everyone has something to sell. Some of us sell agricultural produce from our gardens, others prepare and sell ready-to-eat snacks or have small retail shops or market stalls."

"You cannot have only one source of income and manage loan repayment. If you have borrowed, your brain does not rest like the women who did not borrow. If all else fails, you put aside funds from what the husband has given you to take care of the home and use if for loan repayment."

For stopping to borrow the following reasons were given: (1) achieved the objective of borrowing, usually business stabilisation; (2) the business collapsed; (3) ordered to abandon borrowing by the husband; (4) sickness or death in the family leading to failure to repay loans; (5) to get relief from the pressure of loan repayments; (6) high interest rates. Women indicated that they found the interest rates rather high and also consider the security deposit an extra cost. Some said they would have preferred larger amounts, but usually this is not possible especially with the first loan. Women could accept the loan application requirements and procedures the first time, but expressed discomfort with the same procedures for subsequent loans.

5. Conclusions and discussion

The objective of this paper was to describe the characteristics of the BRAC microfinance program and to assess the degree of matching between lender and borrower conditions and aspirations. We looked at the borrower characteristics, type of their business, and the reasons for borrowing and dropping out. These we compared to BRAC procedures, goals and objectives.

The BRAC modified Grameen lending model seems to fit the Uganda women quite well. Women in Uganda are generally not faced with restrictions on their mobility and can venture out of their homes, unlike in rural areas in South Asia where there is a tradition of *purdah* (Papanek, 1973). This makes it possible for the women to attend the weekly VO meetings. Additionally, the fact that most credit officers are female reduces distrust among husbands.

In our case we found evidence of the advantages of group lending with joint liability for loan recovery, as has been reported in the literature (Armendariz and Morduch, 2010; Postelnicu *et al.*, 2014), to loan recovery. Because women only admit women they know well into their group, they are able to use their social ties to screen new members, monitor the process, and ensure loan repayment by group members. Social capital is utilised to coordinate repayment decisions, cooperate for mutual benefit and reduce loan defaults. The additional requirement of presenting a loan guarantor also helps to ensure loan recovery.

The age and educational profile of the borrowers (both current and new) matched BRAC program requirements. For women with only seven years of education it is difficult to participate in the formal sector. With just basic literacy and numeracy skills such women face personal and institutional barriers to formal credit access, leaving them poor and deprived. The BRAC microfinance program with its reach into rural area offers these women financial services they otherwise would have no access to, different from some MFIs

that shy away from rural areas and from funding agricultural activities (Word Bank, 2007; UBOS, 2010a). Many BRAC borrowers were engaged in subsistence food crop production with some relying exclusively agriculture. Women's limited involvement in animal and cash crop production is probably due to societal perceptions of women as household food providers (Gladwin *et al.*, 2001) and cash crop production as a male activity (Gladwin *et al.*, 2001). Unfortunately, this limits women borrowers' earning capacity since in food production there is a time lag between investment and returns. Agricultural incomes are also unreliable because of erratic climatic conditions and depleted soils (Morvant-Roux, 2011).

Possibly to cope with the risks associated with agriculture, we found many respondents owning both agricultural and non-farm microenterprises. Income diversification is a common strategy in resource-constrained communities (Ellis, 1998; Barrett *et al.*, 2001; Niehof, 2004b; Banerjee and Duflo, 2007) and a prerequisite for the development of rural communities (Word Bank, 2007). Livelihood diversification has been observed to increase with borrowing (Khandker and Koolwal, 2016) and is practiced as an insurance against income shocks (Buckley, 1997). Women engage in agricultural production using resources that are available to them (notably own labour) and complement this with non-farm self-employment activities (Banerjee and Duflo, 2007). As observed by Smith *et al.* (2001) and (Buckley, 1997) about non-farm activities in Uganda, women get the start-up capital for such activities from the sale of farm produce and sometimes husbands and children. Unfortunately, women usually start low-return activities that have little potential to lift them out of poverty (Gladwin *et al.*, 2001). In our case, the non-farm microenterprises the women engaged in were small with low monetary value. They had few business assets and were not employing others. The businesses seemed geared towards survival rather than expansion and self-reliance, and reflect little innovativeness and ambition. This may have to do with the context in which these women operate. Rural and agrarian Uganda has no history of family business or artisanship to build on.

BRAC borrowers indicated that they work harder than before they received their loans. However, rather than their hard resulting in innovativeness and business expansion it amounts to scurrying around between different activities in an effort to diversify income sources to raise money for loan repayment. BRAC and other MFIs have a vision of supporting the *entrepreneurial poor* to improve their socio-economic status. It is questionable whether this description applies to the borrowers in our study. Some of them seem to fit better in the category of the *ultra-poor* of the BRAC Bangladesh Targeting the Ultra Poor (TUP) program described by Hulme *et al.* (2011). And perhaps they would benefit more from such a program. As Viswanathan (2002) observed on the informal sector in West Africa, apart from lack of credit women's informal businesses are constrained by lack of entrepreneurial skills and poor product differentiation. Women deal in almost the same type of products and services, leading to undue competition. Similarly, Adams and Von Pischke (1992) noted that credit may not be the biggest problem for agricultural small holders, who face price and other production risks as well as transportation and other infrastructural challenges.

Some of the characteristics of the BRAC borrowers and their business do not seem to match with BRAC program specifications. First, the requirement of repayment commencing in the week following loan access is notable for loans invested in farming. Hence, the drastic measures women employ to ensure loan repayment, like selling off any kind of salable agricultural produce, using part of the received loans to make loan repayments, or shifting the burden to relatives, children and husbands. Second, BRAC loans are rather small and some women indicated they would have preferred larger loan amounts for more meaningful investments. Our data do not show whether the loan amounts advanced to the women translate into businesses expansion and profitability increase. However, in-depth interviews with BRAC credit officers revealed increasing repayment problems when women graduate to larger loans that come with larger weekly instalments. Interest rates are rather high and the loan processing procedure is rigorous. Montgomery *et al.* (1996) observed that women in Bangladesh had problems with the BRAC security deposit requirement because of the strict rules surrounding the deposit without borrowers having a say on its size and when they may access it.

We pitted the reasons for borrowing against the objectives of the lender and found a potential mismatch. Whereas potential BRAC borrowers must stipulate a productive use for loans, our findings indicate that women borrow to obtain lump-sum amounts for use for school fees and other expenditures. Montgomery *et al.* (1996) reported respondents to be reticent about such loan diversions, but in our study respondents openly shared about their use of loans for non-productive purposes, revealing payment of school fees as a major motive for borrowing. The strong aspirations for the education of their children Dowla (2011) reported about women in Bangladesh, were also found among the women in our sample. Indeed, because education removes barriers to engagement in better-paying non-farm employment (Barrett *et al.*, 2001; Word Bank, 2007). Although Uganda has a policy of universal primary and secondary education, many state-sponsored schools face challenges of absentee teachers and poor quality instruction (Deininger, 2003). This results in parents trying to find money to send their children to private schools. But even though this might be a desirable investment, use of production loans to finance education brings no immediate returns for loan repayment. As Dowla (2011) argued, unlike land and other movable assets, expected future income from education cannot be used as collateral against loans. Such an investment may lead to repayment burden. In line with our results, UBOS (2010b) reported that in Uganda the three most frequent motives for borrowing are: to get working capital for small businesses (25.9%), to buy consumption goods (15.9%) and, third, to pay school fees (14.8%). Matin *et al.* (2002) conclude that loans enable the poor to make lump-sum expenditures against small future savings and income which they use to make repayment instalments. BRAC and/or the Uganda government could consider to make loans available

to support children's education. BRAC currently does have a scholarship scheme, which could be modified to cater for the current need of women for their children's education.

BRAC runs a strict procedure of assessment and review of loan applications, aimed at assessing the borrower's ability to make weekly loan repayments. But after loan disbursement there is no supportive follow-up on the performance of the loan-funded enterprises. BRAC already has programs that could support the women, but these probably have limited coverage since the borrowers in the study were unaware of these programs. We found a few cases of women borrowers who gave the loan to husbands and children to invest and provide funds to enable the women to pay the instalments. Follow up-support might discourage the use of loans for consumption which leaves women with the burden of repayment without a meaningful investment. Follow-up with supportive services could contribute to realising both borrower and lender objectives. Alternatively, as proposed by Mosley and Hulme (1998), BRAC could come up with an alternative lending model with focus on consumption, with flexible repayment periods and with a saving facility.

We can conclude that the BRAC microfinance program indeed reaches poor women who otherwise would be unable to access funds to meet lump-sum needs. However, when these women decide to get a loan, they do so against their future meagre earnings and pay back at a frequency and cost which they eventually realise is high. They stop borrowing, as soon as the immediate need for borrowing is met. To a certain extent, there is a match between the lender and the borrower; women are able to meet their needs for borrowing and the lender is able to attain good repayment levels. For long-term benefit of the borrowing program, however, there is a need for the lender to reassess loan-term related issues, such as the interest rate, commencement of loan repayment, and the loan processing requirements and procedures.

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Applied Studies in Agribusiness and Commerce – APSTRACT
Center-Print Publishing House, Debrecen
DOI: 10.19041/APSTRACT/2016/2-3/10

SCIENTIFIC PAPER

SYNTHETIC BIOLOGY APPLIED IN THE AGRIFOOD SECTOR: SOCIETAL PRIORITIES AND PITFALLS

Frewer, L.J.1*, Coles, D. [1, 2], Dijkstra, A.M.[3], Kuznesof, S.[1], Kendall, H.[1], and Kaptan, G[4]

[*]Author to whom correspondence should be addressed. Lynn.Frewer@newcastle.ac.uk +44(0)1912088272
[1] Food and Society Group, AFRD, Newcastle University, Newcastle, NE1 7RU, UK.
[2] Centre for Professional Ethics, UCLAN School of Health Brook 317, Preston, PR1 2HE, UK.
[3] Faculty of Behavioural, Management and Social Sciences, University of Twente, PO Box 217, 7500 AE Enschede, Netherlands.
[4] Leeds University Business School, Leeds University Business School, Maurice Keyworth Building, The University of Leeds, Leeds, LS2 9JT, UK.

Abstract: *Synthetic biology offers potential for innovation in the agrifood sector, although concerns have been raised consumer rejection of applications will occur similar to that associated with the introduction of genetically modified foods. Risk-benefit assessment should address socio-economic, as well as health and environmental impacts. Ethical issues may be of particular relevance to the application synthetic biology, and may also resonate with societal concerns. A case-by-case analysis of relevant issues may be needed, and innovation must be driven by societal and consumer preferences as well as technological possibilities. Research into consumer and societal priorities is required early in the innovation trajectory.*

Keywords: *Consumer Perception; Synthetic Biology; Agrifood; Ethics; Research and Innovation Policy.*

Introduction

There has been recent discussion regarding the potential for synthetic biology applications to deliver benefits across a range of application areas, including those within the agrifood sector (e.g. Moe-Behrens et al.., 2013). At the same time, the evolving regulatory and governance environment is currently shifting from one that emphasises precautionary approaches and risk avoidance, to one that encourages socially responsible research and innovation, such that science and technology is steered towards societally approved and, indeed, preferred outcomes (Douglas & Stemerding, 2014). In common with regulatory relevant elements of other enabling technologies, such as nanotechnology, there is no standardised definition of the term "synthetic biology", (Synthetic Biology Org, 2014; Cogem, 2013; Rerimassie & Stemerding, 2012), although there is consensus that it represents the convergence of biotechnology (in particular GM [genetic modification]) and systems engineering (Andrianantoandro et al.., 2006; Purnick & Weiss, 2009). A defining element which unites various definitions is that synthetic biology represents "the design and construction of novel artificial biological pathways, organisms or devices, or the redesign of existing natural biological systems" (UK Royal Society, 2014). In other words, the goal of synthetic biology is to synthesis artificial and natural components to form new artificial living systems. The inclusion of artificial DNA in the process, as well as broad claims, including within the media that synthetic biology is "creating life" (Gibson et al.., 2008), has focused societal speculation on the ethical issues associated with the technology (e.g. BBC, 2010). In practice, however, it is important to note that the potential range of applications available for use in the short term remains more prosaic (Kitney & Freemont, 2012), and it is long term future developments which are the object of speculation (Kaiser, 2012; Vincent, 2013). Indeed, Bubela et al. (2012, p.132) have noted that "maintaining the trust of the public and policy regulators is paramount....Hype and exaggerated claims are counterproductive to developing adaptive and ethically sound regulatory models responsive to stakeholder concerns". These authors argue that developing ethical frameworks is necessary to develop public trust in regulation and governance, as well as ensuring effective application and commercialisation of products, not least within the agrifood sector.

Examples of potential areas of application to the agrifood sector

The application of synthetic biology offers considerable potential for generating innovation in the area of agricultural production and food. Potential future applications include bioremediation (e.g. see Brenner et al.., 2008; Lovely, 2003),

developments of healthier foods, (e.g. though increasing the lycopene and b-carotene contents of fruit and vegetables, Fraser et al.., 2009), improving food safety (e.g. through bacterial detection (OECD 7 Royal Society, 2010), the production of metabolites and health-related products such as vitamins, nutraceuticals and probiotics (e.g. see Curran and Alpes, 2012; Fraser et al.., 2009; OECD &Royal Society, 2010), production of improved preservatives (OECD & Royal Society, 2010), flavours and flagrance biosensors (e.g. see Urlacher & Eiben, 2006), and food waste processing (OECD & Royal Society, 2010). Synthetic biology in some ways can be described as representing an "evolution" of GM, albeit one which is described as a convergence with engineering applications, rather than a completely novel technology. This may not align with media representations of synthetic biology, where it is sometimes represented as novel, and separate from previous technological innovations (Bubela et al., 2012).

Potential drivers of societal responses to synthetic biology applied in the agri-food sector

Societal responses to the application of synthetic biology may distinguish between "top-down" and "bottom up" applications (e.g. see Bedau et al., 2009). As is the case for the definition of synthetic biology per se, a range of definitions of what constitutes "top down" and "bottom up" synthetic biology are available. Broadly, "top down" is generally regarded as being initiated from a pre-existing natural living system which is then re-engineered to obtain a specific goal (Ro et al., 2006), through genome synthesis (e.g. Gibson et al., 2008), or genome transplantation (Lartigue et al., 2007). "Bottom up" synthetic biology attempts to develop minimal chemical cellular life (or "protocells") from inanimate raw ingredients (Rasmussen et al., 2008). The latter is less developed scientifically compared to the former. There has been speculation that it is "bottom-up" synthetic biology which will be the primary focus of societal risk perceptions, negativity and ethical concerns (Cranor, 2009). However, while the distinction between top-down and bottom-up synthetic biology is likely to represent a relevant distinction as far as regulation, governance and ethical debate are concerned, similar differentiation in societal debate and public acceptance may be less clear-cut, as many of the same issues (for example, the creation of "artificial life") may be perceived to be relevant in both contexts (but see Bedau et al., 2009). It should be noted that a defining factor of the "protocell" is that the chemical system can adapt to changing environments and therefore has reproductive potential (Rasmussen et al., 2009b), which in turn implies that natural selection might result in unintended, and potentially uncontrollable, new life forms. The ability of an artificial living organism to reproduce and exist outside of contained facilities may be perceived to have irreversible impacts on human and animal health, and the environment. This perception, in turn, may be associated with negative affective (or emotional) responses on the part of the public, which will result in consumer rejection of specific products. Such an effect has been observed for various potential hazards (Slovic et al., 2004). In addition, factors such as perceptions of unnaturalness, and in some cases religious concerns, may influence societal acceptance of synthetic biology and its applications. Research has shown that these factors have been drivers of societal negativity associated with GM foods (e.g. see Frewer et al., 2013a; Gaskell et al., 1999).

As a consequence of synthetic biology both having parallels with the application of GM technology in food and agriculture, and potentially raising additional issues of societal concern, there has been speculation that synthetic biology will be associated with a similar level of societal rejection to that associated with GM technologies (e.g. see Torgersen, 2009). Within the range of areas of application of GM technologies, GM applications linked to food production are judged by society to be the most controversial (e.g. see Costa-Font et al., 2006; Dannenberg, 2009; Frewer et al., 2013a). It might therefore be expected that, in discussions regarding the potential application of synthetic biology to different areas, its application to food and agriculture might be the area of application construed most negatively by the public (Philp et al.., 2013; Torgersen & Schmidt, 2013). However, it can also be argued that the GM foods controversy should not necessarily automatically be regarded as a "normative" societal response to all agrifood innovations, as context and (perceived) product characteristics have, to a large extent, shaped societal responses to GM foods (e.g. see Frewer et al., 2011; Mehta, 2004). In addition, research into people's risk perceptions has tended to focus on high profile and dramatic potential hazards at the expense of low profile and familiar ones (Hawkes & Rowe, 2008). In reality, consumer acceptance of novel products is likely to depend on the extent to which potential consumers perceive there is a benefit associated with the new product, and the extent to which perceived benefit is weighed against perceived risk (e.g. Brown & Ping, 2003; Frewer et al. 2003; Gupta et al., 2012; Poinhos et al., accepted; Ueland et al., 2012). Both the perceived risks and perceived benefits associated with different products produced using different emerging enabling technologies is likely to vary between individuals, and will be influenced by cultural and socio-demographic factors. Socio-economic impacts (for example, negative or positive effects on employment, industrial competiveness, or national and regional competiveness) also need to be assessed (see e.g. Frewer, 1013b; Mora et al., 2012)

As well as making comparisons between the agrifood application of Synthetic biology and the introduction of GM foods, it is also relevant to draw a parallel with societal responses to nanotechnology (including application to agri-food production), where the lack of negative societal response has characterised early commercial introductions, despite predictions that societal rejection of nanotechnology applications would occur (Torgersen; 2009). In this case, expert concerns about negative societal responses to agrifood nanotechnology (e.g. see Gupta et al., 2013) have not been matched, to date, by concern-based societal debate (Torgersen & Schmidt, 2013; Philp et al., 2013), despite NGO opposition to agri-food nanotechnology applications (e.g. Friends of the Earth, 2014), and requirements for more rigid regulation

associated with their application (AAAS, 2014). Frewer et al. (2014) have speculated that the lack of consumer opposition to nanotechnology as currently observed may be attributable to the following. First, innovative technological innovation applied to food production per se is not societally unacceptable. Rather (perceived) characteristics of specific technologies, or their application, or how these are regulated, may potentially be drivers of societal negativity (see also Frewer et al., 2011). Second, it may be too early in the implementation trajectory for societal negativity associated with specific applications of agrifood nanotechnology to have arisen, as consumers are not familiar with either nanotechnology or its application within the areas of agriculture or the human food chain. Third, lessons from the application of GM food technologies have been implemented by regulators and industry in the case of nanotechnology, which has resulted in increased acceptance of agrifood applications by consumers (see also Gupta, 2013). These issues will now be considered in the current analysis, and recommendations for the introduction and commercialisation of synthetic biology in agrifood sector will be developed.

First, if specific characteristics of technologies applied to agriculture and food production drive consumer responses, it is important to identify what consumers perceive to be associated with both risk and benefit of different applications of emerging technologies. Other values or attitudes will also shape peoples intention to adopt specific applications. For example, the extent to which people perceive a particular product, or the technology used to produce it, to be unnatural, or have ethical concerns about technology (see Costa-Font et al., 2008; Frewer et al., 2013a). Similar concerns have not arisen in association with agrifood applications of nanotechnology per se, but appear to focus on specific areas of application. For example, the acceptability of smart pesticides is focused on the issue of pesticide use rather than the issue of nanotechnology being used to develop pesticides (Gupta, 2013). The area of application should be considered when introducing the initial applications of agrifood synthetic biology, to ensure that these early applications deliver concrete and tangible benefits, in which the benefits perceived to be available to (at least some) consumers outweigh perceived risks. This raises the question of whether high levels of risk perception associated with GM was driven by concerns related to (for example) irreversibility of negative biological effects once released into the environment, such as the ability to confer "unnatural" traits on "descendant" organisms (Torgersen, 2009; Frewer et al., 2011). In comparison, nanotechnology may be perceived to be less uncontrollable and potentially amenable to mitigation strategies should problems occur. It might be predicted that synthetic biology will be perceived as being more similar to GM than to nanotechnology, given that living organisms are being manipulated (Bubela et al., 2012; Pauwels, 2013).

The second argument, that it is too early in the implementation trajectory for consumer attitudes towards specific applications of both agrifood nanotechnology and synthetic biology to have crystallized, is potentially valid (Frewer et al., 2014). However, given that labelled nanotechnology consumer products are apparently accepted by many consumers who use them (e.g. in the cosmetics sector, DeLouise, 2012), it is reasonable to posit that societal rejection of nanotechnology per se will not occur. It is important to note that there has not been the same level of media coverage of either nanotechnology or synthetic biology applied to agrifood production when compared to the levels of media attention associated with GM foods (e.g. see Pidgeon et al., 2003; Frewer et al., 2002; Pauwels & Ifrim (2008), or even nanotechnology (Scheufele, et al., 2007). The occurrence of a negative, high profile media associated with a specific enabling technology might ignite societal controversy if it has extensive media coverage (Gupta et al., accepted). It is suggested that synthetic biology may be particularly prone to sensational media reporting, as previously discussed.

The third argument, that lessons learned from the commercialisation of agrifood GM have been applied to the introduction of nanotechnology, and may potentially be applied to synthetic biology, is also worthy of further consideration. The introduction of GM foods was not shaped by information about societal requirements for technological implementation, but rather driven by technological possibilities. However, the 21st century has witnessed the introduction of various policy changes associated with technological innovation which have built on, and attempted to remediate, the barriers to agrifood technology implementation associated with the latter part of the 20th century. For example, the need to assess socio-economic and ethical impacts associated with different applications of enabling technologies has been recognised by various researchers and is frequently embedded in in policy (e.g.Rerimassie & Stemerding, 2012). The need for effective stakeholder, expert and public inputs into the research and development, commercialisation and policy process has also been identified as a factor facilitating acceptance of technology applications (e.g. Powell & Colin, 2008; Renn &Roco; 2006). More recently, there has been a greater likelihood of public engagement being applied prior to technological introductions, rather than subsequent to their application (MacNaghten, et al.., 2005; Delgado et al.., 2011). The consideration of a broader range of expertise in assessing different policy options might lead to better outcomes as more evidence (lay knowledge, perceptions, and preferences) is considered formally as part of decision-making (Reed 2008; Renn & Roco, 2006). For example, nanotechnology was successfully introduced to the public through a number of participatory events, which addressed concerns and problems raised by both experts and ordinary citizens (Torgersen &Schmidt 2013). Thus, public engagement can provide a route to enhance mutual understanding of technological issues, uncertainties associated with risk and benefit assessments, as well as value differences in different stakeholder constituencies (Dietz, 2012).

