Beyond Economic Inequality – A Socio-Ecological Perspective on Consumption

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1 Introduction

We live in times of multiple crisis characterised in particular by social and environmental problems. Within the social dimension, we find especially rising economic and social inequalities unfolding since the beginning of the 1980ies (Atkinson 2015; Piketty 2014). In terms of environmental challenges, we observe that environmental pressures are putting our planet more and more at risk and resulting in ecosystem changes (Steffen et al. 2015).

Although much has been said addressing both crisis-phenomena separately, we feel that important aspects are not discussed with the attention that they deserve: the interaction between income distribution, different patterns of consumption and the resulting consequences for the environment. Rather, largely independent lines of research can be identified:

On the one hand, current debates on inequality are centred on the empirics of inequality, economic and social consequences of rising inequality as well as possible counteracting policy measures (e.g. Atkinson 2015; Piketty 2014; Wilkinson and Pickett 2010). Further, several studies exist examining the impacts of unequal income distributions on consumption patterns coining terms such as conspicuous consumption, consumption cascades or consumption emulation (Frank 1999; Patsiaouras and Fitchett 2012; Trigg 2001; Veblen 1973). However, they are paying little attention to environmental issues. On the other hand, we find rather recent empirical studies on consumption and environmental pressures resulting from specific types of consumption. However, rising income inequality is rarely discussed (Huppes 2006; Labouze et al. 2003; Tukker and Jansen 2006). Put another way, we are missing a fully fledged theory on environmental consumption cascades.

Accordingly, our paper tries to take an integrated perspective on the social, ecological and economic dimensions of income distribution and consumption. Our central argument is as

follows: the unequal distribution of income within a society is not only posing serious challenges for the economy but also adds to the steady erosion of a society's natural resources as inequality fuels luxurious and status consumption. This type of consumption, in turn, can be characterized as relatively more damaging for the environment.

To tackle the issue form an integrated perspective, we will review the existing theoretical and empirical literature on income inequality, status consumption as well as environmental issues of specific consumption patterns. In a next step, we explore household expenditures and the evolution of income inequality in Germany over time to understand the inequality-consumption-nexus and shed light on the hypothesis that consumption changes in times of rising inequality. This is then linked to data on CO2 emission intensities for different household consumption patterns. We end by our paper with a discussion of our findings.

2 Theoretical and empirical foundations

In the following we will attempt to bring together two rather distinct streams of research. On the one hand, several theoretical discussions and empirical studies within economic and sociological discourses are concerned with changing consumption patterns in general and effects of income inequality on consumption in particular. On the other hand, we find studies within ecological economics investigating environmental effects of consumption often neglecting the importance of rising income distribution.

2.1 Consumption and income inequality

There are a number of different theories concerned with consumption patterns, their consequences, their determinants as well as their relation to income inequality - though they use different terms to describe similar observations. The slight differences and the nuances are discussed elsewhere, and are not the aim of our paper (e.g. Dwyer 2009; Patsiaouras and Fitchett 2012; Trigg 2001). Accordingly, we will continue by highlighting the similarities between the different concepts and use the terms, conspicuous consumption, status consumption, luxurious consumption and positional consumption quite interchangeably.

Going back to the roots, Veblen was one of the first to put forward a theory on the relationship between social status and consumption in his book *The Theory of the Leisure Class*, first

published in 1899. Highly criticised by scholars from various disciplines on a number of points, it has been extended and updated since 1899, but still marks an important contribution to theorising consumption patterns (Dwyer 2009; Trigg 2001). Veblen (1973) coins the term conspicuous consumption based on observations from the beginning of America's Gilded Age (beginning approximately 1880 until the Second World War). This period was characterised by economic prosperity with a high level of income and wealth inequality as well as an increase in the institution of today's understanding of private property (as also famously noted by Piketty 2014). This increase in wealth and income affected the relationship between private property and status. Over time "[...] the recognition and attribution of status according to the aggressive behaviour of the members of the community [as a sign of honour and status] was replaced by the acquisition of goods." (Patsiaouras and Fitchett 2012: 157). Hence, it went from a 'struggle of subsistence' to a 'struggle of wealth' and status became closely connected to private property. The acquisition and accumulation of property signified wealth and a greater social status and vice versa. Ultimately, this increased comparisons with others and gave incentives to emulate consumption patterns of the one's higher up the social ladder in order to reach for higher status. (Frank 1999; Patsiaouras and Fitchett 2012; Trigg 2001; Veblen 1973)

In essence, Veblen (1973) identifies two ways to display wealth: (1) through considerable spending on leisure activities and (2) through extensive consumption of goods and services. The latter is the more common way to display wealth and represents what Veblen calls *conspicuous consumption*. Interestingly, this type of consumption pattern is not only prevalent in higher income classes but also in the lowest. Each individual takes inspiration from the people positioned slightly higher in the social hierarchy and tries to emulate their consumption patterns. They do so, because people are concerned with their social standing. A higher social standing "[...] includes material rewards and psychological rewards such as self-respect, self-esteem or sense of one's worth" (Paskov et al. 2013: 1). (Trigg 2001; Veblen 1973)