However, public engagement is unlikely to build societal trust in technology development and implementation if the outputs of such exercises do not make a discernable impact on policy in policy, regulation, and even product design. The lack

of policy impact associated with public engagement has indeed been recognised as problematic (Emery et al., , in press; PytlikZillig and Tomkins, 2011). Others (e.g. Kenyon, 2005) have noted the lack of generalizability of results from specific engagement exercises, which tend to focus on limited areas of application, across a broad policy issue. It is important to balance the interest and values of all relevant stakeholders (Hermans et al., 2012), and develop methods to assure timely incorporation of stakeholder perspectives into the decision-making process associated with synthetic biology policy development (OECD & Royal Society, 2010).

Ethical issues

As for other technologies, (see, for example, Coles & Frewer, 2013; Jensen et al., 2011), it is possible to identify generic and specific ethical issues which may influence both the technological development and commercialisation trajectories associated with synthetic biology. For example, the application of an Ethical Matrix analysis (Mepham, 2000) to synthetic biology applied to food production would enable a range of ethical issues to be assessed against the needs of different stakeholder groups, including basic scientists, technology developers, industry, consumers, and the environment. Very broadly, the ethical principles of autonomy ("self-determination"), non-malfeasance (to "do no harm"), beneficence ("do good") and justice ("fairness") can be applied to different stakeholders. While this has limitations in analysing and weighing the ethical issues associated with a technology, it is helpful in identifying the types of issues that may need to be considered (Schroeder & Palmer, 2003). Synthetic biology may raise specific issues intrinsically related to the characteristics of synthetic biology (Deplazes-Zemp, 2012), insomuch as the design and synthesis of living organisms may lead to specific responsibilities on the part of scientists regarding the products they are developing. It may therefore be important to take these concerns into discussions regarding science and technology policies, possibly as a formal part of the analysis which precedes the enactment of regulation.

Regulatory issues

Synthetic biology, as for other areas of biotechnology, may have both positive and negative impacts, depending on how it is applied, and societal judgements of what constitutes positive or negative application. It has been argued that the current framework for regulation of laboratory research and development of commercial biotechnology products can serve as a basis for regulation of synthetic biology (see, inter alia, Erickson et al., 2011; Rerimassie & Stemerding, 2012). However, inter-regional differences in regulatory application have been associated with the regulation of biotechnology, in particular GM technologies (Vàzquez-Salat et al., 2012), which have not facilitated societal trust in the regulatory process (Frewer et al., 2013b). In addition, some of the ethical issues associated with the development of artificial, self-producing organisms may entail formal additional ethical assessment as part of the risk analysis process which informs regulatory decision-making and governance practices.

Consumer research

Published research in this area is sparse, which may reflect the fact that technological developments are comparatively recent. Given that biotechnology may represent an important benchmark against which synthetic biology is being evaluated by the public (Kronberger et al., 2009), one might predict similar societal concerns to arise in the agrifood sector. Pauwels (2009) notes that, the participants in their US study reported being unfamiliar with synthetic biology and its applications, their perceptions and related attitudes were framed by those they already held about existing biotechnologies such as GM and cloning (Pauwels, 2013). Furthermore, participants were positive about synthetic biology applications when these addressed societal, medical, and sustainability needs. Similarly, concerns arose if credible assessments of potential risks, uncertainties associated with these, and long-term implications were not made. Transparency and accountability through "tailored governance" (i.e. governance focused on specific issues associated with synthetic biology, in particular risks, benefits, and ethical issues) was required by participants. Ethical or moral impacts associated with the technology and its applications were reported as relevant in several studies. For example, research using Malaysian stakeholders (Amin et al., 2011) has identified ethical concerns to be associated with genetically modified (GM) rice which contains a synthetic mouse gene to increase its vitamin C content. At the same time, the loss of benefits from not developing the application were perceived to be inconsequential.

In summary, various questions need to be asked of synthetic biology prior to, and during, the commercialisation process associated with the agrifood sector. These are similar to those applied in other sectors although some issues specific to synthetic biology can be identified.

- Do the applications to the agrifood sector meet a recognised societal need? (see also Gupta et al., 2012)
- Can similarities between synthetic biology applied in the agrifood sector, and potentially societally controversial aspects of previously applied agrifood technologies be identified? (see also Frewer et al., 2011; 2014).
- Is agrifood application of the technology differently perceived by the public to other areas of application, such as pharmaceutical application? (Frewer et al., 2013a). In other words, is it the area of application, rather than the technology per se, which is associated with societal negativity? (Gupta et al., accepted).
- Are alternative, less controversial, technological approaches, which have potential to deliver the same benefits, identifiable? (Gupta et al., 2013).
- Are additional issues raised over and above those associated with other enabling technologies applied to food production? For example, are there specific ethical issues associated with synthetic biology which are not as-

sociated with the application of nanotechnology? (e.g. see Cranor, 2009).

- If the technology is, in itself, acceptable to society, what needs to be done to "fine tune" the development and implementation of agrifood applications of synthetic biology to align with consumer priorities for commercialisation of specific applications? (e.g. see Raley et al., submitted).
- Are there specific features of the regulatory framework which are required to ensure societal acceptance of specific applications (for example, formal and institutionalised ethical analysis and socioeconomic impact analysis)? (e.g. see Bubela et al., 2012).

An important part of implementing a societally acceptable development and commercialisation trajectory in particular in relation to synthetic biology applications which are potentially societally controversial (for example, application in the agrifood sector), will require inclusion of societal priorities and preferences for specific benefits to be included in the design of new applications. There are many ways to collate this information. Examples include public engagement regarding the development, implementation and governance of the technology during development, and qualitative and quantitative consumer research which can be applied to "fine-tuning the characteristics of specific applications. This will require closer engagement and communication between scientists, technologists and those with expertise in assessing societal and consumer preferences and priorities for technology and product design. In terms of regulation and governance, it is important to ensure that the outputs of public engagement are explicitly addressed in the development of regulatory and governance strategies if social trust in these is to be developed and maintained. In terms of the development of concrete products, research has suggested that the need to consider information regarding societal and consumer preferences would be most relevant prior to new product development and prior to any marketing activities being operationalized, as there is still time to alter the design and delivery of novel foods and processes. It may also be important to assess consumer responses to the first generation of synthetic biology products developed, in order to predict what features of second generation products are most likely to be successful. In other words, it is important to understand what applications are most wanted by consumers, and which are unacceptable. This could contribute to an application based risk(benefit) framework, The development of these principles is a consequence of lesson from the GM debate, and can be adapted to take account of specific characteristics of synthetic biology. This speaks to the third question identified in the introduction, namely that "lessons from the application of GM food technologies have been implemented in the case of nanotechnology, which can subsequently be applied to agrifood applications of synthetic biology". Synthetic biology may be regarded as an acceptable technology by society, if appropriate societal benefits are delivered from its application, ethical issues are addressed, and transparent regulatory and governance structures are constructed. Rather than it being "too early" in the process of synthetic biology development for public opinions and attitudes to crystallise, we suggest that this is the most appropriate point in the development trajectory to utilise public and consumer information in the development and design of agrifood synthetic biology applications.

Conclusions

The successful implementation of synthetic biology in the agrifood sector will be contingent on various factors. These include the development applications (in particular first generation consumer products) that society and consumers want, and regard as safe. Given the potentially diverse range of applications, assessment of societal and consumer priorities need to be on a case by case basis. Risk-benefit assessment should be an integral part of governance, and address socio-economic impacts as well as health and environmental effects. Ethical issues may be of particular relevance to the application of synthetic biology, and may also resonate with societal concerns. Again a case-by-case analysis of relevant risk and ethical issues may be needed. Societal and consumer acceptance of agrifood applications of synthetic biology is likely to be driven by perceptions that applications are needed, but hindered by lack of public debate about risk, benefit and unintended effects, and the failure to establish and adequate regulatory framework to promote consumer and environmental protection.

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Applied Studies in Agribusiness and Commerce – APSTRACT
Center-Print Publishing House, Debrecen
DOI: 10.19041/APSTRACT/2016/2-3/11

SCIENTIFIC PAPER

THE MUTUAL INFLUENCES OF MAN-MADE POLLUTANTS AND ALLERGIC MANIFESTATIONS

Prescilla V. Jeurink[1,2*], Athanasios Damialis[3], Harry Wichers[4], and Huub F.J. Savelkoul[5]

[1]Utrecht Institute for Pharmaceutical Sciences, Utrecht University, Utrecht, The Netherlands;
[2]Nutricia Research, Utrecht, The Netherlands;
[3]Chair and Institute of Environmental Medicine, UNIKA-T, Technical University of Munich and Helmholtz Zentrum München, Germany - German Research Center for Environmental Health;
[4]Food & Biobased Research, Wageningen University and Research Centre, Wageningen, The Netherlands;
[5]Cell Biology and Immunology group, Wageningen University, Wageningen, The Netherlands

**Correspondence:*
Prescilla V. Jeurink, PhD
Nutricia Research
Uppsalalaan 12
3584 CT Utrecht, the Netherlands
Mail: prescilla.jeurink@danone.com

Abstract: *The United Nations have projected the world population to reach 9.6 billion by 2050 and that, by then, over 50% of the world population will be living in urban areas. This continuing population growth and accompanying urbanization lead to serious concerns about clean water and food for all, but also about climate change and pollution. Soil and water pollution are directly affecting the crops grown for consumption, and air pollution is affecting our mucosal barriers in the respiratory and gastro-intestinal tract on a daily basis. This review provides an overview of the different types of pollution, and the health effects triggered by especially air pollution ranging from heart disease, pulmonary disease, cancer, to fatal respiratory infections. In addition, the differences in how pollution-induced effects are affecting different age-groups are discussed. Finally, the socio-economic causes and consequences (e.g. Quality of Life and Years of Life Losses versus medical care cost) of these pollution-induced diseases are debated.*

Keywords: *air pollution, urban environment, allergy, asthma, socio-economic costs*

1. Global urbanization and man-made pollution

1.1. Urbanization

Around 10.000 BC, the first hunter-gatherers started to live in villages near which they grew their crops and housed their livestock (Pain, 2016). Pain paints the transition of these early villages into the urban situation we live in nowadays, addressing both the benefits as well as the risks of this way of living. In 1950, 30% of the world's population was urban, whereas it is anticipated that by 2050, 66% of the world's population will be urban (United and Nations, 2014). This growing urbanization leads to serious concerns about climate change, pollution and the demands for clean water, food and energy and urge the need to place this topic in a broader context that connects energy production, related water consumption and environmental pollution of air and water (Kumar and Saroj, 2014). Besides the pollutants in air and water, also attention is needed for the pollution of the soil and thereby the crops that are grown on them (dos Santos-Araujo and Alleoni, 2016). In general, the major forms of pollution are contamination (occurs when chemicals are released by spill or underground leakage), water pollution (by the discharge of wastewater from commercial and industrial waste into surface waters) and air pollution (the release of chemicals and particulates into the atmosphere). All these types of pollution are also indirectly related to contaminated foods, which in turn bring an extra risk for the consumers.

1.2. Soil contamination

Soil contamination is caused by the presence of man-made chemicals in the natural soil environment and is typically caused by improper disposal of waste, agricultural chemicals, or industrial activity. Contamination is correlated with the degree of industrialization and intensity of chemical usage, and frequently consist of heavy metals (such as lead), petroleum hydrocarbons, polynuclear aromatic hydrocarbons (such as naphthalene and benzo(a)pyrene), solvents, and pesticides (George, Joy *et al.*, 2014). As the seriousness of this issue is highly recognized, efforts to remediate organic pollution from soil are explored. Some applications are identified

as promising tools (such as manufactured nanoparticles to remove organic pollutant from soil), but it is questioned whether the introduction of these new particles might lead to new environmental concerns in the future (Li, Chen *et al.*, 2016).

1.3. Water contamination

Only less than 0.01% of water present in our world is fresh water (Piccoli, Kligerman *et al.*, 2016), but since it is an essential factor to keep life as we know it possible, and thus clean fresh water is of the highest priority. Unfortunately, water pollution is daily causing deaths as clean drinking water is not accessible to all (Li, Chen *et al.*, 2016). In addition, polluted areas as for example found in China, have lakes and rivers which are not even suitable anymore to be cleaned to provide safe drinking water (Li, Chen *et al.*, 2016). In addition to the acute problems of water pollution in developing countries, developed countries also continue to struggle with pollution problems. The Sano River in Italy is probably the most polluted river in Europe. Its pollution is derived from the urban density, agricultural and industrial activities and consists of *a.o.* metals, boron, cyanides, chlorides, nitrates, fluorides and sulphates (Lofrano, Libralato *et al.*, 2015). Besides these man-made chemicals, also organic contaminants pollute fresh water sources. For example, algae blooms are frequently observed in fresh water, presumably intensified by global warming. The hazardous toxins that are produced by these cyanobacteria are difficult to remove from fresh water sources, which would be required in order to make it suitable for consumptions (Weller, 2013). In addition, wastewater has been linked to viral, bacterial and protozoan diseases leading to e.g. salmonellosis, shigellosis, cholera and hepatitis A (Dickin, Schuster-Wallace *et al.*, 2016). In the capital of Bangladesh, Dhaka, it was shown, however, that the use of improved water sources and sanitation had a significant positive impact on the incidence of childhood diarrhea (Kamal, Hasan *et al.*, 2015). Therefore, it is essential that, through human intervention, the water quality will significantly be improved.

1.4. Food contamination

Food contamination refers to the presence of harmful chemicals and microorganisms in food which can cause consumer illness. Both soil and water pollution influences the agricultural suitability of the available land. About 70% of water usage is covered by the agricultural sector, and wastewater is used more and more used for irrigation, with the potential risk for crop contamination. It is crucial to realize that contaminants are not only entering the crops planted on polluted soil, but also a large amount of these potentially polluted foods are converted into animal feeds, leading to adverse health effects also in cattle (Coufal-Majewski, Stanford *et al.*, 2016). It is therefore essential to balance the steps taken to reduce health risks with the increasing need for food security and sufficient nutrition (Dickin, Schuster-Wallace *et al.*, 2016).

1.5. Air pollution

Air pollution is the introduction of particulates, biological molecules, or other harmful materials into the earth's atmosphere causing diseases, and even death to humans. Furthermore, damage to other living organisms such as animals and food crops, or the natural or built environment are accounted for by air pollution. In general, a distinction is drawn between ambient air pollution (AAP) and household air pollution (HAP) (Pant, Guttikunda *et al.*, 2016). AAP often contains particulate matter (PM) 2.5, PM10, ozone (O_3), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2) (Liu, Cai *et al.*, 2016; Zhang, Li *et al.*, 2016). Besides the typical air pollution, pollution-dependent haze is identified as a separate class that should be discriminated from fog or mist. As fog consists of 90% water, it is mainly affecting traffic conditions due to bad visibility. Pollution-dependent haze, on the other hand, may already occur with a humidity of 80% and will also contain PM2.5, PM10, O_3, NO_2, and SO_2 (Liu, Cai *et al.*, 2016; Zhang, Li *et al.*, 2016). NO_2 and SO_2 in haze can react with the water droplets, leading to nitric acid and sulfuric acid, respectively, to be observed as a yellow or orange grey color of the haze (Liu, Cai *et al.*, 2016). Besides different compositions of AAP, there are also differences between the composition of AAP and HAP (D'Amato, Vitale *et al.*, 2015; Jiang, Mei *et al.*, 2016). Although there are compositional overlaps by means of PM, O_3, SO_2, NO_2, CO and lead (Pb), often the concentration and duration of the exposure are different. Furthermore, indoor exposure also includes combustion of solid fuels indoors, tobacco smoking and poor ventilation (Jiang, Mei *et al.*, 2016). This poor ventilation can lead to a build-up of another indoor pollutant, house dust, which has been shown to affect people with lung diseases through its' microbial content (Dannemiller, Gent *et al.*, 2016).

2. Adverse effects of air pollutants on human health

A recent systematic review and meta-analysis (SRMA) identified 43 systematic review (SR) studies or meta-analyses (MA) in which the relation between the ambient air pollutants PM2.5, PM10, NO_2, SO_2, CO and O_3 with a diversity of adverse health outcomes were investigated (Sheehan, Lam *et al.*, 2016). This considerable amount of SR and MA shows that there is a major interest in these air pollutants, and the outcomes of the studies conducted all point into the same direction: air pollution is related to multiple adverse health outcomes. However, the composition of air pollution is diverse throughout the world, and the role of meteorological factors (including atmospheric pressure, temperature and humidity) (D'Amato, Vitale *et al.*, 2015; Wang, 2016) in aggravating the effects of pollution are still not fully clear. Also changing lifestyle habits like the transition from coal combustion to a mixed coal smoke and motor vehicle emission lead to altered air pollutant composition throughout the years (Liu, Cai *et al.*, 2016). Furthermore, different governments and organizations have put variable regulation limits on these pollutants to reduce the risks. The United States Environmental Protection Agency (EPA), the World Health

Organization (WHO), the European Commission (EC), the Chinese Ministry of Environmental Protection (MEP) and the Environmental Protecting Department (EPD) of Hong Kong have declared different standard limits for these pollutants (Yi, Lo *et al.*, 2015). These discrepancies complicate the direct comparison of studies conducted in different geographical areas. Interestingly, studies comparing different situations within the same country are showing that urbanization is the leading cause of pollution-induced disease developments. For example, Zhang *et al*. have shown that there is now sufficient evidence to indicate that the observed detrimental impact of environmental pollution on asthma and allergic disease first observed in West China is now also occurring in East China (Zhang, Qiu *et al.*, 2015).

Another interesting finding is that commercial airliners routinely "bleed" compressed air to the cabin that is extracted from the aircraft engines. This unfiltered air may sometimes be contaminated with hydraulic fluids or synthetic jet engine oils. Medical record reviews of exposed airline crewmembers showed acute respiratory and/or central nervous system symptoms, again emphasizing the need to learn more about which airborne pollutants affect human health (Abou-Donia, Abou-Donia *et al.*, 2013; Reneman, Schagen *et al.*, 2015). These studies show that a better understanding of when, where and how humans are exposed to airborne pollutions is essential to estimate its possible impact on human health.

2.1. Indirect health effects

Man-made pollutants like O_3 and NO_2 not only directly trigger disease development in humans, but they can also affect plants that are exposed to these pollutants. This exposure can impact pollen protein (Frank and Ernst, 2016) as well as the pollen-derived lipids (Traidl-Hoffmann, Kasche *et al.*, 2003) leading to modified immune responses in humans. Of course, the timing and concentration of pollution-exposure to the plant during the different seasons is a key element in this indirect impact of pollen-allergenicity on humans. These studies bring the realization that pollution also makes plants more prone to protect themselves against the damage caused by pollutants. Unfortunately, the major proteins involved in this specific defense mechanism are often the leading cause of disease-priming in humans after ingestion or inhalation.

Similar research is performed within the fungal kingdom, albeit very limited, even though fungal spores can have equal or even more direct effects on human health (Bush and Prochnau, 2004; Gioulekas, Damialis *et al.*, 2004). As a matter of fact, specific fungal taxa like *Alternaria*, *Aspergillus* and *Cladosporium*, have been found responsible for hospital admissions due to severe asthma attacks, noticeably with a higher prevalence among children and with symptoms sometimes manifested as acute respiratory failure (Dales, Cakmak *et al.*, 2000; Bush and Prochnau, 2004). Hence, it has been highlighted that fungi comprise a neglected and underestimated source of respiratory allergy, especially if compared to pollen allergies (Crameri, Garbani *et al.*, 2014)2014. Beggs has also reviewed the need for research on fungal spores; however, little has been done since then (Beggs, 2004). Consequently, the exact relationship between pollutants, fungi and human health is still poorly described. Recent bio-monitoring and experimental data suggest that fungi seem to respond to environmental stress, like increased air pollution and climate change, in a strong but slow manner (compared to plants) (Damialis, Mohammad *et al.*, 2015; Damialis, Vokou *et al.*, 2015). Many of the allergenic fungal species are saprotrophs, endophytes, or plant parasites (Carlile et al., 2007)(Carlile, Watkinson *et al.*, 2001). This means that they are closely related with (symbiotic relationship) or dependent on (parasitic relationship) their host organisms, plants. There are indications that this plant-fungal symbiosis leads to simultaneous long-term alterations and life strategy changes (Damialis, Mohammad *et al.*, 2015): fungi may be elongating their growth phase and delaying their sporulation stage, whereas plants may be increasing the amount of pollen produced. In either case, more frequent or more severe respiratory allergy symptoms can be induced. Hence, Heinzerling *et al*. have shown that many allergens previously regarded as untypical for some regions in Europe have been underestimated, among which several fungal taxa (Heinzerling, Burbach *et al.*, 2009). Particularly *Cladosporium* species, frequently observed within the most abundant spore concentrations in the atmosphere worldwide, seems to pose a forthcoming threat in allergic patients (Damialis, Mohammad *et al.*, 2015).

2.2. Public health effects

The public concern around air pollution is increasing significantly due to the serious hazards to health; heart disease, chronic obstructive pulmonary disease (COPD), stroke and lung cancer are highly related to air pollution (Yi, Lo *et al.*, 2015; Liu, Cai *et al.*, 2016; Pant, Guttikunda *et al.*, 2016). Furthermore, China's largest cities have a marked increase in the incidence of bronchial asthma (Liu, Cai *et al.*, 2016; Wang, 2016). The awareness of the seriousness of respiratory disease development is also recognized in the establishment of the Global Alliance against Chronic Respiratory Diseases (GARD) by the World Health Organization in 2006 (WHO, 2015). Air pollution plays a well-documented role in asthma attacks, however, the role air pollution plays in initiating asthma is still under investigation and may involve a very complex set of interactions between indoor and outdoor environmental conditions and genetic susceptibility. Asthma is a complex respiratory condition operationally defined as a respiratory disease with three primary features (Leikauf, 2002). These include a) airway inflammation associated with cytokine formation, eosinophilic infiltration, and altered T-cell lymphocytic function; b) altered epithelial function associated with thickening of the basement membrane, mucin hypersecretion, and lost or altered cilia structure; and c) recurrent airflow obstruction often presenting in acute phases as decreased forced expiratory volume and reversible bronchospasm followed by persistent airway hyperreactivity. Although the frequency of asthma is higher among atopic

individuals, not all people with asthma exhibit specific antigen–antibody responses (Leikauf, 2002).

Special attention is given to children and elderly, who are at higher risk to experience more severe adverse effects of air pollution (Zhang, Qiu *et al.*, 2015; Zhang, Li *et al.*, 2016). Children were shown to be more susceptible than adults, as they spend more time outdoors, have a higher activity level and minute volume per unit body weight, which leads to higher deposited concentrations of PM dose per lung surface. Another study showed that children between 6 and 10 years old had less nasal deposition of fine particles during light exercise compared to adults, suggesting that limiting exertion in children may be especially important for reducing their exposure to PM (Laumbach, Meng *et al.*, 2015). Elderly are regarded as more at risk due to the general gradual decline of their physiological processes over time. These conditions have often already led to pre-existing cardio-vascular and respiratory sensitivity which may further increase the susceptibility to PM (Zhang, Li *et al.*, 2016). In addition, multiple studies confirmed the association of exposure to ambient air pollution during pregnancy with adverse pregnancy outcomes (Poursafa, Baradaran-Mahdavi *et al.*, 2016; Qian, Liang *et al.*, 2016). Sbihi *et al.* showed that within-city air pollution exposure increased the odds of new asthma onset up to 25% in children of mothers living near highways during pregnancy (Sbihi, Tamburic *et al.*, 2016). This is in line with the strong consistent association observed between the distance to the nearest main road and allergic disease outcomes. Children living closer than 50 meters to a busy street had a higher probability of getting allergic symptoms, compared to children living further away (Parker, Akinbami *et al.*, 2009). In fact, one recent Los Angeles study found that eight percent of childhood asthma cases could be associated to living close (within 250 feet) to major roadways. A recent study in atopic volunteers showed that inhalation of diesel exhaust at environmentally relevant concentrations augments allergen-induced allergic inflammation in the lower airways (Carlsten, Blomberg *et al.*, 2016). In contrast to the adverse pregnancy outcomes when exposed to PM2.5, Capobussi *et al.* showed that exposure to SO_2 and CO seemed to postpone delivery, thereby making up for the maternal hypoxemic-hypoxic damage (Capobussi, Tettamanti *et al.*, 2016). Taken together, these studies suggest that pregnant women, young children and elderly are the populations that are most affected by the consequences of pollution exposure. Therefore, better care and protection from exposure of these risk populations will be of great value for future public health.

2.3. Health effects of exposure to specific air pollutants

To inform the public about the daily air quality, the EPA records the local air quality through its Air Quality Index. This AQI shows the levels of five major air pollutants, as they have been implicated to have great impact on human health (Gardiner, 2011).

The first two major pollutants are comprised of two size categories of Particulate Matter (PM). PM with a diameter between 2.5 and 10 μm are also referred to as PM10 or coarse particles. These particles can penetrate the thoracic airways and are often derived from soil and other crustal materials (Liu, Cai *et al.*, 2016). Particulate Matter with a diameter between 0.1 and 2.5 μm are referred to as PM2.5 or fine particles, and are primarily derived from secondary sulphate/nitrate, coal combustion, traffic emissions, dust/soil, secondary organic aerosol and industry (Zhang, Qiu *et al.*, 2015). They contain primary pollutants (e.g. gases originating from combustion processes) and secondary pollutants (e.g. by reactions of these primary pollutants with other components in the atmosphere) (Liu, Cai *et al.*, 2016). The proportion of PM2.5 in the distal pulmonary tissues was found to be three times larger than that of PM10 (Zhang, Li *et al.*, 2016). Around 81 million Americans live in areas that fail to meet national air quality standards for particulate matter (Parker, Akinbami *et al.*, 2009; Gardiner, 2011). Multiple studies have reported specifically on the relation between PM-exposure and adverse health outcomes. Lamichhane *et al.* have performed a meta-analysis of the exposure to PM and adverse birth outcomes. They concluded that their meta-analysis supported the adverse impact of maternal exposure to PM during pregnancy on the birth outcome, but also indicated that the variation in effects by exposure period and sources of heterogeneity between studies is complicating a strong causal relationship (Lamichhane, Leem *et al.*, 2015). Large geographical differences in PM2.5 concentrations were found comparing North America versus Asia (12 $\mu g/m^3$ versus 38 $\mu g/m^3$ respectively), making direct comparisons of PM2.5-induced health issues difficult (Pant, Guttikunda *et al.*, 2016). In relation to this, an increase of 0.58% of the respiratory mortality for every additional 10 $\mu g/m^3$ PM10 and 8% more hospitalizations due to respiratory complaints with an increasing concentration of 10 $\mu g/m^3$ PM2.5 have been reported (Xing, Xu *et al.*, 2016). The percentage relative risk for hospitalizations due to total respiratory diseases increased mostly due to an increment of 10 $\mu g/m^3$ of the pollutant PM10, followed by SO_2, and O_3 (Freitas, Leon *et al.*, 2016). In addition, the majority of people in developing countries live in population-dense areas that do not meet local air-quality guidelines, whereas in Europe it is the other way around (Pant, Guttikunda *et al.*, 2016). Lu *et al.* aimed to provide an estimate of the magnitude of adverse health effects of PM10 and PM2.5 pollution in the Chinese population. They concluded that short exposures to PM10 and PM2.5 are associated with increased mortality, but evidence of constituent-associated health effects, long-term effects and morbidity in China is still inadequate (Lu, Xu *et al.*, 2015). In Canada and the United States, long-term exposure to PM2.5 increased the chances of both cardiopulmonary complaints and lung cancer mortality, as shown by an extension of the average life span with 0.35 years for every 10 $\mu g/m^3$ decrease of PM2.5 (Xing, Xu *et al.*, 2016). Besides the clinical evidence, many groups are focusing more on the mechanism by which PM affect the physiological processes. The results range from declined non-specific immune defense, less viable macrophages, a more pro-inflammatory status of immune cells, and a lower capacity

of macrophages to phagocytose (Xing, Xu *et al.*, 2016).

The third major pollutant, NO_2 can both act as a reducing agent as well as an oxidizing agent that easily combines with water to form nitric acid. When this happens with airborne water, it results in acid rain. Nitric acid is also a common component of pollution-dependent haze (Liu, Cai *et al.*, 2016). A large European cohort study (ESCAPEs study) recently evaluated the impact of traffic pollution (studied as NO_2 and NOx) on the quality of life (QoL). Probably due to the bias related to susceptibility (e.g. avoidance), moderate exposure levels or confounders related to the type of residential area, there was no difference in the impact of air pollution on QoL between controls, asthmatics or individuals with chronic rhino-sinusitis (Sommar, Ek *et al.*, 2014). Another study performed in London children concluded that exposure to traffic pollution (containing NO_2, NO, NO_x and PM) may cause a small overall reduction in lung function and may increase the prevalence of children with clinically relevant lung function reduction (Barone-Adesi, Dent *et al.*, 2015). Like NO_2, the fourth major pollutant SO_2 is a molecule that can both act as a reducing agent as well as an oxidizing agent. It can therefore alter many different compounds, and subsequently has a major influence on the suitability of a habitat for its plants and animals (Liu, Cai *et al.*, 2016). Compared to NO_2 and SO_2, the fifth major pollutant ozone (O_3) is the most powerful oxidizing agent, and, in high concentrations, will damage respiratory tissues in animals and even plants (Liu, Cai *et al.*, 2016). In 2013, according to the American Lung Association, around 38% of the Americans lived in areas with unhealthful levels of ozone. It has been shown that long-term ozone exposure increased the risk of developing the Acute Respiratory Distress Syndrome (Parker, Akinbami *et al.*, 2009; Gardiner, 2011; Ware, Zhao *et al.*, 2016). In addition, patients with chronic obstructive pulmonary disease (COPD) are hospitalized more frequently when exposed to O_3, NO_2 and SO_2 levels $>10\ \mu g/m^3$ (Ghanbari Ghozikali, Heibati *et al.*, 2016). Multiple studies have further investigated the effects of O_3 on lung function, showing a significant drop in FEV1 and a positive association between O_3 and asthma emergency visits in children (Zhang, Qiu *et al.*, 2015).

These studies show that each pollutant affects different organs through a different mechanism. Therefore, the timing and sequential order at which an individual is exposed will determine the disease outcome. A better understanding of the interaction between pollutants and the window of opportunity to repair the affected tissue will help to design improved prevention and therapeutic approaches.

In addition to the role air pollutants play in triggering severe allergic reactions and asthma attacks, especially the combination of pollution and allergens such as pollen is gaining interest. Reviews on this subject showcased frequent instances of interactions between fragments of airborne pollen and atmospheric pollution: there is growing evidence supporting the fact that pollen allergens can interact with air pollutants by adhering to the surface of pollen grains or paucimicronic allergen-carrying particles, with air pollutants thus modifying the antigenic potency of these particles (e.g. (D'Amato, 2000)).

3. The Social-Economic burden of pollution-induced diseases

In 2008, 1.3 million deaths were reported due to air pollution (Jiang, Mei *et al.*, 2016). The WHO reported that in 2012 around 7 million people died as a result of air pollution exposure, of which 3.7 million deaths from urban and rural sources worldwide. Regionally, low- and middle-income countries in South-East Asia and Western Pacific Regions had the largest air pollution-related burden in 2012, with a total of 3.3 million deaths linked to indoor air pollution and 2.6 million deaths related to outdoor air pollution (WHO, 2014). The causes of death caused by outdoor air pollution can be divided into different diseases: ischaemic heart disease (40%), stroke (40%), chronic obstructive pulmonary disease (COPD, 11%), lung cancer (6%), and acute lower respiratory infections in children (3%) (WHO, 2014). He *et al*. found significant associations of PM2.5, PM10, NO_2 and SO_2 with daily 'years of life lost' (YLL) and daily death counts in Ningbo, China. Interestingly, the associations with both outcomes were more evident in the elderly (He, Yang *et al.*, 2016). These findings are in line with the earlier report of Guo *et al*. that showed the mortality risk was higher for older people than for those aged 65 years or younger. Interestingly, they also showed that the effect estimates of PM2.5 and PM10 on YLL were higher in women than men, with the opposite for SO_2 and NO_2 (Guo, Li *et al.*, 2013). Similar findings have been reported on the relation between air pollution and premature elderly deaths in Moscow, Russia (Revich and Shaposhnikov, 2010; Shaposhnikov, Revich *et al.*, 2014).

3.1. Social impact of air pollution

There is relatively little people can do about their daily exposure to (air) pollutants. There are advises that aim for proper water intake to improve the disposal of water-soluble pollutants, and there are indications that sufficient anti-oxidant intake (a.o. vitamins), fish oil supplements or high flavonol cocoa might help the human body to lower the damage by pollutants (Cai and He, 2016; Zhang, Li *et al.*, 2016). Laumbach *et al*. have reviewed the various non-nutritional individual-level strategies for reducing exposure risk, which all influence the socio-economic situation of an individual (Laumbach, Meng *et al.*, 2015). The identified strategies include the reduction of personal exposure to ambient air pollution by staying indoors, cleaning indoor air with portable or central air cleaning systems, reduced exercise, avoiding outdoor activities when and where air pollutant levels are higher, reducing exposure in microenvironments near sources such as traffic, and the use personal protective equipment (respirators) (Laumbach, Meng *et al.*, 2015). Multiple of these advices are also addressed elsewhere (Cai and He, 2016; Jiang, Mei *et al.*, 2016; Pant, Guttikunda *et al.*, 2016), and all impact the quality of life of people with respiratory diseases like asthma or COPD. Some advises are specifically aimed at parents: when walking outdoors, choose a route that avoids major streets or highways where possible. Take children to

playgrounds that are not next to major highways. Further, take any steps to ensure that new schools and housing developments are not placed near busy roadways, ports, rail yards or other industrial areas where the risk of diesel exposure increases. In addition, people living in an area with very high air pollution are advised to consider installing air filters inside their home (Parker, Akinbami *et al*., 2009; Gardiner, 2011).

Besides the economic and emotional costs that are accompanying the above described adjustments to air pollution, exposure to air pollution and associated health effects are often interlinked with socio-economic status as well as socio-cultural norms of the individual (Neidell, 2004; Pant, Guttikunda *et al*., 2016). For example, it has been shown that lower median incomes have higher levels household exposure compared to households with higher median incomes possibly concomitant with the tendency to live in more crowded conditions, co-habitation with cigarette smokers, and higher indoor PM levels (Pant, Guttikunda *et al*., 2016). Studies that focus on the socio-economic relationship between health outcomes and pollution are often showing results on pregnancy and young infants. For example, Chan *et al*. developed a socio-economic status (SES) index specifically for Canada, allowing more precise examining of the health outcomes from environmental pollution. They corroborate with the current literature: increased rates of preterm births, low birth weight and small for gestational age are correlated with a lower SES in case of PM2.5 exposure (Chan, Serrano *et al*., 2015). Similar findings have been reported in North Carolina, USA; a stable but negative association between air pollution exposure and adverse birth outcomes, with a further increased risk in the more socially disadvantaged populations (Gray, Edwards *et al*., 2014). Kathuria and Khan (2007) have also commented on the inequity in air pollution exposure in the Indian context. Not surprisingly, the relationship between socio-economic conditions and pollution exposure is expected to vary across communities and countries as also shown by Yap *et al*. They showed that in lower-SES South Coast areas, PM2.5-associated hospital admission rates for all respiratory outcomes were predominantly positive whereas results in the Central Valley were variable, often tending toward the null. These distinct patterns could be attributed to the heterogeneity of regional confounders as well as the seasonal variation of emission sources of PM2.5 (Yap, Gilbreath *et al*., 2013).

As described above, especially elderly experience premature death due to air pollution. As China has become an aging society, and is troubled by significant air pollution, research specifically aimed to analyze the effect of air pollution and rural-urban difference on mental health of the elderly in China was conducted. They showed that around 28% of the elderly people had psychological disorders. Air pollution significantly influenced the mental health of the elderly. In China, the urban elderly had a better psychological status than the rural elderly. The female elderly had more serious mental health problems. Marriage, education, and social activities had positive effects on the mental health of the elderly (Tian, Chen *et al*., 2015). However, this association of air pollution and depressed mood could not be confirmed in individuals from four European cohorts (Zijlema, Wolf *et al*., 2016). Morbidity and mortality from asthma are high in older adults and quality of life (QOL) might be lower, although standardized measurements of QOL have not been validated in this population. Traffic pollution exposure was the strongest predictor of poorer asthma-related QOL in older adults with asthma (Kannan, Bernstein *et al*., 2015).

3.2. Economic impact of air pollution

In 2000, the total losses due to O_3-induced crop damage in Spain accounted 20.7 M□, which are reduced to 18.8 M□ in 2020. The bulk of reduced economic loss concentrates on wheat, potato and grapes (Vedrenne, Borge *et al*., 2015). In the United States, the impact of O_3-induced crop damage was observed for maize and soybean from 1980 to 2011. They showed that over that period production of rain-fed fields of soybean and maize were reduced by roughly 5% and 10%, respectively, costing approximately 9 billion USD annually (McGrath, Betzelberger *et al*., 2015).

Besides the economic losses through crops, a large economic burden because of air pollution is found in the health care system. In 2014, asthma affected 334 million people worldwide. In Asia, it is more pronounced in South-east Asia and the Western Pacific regions where there is an estimated 107 million sufferers (Price, David-Wang *et al*., 2016). About 25 million Americans are intimately acquainted with the symptoms of an asthma attack (Gardiner, 2011). During an asthma strike, the airways become constricted, swollen, and are filled with mucus. The chest feels tight, causing cough or wheezing. In severe cases, asthma attacks can be deadly, as they are for more than 3,000 people every year in the United States (Gardiner, 2011; Roy, Sheffield *et al*., 2011). According to the Centers for Disease Control, asthma keeps children out of school for a total of more than 10 million lost school days each year and sidelines them from physical activity. Later in life, employers lose 14 million work days every year when asthma keeps adults out of the workplace. The disease is also responsible for nearly 2 million emergency room visits a year (Parker, Akinbami *et al*., 2009). In recent years, it has been shown that air pollution from cars, factories and power plants are a major cause of asthma attacks, affecting over 131 million Americans. Roughly 30 percent of childhood asthma within the USA is due to environmental exposures, with an associated cost of 2 billion USD per year (Roy, Sheffield *et al*., 2011). A Spanish study showed that a more strict regulation of the air quality resulted in a decline of the number of years lost due to PM2.5 air pollution from 230,700 in 2002, towards a predicted level of approximately 195,500 years until 2020 (Vedrenne, Borge *et al*., 2015). In addition, an Estonian analysis showed that air pollution results in 3859 Years of Life Lost (YLL) per year. When dividing the YLL by the number of premature deaths, the decrease in life expectancy among the actual cases is around 13 years. As for the morbidity, the short-term effects of air pollution were estimated to result in an additional 71 respiratory and 204 cardiovascular hospitalizations per year. The biggest external

costs are related to the long-term effects on mortality: this is on average 150 M annually. In comparison, the costs of short-term air-pollution driven hospitalizations are only 0.3 M (Orru, Teinemaa *et al.*, 2009).

As mentioned above, there is a clear link between PM2.5 exposure during pregnancy and preterm birth. It has been shown that in 2010, around 15,808 preterm births within the USA could be attributed to PM2.5 exposure. The concomitant preterm birth cost was estimated at 4 billion USD, of which 760 million USD were spent on medical care (Trasande, Malecha *et al.*, 2016). Another study in South Carolina estimated the incremental costs of comorbidities observed in preterm infants to range from 4.529 to 23.121 USD. Whenever surgery was necessary, incremental costs could get as high as 41.161 USD. Incremental comorbidity costs are additive, so the costs for infants with multiple comorbidities could easily exceed the high of 41.161 USD (Black, Hulsey *et al.*, 2015).

Taken together, medical care, loss of school and workdays, and crop waste due to pollution all have a major economic impact. Improvements of the air quality is therefore of great importance for many governmental bodies and constant monitoring is implied as an essential step in this step. To better assess the severity of air pollution at a wider range of locations, new devices have been developed. An example is the use of a Static Sensor Network (SSN), in which the sensor nodes are typically mounted on streetlights, traffic light poles, or walls (Yi, Lo *et al.*, 2015). In a Community Sensor Network (CSN), the sensor nodes are typically carried by users, and in a Vehicle Sensor Network (VSN), the sensor nodes are typically carried by buses or taxis (Yi, Lo *et al.*, 2015). By utilizing and further developing these advanced sensing technologies, air pollution can be monitored with higher precision, which might lead to better solutions for the protection of the public health (Yi, Lo *et al.*, 2015).

4. Conclusion

By 2050, 66% of the world's population will be urban. The subsequent major forms of pollution of this urbanization are soil-, water-, and air pollution, and as a consequence polluted foods and feeds. This implicates that on a daily basis, humans are exposed to a multitude of pollutants, that each, on its own specific way, affect human health. In general, pollutants affect different organs, leading to multiple diseases such as heart disease, pulmonary disease, cancer, and fatal respiratory infections. Besides the major impact of the onset of these diseases in early life, also the effect of pollution during pregnancy is linked to adverse birth outcomes. After the onset of disease, especially young children and elderly are experiencing more severe complaints due to pollution exposure, leading to a strong reduction of the Quality of Life. Subsequent direct and indirect socio-economic costs are negatively impacted by a lower socio-economic status of the individual. Studies comparing the health situation before and after the implementation of air quality measures by governmental bodies have shown that a better air quality is related to lower crop wastes and improvements of the Quality of Life and lower Years of Life Losses. Therefore, air pollution should be considered as a modifiable risk factor in the prevention of non-communicable diseases like asthma. However, additional research is needed to improve our understanding of how the different air pollutants influence human health, and whether improved lifestyle factors like nutrition, living conditions and medical expertise can help individuals to reduce the negative health effects caused by pollution.

Acknowledgements

The authors would like to thank Prof. Dr. med. Claudia Traidl-Hoffmann and Dr. Selma Wiertsema for critically reviewing this manuscript and Prof. Gerrit Antonides for his excellent input on the importance of the mutual influence of the socio-economic characteristics of an individual, and the health aspects of allergic diseases.

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Applied Studies in Agribusiness and Commerce – APSTRACT
Center-Print Publishing House, Debrecen
DOI: 10.19041/APSTRACT/2016/2-3/12

SCIENTIFIC PAPER

THE DIRECT AND INDIRECT COSTS ASSOCIATED WITH FOOD HYPERSENSITIVITY IN HOUSEHOLDS: A STUDY IN THE NETHERLANDS, POLAND, AND SPAIN

Jantine Voordouw[1, 2], Gerrit Antonides[3*], Margaret Fox[4], Inma Cerecedo[5], Javier Zamora[6], Belen de la Hoz Caballer[7], Ewa Rokicka[8], Judith R. Cornelisse-Vermaat[1], Maciej Jewczak[8], Pawel Starosta[8], Marek Kowalski[9], Monika Jędrzejczak-Czechowicz[9], Sonia Vázquez-Cortes[10], Sara Cano-Escudero[11], Bertine M.J. Flokstra-De Blok[12], Anthony E.J. Dubois[13], Miranda Mugford[4], Lynn J. Frewer[1, 14]

Affiliations:

[1] Wageningen University, Marketing and Consumer Behaviour group, Wageningen, the Netherlands.
[2] VU university medical center Amsterdam (VUmc), Department of social medicine, Amsterdam, the Netherlands.
[3] Wageningen University, Economics of Consumers and Households group Wageningen, the Netherlands
[4] University of East Anglia, Health Economics Group, Norwich Medical School, Norwich, United Kingdom.
[5] Allergy Division. Department of Medicine. Hospital del Sureste. Arganda del Rey. Madrid. Spain.
[6] Clinical Biostatistics Unit, University Hospital Ramón y Cajal (IRYCIS) and CIBER Epidemiologia y Salud Publica (CIBERESP), Madrid, Spain.
[7] Allergy Department, University Hospital Ramón y Cajal, Madrid, Spain.
[8] Lodz University, Faculty of Economics and Sociology, Lodz, Poland.
[9] Lodz University, department of Immunology, Rheumatology and Allergy, Faculty of Medicine, Lodz, Poland.
[10]Allergy Department, Hospital Clinico San Carlos, Madrid, Spain.
[11] Clinical Epidemiology Unit, Preventive Medicine Department, Hospital Clinico San Carlos, Madrid.
[12] University Medical Center Groningen, University of Groningen, Department of General Practice, GRIAC Research Institute, Groningen, the Netherlands.
[13] University Medical Center Groningen, University of Groningen, Department of Pediatric Pulmonology and Pediatric Allergy, GRIAC Research Institute, Groningen, the Netherlands
[14] Centre for Rural Economy, Newcastle University, United Kingdom.

** Corresponding author address: Hollandseweg 1, bode 55, 6706 KN Wageningen, The Netherlands. Tel. +31 317 483897.*
E-mail address: Gerrit.Antonides@wur.nl.

Email addresses: JV: J.Voordouw@vumc.nl; GA: Gerrit.Antonides@wur.nl; MF: M.Fox@uea.ac.uk;
IC: inmaculadacerecedo@gmail.com; JZ: javier.zamora@hrc.es; BHC: bhoz.hrc@salud.madrid.org
ER: rocicka@uni.lodz.pl; JC: j.cornelisse@gelre.nl; MJ: jewczak@uni.lodz.pl; PS: starosta@uni.lodz.pl
MK: Marek.Kowalski@csk.umed.lodz.pl; MJC: socwim@uni.lodz.pl; SVC: sonia.vazquez.cortes@gmail.com
SCE: saracano78@gmail.com; BFD: b.m.j.flokstra@med.umcg.nl; AEJD: a.e.j.dubois@bkk.umcg.nl
MM: M.Mugford@uea.ac.uk; LJF: lynn.frewer@newcastle.ac.uk

Abstract:

Background

Recent studies show that food hypersensitivity, such as food allergy or food intolerance, has the potential to affect direct, indirect and intangible economic costs experienced by individuals and their families. This research assesses the direct and indirect economic costs of food hypersensitivity at the household level in the Netherlands, Poland, and Spain.

Methods

A self-administered postal survey was conducted (n=1558). Respondents with food hypersensitivity were clinically diagnosed cases recruited through clinical centres in Poland and Spain. In the Netherlands, food hypersensitivity cases were recruited through hospitals, patient organisations and advertisements. The controls formed the baseline sample and were obtained from households in which none of the members had food hypersensitivity. The monetary value of indirect costs, forgone time, was calculated using the opportunity cost method. The indirect and direct costs were expressed in purchasing power parity. Analysis of co-variance on the cost items was used to test the within-country differences between respondents with food hypersensitivity and respondents without food hypersensitivity, as well as across the three countries.

Results

The average total direct and indirect costs across all countries for families with food hypersensitive family members are not higher than for households without food hypersensitive members. However, the intangible costs for food hypersensitive individuals appear to be higher than for individuals in the control group.

Conclusions

These results do not support the hypothesis that all food allergies incur high costs to the individual. However, being hypersensitive to foods may have a negative impact on quality of life compared to people who are not food hypersensitive.

Background

Food allergy is a chronic disease for which, at the present time, no general treatment is available, although research is being conducted which aims to curing the disease [1-5]. The only treatment currently available, is managing the disease through avoidance of problematic allergens in the diet of food allergy sufferers [4-6]. Despite the application of precautionary measures, accidental exposure to allergenic proteins may result in allergic responses. The socio-economic burden of food allergy is experienced not only by food allergy sufferers themselves, but also other family members and caregivers [7-11].

A meta-analysis of existing epidemiology surveys suggests that the prevalence of self-reported food allergy also varies across the population, with self-reported allergy rates reaching 35% [1, 12-16]. Estimates of prevalence derived from oral food challenges, such as double blind placebo controlled food challenges (DBPCFC), tend to be more conservative, but nevertheless suggest that food allergy affects a substantial percentage of the population [10, 14]**.** There is some evidence to suggest that the prevalence of food allergy is increasing. Studies focusing on peanut allergy indicate that prevalence rates in children have increased, exceeding 1% in school-aged children. A 2008 Centres for Disease Control and Prevention report indicated an 18% increase in childhood food allergy from 1997 to 2007, with an estimated 3.9% of children currently affected [17-20]. In addition, data collected in 2003 and 2007 from the National Survey of Children's Health also suggests that the prevalence of food allergy increased [17].

The increase in prevalence of food allergies affects the economic burden of food–allergy management. Although various studies have provided estimates of the economic costs of respiratory allergies [22,23], very little research has been conducted which focuses on the economic costs of food allergy to households and individuals. A French study estimated the costs per patient for the health care sector for severe anaphylaxis resulting from food allergy to vary from 1895 to 5610 euro in nonfatal cases, together with three working or school days per year lost due to ill health [24]. There is more information about the aggregate costs of major allergic diseases, which were estimated at 10 billion ECU (European currency unit) for direct costs and 19 billion ECU for indirect costs in Europe [9]. In addition, a recent study has reported that food allergic individuals self-report spending more time on food shopping, lose more time because of inability to perform everyday (household) tasks, and face higher societal costs, including health care costs and work-related absences, compared to non-allergic individuals [7].

Miles *et al*. [25] developed a framework which could be applied to measure the costs of food allergy. This study suggested that the costs can be divided into three categories, namely, direct costs, indirect costs and intangible costs [25]. The *direct costs* can be defined as the financial (out-of-pocket) costs food allergic individuals and their family incur as a result of the disease. The *indirect costs* can be defined as time loss, lost productivity and opportunity costs due to illness [32]. *Intangible costs* are defined as loss of value or utility, which are difficult to measure in monetary terms but can be indicated by self-reported health status, well-being and economic welfare experienced as a consequence of food allergy. This suggests that food allergy may potentially have a negative effect on the quality of life and economic functioning of food allergic individuals and their households. In addition, intangible costs may comprise restrictions concerning job and career opportunities, education, leisure and social life.

The burden on health care services associated with chronic diseases leads to an increased interest in their economic impact. In making decisions about optimal allocation of health care resources, it is important to consider the economic effects of chronic diseases, such as food allergy. Evidence is needed regarding the relative importance of food hypersensitivity, including food allergy and food intolerances, compared to other chronic diseases to justify the economic cost for development of new legislation or policies (for example, in terms of food and ingredient labelling, food production or investment in formal diagnosis within the health care system) [26].

The purpose of this study is to assess the direct, indirect and intangible cost of food hypersensitivity at the household

Table 1: Distribution of adult and parental versions of the questionnaire

		Adult version	Parental version	Total
Netherlands	Case	65	72	137
	Control	52	102	154
Poland	Case	97	153	250
	Control	224	169	393
Spain	Case	97	100	197
	Control	190	237	427
	Total	725	833	1558

level. The hypothesis to be tested is that families with food hypersensitive family members incur higher direct and indirect cost on all items compared to households without food hypersensitive members. The results could be used to prioritise resources for development of new food allergy management strategies and could help to inform legislation in this area.

Methods

Study population

This study was part of the large EU-funded project EuroPrevall. The respondents from Poland and Spain were collected as part of the epidemiological study performed within EuroPrevall. The protocol on the sampling strategy is described elsewhere [22, 23]. This epidemiological study was designed as a clinical case-control study to establish the prevalence of food allergy and food hypersensitivity. In the Netherlands, the protocol from the epidemiologic study was used to select the cases with food hypersensitivity and food allergy. The recruitment was conducted through hospitals and patient organisations. Respondents were included if they indicated having one or more food allergies to the 14 food allergens listed in the EC Directive 2006/142/EC, or reported experiencing symptoms following accidental ingestion of problematic foods, or reported that they had been diagnosed as having food allergy by a health care professional. A pre-analysis was performed to test if the cases from each sampling method were comparable. No significant differences between the recruitment methods were identified. The target group of respondents with food allergy or food hypersensitivity and their family were compared to a baseline control sample. The control groups in Spain and Poland were recruited as part of the epidemiological study. In the Netherlands, the control group was selected to be comparable on the demographic characteristics of the case sample. Pre-analysis showed that the sampling method in the baseline group was not significantly different between countries. The cases recruited through the epidemiological study were tested through double blind placebo controlled food challenges (DBPCFC), resulting in the majority of the cases being classified as *food hypersensitive* and the minority *food allergic*. Therefore, in this study, we will use the broader term food hypersensitivity indicating all cases with food allergy and food intolerances.

The survey was conducted in the Netherlands, Poland, and Spain[1] to estimate potential cost differences between households with and without food hypersensitive members, by comparison of the target food hypersensitive group to the baseline sample. The participants were matched with the controls with respect to their zip code area such that they were roughly comparable with respect to income, education, and residence (urban *versus* rural). The participants received written information about the study together with the questionnaire inquiring about the costs incurred at the level of the household. Their participation was voluntary and had no consequences for their treatment. Participants did not receive any incentive for their contribution. The questionnaires were assigned unique codes to provide a data set with anonymous records. Only the Europrevall researcher could match the unique codes with the personal data of the participants. Ethical approval from the medical ethical committees in the participating hospitals, clinical centres and universities was obtained.[2]

In total, 1558 respondents were included in this study (see Table 1). The target sample comprised both food hypersensitive adults, and food hypersensitive children. In the case of the latter, the parent of the child completed the questionnaire. The food hypersensitive adults from the target sample and the healthy adults from the baseline sample received the *adult version* of the questionnaire which was designed to estimate the household costs experienced by adults with or without (perceived) food sensitivities. The families with food allergic children received the *parental version* which was designed to provide the same estimates in households including children with or without food hypersensitivity. A household without a food hypersensitive child (control) reported the cost of the oldest child living at home.

1 Although the survey was also conducted in the UK, the number of participants was too small (69) to be included in the analysis.

2 Medical Ethical Committee of University Medical Centre Groningen, The Netherlands; Ethics Committee of the Hospital Ramon y Cajal, Madrid, Spain; Bioethical Committee of Medical University of Lodz.

Survey

The data was collected through a patient-based resource and expenditure cost survey (a copy of the "household costs of food allergy" questionnaire can be obtained on request from the authors).

A detailed description of the development and validation of this questionnaire has been provided elsewhere [10, 29]. The questionnaire used in this study gathered structured information on all aspects of health and social care resource use. To summarise, the questionnaire development was performed in three stages: (1) identification of cost items through a review of literature, patient organisations and focus groups; (2) formulation of the questionnaire; (3) pilot testing and validation. The framework developed by Miles *et al*. [25] was used to structure the questionnaire into the three cost sections. This study will analyse the direct and indirect costs of living and seeking health care for families with and without food-hypersensitive members.

The costs will be calculated using the Purchasing power parity (PPP) of the Geary-Khamis dollar with base line year 2007 to compare the costs across the different countries. PPP is a device which assumes that exchange rates between currencies in different states are in equilibrium when their purchasing power is the same [30]. The international Geary-Khamis dollar, often used together with PPP, is a hypothetical unit of currency with the same purchasing power as the US dollar at a given point in time.

A methodology which values the time loss of household production as a monetary value was used to calculate the indirect costs. In the *opportunity cost method,* the individual's own market wage rate is used to evaluate the time loss or household production [31]. In economic models used for analysing the choice between labour market participation and home production, it is frequently assumed that the value of the first hours spent on home production is higher than an individual's labour time in the job market (represented by their wage rate). The income the individual foregoes by spending time on home production is found by the multiplication of the wage rate by these hours. The opportunity cost method is widely used in the literature and is well-validated [32]. This method was used in the analysis of the indirect costs. When a person was not employed in paid work the minimum wage rate per country was used (4.8% of case respondents, 5.1% of their partners; 4.4% of control respondents, 4.4% of their partners). When the person reported they were working but did not state their income, the national average wage rate was used (1.0% of case respondents, 63.2% of their partners; 0.9% of control respondents, 63.2% of their partners). The direct cost was calculated by summing all out-of-pocket cost items from the questionnaire. When no direct or indirect cost was incurred zero cost was used in the analysis. If, in previous questions, it was stated that costs were made on a particular item without mentioning the amount, the cost item was entered as a missing value.

The direct costs included costs for medical treatment not covered by insurance and thus paid by the individual, travel costs to obtain medical treatment, costs for medication, including over-the-counter and prescribed medicines, and cost of health insurance; costs of living, including food expenses, holiday expenses, costs during leisure activities, costs for equipment required to prepare safe meals, and domestic help. The societal costs, covered by government and insurance companies were excluded from our analysis. The indirect costs included lost working days, loss of education or working opportunities, lost earnings, lost human capital (i.e., limitations of job, schooling, leisure, and family life), time spent on searching for information on health related issues, and time spent obtaining medical treatment (e.g., travel time, consultation time).

Analysis

All significance tests have been conducted on the logarithms of the cost variables, in order to reduce the skewness of the cost distributions. Analysis of covariance (ANCOVA) with planned contrast and post-hoc tests using Bonferroni corrections were used in all comparisons for each cost item to identify significant differences between cases and controls within countries and across the three countries. Each analysis included fixed factors of country by case–control interaction, and a number of covariates: age, gender, education, total working hours, household income, household composition, and severity and type of food allergy. All covariates were categorized and converted into dummy variables (except for the reference category) in order to deal with non-linear relationships between the dependent and independent variables. In the case of substantial partial non-response, a dummy variable was constructed which was equal to one if the variable was missing and zero otherwise. This way, as many participants as possible could be included in the analysis.

We estimated the effects for each type of cost using equation (1), in which the βs denote coefficients, ε is a normally distributed error term, *C* denotes the logarithm of the costs, all other terms are dummy variables which equal zero for the reference category. *All* denotes severity of allergy (5 categories, the first of which is included in the constant term, β_0), *Version* is a dummy which equals 1 for the parental version (0 elsewhere), *Educ* denotes education level (5 categories, the first of which is included in the constant term), *WorkR* denotes hours worked by the respondent (3 categories, the first of which is included in the constant term), *WorkP* denotes hours worked by the respondent's partner (3 categories, the first of which is included in the constant term), *Inc* denotes income level (3 categories, the first of which is included in the constant term, plus a category for non-reported income), *AgeR* denotes age categories of the respondent in case of the adult version of the questionnaire (4 categories, the first of which is included in the constant term, plus a category for non-reported age, all dummy variables equal zero in case of the parental version), *AgeCh* denotes age categories of the child in case of the parental version of the questionnaire (4 categories, the first of which is included in the constant term, plus a category for non-reported age, all dummy variables

$$C = \beta_0 + \sum_{j=2}^{4} \beta_{1j} All_j + \beta_2 Version + \sum_{k=2}^{5} \beta_{3k} Educ_k + \sum_{l=2}^{3} \beta_{3l} WorkR_l + \sum_{m=2}^{3} \beta_{4m} WorkP_m + \sum_{n=2}^{4} \beta_{5n} Inc_n +$$

$$\sum_{o=2}^{5} \beta_{6o} AgeR_o + \sum_{p=2}^{5} \beta_{7p} AgeCh_p + \beta_8 SexR + \beta_9 SexCh + \sum_{q=2}^{4} \beta_{10\,q} H_q + \sum_{r=2}^{16} \beta_{11\,r} Food_r + \beta_{12} NLCase + \beta_{13} NLCtrl +$$

$$+ \beta_{14} PLCase + \beta_{15} PLCtrl + \beta_{16} ESCase + \varepsilon$$

equal zero in case of the adult version), *SexR* denotes a female respondent in the adult version of the questionnaire (zero for male respondent in the adult questionnaire, and for parental questionnaire), *SexCh* denotes a female child in the parental version of the questionnaire (zero for male child in the parental questionnaire, and for adult questionnaire), *HH* denotes household category (4 categories, the first of which is included in the constant term), *Food* denotes type of allergy (16 categories, the first of which is included in the constant term; for controls all food allergy type dummy variables equal 0), the remaining terms refer to cases and controls in each of the three countries, resp. (Spanish controls are included in the constant term).

All analysis were conducted using the Univariate Anova procedure in SPSS. After each analysis, the marginal means, corrected for the effect of covariates, evaluated at their respective means, were calculated for each cost item. The natural exponent of the difference in mean cost items between cases and controls indicate the percentage difference of their respective geometric means. For example, if the difference in the average logarithmic costs was 0.22, the proportional difference equaled exp(0.22) = 1.25 resulting in 25% difference.

Results

The reported results are based on the pooled sample, including responses to the adult version and parental version of the questionnaire, because the analysis on the separate samples did not show significant differences in cost items between the groups.

Direct costs

Although analysis of variance was performed on each cost item, we only report the parameter estimates of the analysis of variance of the total direct household costs in Table 2. However, the marginal means for each country and case–control group, based on separate analyses of variance, will be reported for each cost item in Table 3. Since the variance of total direct costs differed significantly across country and case–control groups and the groups were of different size, we took a conservative approach in setting the significance level at $p<.01$ (cf. Stevens, 1990). The distribution of residual terms was normal, as it should be. The distribution of covariates was roughly the same in the case and control groups.

Table 2a shows that respondents with more severe reactions to food allergens did not incur significantly higher total direct costs than those with very mild reactions to food allergens (reference group) using Mueller's severity grading scale [33,34]. Apparently, allergy severity did not significantly affect total direct cost.

For both food hypersensitive and control respondents, the direct costs were relatively high for households with more highly educated respondents, and higher household incomes as compared with the respective reference groups. They were also higher for households composed differently to two adults with children. These variables are highly correlated with income (i.e. the more educated people are the higher the income, and not having children also frees people to enable working longer hours and earning more money). Higher income means people have more resources to spend on holidays and food. No significant differences were observed for the other demographic variables included in the analysis.

Regarding the type of food allergy, it appeared that respondents hypersensitive to nuts had higher total direct household costs than respondents hypersensitive to milk and dairy products (which was the most common type of food allergy).

Next, the analysis of variance was used to compute marginal means, i.e., average direct costs of control respondents, and food hypersensitive respondents in each of the three countries, corrected for the influence of the covariates (that is, each covariate was set at its respective mean to calculate the marginal means). Contrary to expectations, for all three countries the total direct costs were not significantly different between the control respondents and the food hypersensitive respondents, given the influence of the covariates.

Indirect costs

Table 4 shows the parameter estimates of the analysis of variance of the total indirect household costs (analyses of variance of separate cost items is not reported here). The parameter estimates indicate that severity of food hypersensitivity did not significantly affect total indirect costs.

The higher the educational level, the higher were the indirect costs, regardless of food hypersensitivity status. The level of income had a positive effect on total indirect cost because the costs of time were converted into money by using the wage rate.

For the respondents to the adult version, either case or control, the higher the age the higher were the total indirect costs. This could be partly explained by a higher wage rate of respondents with more working experience as they become older, although the effect may tail off and reduce when people

Table 2: Parameter estimates of analysis of variance on total direct costs

		Coeff.	SE	
Intercept		7.51	0.16	*
Mild food allergy		0.09	0.11	
Moderate food allergy		0.15	0.11	
Severe food allergy		0.13	0.14	
Very mild food allergy	Reference group			
Parental version		–0.01	0.10	
Adult version	Reference group			
University degree respondent		0.46	0.08	*
High school diploma respondent		0.24	0.12	
Secondary Education respondent		0.30	0.10	*
Education level not reported		–0.02	0.08	
Primary education respondent	Reference group			
Respondent working 40 hours per week		0.14	0.07	
Respondent working >40 hours per week		0.15	0.09	
Respondent working <40 hours per week	Reference group			
Partner/spouse working 40 hours per week		0.28	0.07	*
Partner/spouse working >40 hours per week		0.32	0.08	*
Partner/spouse working <40 hours per week	Reference group			
Household income €2,000 – 3,000		0.18	0.09	
Household income ≥ €3,000		0.25	0.09	*
Household income not reported		–0.72	0.11	*
Household income < €2,000	Reference group			
Adults version: Age adult 30–39 years		0.08	0.10	
Adults version: Age adult 40–49 years		0.21	0.10	
Adults version: Age adult ≥ 50 years		0.32	0.11	*
Missing data age		–0.52	0.14	*
Adults version: Age adult ≤ 29 years	Reference group			
Parental version: Age child 8–9 years		0.15	0.11	
Parental version: Age child 10 years		0.08	0.12	
Parental version: Age child > 10 years		0.00	0.10	
Parental version: Age child ≤ 9 years	Reference group			
Adults version: female respondent		0.01	0.08	
Adult version: male respondent	Reference group			
Parental version: female child		–0.04	0.08	
Parental version: male child	Reference group			
Household composition single adult		0.84	0.15	*
Household composition one adult and child/children		0.54	0.12	*
Household composition two adults without children		0.39	0.09	*
Household composition two adults and child/children	Reference group			
Chocolate and Sweets * case		0.17	0.11	
Celery * case		0.33	0.17	
Eggs * case		0.08	0.12	
Fish * case		0.05	0.15	
Fruit * case		0.04	0.09	
Meat or poultry * case		–0.05	0.27	
Mustard * case		–0.21	0.19	
Nuts * case		0.17	0.10	
Sesame seed * case		0.06	0.23	
Shellfish and crustacean * case		–0.35	0.17	
Soy * case		–0.05	0.17	
Sulphites * case		–0.05	0.57	
Wheat and gluten * case		0.26	0.21	
Vegetables * case		.73	0.24	
Other food allergy		0.86	0.36	
Milk and dairy * case	Reference group			
Netherlands * case		–0.61	0.15	*
Netherlands * control		–0.32	0.11	*
Poland * case		–0.49	0.11	*
Poland * control		–0.39	0.08	*
Spain * case		–0.02	0.13	
Spain* control	Reference group			

Note. * $p < .01$.

$F = 1023.83$ (df=47), $p < .01$; adjusted $R^2 = 0.16$.

ln is the natural logarithm to the base e ($\ln(x) = \log_e(x)$).

Table 3: Estimated means of direct costs of cases and controls in three countries (logarithms)

		NL and case	NL and control	Poland and case	Poland and control	Spain and case	Spain and control	All cases	All controls
Cost of living	ln mean	6.98	7.36	6.94	7.03	7.79	7.83	7.24	7.41
	SE	0.16	0.16	0.15	0.15	0.19	0.19	0.09	0.11
Travel cost to obtain health care	ln mean	2.20	1.22	1.21	1.00	1.43	1.04	1.61	1.09
	SE	0.17	0.17	0.15	0.15	0.19	0.19	0.10	0.12
Cost of consultation health professional	ln mean	1.21	0.43	0.60	0.35	0.77	0.52	0.86	0.43
	SE	0.18	0.18	0.17	0.17	0.21	0.21	0.11	0.13
Medicine (prescribed and OTC)	ln mean	2.37	2.02	5.14	5.04	4.06	3.32	3.86	3.46
	SE	0.24	0.24	0.22	0.22	0.28	0.28	0.14	0.17
Medical insurance	ln mean	2.26	2.24	2.86	2.92	2.54	2.76	2.55	2.64
	SE	0.07	0.07	0.07	0.07	0.08	0.08	0.04	0.05
Total direct costs	ln mean	7.41	7.64	7.54	7.61	8.09	8.10	7.68	7.78
	SE	0.12	0.12	0.11	0.11	0.14	0.14	0.07	0.08

Note: figures based on unweighted means.

reach retirement age. Furthermore, household composition seemed to influence total indirect costs. Namely, households with one adult and children incurred higher indirect costs compared to households with two adults and children, regardless of whether they had a food hypersensitive family member or not. Neither the other demographic variables nor the type of food allergy had significant effects on total indirect cost.

The analysis of variance of each indirect cost item was used to compute marginal means, i.e., average direct costs of respondents who were not sensitive to food, and food hypersensitive respondents in each of the three countries, corrected for the influence of the covariates (that is, each covariate was set at its respective mean to calculate the marginal means).

The costs of time spent on obtaining health care from a health care professional across all countries was 45% ($p<.01$) higher for food hypersensitive respondents than for respondents asymptomatic to foods. Within-country analysis shows that food hypersensitive respondents in the Poland had 36% ($p<.01$) higher costs than control respondents. In the other countries, no significant differences were found. These results are partially in line with our expectation that food hypersensitive respondents incur greater costs than controls, at least in Poland. However, the effect is not generalizable to the Netherlands and Spain, suggesting that this may reflect local variations in national health care services.

No significant differences were found for the other types of indirect costs.

Finally, the intangible costs of having a food allergy were assessed by comparing cases and controls regarding a number of human capital issues. Respondents were asked to report about radical changes in their life, due to their health situation. Table 6 shows a number of differences between the groups concerning career and schooling opportunities, social life, leisure and emotional life. Cases were significantly more likely than controls to report restrictions concerning job, giving up a job, changing job, restrictions on leisure activities and social life, change of residence, delayed family expansion, and change of emotions. Although these restrictions are hard to quantify in monetary terms, they may be associated with substantial opportunity costs, i.e., the costs of foregoing more pleasurable or profitable activities due to food allergy.

Discussion

This study reports the differences in household costs associated with having a family with food hypersensitive members, compared to households without food hypersensitive members. Contrary to our expectations, households with food hypersensitive respondents had almost equal direct and indirect costs across all countries. One reason for the lack of greater incurred costs in the case of food hypersensitive respondents/households might be due to a restriction in food choices and related behaviours, insomuch as shopping and cooking may be more routine due to the limited variety of foods people with a food allergy can safely consume, and by the avoidance of more expensive processed foods leading to less expenses on groceries and less time spent buying and preparing meals [7,35]. Moreover, families with food hypersensitive members may also restrict social and recreational activities where the food provided cannot be managed to an appropriate level (for example, going out for dinner, ordering takeaway food, or recreational travel) leading to less expenses when compared to a family without food hypersensitive members (see [7, 35]). An important issue which needs to be raised at this point relates to the relation between household expenditure and household activity. Spending less on recreation and recreational travel

Table 4: Parameter estimates of analysis of variance on total indirect costs

		Coeff.	SE	
Intercept		7.99	0.18	*
Mild food allergy		–0.09	0.12	
Moderate food allergy		–0.04	0.13	
Severe food allergy		0.02	0.16	
Very mild food allergy	Reference group			
Parental version		–0.11	0.12	
Adult version	Reference group			
University degree respondent		0.53	0.10	*
High school diploma respondent		0.40	0.13	*
Secondary Education respondent		0.34	0.11	*
Education level not reported		–0.16	0.09	
Primary education respondent	Reference group			
Respondent working 40 hours per week		0.02	0.08	
Respondent working >40 hours per week		–0.06	0.10	
Respondent working <40 hours per week	Reference group			
Partner/spouse working 40 hours per week		0.17	0.08	
Partner/spouse working >40 hours per week		0.14	0.09	
Partner/spouse working <40 hours per week	Reference group			
Household income €2,000 – €3,000		0.08	0.10	
Household income ≥ €3,000		0.25	0.10	*
Household income not reported		0.75	0.12	*
Household income < €2,000	Reference group			
Adults version: Age adult 30–39 years		0.05	0.11	
Adults version: Age adult 40–49 years		0.23	0.11	
Adults version: Age adult ≥ 50 years		0.51	0.12	*
Missing data age		–0.47	0.16	*
Adults version: Age adult ≤ 29 years	Reference group			
Parental version: Age child 8–9 years		0.05	0.12	
Parental version: Age child 10 years		–0.04	0.14	
Parental version: Age child > 10 years		–0.07	0.12	
Parental version: Age child ≤ 9 years	Reference group			
Adults version: female respondent		0.02	0.09	
Adult version: male respondent	Reference group			
Parental version: female child		–0.08	0.09	
Parental version: male child	Reference group			
Household composition single adult		–0.42	0.17	
Household composition one adult and child/children		0.39	0.13	*
Household composition two adults without children		–0.02	0.10	
Household composition two adults and child/children	Reference group			
Chocolate and Sweets * case		0.19	0.13	
Celery * case		0.46	0.20	
Eggs * case		0.08	0.13	
Fish * case		0.18	0.17	
Fruit * case		0.09	0.10	
Meat or poultry * case		–0.07	0.31	
Mustard * case		0.00	0.22	
Nuts * case		0.13	0.12	
Sesame seed * case		0.42	0.26	
Shellfish and crustacean * case		–0.39	0.19	
Soy * case		0.06	0.20	
Sulphites * case		0.22	0.65	
Wheat and gluten * case		0.19	0.24	
Vegetables * case		–0.03	0.28	
Other food allergy		0.79	0.41	
Milk and dairy * case	Reference group			
Netherlands * case		–0.19	0.17	
Netherlands * control		0.03	0.13	
Poland * case		–0.70	0.13	*
Poland * control		–0.68	0.10	*
Spain * case		0.07	0.15	
Spain * control	Reference group			

Note. * $p < .01$.

$F = 691.73$ (df=47), $p < .01$; adjusted $R^2 = 0.22$.

ln is the natural logarithm to the base e ($\ln(x) = \log_e(x)$).

Table 5: Analysis of variance of indirect costs of cases and controls in four countries (logarithms) (Value of time equals spent time by household partners multiplied by the respective wage rates.)

		NL and case	NL and control	Poland and case	Poland and control	Spain and case	Spain and control	All cases	All controls
Total value of time spent on household tasks	ln mean	7.74	7.48	7.30	7.46	7.91	8.12	7.65	7.69
	SE	0.38	0.38	0.33	0.33	0.47	0.47	0.14	0.21
Total value of time spent with and travelling to health professional	ln mean	2.99	2.77	2.57	1.49	3.64	3.27	3.06	2.51
	SE	0.43	0.43	0.37	0.37	0.51	0.51	0.15	0.23
Value of time spent by family members visiting family members in hospital	ln mean	-0.05	-1.49	0.56	-0.01	-0.26	0.71	0.09	-0.26
	SE	0.49	0.49	0.43	0.43	0.60	0.60	0.18	0.26
Total indirect costs	ln mean	7.77	7.47	7.36	7.43	7.91	8.21	7.68	7.71
	SE	0.35	0.35	0.30	0.30	0.43	0.43	0.13	0.19

Note: figures based on unweighted means.

may actually reflect a reduced quality of life as experienced by food hypersensitive individuals and their families. From this, it can be concluded that reduced, as well as increased, household expenditure may reflect a reduced quality of life associated with having a chronic disease.

It is possible that food hypersensitive cases needed to travel further and more often to seek a (food) allergy specialist due to the small number of clinicians with expertise in this area, resulting in higher travel costs. Once a food allergy patient has been diagnosed and is adequately informed about the avoidance diet and emergency treatments, cases will be monitored at least yearly with a follow-up consultation (some cases outgrow food allergy whereas others develop new allergies), leading to relatively low consultation costs compared to other chronic diseases which require regular check-ups by a specialist. The medication for food allergy mainly consists of emergency treatment, such as carrying an epinephrine auto-injector or oral antihistamines [36, 37], resulting in higher medication costs for cases than controls. The differences in health care insurance systems across the countries make it difficult to develop a sensitive measure to establish the impact of food hypersensitivity on health care insurance. However, taking into consideration the above (low consultation costs and low medicine costs in several countries), it may be concluded that food hypersensitive cases do not need more expensive health insurance than people without food hypersensitivity.

Table 6: Changes in life situation due to one's health

	Case	Control
My choice of job or career has been restricted	15.4	6.7*
I gave up my job	9.4	4.4*
I was dismissed from my job	2.7	1.8
I changed jobs	5.8	2.9*
I moved to a different home/city	7.0	2.4*
I have been unable to participate in sports and hobbies	11.1	7.7*
My social life is restricted	16.1	7.3*
I changed schools	2.1	1.3
I have delayed having children/expanding my family	6.0	1.5*
The relationship with my partner broke down	2.4	1.1
I have experienced a change in emotions (anger, fear, anxiety, feeling left out, trauma)	25.9	10.9*
My child has experienced a change in emotions (anger, fear, anxiety, feeling left out, trauma)	5.8	1.6*

Note. * p<.01

The severity of the food hypersensitivity was not associated with significantly higher total direct costs. Concerning the indirect costs, the results only showed higher costs for time spent with and traveling to health professionals. It is of interest to note that the results do not align with the self-report data reported in references [7] and [35], suggesting that a patient's perception of relative expenditure, associated with a specific condition or disease, or in comparison to an individual not experiencing the condition, may not align with actual expenditures when these are directly measured. This may explain why many patient interest groups working in the area of food allergy report anecdotal evidence that food allergic cases have very high costs associated with their disease (see, for example, [38-45]. However, the results presented here, derived from the analysis of extensive survey data collected in different European countries, and through application of a validated instrument do not support the contention that food allergy is associated with high costs at the household level.

Our study design may have had some methodological limitations. When respondents were employed, actual wage rates were used because the respondent had chosen income over household production. When a respondent was not in paid employment, the minimum wage rate used in the country

under consideration was used to calculate the opportunity costs, because it was assumed that, regardless of educational level, the respondent could earn at least the minimum wage rate on the labour market. It could be argued that this assumption was inappropriate, as the unemployed individual could have earned more than the minimum wage if employed. A further limitation is associated with the method used to calculate the costs associated with children in the household. In the parental survey, in the control group, information was requested regarding the cost of the oldest child. Since the cost may depend on age, this can lead to bias between the case and control groups, as the cases are not necessarily also the oldest child in the household.

Although having food hypersensitivity did not increase direct and indirect costs at the household level, the results on intangible costs suggests that lost opportunities were substantial. Having food hypersensitivity might influence or indeed limit choices associated with schooling, employment, and family planning, which might result in unfulfilled aspirations. Furthermore, emotional problems appeared to add to the psychological costs of having a food allergy.

Conclusions

For policy makers, information about the cost at the household level as well as cost for the health sector and industry are important to develop adequate and cost-effective regulatory measures regarding consumer protection and provision of health care services. Since both direct and indirect costs of food hypersensitive respondents differed little to those incurred by controls, our results suggest that compensating cost measures for cases are not necessary. Further research is required to confirm our preliminary finding concerning intangible costs of cases as compared with controls. Policy makers might consider putting resources into services to better diagnose and manage food allergy to avoid or mitigate such intangible costs.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

JV was involved in the design and organization of the study, drafted the manuscript, and

performed the statistical analysis. MF, IC, JZ, BH, ER, JC, and MM were involved in the design and organization of the study and have revised the manuscript critically. GA and LF were involved in the design and organization of the study and supervised the statistical analysis and data interpretation and made substantive contributions to the manuscript. MJ, PS, MK, MJ, SV, SC, BF and AD have revised the manuscript critically, and were involved in acquisition of the data. All the authors have read and approved the final manuscript.

Acknowledgements

The research presented her was funded by the European Commission contract no. 514000 EuroPrevall "*The Prevalence, Cost and Basis of Food Allergy across Europe*." We would like to thank all the participants for their input in this study. Furthermore, we would like to thank all the clinicians that contributed to the data collection. In particular we would like to thank; Laura Barreales-Tolosa, Kirsten Beyer, Peter Burney, Montserrat Fernandez Rivas, Ana Fiandor, Jose Ignacio Larco, Ischa Kummeling, Doreen McBride.

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Applied Studies in Agribusiness and Commerce – APSTRACT
Center-Print Publishing House, Debrecen
DOI: 10.19041/APSTRACT/2016/2-3/13

SCIENTIFIC PAPER

TRANSITION ECONOMY AND HAPPINESS THE CZECH REPUBLIC COMPARED WITH THE NETHERLANDS IN THE 1990- 2004 PERIOD

JAC van Ophem, V. Kohout and W.J.M. Heijman.

Wageningen University The Netherlands. Email: Johan.vanOphem@wur.nl

Abstract: *The paper deals with the subject Transition economy and happiness – a case study of the Czech Republic in a comparison with The Netherlands in the 1990- 2004 period. The paper addresses the following two questions: 1. How has the level of happiness changed since 1990 in the Czech Republic and in The Netherlands? 2. Are there differences with respect to variables that explain differences in happiness between both countries. It appears that. at the beginning of the 1990s of the last century, the Czechs were less happy than the Dutch and, that, people in the Czech Republic were less happy in 1999 than they were in 2004. Furthermore, Happiness in the Czech Republic is approaching the level of happiness in The Netherlands. In both countries happiness is positively affected by subjective health status, perceived freedom of choice over life, being married or living together and satisfaction with one's financial situation and having trust in social institutions. But there are differences with respect to the impact of age, education and religion .*

Keywords: *happiness, transition economy, CZ, NL*

1. Introduction

Nowadays, The Netherlands(NL) and The Czech Republic (CZ)are part of the European Union. The Netherlands was a founder of the EU in 1958 ,whereas the Czech Republic joined in 2004. After the second world war Czechoslovakia became part of the communist world dominated by the Russian communist party with a centrally planned economy. This lasted until 1989. Thereafter t CZ became a transition economy, whereas the accession to the EU can as the completion of the transition. Since, the end of the 1950s, The Netherlands is a welfare state somewhere between a continental and a Nordic one with a stable liberal democracy.

Happiness and economy are related. In this paper we examine the idea that a transition economy will bring more happiness to the people in CZ. On the other hand there factors that are universally affecting the happiness of people such as individual's social life (family relationships, friendship, community),economic circumstances of the individual, individual's health, having work, personal values and freedom, see section two.

This paper deals with two research questions

How has the level of happiness changed in the Czech Republic and in The Netherlands in the 1990-2004 period?

Are there differences with respect to variables that explain differences in happiness between both countries

Because CZ became part of the EU at a later stage after a period of transition , CZ can be seen as treatment group and NL as a control group. Both countries are smaller in terms of population whereas NL is richer. The structure of the paper is as follows; Section two contains the theoretical orientation. Data and method are discussed in Section three. Section four contains the results and the paper ends with the conclusion and discussion.

2. Theoretical orientation

Happiness is considered to be the ultimate goal of life, or at least desirable (Veenhoven, 2004; Frey and Stutzer, 2002). Happiness can be defined as the degree to which people positively evaluate their overall life situation (Veenhoven, 1997). The most commonly used concept of happiness in economic surveys is happiness (Easterlin, 2001a and b; Frey and Stutzer, 2002).

Previous researches in happiness discovered a number of aspects strongly correlated to happiness . The following six dimensions are to be discerned : (1) family relationships, (2) socio-economic situation, e.g. financial issues and work, (3) community, (4) individual characteristics, (5) personal values and (6) personal freedom, see e.g. Layard (2005)

(1) To start up an own family is one of the ultimate goals of human's life. It all starts with love and everything what comes out of love has a great (either positive or negative) impact on people's lives. For this reason, survey participants are grouped according to following characteristics: those who are married or cohabitating (living with wife/husband or partner), divorced or widowed, and people who have had a child or children. The last variable determining the family relationships is the number of people living in the household.

(2) The socio-economic dimension is further divided into the financial issues and work. The financial issues deal with household's income, how much money people though they earned and how satisfied they were with their income. The other sub-dimensions indicate whether the participants were employed or not and if so how much their work fulfilled them and how satisfied they were when dealing with various duties at work.

(3) The community dimension deals mainly with the trust in the society in general. The level of social trust is further narrowed down in two aspects: trust other people and trust in various social institutions (e.g. countries parliament, police, political parties, justice system and similar).

(4) Individual characteristics cluster people into various groups according to gender, age, attained level of education, and also to examine the impact of subjective health status and education on happiness.

(5) Personal values determine few aspects of respondents' attitudes toward life (role of religion in people's life, materialistic or post-materialistic values, importance of financial means and material ownership) society, and further personal preconditions determine other characteristics such as gender, age, subjective health status, and

(6) The last aspect of people's life is the level of freedom they perceive. This might have a higher importance especially in the context, where people live or lived under various kinds of oppression.

The literature doesn't indicate a clear relationship of happiness and age. Gerdtham and Johannesson (2001) say the relationship between age and happiness is U-shaped. Although, elderly are most of the time worse off (poorer health, lower income, etc.) they are more satisfied than younger. This may be a result of a longitudinal perspective as the elderly have passed a longer life path and they may be satisfied with their achievements. Another explanation can be religion. There are more religious people among the elderly and it has been proved believers are in general happier than atheists. However, the relationship of religion and happiness is not still clear (Cohen, 2002). For this reasons, positive and negative effects of age on happiness can be expected.

Similar unclear relationship has education with happiness. Lower educated people have in general lower income and score lower on the level of happiness It is believed among people that higher education opens the door to higher income. On the other hand, the level of income of higher educated people doesn't have to match always their imagines and the consequent disappointment can damage their happiness.

Regarding the family relationships, marriage and cohabitations (living with husband/wife or a partner as an equivalent of the ESS datasets) and having children have a strong positive impact on happiness according to Layard (2005) while separation and divorce harm people's happiness (Helliwell, 2003). Number of people living in the household as regular members of the household is expected to have a positive effect as the more people in the household, the more emotionally rich lives the household's members have assuming that the cohabitation is based on positive utility either in the form of emotions such as friendships and love or in the form of more materialistic functioning. (Van Ophem and Heijman, 2008)

Subjective health status shows a positive correlation with happiness, see e.g. Cornelisse et al. (2007). Money is one of the strongest determinants influencing people's happiness (Easterlin, 2001b). People with lower income think they would be better off if they had more money. For this reason, the expected effect of financial situation of respondents is positive, although the literature says there is a certain upper limit when the level of happiness doesn't rise anymore (Cummins, 2000). There is a positive relationship between income and happiness in the national cross-sectional data, but this same relationship is not evident in the life cycle analysis (Heijman & VanOphem, 2010).

Regarding work, unemployment damages people's self-respect and decreases their income; therefore it is perceived as a big disaster (Layard, 2005). On the other hand, those who are employed and on the top of it even satisfied with their current job, they generally score higher on happiness.

The level of social trust determines how safe people feel in the society. When they feel secure and safe happiness is expected to be higher than in the community where people face various forms of crimes, bribery and injustice.

Personal freedom is very important for people too. Especially for those who experienced various repressions of the communist regime, the level of personal freedom is expected to have a positive effect on happiness (Layard, 2005).

Overview 1 gives the list of variables with their expected effect on happiness. In general we expect a convergence with respect to happiness and its determinants across the two countries. The impact of personal freedom and community is different. The Dutch are used to personal freedom and see it as something normal and are more positive on community values, whereas the Czech see personal freedom is not taken for granted and suspicion prevails with respect to community: 40 years of communism led to a decline of social trust. We will test the following hypotheses:

At the beginning of the 1990s of the last century, the Czechs were less happy than the Dutch

People in the Czech Republic were less happy in 1999 than they were in 2004

Happiness in the Czech Republic is approaching the level of happiness in The Netherlands.

The impact of the variables age, family relations, financial situation, health, work and education and personal values on happiness is the same in the Czech Republic and the Netherlands . However, there are difference with respect to the impact of community, and personal freedom.

3. Data and method

Two kinds of datasets are used for the empirical part of the paper: the World Value Survey dataset (WVS) available on http://www.worldvaluessurvey.org/, and the European Social Survey datasets (ESS)available on http://www.europeansocialsurvey.org/.

The WVS dataset includes data for many countries starting in 1981. Unlike the ESS, the WVS data are not collected for

Overview 1: List of variables with their expected effects on happiness

Dimensions	Variables	Index	Dataset	Expected effect
Happiness	Happiness:4 scale answer	Ya1	WVS	
	Happiness: 11 scale answer	Yb1	ESS	
Life satisfaction	Life satisfaction: 10 scale answer	Ya2	WVS	
	Life satisfaction: 11 scale answer	Yb2	ESS	
Gender	Sex	X1	WVS,ESS	+/-
Age	Aged 15-24	X2	WVS,ESS	+/-
	Aged 25-34	X3	WVS,ESS	+/-
	Aged 35-44	X4	WVS,ESS	+/-
	Aged 45-54	Reference group	WVS,ESS	
	Aged 55-64	X5	WVS,ESS	+/-
	Aged 65 and more	X6	WVS,ESS	+/-
Health	Subjective health status	X7	WVS,ESS	+
Family relations	Married or cohabitating	Xa1	WVS	+
	Living with husband/wife or partner	Xb1	ESS	+
	Divorced	X8	WVS,ESS	-
	Widowed	X9	WVS,ESS	-
	Have ever had kid(s)	X10	WVS,ESS	+
	Number of people living in the household	Xb2	ESS	+
Financial situation	Income scale	Xa2	WVS	+
	Household net total income €	Xb3	ESS	+
	Satisfaction with the financial situation of the household	Xa3	WVS	+
	Feelings about household's income	Xb4	ESS	+
Work	Unemployed	X11	WVS,ESS	-
	Job satisfaction	Xa4	WVS	+
Com-munity	Trust other people in the country: yes/no	X12	WVS	+
	Trust other people in the country: scale one to ten	X	ESS	+
	Confidence in social institutions	Xa5	WVS	+
	Trust in social institutions	Xb6	ESS	+
Personal freedom	Freedom of choice over life	Xa6	WVS	+
Personal values	Religious person	Xa7	WVS	+
	How religious person are you	Xb8	ESS	+
	Post materialist index	Xa8	WVS	+/-
	Important to be rich, have money and expensive things	Xb9 Xb7	ESS	+/-
	Important to make own decisions and to be free		ESS	+
Education	Lower educated	X13	WVS,ESS	+/-
	Middle educated	Reference group	WVS,ESS	
	Higher educated	X14	WVS,ESS	+/-

+ Positive effect, - negative effect, +/- either positive or negative effect expected

every country in every wave or year. WVS data for the Czech Republic and The Netherlands are available for the years 1990 and 1999. ESS data are available for both countries for the years 2002 and 2004. The World Value Survey is a project conducted mainly to investigate the trends and changes in personal values, believes and the mood of the people. The data are collected in face-to-face interviews. Questions relate to happiness: perceptions of life, environment, work, family, politics and society, religion and morale, national identity, and socio-demographics. However, troublesome was the coding of the data and the unsystematic approach of the data collection, when some data on relevant issues were not collected in some years (e.g. education not investigated in 1990, subjective health status, satisfaction with the financial situation of household in 1999).

The European Social Survey is a social survey aiming at the explanation and charting the attitudes, believes and behavioural patterns of the European population. The organization of the ESS has partly overtaken the role of the WVS. Every two years data are collected. The questionnaires of the ESS consist of two parts: a core and rotating module. The core module repeats each round and covers twelve broad topics such as trust in institutions, national, ethnic and religious identity; political engagement; well-being, health and social security; demographic composition; moral and social values; education and occupation, social capital; financial circumstances; social

Overview 2: Questions asked to the respondents of the WVS and ESS

1. All things considered, how satisfied are you with your life as a whole these days?" (WVS, ESS)
2. Taking all things together, how happy would you say you are? (WVS, ESS)
3. What is your gender? (WVS, ESS)
4. What age group do you belong to? (WVS, ESS)
5. All in all, how would you describe your state of health these days? (WVS, ESS)
6. Are you living with your spouse or partner in one household? (WVS, ESS)
7. Are you divorced? (WVS, ESS)
8. Are you widowed? (WVS, ESS)
9. Do you have a child (children)? (WVS, ESS)
10. Can you indicate the number of people living in your household as a regular member? (ESS)
11. What level of education have you attained? (WVS, ESS)
12. Do you have a paid job currently? (WVS, ESS)
13. On the scale one to ten, where would you place your income? (WVS)
14. If you add up all sources during one month, in what interval would you put the total sum? (ESS)
15. How satisfied are you with the financial situation of your household? If 1 means you're completely dissatisfied and ten means you are completely satisfied, where would you put your satisfaction with the financial situation of your household? (WVS)
16. Which of the descriptions comes closest to how you feel about your household's income nowadays? (ESS)
17. Overall, how satisfied or dissatisfied are you with your job? (WVS)
18. Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people? (WVS, ESS)
19. How much confidence would you say, you have in following institutions: Press, labour unions, police, parliament, civil cervices, and justice system? (WVS), legal system, police, political parties(politicians), parliament (ESS)
20. Would you say you are a religious person? (WVS)
21. How religious would you say you are? (ESS)
22. Some people feel they have completely free choice over their lives, while other feel that what they do has no effect on what happens to them. Please, use this scale to indicate how much freedom of choice and control you feel you have over the way your life turns out. (WVS)
23. How much does the following statement express your opinions? It is important to make own decisions and to be free (ESS)
24. How much does the following statement express your opinions? It is important to be rich, have money and expensive things (ESS)
25. Would you say you have rather materialist, post-materialist or mixed opinions? (WVS)

exclusion and household circumstances. The rotating module changes from round to round.

Overview 2 presents the questions in both data sets that are used to operationalise the variables mentioned in Overview 1.

Table 1 gives an overview of the characteristics of the WVS and ESS sample. Both WVS and ESS survey data are characterised by more female respondents. The number of respondents is higher in the Czech Republic in both data sets.

To study the effects of the above listed variables on the level of happiness an OLS regression analysis is conducted when self-reported happiness will be taken as the dependent variables

4. Results

Tables 2 and 3 give information on the Czechs and the Dutch on happiness in the 1990-2004 period.

Happiness in the Czech Republic is approaching the level of happiness in The Netherlands over the observed period 1990 and 2004.

Comparing the average scores on happiness and life satisfaction between the countries in the four years (1990, 1999, 2002, and 2004), The Netherlands comes out as the winner. The Dutch population was happier and more satisfied than the Czech population over the whole period of the interest. The differences in the level of happiness between the countries were statistically significant in every year the comparison was conducted. As can be seen in both tables , the perceived level of happiness in the Czech Republic was lower than in The Netherlands. However, the Czech population got happier as the last decade of the twentieth century was passing by. T-tests confirmed the average scores on happiness in these two years were statistically different in the Czech Republic (Happiness: M_{1990}=2.75, SE_{1990}=0.02 and M_{1999}=2.93, SE_{1999}=0.013, t=-7.538 with p val=0.000;). Whereas in The Netherlands, happiness remained more or less on the same level (Happiness: M_{1990}=3.38, SE_{1990}=0.021 and M_{1999}=3.40, SE_{1999}=0.019, t=-0.749 with p val=0.454;. Comparing the situation in the beginning of the new century (years 2002 and 2004) the level of happiness-being did not change significantly in the Czech Republic (Happiness: M_{2002}=6.75, SE_{2002}=0.057 and M_{2002}=6.81, SE_{2002}=0.037, t=-0.896 with p val=0.370)).

In The Netherlands, the situation had an unexpected change. Surprisingly, there was a slight but statistically significant decrease of happiness (Happiness: M_{2002}=7.79, SE_{2002}=0.029 and M_{2004}=7.68, SE_{2004}=0.033, t=-2.508 with p val=0.012)

With respect to the hypotheses 1 to 3 we may conclude

Table 1: Characteristics of WVS and ESS samples

Year	1990				1999			
Dataset	WVS				WVS			
Nationality	Czech		Dutch		Czech		Dutch	
Measure	Count	%	Count	%	Count	%	Count	%
Males	444	48.2	441	43.4	913	47.9	491	49
Females	480	51.8	576	56.6	995	52.1	510	50.8
Total	924	100	1017	100	1908	100	1003	99.8*
Year	2002				2004			
Dataset	ESS				ESS			
Nationality	Czech		Dutch		Czech		Dutch	
Measure	Count	%	Count	%	Count	%	Count	%
Males	644	47.4	1042	44.1	1414	46.7	786	41.6
Females	707	52	1322	55.9	1612	53.3	1098	58.4
Total	1360	99.4*	2364	100	3026	100	1884	100

*In some cases, the respondents' gender was not indicated

the following: The first hypothesis: In the beginning of the nineties of the last century, the Czechs were less happy than the Dutch is confirmed. In the beginning of the nineties of the last century, the Czechs were less happy than the Dutch. The second hypothesis The second hypothesis: Shortly after the Velvet Revolution (1990) people in the Czech Republic were less happy than they were in 2004 is confirmed too. The average score on happiness has been increasing since 1990. However the change between years 2002 and 2004 was not proved to be statistically significant. The third hypothesis: Happiness in the Czech Republic is approaching the level of happiness in The Netherlands can be confirmed.

Table 2: The Czechs on happiness (standard deviation in parentheses)

Happiness	Score	1990	1999	2002	2004
Taking all things together would you say you are: 4. very happy, 3. quite happy, 2. not very happy, 1. not at all happy	1 to 4	2.76 (.60)	2.96 (.57)		
	0 to 10	6.29	6.9		
Generally speaking, how happy do you feel? 0. extremely unhappy, 10. extremely happy	0 to 10			6.75 (.2.08)	6.81 (2.00)

Table 3 The Dutch population on happiness (standard error in parentheses)

Happiness	Scale	1990	1999	2002	2004
Taking all things together, would you say you are? 1. not at all happy, 4. very happy	1 to 4	3.38 (.60)	3.41 (.61)		
	0 to 10	7.95	7.98		
Generally speaking, how happy do you feel? 0. extremely unhappy, 10. extremely happy	0 to 10			7.79 (.1.42)	7.68 (1.43)

Tables 4 and 5 give an overview of the regression analyses. This analysis showed that very similar determinants affect happiness (health, satisfaction, with financial situation, marriage, divorce, widowhood, the level of social trust, etc.). Health is one of the most important issues in people's life, regardless the country of origin, especially in the recent past. The relative importance of other variables varied between the countries especially in the 1990's. For instance, freedom of choice over life was highly important for happiness of the Czechs, The same trend could be observed for satisfaction with the financial situation of households. In general, most of the factors determining happiness are common for the two countries.

The regression analyses establish influential factors of happiness. *Health, freedom, financial issues, and marriage and cohabitation* are the four common factors going throughout the whole examined period disregarding whether the population went through a socio-economic transition or not. However, there were some differences. There were few significant factors explaining variance of happiness only in The Netherlands in the 1990's (the post-materialist index, religious devotion). Few factors were significant only in the Czech Republic during the last decade of the twentieth century (confidence in social institutions, and trust other people in the country). For these reasons, hypothesis 4 cannot be fully confirmed. For the explanation of the variance in happiness , feelings about income and satisfaction with the financial situation were more important than the total net income. This holds both for The Netherlands as well as for the Czech Republic. Further, older people in the age of retirement were generally more satisfied, and younger generations and later also middle aged people have become happier also regardless the experience of the socio-economic transition. Other factors played different roles in the countries. Czech women have become in general happier and more satisfied than Czech men. Unemployment had a harming effect in The Netherlands over the whole period . In the case of the Czech Republic, unemployment gained on importance in 1999 when it became a threat as the unemployment rate was rising. The insignificance of unemployment in the Czech Republic shortly after the Velvet Revolution was caused by an extremely low unemployment rate (0.2%) in 1990.

The post-materialist index revealed a clear difference between the countries. While the index had a significant negative influence on happiness in The Netherlands, it didn't show any significant effect in the Czech Republic in the 1990's . Also religion revealed some difference in people's happiness between the countries. Being religious had a positive impact on life satisfaction of the Dutch population and no influence at all on the Czech population in 1990. The results also show, religion in the Czech Republic gained on significance over time. Surprisingly, religious devotion lost its significance in The Netherlands in 2002 and 2004. Finally, the negative impact of divorce and widowhood can be observed in some years over the scrutinized period in both the countries as it was expected. The effect of education was proved only in The Netherlands in 2002, when the lower educated Dutch perceived in general lower subjective wellbeing and higher educated people were happier.

The impact of the variables age, family relations, financial situation, health, work and education and personal values on happiness is the same in the Czech Republic and the Netherlands . However, there are difference with respect to the impact of community, personal l freedom. Hypothesis four is partly corroborated, see Scheme 3.

Scheme 3: An overview of the expected and established effects on happiness

Variables	Label	Dataset	Expected effect	Found CZ	Found NL
Happiness	Happiness:4 scale answer	WVS			
	Happiness: 11 scale answer	ESS			
Life satisfaction	Life satisfaction: 10 scale answer	WVS			
	Life satisfaction: 11 scale answer	ESS			
Gender	Sex	WVS,ESS	+/-	-**	-*
Age	Aged 15-24	WVS,ESS	+/-	+*	+*
	Aged 25-34	WVS,ESS	+/-	+**	+**
	Aged 35-44	WVS,ESS	+/-	-*	+/-*
	Aged 55-64	WVS,ESS	+/-	-	-**
	Aged 65 and more	WVS,ESS	+/-	-**	-*
Health	Subjective health status	WVS,ESS	+	+**	+**
Family relations	Married or cohabitating	WVS	+	+**	+**
	Living with husband/wife or partner	ESS	+	+**	+**
	Divorced	WVS,ESS	-	-**	-**
	Widowed	WVS,ESS	-	-**	-**
	Have ever had kid(s)	WVS,ESS	+	+/-**	+**
	Number of people living in the household	ESS	+	+**	+**
Financial situation	Income scale	WVS	+	+**	+**
	Household net total income €	ESS	+	+**	+**
	Satisfaction with the financial situation of the household	WVS	+	+**	+**
	Feelings about household's income	ESS	+	+**	+**
Work	Unemployed	WVS,ESS	-	-**	-**
	Job satisfaction	WVS	+	+**	+**
Community	Trust other people in the country: yes/no	WVS	+	+**	+**
	Trust other people in the country: scale one to ten	ESS	+	+**	+**
	Confidence in social institutions	WVS	+	+**	+*
	Trust in social institutions	ESS	+	+**	+**
Personal freedom	Freedom of choice over life	WVS	+	+**	+**
Personal values	Religious person	WVS	+	+/-	+*
	How religious person are you	ESS	+	+/-	+**
	Post materialist index	WVS	+/-	+**	+/-
	Important to be rich, have money and expensive things	ESS	+/-	+**	-*
	Important to make own decisions and to be free	ESS	+	+**	+*
Education	Lower educated	WVS,ESS	+/-	-**	-
	Middle educated	WVS,ESS	+/-	-**	-**
	Higher educated	WVS,ESS	+/-	+**	+/-

+/- positive/negative relationship of a variable with happiness and life satisfaction
* Level of significance = 0.05
* Level of significance = 0.01

5. Conclusion and discussion

This paper dealt with two research questions

How has the level of happiness changed in the Czech Republic and in The Netherlands in the 1990-2004 period?

Are there differences i with respect to variables that explain differences in happiness between both countries

Over the period of 15 years, four different samples of people in the two countries were interviewed and their answers analyzed with respect to their perception of happiness. The World Value Survey data were used to cover the last decade of the twentieth century (computation conducted for the years 1990 and 1999). The aim of the WVS was to investigate the trends and changes in personal values, believes and mood of the people. But it was also possible to gain data relevant to happiness. However, troublesome was the coding of the data and the unsystematic approach of the data collection, when some data on relevant issues were not collected in some years (e.g. education not investigated in 1990, subjective health status, satisfaction with the financial situation of household in 1999). The European Social Survey data from years 2002 and 2004 were analyzed to get a picture of the situation in the beginning of the 21th century.

The Dutch population was happier than the Czech population over the whole period . The differences in the level of happiness between the countries are statistically significant in every year the comparison was conducted.

Hypotheses 1 to 3 are confirmed.: 1. At the beginning of the 1990s of the last century, the Czechs were less happy than the Dutch 2. People in the Czech Republic were less happy in 1999 than they were in 20043. Happiness in the Czech Republic is approaching the level of happiness in The Netherlands.The fourth hypothesis cannot be fully confirmed. There were few significant factors explaining the variance of happiness in The Netherlands in the 1990's (the post-materialist index, religious devotion). Some factors were significant only in the Czech Republic during the last decade of the twentieth century (confidence in social institutions, and trust other people in the country). However, as stated before, some of the factors were common for both countries (subjective health status, perceived freedom of choice over life, marriage and cohabitation, satisfaction with financial situation).

Firstly, the Czech population has become happier since 1990 when the country started a democratic evolution. The level of happiness ion has increased and approached the level of happinessg in The Netherlands. However, the Dutch population is still better off. Secondly, most factors determining happiness were common for both countries in 2002 and 2004 similarly as it was already at the end of the last century. Only (post-) materialist values became significant in the Czech Republic only in 2004, while in The Netherlands, the post-materialist index and having money was significant with the negative effect throughout the whole period. Remarkably, social trust, which was not significant in The Netherlands during the 1990's, became significant in the new century. In addition, the

Table 4: Results of the linear regression analysis, WVS 1990 and 1999

Czech Republic	1990		1999		*The Netherlands*	1990		1999	
	Happiness		Happiness			Happiness		Happiness	
Sex	-0.036		0.032		Sex	0.003		0.030	
Age	-0.063		-0.138	**	Age	-0.099	**	-0.134	**
Aged 15-24	0.071	*	0.049	*	Aged 15-24	-0.012		0.067	*
Aged 25-34	0.054		0.110	**	Aged 25-34	0.118	**	0.063	*
Aged 35-44	-0.068	*	-0.013		Aged 35-44	0.018		0.072	*
Aged 55-64	-0.037		-0.004		Aged 55-64	-0.090	**	-0.063	*
Aged 65 and more	0.001		-0.104	**	Aged 65 and more	-0.038		-0.067	*
Subjective health status	0.231	**			Subjective health status	0.326	**		
Married or cohabitating	0.165	**	0.147	**	Married or cohabitating	0.261	**	0.235	**
Divorced	-0.104	**	-0.090	**	Divorced	-0.119	**	-0.189	**
Widowed	-0.134	**	-0.148	**	Widowed	-0.192	**	-0.130	**
Have ever had kid	-0.006		-0.011		Have ever had kid	-0.003		0.004	
Lower educated			-0.076	**	Lower educated			-0.029	
Middle educated			0.027		Middle educated			0.040	
Higher educated			0.083	**	Higher educated			-0.012	
Unemployed	-0.047		-0.083	**	Unemployed	-0.058		-0.081	*
Income scale	0.132	**	0.164	**	Income scale	0.145	**	0.226	**
Satisfaction with the financial situation of household	0.293	**	0.170	**	Satisfaction with the financial situation of household	0.209	**		
Job satisfaction	0.118	**			Job satisfaction	0.097	**	0.171	**
Most people can be trusted	0.127	**	0.000		Most people can be trusted	0.073	*	0.021	
Confidence in social institutions	0.128	**	0.098	**	Confidence in social institutions	0.061		0.066	*
Religious person	-0.002		0.008		Religious person	0.065	*	0.012	
Freedom of choice over the life	0.220	**	0.236	**	Freedom of choice over the life	0.126	**	0.125	**
Post-materialist index 4 items	0.100	**	0.073	**	Post-materialist index 4 items	-0.037		0.005	
N	924		1908		N	1017		1003	
R square	.20		..14		R square	.20		.17	
R quare adjustedS	.18		.13		R square adjusted	.19		.15	

* Level of significance = 0.05
** Level of significance = 0.01

analysis of the ESS datasets showed that four relatively most important factors were common for both countries (health, living with husband/wife or a partner, feelings about income, and trust in social institutions). Only in 2004, age category 65 and higher replaced trust in institutions in The Netherlands.

To summarize the results of the research, the post-communist transition of the Czech society has had a positive influence on people's happiness. People were less happy after the Velvet Revolution than they are nowadays.

The Dutch were better off in many indicators GDP per capita in PPS was more than twice higher in The Netherlands at the beginning of the 1990's. The Dutch earned more money, their marriages were more successful (more marriages in the Czech Republic ended with divorce), and they trusted each other more than the Czechs. The only exception was unemployment. The unemployment rate was lower in the Czech Republic in the period 1990-1997. It is important to stress that the former communist governments supported the full employment policy in Czechoslovakia. The new democratic government installed after the Velvet Revolution stopped supporting this policy. Thus, a new situation –,unemployment, occurred. Losing a job was a threat the Czechs had not experienced before. While being without a job was proved to have a negative effect on happiness in The Netherlands already in 1990, it gained significance in the Czech Republic.

Consistently with findings (higher income, lower divorce rate), the Dutch felt more satisfied with the financial situation, they were happier with their family lives, more satisfied with their jobs, they trusted more in institutions than the Czechs did. Logically, they were happier than the Czechs. As time was passing by, the differences levelled out and the level of happiness increased in the Czech Republic. A remarkable fact is that the Czechs born before 1926 did not indicate any significant change in happiness between the 1990 and 1999. Further, the Czechs born between 1956 and 1965 didn't become happier in the 1990's, although the overall level of happiness did increase in the country. Worth mentioning is also a higher level of happiness of younger generations (people in the 15-35 ag bracket and lower happiness of people in the age of 35-54 in the 1990's.

It should be noted that the Czech republic is a more secularised society than the Netherlands. The Netherlands has an Islam minority of about 5 per cent of its population.

The younger generations are more adaptive and susceptible to consumerism and internet. Therefore, it is no surprise that younger generations in the Czech Republic are more happier with the changes brought about by the collapse of the centrally planned economy than older generations.

Higher happiness has certainly to do with higher GDP per capita (see e.g. Heijman & van Ophem (2010)) but also with more personal freedom. Which one is the most important is subject to debate.

One of the greatest damages the communist regime has inflicted on Czech society is the low level of social trust. Although of Ohara at. el. stated (2007) that the level of social trust has been increasing in post communist countries since the fall of the regime, the reality in the Czech Republic istill is far behind the Netherlands. Furthermore, according to the WVS and ESS results for the Czech Republic, the situation regarding the confidence in certain institutions was strongly influenced by contemporary affairs (drop of confidence in the Czech parliament after the government resignation in 1998,

Table 5: Results of the linear regression on happiness ESS 2002 and 2004

	2002		2004		The Netherlands	2002		2004	
Satisfaction	Happiness		Happiness			Happiness		Happiness	
Sex	-0.016		-0.021		Sex	-0.005		-0.012	
Age	-0.129	**	-0.156	**	Age	-0.041	*	-0.020	
Aged 15-24	0.080	**	0.101	**	Aged 15-24	-0.003		0.047	*
Aged25-34	0.075	**	0.078	**	Aged25-34	0.048	*	0.012	
Aged 35-44	0.025		0.027		Aged 35-44	-0.011	*	-0.005	
Aged 55-64	-0.035		-0.030		Aged 55-64	-0.024		-0.029	
Aged 65 and over	-0.079	**	-0.094	**	Aged 65 and over	-0.025		0.030	
Subjective health status	0.349	**	0.305	**	Subjective health status	0.307	**	0.281	**
Living with husband/wife or partner	0.229	**	0.154	**	Living with husband/wife or partner	0.229	**	0.237	**
Divorced	-0.116	**	-0.162	**	Divorced	-0.134	**	-0.173	**
Widowed	-0.209	**	-0.135	**	Widowed	-0.094	**	-0.093	**
Have ever had kid living in the house	0.100	**	-0.062	**	Have ever had kid living in the house	0.073	**	0.010	
Number of people in the household	0.215	**	0.179	**	Number of people in the household	0.118	**	0.156	**
Lower educated	-0.042		-0.009		Lower educated	-0.016		-0.030	
Middle educated	-0.051		-0.078	**	Middle educated	0.023		-0.011	
Higher educated	0.085	**	0.088	**	Higher educated	0.037		0.035	
Unemployed	-0.033		-0.123	**	Unemployed	-0.016		-0.114	**
Total household net income in € (all sources)	0.198	**	0.166	**	Total household net income in € (all sources)	0.137	**	0.198	**
Feelings about income	0.310	**	0.264	**	Feelings about income	0.251	**	0.232	**
Most people can be trusted	0.201	**	0.222	**	Most people can be trusted	0.161	**	0.166	**
Trust in soc. Institutions	0.276	**	0.233	**	Trust in soc. Institutions	0.151	**	0.181	**
How religious are you	0.018		-0.011		How religious are you	0.035		0.071	**
Important to bee free	0.087	**	0.170	**	Important to bee free	0.045	*	0.024	
Important to be rich	0.063	*	0.070	**	Important to be rich	-0.051	*	0.013	
N	1360		3026		N	2364		1881	
R square	..33		.23		R square	.20		.20	
R square adjusted	.31		.22		R square adjusted	.19		.19	

* Level of significance = 0.05
** Level of significance = 0.01

distrust of politicians and dissatisfaction with politics in general because of constantly emerging new affairs and corruption scandals coming up to surface, anf the like).

To conclude, if the Czechs want to become more happy and satisfied with their lives, at least three aspects of life should be improved : an income comparable with incomes in the western part of the EU, more steady families, and an increase in social trust among the population.

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Applied Studies in Agribusiness and Commerce – APSTRACT
Center-Print Publishing House, Debrecen
DOI: 10.19041/APSTRACT/2016/2-3/14

SCIENTIFIC PAPER

A NOTE ON THE MEASUREMENT OF THE RELATIONSHIP BETWEEN HAPPINESS AND GDP

Wim Heijman, Johan van Ophem and Job van Logtestijn

Wageningen University,
Department of Social Sciences, Economics Section

Abstract: *This research note compares the results of the measurement of the relationship between happiness and GDP in the EU based upon unweighted data with the results based upon weighted data. The data are weighted in order to correct for the different sizes of the populations in the EU countries concerned. The result of the weighing is an even stronger relationship between happiness and GDP per capita than in the case with unweighted data.*

Keywords: *happiness, GDP, EU*

1. Introduction

Scientific research on happiness has emerged since the seminal article by Easterlin (1974) on the relationship between raising income and happiness. Since the publication of that paper many scientists have carried out research on the topic of happiness and income. Many have focused on the influence of (relative) income on happiness, which can be done in several ways. A conventional method is to regress happiness rates - as measured through a survey on GDP per capita - for a country or a set of countries. In the European Union (EU), the so-called EuroBarometer published by the European commission provided an insight into the happiness rates of the European Union in both 2006 and 2010 whereas Eurostat provides data on population size and GDP.

This conventional method does not take into account that population sizes differ across the EU. This problem can be addressed by a rather complicated method like a multilevel analysis or in a more simple way like the share method, in which shares of happiness rates and shares of GDP in the overall GDP of the EU are calculated. For the calculation of the shares of happiness rates and GDP, the happiness rates measured by the Eurobarometer as well as the GDP per capita are multiplied by the share of a country's inhabitants out of the total number of EU inhabitants.

The objective of this short research paper is to test this method of measuring the relationship between happiness and GDP for individuals living in the 25 countries of the EU and to find out whether weighted data would generate results that are different from those derived from the analysis done with the unweighted data. This will be done in Section 4. In Section 2 we will discuss our theoretical framework and Section 3 will cover the data and method. Finally, Section 4 contains the conclusion and discussion.

2. Theoretical Framework

Easterlin found a positive correlation between income and happiness in his research in 1974. He found that there were clear happiness differences when comparisons of economic status were made within individual countries; groups with a higher income within a country were happier than groups with a lower income within the same country (Easterlin, 1974). Before Easterlin's innovative article in 1974, a somewhat similar conclusion had already been drawn in 1920. Pigou (1920) reasoned that much of the satisfaction of rich people is because of their relative income, and therefore rich people's satisfaction would not be reduced if the income of all the rich diminished at the same time, justifying redistributive taxation (Graham, 2005).

In the US a strong relationship between income and happiness was found for the part of the population in low income groups. A relationship between income and happiness for the higher income group was also found, but this relationship was weaker than the relationship between happiness and income for the low income group. Furthermore, a medium relationship between wealth and life satisfaction was found to exist across countries (Diener et al., 1993).

More recently, in research conducted with data from 29 European countries, evidence has been found for a positive relationship between income per capita and happiness. Also a levelling-off effect was found when income grows (Heijman and van Ophem, 2010). This corresponds with the findings of Veenhoven (1991), who explained the stronger relationship between happiness and income for low income groups through the ideas that aspirations rise with a higher income. Expected happiness gains are therefore diminished by rising aspirations which accompany a higher income. Because the aspirations of the low income group either do not rise, or only do to a

slight extent, the relationship between happiness and income is stronger for low income groups.

Another related theory is the set-point theory. Following this theory, happiness has an upper bound, after which there is no more progress. People's happiness will only increase until that point. People even revert to this maximum level of happiness after important events impacting upon happiness such as winning the lottery or a divorce. This maximum level is the so-called set-point (Graham, 2005).

One study that found evidence for a relationship between GDP and happiness is that of Frijters et al., about the development of life satisfaction after the reunification of Germany. In the Eastern part of Germany, life satisfaction increased. According to the research, 35-40% of this increase was accountable to the increase of real household income (Frijters et al., 2004).

The European Union is also aware of the importance of GDP for the happiness of its inhabitants. Research conducted on behalf of the EU on well-being within the member countries of the European Union concluded that the poorest people in a country are the ones that suffer the most from mental health problems. It is also the poorest in society who have the most negative feelings (Eurobarometer 345, 2010).

There also is a difference between developing and developed countries. On average, people in developed countries feel happier than those in developing countries. Given this difference, there is a suggested threshold beyond which more money doesn't raise reported well-being, and developing countries have not yet crossed this line (Graham and Pettinato, 2001).

The hypothesis there is positive relationship between GDP per capita and the happiness rate across countries. The question, then, is how this hypothesis can be tested when comparing happiness rates and GDP across countries that differ in terms of their size of population and economy. This will be analysed and discussed in Section 4, based on the data and method discussed in Section 3.

3. Data and Method

Happiness rates for 2006 and 2010 were retrieved from the EuroBarometer statistics on mental well-being from 2006 and 2010. These surveys were conducted on behalf of the European Commission, and define happiness with the following question: "How often during the past four weeks have you felt happy?". Possible answers are: 1; All of the time, 2; Most of the time, 3; Sometimes, 4; Rarely, 5; Never and 6; Don't know. The number of respondents per country that gave 1 or 2 as their answer are considered to be the happy people, and the total number of these 'happy' respondents in any one country is then divided by the total number of respondents for that country. The resulting ratio is the happiness ratio of the given country. The happiness rates therefore estimate the percentage of happy people in a country.

The data set which was used consists of 27304 respondents in 25 countries. GDP per capita data was retrieved from Eurostat, as well as data on the number of inhabitants (see Appendix).

Two different measurement methods on the relationship between happiness and GDP (per capita) are used. The conventional method weighs the data by using the GDP per capita whereas the new 'share' method makes use of shares of the happiness rates and of the GDP. For the calculation of the shares of the happiness rates, the happiness rates of the Eurobarometer are multiplied by the share of a country's inhabitants in the total number of EU inhabitants. The GDP per capita of a country is multiplied by the share of a country's population in total EU population. All variables are transformed into logarithmic numbers since this leads to a better interpretation of the coefficients. With this data, regression analyses are then conducted to test the relationship between happiness and GDP (per capita) as income is one of the most important predictors of happiness (see previous section). This will first be done with the conventional per capita measurement method, and then with the share method.

4. Results

Measuring the relationship with the *conventional method* is done using the following Cobb-Douglas function:

$H = \alpha Y^{\beta}$, where Y stands for GDP per capita and H for happiness. From this the regression function in logarithms can be derived:

$$\ln H = \ln \alpha + \beta \ln Y.$$

The data used for this regression are presented in the appendix. The results for the years 2006 and 2010 are presented in Tables 1 and 2.

Table 1: Happiness explained by GDP per capita in 2006 and 2010 for 25 EU-countries: Unweighted data (t-values in brackets).

Year	α	β	R^2	N
2006	-2.2699 (-6.78)	0.1846 (5.38)	0.56	25
2010	-2.4844 (-7.07)	0.2003 (5.56)	0.57	25

The results in Table 1 demonstrate that GDP per capita has a clearly significant positive effect on the national happiness rates even with unweighted data.

The relationship between happiness and GDP measured with the *share-method* is tested with the following regression function:

$$\ln S_h = \ln \alpha + \beta \ln S_y ,$$

where S_h stands for the number of happy people in country as a share of the total EU-population (share of the happy people in the national population multiplied by the share of the national people in the total EU-population), S_y stands for national GDP per capita multiplied by the share of the national population in total EU population, with α and β as coefficients.

Table 2: Happiness explained by GDP per capita in 2006 and 2010 for 25 EU-countries: Weighted data (t-values in brackets).

Year	α	β	R^2	N
2006	-9.0993 (-20.25)	0.7978 (10.80)	0.86	25
2010	-9.4333 (-22.69)	0.8302 (12.07)	0.84	25

The share model (Table 2) finds a strong relationship between happiness and GDP; t-values and R^2 for the results of share-model are higher than for the results of the conventional model (Table 1).

5. Conclusion

The hypothesis that there is a positive relationship between GDP and the happiness rate of a country is confirmed. It can also be concluded that the share method is a better way to measure this relationship than the conventional method. The R^2 and t-statistics are higher compared to the values found with the help of the conventional method of measuring.

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Appendix: Data used for the analysis

Country	Happiness rates (2006)	Happiness rates (2010)	Gross Domestic Product per capita (2006)	Gross Domestic Product per capita (2010)	Share of national pop. in total EU pop. (2006)	Share of national pop. in total EU pop. (2010)
Austria	0.60	0.55	30800	31300	0.0168	0.0168
Belgium	0.82	0.70	29500	29600	0.0214	0.0217
Bulgaria	0.42	0.44	3200	3500	0.0157	0.0149
Czech Rep.	0.62	0.56	10900	11400	0.0208	0.0210
Denmark	0.71	0.68	39400	37300	0.0110	0.0111
Estonia	0.48	0.49	9200	8300	0.0027	0.0027
Finland	0.78	0.79	31200	30600	0.0107	0.0107
France	0.74	0.69	27800	27400	0.1286	0.1295
Germany	0.59	0.57	28000	29100	0.1676	0.1639
Greece	0.61	0.42	18300	17100	0.0226	0.0227
Hungary	0.57	0.48	9200	8800	0.0205	0.0201
Ireland	0.82	0.78	40300	35900	0.0086	0.0091
Italy	0.48	0.54	24900	23500	0.1194	0.1209
Latvia	0.42	0.40	6500	5900	0.0045	0.0042
Lithuania	0.52	0.48	6900	7100	0.0067	0.0063
Luxembourg	0.75	0.71	67200	64500	0.0010	0.0010
Netherlands	0.83	0.82	32500	33100	0.0332	0.0332
Poland	0.60	0.52	6800	8000	0.0776	0.0765
Portugal	0.56	0.59	14800	14900	0.0214	0.0212
Romania	0.56	0.48	4000	4200	0.0432	0.0407
Slovakia	0.63	0.66	7700	8900	0.0109	0.0108
Slovenia	0.61	0.64	15100	15300	0.0041	0.0041
Spain	0.70	0.60	21500	20600	0.0895	0.0931
Sweden	0.70	0.65	34300	34500	0.0184	0.0187
UK	0.75	0.71	31700	30500	0.1232	0.1252

Sources: Special Eurobarometer, 2006, 2010; Eurostat.

Applied Studies in Agribusiness and Commerce – APSTRACT
Center-Print Publishing House, Debrecen
DOI: 10.19041/APSTRACT/2016/2-3/15

SCIENTIFIC PAPER

IS THERE A KINK IN THE HAPPINESS LITERATURE?

Morris Altman*

Dean & Head, Newcastle Business School
Professor of Behavioural & Institutional Economics
The University of Newcastle, Australia
Professor Emeritus, University of Saskatchewan, Canada
Email: morris.altman@newcastle.edu.au

**Thanks to Jerome Kogan for his encouragement to take on this project and to Louise Lamontagne and Hannah Altman for their comments and suggestions.*

Abstract: *One of the early key empirical findings of the happiness literature is that at higher levels of per capita real income there appears to be diminishing returns to income at least with regards to marginal changes in 'happiness' measured by various survey instruments. Although these results have been recently challenged, these earlier findings and the results of many contemporary studies suggest that an inelastic relationship exists between real per capita income and happiness after a relatively low threshold of per capita income is reached. Appling some of the results of prospect theory I argue that even if it were true that the marginal effect of income on happiness is zero, a reduction in income would probably reduce the level of happiness, yielding a kink in the 'happiness curve'. Also, applying a target income approach to the happiness literature, one can argue that pursuing higher target income, in itself, is a means of increasing life satisfaction. These two theoretical instruments yield results consistent with some of the most recent empirical finding based on Gallup Poll Survey data. In addition, applying insights from the capabilities approach, I argue, that increasing income is a means of purchasing the capabilities to increase individual levels of happiness through the production of public goods, such as health care and education. A given marginal increase in income need not generate any increase in happiness if this income increase is highly unequally distributed in a population or is not used to purchase goods and services that contribute to increases in the level of happiness.*

Introduction

Richard Easterlin (1974) challenged, what he argued, was the received view in economics, which had trickled down to other disciplines, that higher levels of real per capita real income should increase the level of utility or wellbeing of the affected population. Easterlin identified utility and wellbeing with happiness, which has become standard fare in the happiness literature. He argued, based on evidence, that this prediction does not hold as real per capita income increases above a certain threshold. There appeared to be diminishing returns to income at least with regards to marginal changes in 'happiness' measured by various survey instruments. Indeed, at the extreme it is argued in the happiness literature, that beyond such a threshold, increasing real per capita has no affect on the level of happiness. Although these results have been recently challenged, Easterlin's narrative has been the mainstay of the happiness literature.

Less extreme data analysis would suggests that the elasticity of happiness to relative to changes in real per capita income diminishes at higher levels of real per capital income. Can one infer from this that increasing per capita income beyond this threshold is of no value to affected individuals? Do these empirical results imply that income can be reduced amongst income cohorts and economies, without negatively impacting the level of happiness of the affected individuals, keeping in the back burner any potential negative productivity effect of such actions? Appling some of the results of prospect theory I argue that even if it were true that the marginal effect of income on happiness is zero, a reduction in income would probably reduce the level of happiness, yielding a kink in the 'happiness-income curve'. Also, applying a target income approach to the happiness literature, one can argue that pursuing higher target income, in itself, is a means of increasing life satisfaction or happiness.

These two theoretical instruments yield results consistent with some of the most recent empirical finding based on Gallup Poll Survey data. In addition, applying insights from the capabilities approach (Nussbaum and. Sen, 1993), I argue, that increasing income is a means of purchasing the capabilities to increase individual levels of happiness through the production of social and public goods and services, such as health care and education. A given marginal increase in income need not generate any increase in happiness if this income increase is highly unequally distributed in a population or is not used to purchase goods and services that contribute to increases in the level of happiness.

What is Happiness

Contemporary economics does not speak directly to the notion of happiness. Rather, it speaks to the notion of utility, which tends to mean satisfaction. A level of utility therefore refers to a level of satisfaction. Utility is often referenced as a dependent variable whose value is a function of ones level of consumption, for example. The null hypothesis is that the more real income there is the higher should be the level of utility. Money is able to purchase more goods and services in the present and the future that should yield higher levels of utility or satisfaction. In the happiness literature, happiness is substituted for utility or satisfaction. Hence, when utility goes up in the conventional model, so should the level of happiness. It is important to note this assumed identity between satisfaction and happiness. The happiness literature builds on this assumed relationship. But, of course, economics has, at a minimum, assumed that money does by buy utility and satisfaction if this money is controlled by the individual or is used by others (government, for example) to provide goods and services that directly benefit the individual. For the most part this relationship is not one that is clearly empirically based. It rather deduced logically from set of first principle assumption about how assumed income and wealth maximizing individuals would evaluate the impact of increases to income and wealth on their level of utility or satisfaction.

This being said, happiness has two key and different definitions within the happiness literature: life evaluation related happiness and emotional well-being (or hedonic well-being or experienced happiness). Life evaluation related happiness is most closely related to the conventional notion of happiness. This is measured based on surveying a sample population where individuals rate their of level of life evaluation-happiness. The individuals rate their current life on a scale of 0 to10, where 0 is "the worst possible life for you" and 10 is "the best possible life for you." A most common question is: "How satisfied are you with your life as a whole these days?" (Kahneman and Deaton, 2010). This is viewed as a more long term rating of one's level of measured happiness.

Emotional well-being is also measured along a 0 to 10 scale. But this is much more of a short term measure of happiness, referring to experienced happiness—how does one feel right now about one's day. This rating can be affected by events that transpire in the very short run, finding or losing a job, personal problems, or an immediate personal success. This is an important measure of happiness but it is not the one most clearly linked to the level or changes in the level of real income. For any given level of real income per person, one can expect a lot variation in the level of experienced happiness, given particular events transpiring at the time of the survey. This type of measure of happiness is not easily tied to the conventional economics approach to 'happiness', utility, or satisfaction. But this measure and related empirical evidence suggest a more inclusive understanding of what it means to be happy, going beyond the money can buy happiness narrative.

Happiness and Economic Theory: A deconstruction

Conventional economics predicts that increases in real income to an individual should increase that individual's level of utility or wellbeing, which is often related to some measure of happiness. This follows from the assumption that, ceteris paribus, more is better than less. The impression one gets from the literature is that the relationship is linear and that what happens to the representative individual is expected to be replicated to all individuals in a particular society.

There are clearly two key assumptions here. First, one has the assumption of a linear and positive relationship between real income and wellbeing or happiness. Second, it is assumed that what is true on average should hold true for all or most individuals. Therefore, it assumed that if real per capita income increases on average, most people will experience a similar growth and hence should experience a similar increase in utility or wellbeing. But even if the first hypothesis hold true, if the growth of real per capita income is heavily skewed to a relatively small percentage of the population, one would not expect that the average level of utility to increase by much given the small weight attached to those members of society experiencing much the growth in real per capita income. To illustrate this point, assume a population of 100, income per capita is $60,000, and perfect income equality. Double average per capita income to $120,000. But assume that only 10 people capture the entire income increase. In the conventional model, average happiness might double for 10% of the population, but it won't increase for the rest.

Total average happiness increases by:

(100%*10%+0%*90%= 10%)

If you simply look at averages, the impression one gets is that there is a huge increase in per capita income, but happiness does not increase by much. But digging beneath the surface, the conventional economics prediction holds at the individual level. One can't analysis the income-happiness relationship without considered placing it in the context of the distribution of income.

Moreover, if happiness is in part conditional on how the public sector spends the increase in public revenue generated by the growth in per capita income, if this public revenue is not spent on projects that are pertinent to the general population, ceteris paribus, a given increase in per capita income will have a lesser impact on the level of utility than it might otherwise have had. For example, expenditure of health, public health insurance (which reduces anxiety over health care payments and access to health care), and investment on job maintenance (keeping unemployment rates low and job retraining) can have a large positive impact on the average level of happiness in society, ceteris paribus. These provide individuals with the capabilities to live a happier life.

In its theoretical 'pure' version of the relationship between the growth of real per capita income and the level of utility, wellbeing, or happiness, the conventional wisdom focuses on the individual, not the group. It is only the individual that is supposed to be positively affected by the growth of her or his per capita income. If data don't accurately reflect

what transpires at the level of the individual (and this must incorporate public expenditure effects), demonstrating that increases in real per capita income have no or little impact on wellbeing does not contravene the conventional wisdom's purported predictions on the relationship between income and happiness. Importantly, however, when this positive relationship does not hold in the average calculations this strongly suggests serious distributional and public expenditure issues that speak to most people not benefiting from measured average increases in real per capita income. Even if money can buy happiness, it does so at the level of the individual, and only if the individuals actually benefits from increases in real per capita income.

Happiness, and the Easterlin Paradox

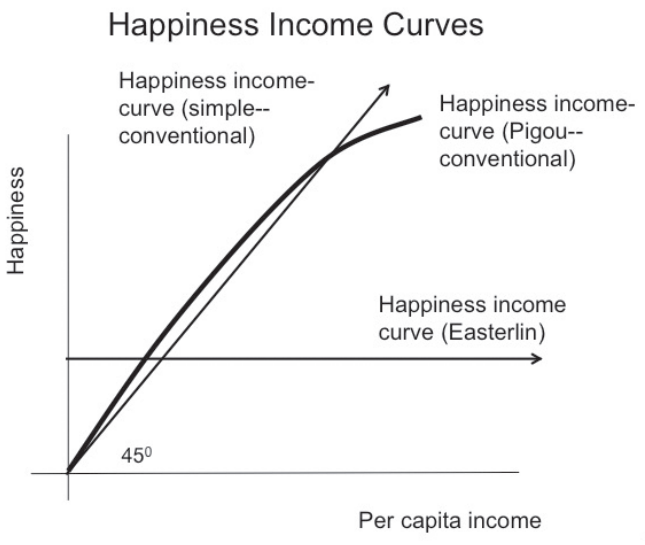
The basis of the so-called Easterlin Paradox is that, according to Easterlin's analysis, there is positive relationship between levels of real per capita income and happiness (self-reported measures of life evaluation related measures of happiness) within a country but not necessarily across countries.1 Hence, the paradox that income buys happiness, but only within country comparisons of income groups. This type of inconsistency should not exist if money actually does buy happiness. Within a country, richer people are much happier than poorer people. Easterlin (1974, 100) finds: "… the results arc clear and unequivocal. In every single survey, those in the highest status group were happier, on the average, than those in the lowest status group." Easterlin (1974, 104) concludes: "On the whole…I am inclined to interpret the data as primarily showing a causal connection running from income to happiness." However, Easterlin (1974, 106-107) finds that: "The happiness differences between rich and poor countries that one might expect on the basis of the within-country differences by economic status are not borne out by the international data." From the sample of countries examined, there is little difference in happiness, for the most part, across the poorer to richer country spectrum. The relationship is almost a linear one. Easterlin finds that this paradoxical relationship between income and happiness holds for both life evaluation related happiness and emotional well-being or experienced happiness (see also, Easterlin 1974, 118).

This initial empirical analysis fuelled a firestorm of research papers that appear to affirm Easterlin's intial findings. This includes time series analysis within countries for a large number of countries, which show that even with significant increases in real income per person, the level of happiness did not increase or increased hardly at all. Easterlin (1995, 44) concludes: "Today, as in the past, within a country at a given time those with higher incomes are, on average, happier. However, raising the incomes of all does not increase the happiness of all. This is because the material norms on which judgments of well-being are based increase in the same proportion as the actual income of the society." At least within countries even if real per capita income increases many-fold the level of happiness does not. Here, an implicit assumption that is made is that the distribution of income does not change as per capita income increases. The implication here is that money can't buy happiness unless your income increases relative to other individuals. Here, one must make the assumption that you are aware when your income is increasing relative to that of other individuals.

A bottom line policy prescription following this analysis and from follow-up research is that successful efforts to increase economic growth can have no long term impact on an individual's utility or long term happiness. If the objective of policy is to improve individuals' level of happiness making a society wealthier will not do the trick. This is the case even if the benefits of growth accrue equally to all members of society. In other words, even if one controls for income distribution or public expenditure effects, increases in real income are expected to have no long term affect on individuals' and, more generally, on society's level of happiness.

Key differences between the conventional modelling and the Easterlin modelling of the relationship between real per capita income and the level of happiness is illustrated in Diagram 1. In very basic terms, in the conventional model, there is a positive and perhaps even a linear relationship between the level of per capita income and the level of happiness. Moreover, this relationship could also be specified in logarithmic terms where real per capita income is measured in log form. Here, there would be a positive and linear relationship between the rate of growth in real per capita income and the level of happiness. But it is important to note that in the early twentieth century version of the conventional model, championed by Pigou (1932), there should be diminishing returns, in terms of utility, to increases in income. The happiness-income curve should be concave especially when income is at a relatively higher level. The happiness-income relationship is non-linear and concave for wealthier members of society. In the Easterlin modelling increasing per capita income has little if any effect on the level of happiness. The happiness-income curve is horizontal—the level of happiness is inelastic to levels or changes in levels of real per capita income. But higher income people are happier than lower income people, ceteris paribus.

Diagram 1

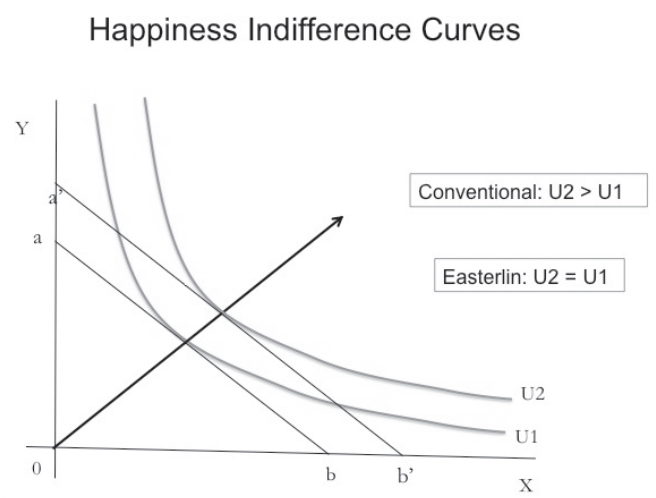


Explaining the Easterlin Paradox

How is it possible for individuals not to be made happier with more money and all the desired goods and services this allows an individual to purchase in the present and the future? This would include health and education related goods and services. An explanatory variable in the happiness literature is the notion of adaptive preferences. Individuals are assumed to revise their preferences for real income upwards as real income increases. Easterlin (1974, 116) writes: "Economic growth causes a continuous upward pressure on consumption norms. This upward shift in standards (tastes) tends to offset the positive effect of income growth on well-being that one would expect on the basis of economic theory." Easterlin (1974, 121) elaborates: "If the view suggested here has merit, economic growth does not raise a society to some ultimate state of plenty. Rather, the growth process itself engenders ever-growing wants that lead it ever onward."

Growth affects tastes or preferences, therefore, it is assumed, neutralizing the impact of real income increases upon the level of happiness. From this perspective, a level of income that generates a particular level of utility, yields a lower level of utility once this person's income increases. Hence, to maintain the same level of utility as with the lower level of income, income must increase. The higher level of income just suffices to maintain the former level of utility. The higher income not only increases the aspirations of the individual for more income, it also serve to maintain the individual's level of utility at its pre-income increase level of utility. In the conventional model, the increase in income would simply increase this person's level of utility. These points are illustrated in Diagram 2, where in the Easterlin narrative the utility generated by the higher level of income is identical to that generated by the lower level of income (and visa versa), given the changing aspiration level of the individual.

Diagram 2

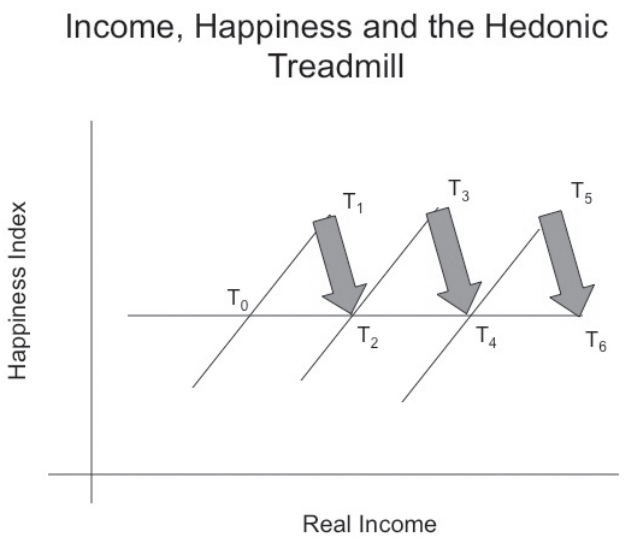


In this narrative, the pursuit of increasing income is a meaningless exercise if the end game is to increase the individual's level of happiness. This narrative also suggests that reducing income would adjust downward individuals' aspiration level. Poorer people would have a lower aspiration than higher aspiration higher income people. In the conventional model preferences or tastes are held constant. They are certainly not affected by economic growth or, more precisely, by increases to an individual's income.

The notion that increasing income has no long term effect on happiness is also explained through what is referred to as the hedonic treadmill. In this case, individuals' utility-happiness is a also function of your income relative to that of other individuals (Duesenberry, (1949). Increasing income yields only short term increases in happiness. An individual might pursue higher levels of income in the believe that her or his income will increase relative to others, thereby increasing this person's level of happiness. Even if this relative increase occurs initially, once others catch-up, each individual's relative income positioning returns to it's initial state, resulting in all individuals' level of happiness returning to what it was originally.

This point is illustrated in Diagram 3. As income increases, happiness goes up in the short term if relative income increase or individuals believe that their relative income has increased. But the long term, once the dust settles, happiness returns to its original state as individuals' relative income positioning returns or is perceived to return to its original state. Increasing income for all, proportionally, has no effect on the level of happiness. In this case, there need not be any change in preferences, in aspiration levels. Rather, happiness cannot increase in society as a whole by increasing income. But individuals consistently err in choice behavior, pursuing higher income in the expectation that this would increase their level of happiness. Also, in this narrative, reducing income for all, proportionately, should not reduce anyone's level of happiness.

Diagram 3



Implications from the Easterlin Narrative

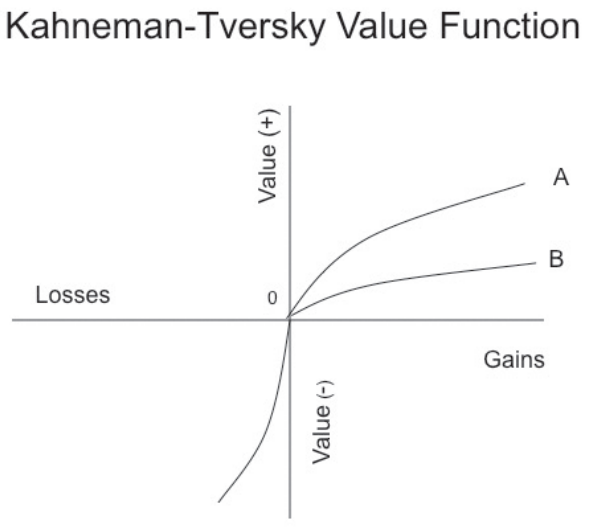
It is important to note that the Easterlin Paradox has been challenged using more comprehensive data sets and more appropriate methodologies—although the debate persists. There appears to be a strong positive relationship between the level of happiness and real per capita income and between the level of happiness and the growth in real per capita income, within country and across countries (Deaton, 2008; Kahneman and Deaton, 2010; Weimann, Knabe and Schöb, 2015). This will be discussed in more detail below.

But one important question to address is: even if individuals are indifferent to higher levels of income, what might be the implications for evaluative happiness of reducing per capita income or of denying increases in per capita income? How do changes in target income affect an understanding of the persistent positive relationship increasing per capita income and the level of evaluative happiness? The latter flows from the most comprehensive research on the relationship between happiness and per capita income.

Loss Aversion And Happiness

Applying some of the results of prospect theory one can argue that even if it is true that the marginal effect of income increases on happiness is zero, a reduction in income would probably reduce the level of happiness, yielding a kink in the 'happiness curve'. Prospect Theory (Kahneman and Tversky) suggests that marginal gains have more weight than marginal and symmetrical losses (2.1 weight associated with a loss as compared to a weight of 1 associated with an equivalent gain). This differential weight is related to the notion of loss aversion; the fact that, on average, people have a very strong aversion to losses. This is illustrated in Diagram 4, which maps out prospect theory in terms of the Kahneman and Tversky value function. Line segment A represents the gain function in the original Kahneman and Tversky value function narrative. Line segment B represents the gain function consistent with the assumption that increasing income yields no or little increases in gains for which happiness would be our proxy when dealing with the Easterlin Paradox. Gains may yield little happiness but cuts in real income may yield permanent reductions in utility. If the reference point is current income, any reduction from this point yields lower levels of happiness, unless individuals can permanently adjust their preferences and related aspirations downward to accommodate such a loss in income. This loss aversion proposition can be tested using experimental survey instruments. An important task to be asked of individuals is to rate their level of happiness if their income is reduced and if the rate of growth in their incomes is reduced, when this decrease not change their relative income position in their society.

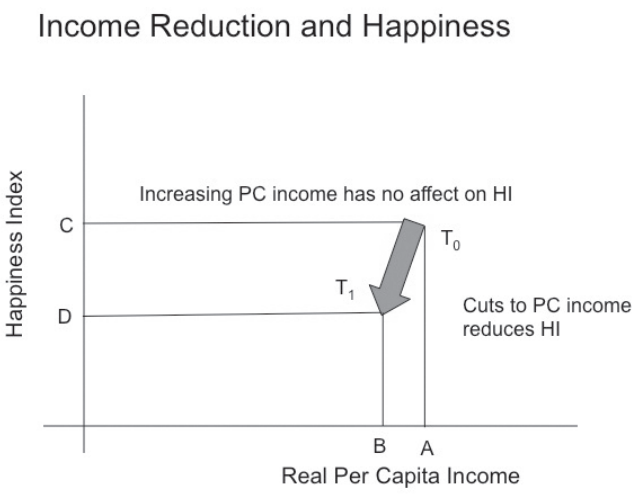
Diagram 4



If individuals prefer to pursue higher levels of income to increase their level of happiness (they set higher target incomes) and this preference is denied through public policy, this forced inability to increase evaluative happiness can be viewed as a loss.2 In this case, denying the preference to pursue increased happiness by increasing income, ceteris paribus, reduces the level of happiness. In this case, reducing the rate of growth of income to individuals can be regarded as a loss from the reference point of a preferred and obtainable rate of growth in income. The level of happiness shifts downward even without any decrease in per capita income, but with a forced reduction in the growth of income. Here, the pursuit of happiness involves pursuing higher level of income irrespective of how this affects ones relative positioning.

This point is illustrated in Diagram 5. The horizontal axis can be read in terms of the level or rate of growth of real per capita income. Any reduction in the level or rate of growth of real per capita income results in a predicted reduction in the level of happiness, ceteris paribus.

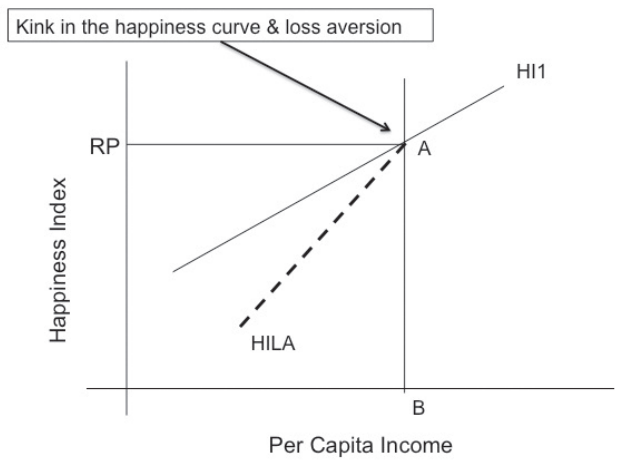
Diagram 5



To the extent that loss aversion theory hold true, any happiness-income function is kinked at an individual's reference point when the level of real income or its rate of growth is diminished. This point is illustrated in Diagram 6. In this Diagram, one has a happiness-income curve (solid line) that is positively sloped. The individual's reference point is A. Reducing per capita income or its rate of growth not only reduces the level of happiness along the original solid line happiness-income curve, it kinks this curve downward at the reference point (A), increasing its slope. Therefore, along the new dashed loss aversion related happiness-income curve, the level of happiness diminishes even further for any given level decrease in per capita income or decrease in its rate of growth.

Diagram 6

Loss Aversion and a Kink in the Happiness Curve



In terms of public policy, the loss aversion-happiness model predicts that reductions in per capita income or in its rate of growth and impediments to increasing per capita income can be predicted to reduce the level of evaluative happiness. These results would only be exacerbated when per capita income and happiness are positively related. One would have a kink in the happiness curve at the reference point. The potential kinkiness in the happiness-income function needs to be recognized and integrated in any analysis of the relationship between happiness and income.

Social Goods and Happiness

The extent of the elasticity of evaluative happiness to increases in real per capita income might be a product of how the marginal income increases are used. Marginal increases in income used for the provision of social goods can increase the level of happiness for the majority of the population. Or, these marginal increases in income can be used for private consumptive purposes that might result lesser average increases in happiness or increases concentrated in the hands of a small percentage of the population (see above for further discussion on this point). The importance of social or public goods and services (including efforts to diminish the rate of employment) to determining the level of happiness is well documented in the literature (Clark and Oswald, 1994; Helliwell, Layard, and Sachs, 2015; Deaton, 2008; Marmot 2004).

It is possible for relatively low per capita income economies to have happiness levels well above their predicted values and relatively high per capita income economies to have happiness levels well below their predictive levels contingent upon how marginal increases in income are exploited. This point can be illustrated using 'thick' utility curves in Diagram 7, wherein increases in income need not generate increased level of utility or evaluative happiness. Each thick utility curve generates the same level of utility throughout. The utility curves thin out, when a larger proportion of marginal increases to income are invested in the provision of happiness enhancing social goods and services.

This point is further illustrated in Diagram 8. Changes in variables such as health status, health care, life expectancy, unemployment pivot the happiness curve up or down, without obviating the predicted positive relationship between income and happiness. These social goods and services impact on the level of happiness that can be generated by a given level of or rate growth in real per capita income. It is possible that very high income countries can average less happiness than lower income countries, when the former are characterized by a significant enough lower provision of social goods and services. But this, once again, does not diminish a positive relationship between income and happiness, ceteris paribus.

Diagram 7

Income & Thick Utility Curves

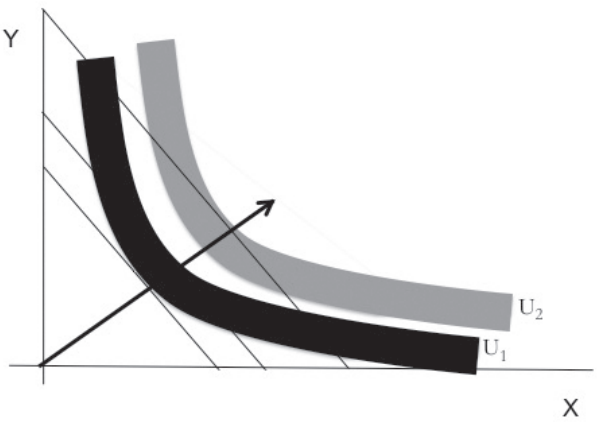
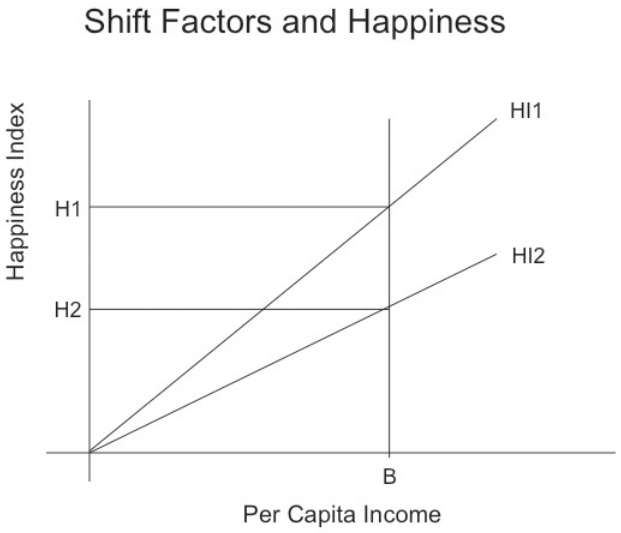


Diagram 8



Public Policy and Happiness

How does one deal with the human reality of desiring increasing income and the pursuit of increasing income (ever increasing levels of target income)? There are two basic options.

1. Facilitate the realization of such preferences.

2. Nudge individuals not to realize these preferences or work towards changing these preferences.

If one is situated in the Easterlin narrative, one might argue in favor of the latter. But even from this perspective, once one introduces loss aversion and a kink into the happiness-income curve, this option results in utility (happiness losses) to effected individuals. One would expect these losses to be most severe amongst the lower income cohorts of the population, if the Pigouvian assumption of diminishing returns to income holds true. In this case, there can be a significant opportunity cost to reducing the level or rate of growth in real per capita income, especially when such reductions reduce the capacity of society to produce and deliver happiness enhancing social goods and services.

The evidence is strongly in favour of the hypothesis that individuals prefer higher levels of income and are not indifferent between lower and higher levels of per capita income. This plus introducing loss aversion and a kink into the happiness-income curve, introduces even more severe opportunity costs to reducing the level or rate of growth in real per capita income,

If one respects the preferences of individuals and more specifically the preferences of individuals when they are free to choose and develop their own preferences, public policy should be designed to increase per capita income. One should also design policy that would increase the supply and capacity of individuals to demand happiness enhancing social goods and services. The alternative is impose external standards for what are optimal preferences and attempt to educate individuals to adapt to these expert driven external standards for happiness situated at lower level of material wellbeing.

Revision of the Evidence

The most recent analysis based on a much broader and detailed data set (Gallup Poll surveys) than used by Easterlin and others following in his footsteps, have found in favour of the traditional view that money does buy happiness. But a careful reading of these finding demonstrate the importance of intermediaries between per capita income and its growth as determinants of the level of happiness. Increasing per capita income is not the magic bullet yielding increasing happiness irrespective of institutional and social context. These critical intermediary variables were forced into the surface of the debate by Easterlin's initial finds that challenged the conventional wisdom and its very much trickle-down perspective on the relationship between income and happiness.

For example Deaton (2008, 57) found that: "life satisfaction is higher in countries with higher GDP per head. The slope is steepest among the poorest countries, where income gains are associated with the largest increases in life satisfaction, but it remains positive and substantial even among the rich countries; it is not true that there is some critical level of GDP per capita above which income has no further effect on life satisfaction."

Stevenson and Wolfers (2008, 3) conclude: "Our key result is that the estimated subjective well-being-income gradient is not only significant but also remarkably robust across countries, within countries, and over time. These comparisons between rich and poor members of the same society, between rich and poor countries, and within countries through time as they become richer or poorer all yield similar estimates of the well-being-income gradient. Our findings both put to rest the earlier claim that economic development does not raise subjective well-being and undermine the possible role played by relative income comparisons."

Deaton writing with Kahneman (Kahneman and Deaton, 2010), an earlier advocate of aspects of the Easterlin Paradox, conclude the same from an analysis of American data. They find that even in the United States, with its relatively high real per capita income in the global context, increasing real per capita income has a strong positive effect on both life evaluation related happiness and emotional well-being or experienced happiness. For the latter, it appears that happiness does not change once one reached about $75,000 USD. But the for former, the most closely related to the conventional economic concerns about the relationship between income and income growth and utility, there is no apparent satiation threshold for the income-happiness relationship. Increasing income increases the level of happiness. Kahneman and Deaton (2010, 16491), find: "We conclude that lack of money brings both emotional misery and low life evaluation; similar results were found for anger. Beyond $75,000 in the contemporary United States, however, higher income is neither the road to experienced happiness nor the road to the relief of unhappiness or stress, although higher income

continues to improve individuals' life evaluations." Life evaluations might become satiated at well over $120,000 USD per year. About 65 percent of American households earned less than $75,000 per year and about 85 percent of American earned less than $120,000 in 2014.

The revised evidence reinforces the argument that reducing the rate of growth of income will have damaging effects on both evaluation related happiness and emotional wellbeing. This would be even more so when one introduces loss aversion into the analytical mix. The most harm would be caused to the lower income cohorts.

Conclusion

The Easterlin Paradox is discussed and placed in the context of the broader empirical and theoretical literature. The key finding embedded in the Easterlin Paradox literature is that money can't buy happiness although richer people tend to be happier than poor folk—there is a happiness ladder I also discuss the more recent empirical finding that tend to refute critical aspects of the Easterlin Paradox.

The happiness literature is also deconstructed and placed in the context of a more sophisticated and nuanced conventional-type model wherein money buys happiness at the level of the individual or the family. This more sophisticated and nuanced approach is too-often absent from the conventional literature. This more nuanced approach speaks to the importance of the distribution of income in both a static and dynamic (growth) sense to determining the relationship of income and income growth to the level of happiness. Also, discussed is what money purchases in terms of social and public goods and services that can affect the level of happiness. A given level of or increase in income can have different effects on the level of happiness contingent upon the distribution of income and the provision of social and public goods and services that affect the level of happiness.

One of the implications of the Easterlin Paradox is that perhaps the pursuit of increasing income is misplaced given that such increases have little impact on the level of happiness. However, this ignores the significance of loss aversion to individuals' preference function and the implications of this not only for reducing per capita income but also for reducing the rate of growth in per capita income. In this modeling scenario, a kink is introduced to the happiness curve at the individual's income reference point, yielding a much more severe negative impact on happiness as a consequence of reducing income or its rate of growth.

The kinked happiness-income curve also has implications for scenarios, supported by the most recent evidence, that income does buy happiness. Efforts to reduce growth, which individuals can frame as a loss, would generate more severe losses in happiness than would the standard linear or concave happiness-income curve. This argument also relate to efforts to reduce the rate of growth in the production and provision of social and public goods and services than can increase the level of happiness. This is especially true for the lower income cohorts in society.

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Notes

(Endnotes)

1. For a detailed discussion of the happiness literature see for example: Antonides (2007); Clark and Oswald (1994); Clark, Frijters and Shields (2008); Clark and Senik (2011); Di Tella and MacCulloch (2008); Di Tella, MacCulloch, and Oswald (2003); Frey and Stutzer (2000); Frey and Stutzer (2002); Helliwell, Layard and Sachs, (2015); Layard (2005) Weimann, Knabe and Schöb (2015).
2. Conventional economics assumes that tastes are insatiable. The more you have, the higher your level of utility. But as Easterlin (1974) points out tastes or preferences can change with changes in income. There is clear evidence that target income increases with increasing income (see, for example, Altman, 2001, 2015). The more you have the more you want. Increasing income to meet unfulfilled wants as target income increases, should increase the level of happiness. Both the pursuit of and increases to real income increases the level of happiness. If one can't pursue and realize higher levels of income, the level of happiness diminishes. This appears to be in line with the revisionist empirical findings on the positive relationship between increasing income and the level of evaluative happiness.

ABSTRACT

Contents

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