Building on Veblen (1973), Frank (1999: 15) formulates the term *expenditure cascade* to describe what he calls "another luxury fever" that one can witness today. Tracing the development of incomes and especially of income inequality of the 20th century, Frank defines expenditure cascade as "[...] a process whereby increased expenditure by some people leads others just below them on the income scale to spend more as well, in turn leading others just below the second group to spend more, and so on." (Frank et al. 2014: 57) Everyone tries to

adapt his/her expenditures and hence, his/her consumption to the expenditures of the next higher person in the social hierarchy. While Veblen (1973) is more concerned with the conspicuous nature of consumption, Frank identifies increasing income inequality as an accelerator of expenditure - especially for expenditure on luxury goods. In *Luxury Fever* (1999), Frank exemplifies a number of different forms of luxury expenditure that has risen substantially over the last decades. Among those are status items such as a Patek Philippe wristwatch, expensive cars, lavish holiday trips including high-priced hotel suits and flight travel, yachts, but also the boom in second-home construction, "bigger and better equipped homes" (p. 20) with lots of technological equipment. (Frank 1999; Frank 2007; Frank et al. 2014)

Assuming that income inequality represents status hierarchies within a society - at least to some extent - the greater the economic inequality the steeper the social hierarchy and the larger the income differences between the bottom and the top. This in turn fosters competition for status and draws attention to one's own relative position in the social hierarchy. (Paskov et al. 2012; Veblen 1973; Wilkinson and Pickett 2010) Changes in the income distribution, e.g. greater income inequality, means that the reference frame for comparison changes. When the rich become even richer and thus, can afford an even greater house or a bigger car, the reference for the income group just below changes. This change can be observed for every income group as the reference frame for the next higher group changes. Yet, in a context with greater income inequality this also means that while the rich might afford a more affluent consumption pattern, the poor might not have the money for it and might even get into debt. This will automatically lead to higher absolute consumption. (Frank 2007; Frank et al. 2014)

Coming from a background in sociology, Paskov et al. (2012) study the relationship between status anxiety and income inequality concluding that "[...] income inequality causes people to feel more anxious about their social status [...]" (Paskov et al. 2013: 2). Referring back to Frank (1999, 2014), they argue that one of the diverse consequences of status anxiety are increased levels of consumption. Thus, if status anxiety is fuelled by increasing income inequality, one way people react is to consume more in order to counteract a potential loss of status and keep up with the status they want to attain. Similarly to Veblen's and Frank's argument, both richer and poorer people are affected by status anxiety. The fear of losing his/her social position is not automatically alleviated when occupying a higher social position, because one can still strive for an even higher one and/or be concerned about keeping it. (Paskov et al. 2012)

Turning to the empirical studies on the relationship between income inequality and consumption there seems to be general support for Veblen's argument though there are only few studies addressing the issue. Bertrand and Morse (2013) show that middle-income households (20th to 80th percentile) consume more when faced with upper incomes. They argue that status seeking as well as the urge to buy more luxurious items just because they exist (supply-driven) can serve as an explanation for the observed consumption pattern of the middle-income households.

Trying to trace the relationship between rising inequality in the U.S. in recent decades and lower savings rates, Frank et al. (2014) measure increased consumption indirectly through bankruptcy filings, divorce rates and time to travel to work. All of these measures are identified as a response financial distress, assumed to be caused by the pressure to consume more in order to keep the position in the social hierarchy. Their expenditure cascades hypothesis is supported by the data in high inequality contexts. (Frank et al. 2014) Similarly, Aguiar and Bills (2013) study whether the rise in income inequality over the last 30 years has been paralleled by rising consumption inequality. Confirming their hypothesis, they find that high-income households have directed their spending towards more luxurious instead of buying necessities relative to low-income households resulting in greater consumption inequality across income groups. Focusing on low-income households in India Marjit et al. (2014) state that in case of high inequalities consumption gets directed away from food and towards status goods.

Paskov et al. (2012) examine the prevalence of status anxiety across countries and different income groups using status seeking as a measure of anxiety more closely. They find that countries with a greater income inequality show a higher average level of status seeking across society. Also, on average people that live in less equal societies are more likely to display some form of status seeking. This is true for all income groups. Still, poor people show slightly more concerns about their social position than rich. They do not, however, discuss their findings in the context of changes in consumption patterns though they acknowledge that it can be one of the consequences of status anxiety. (Paskov et al. 2012)

2.2 Environmental effects of consumption

There is little theoretical explanation of the relationship between household consumption and its environmental burden beyond the mere argument that consumption is an important (if not

the most important) driver for environmental pressures. Berthe and Elie (2015) constitute an important exception, since they are reviewing and structuring the existing theoretical literature on income inequalities and the related environmental impacts, particularly drawing on Boyce (1994, 2003, 2007) and Wilkinson and Pickett (2010).

Frank (1999: 107) is not only concerned with the nature of consumption but also with its consequences: "[b]y scaling back on the rate at which luxury consumption has been growing, we could drink safer water, breath cleaner air, and eat food that is less likely to make us seriously ill". This gives some first hints on the tremendous negative environmental effects of consumption. Even though this is an ostensive reasoning, we do not find much theory on the relationship and possible causal directions between income inequality, consumption and environmental burden. Put another way, we are missing a fully-fledged theory on environmental consumption cascades.

This is also observed by Kraemer (2011, 2014) who argues that there is a blind spot with respect to the systematic analysis on the interplay between the environment and income inequality. More particular, he argues that environmental impact studies usually analyse the material flows on national levels, with respect to different consumption patterns or sectors, but are missing to differentiate for other socio-economic patterns such as income distribution (Kraemer 2014). Hence, on a theoretical and conceptional level, recent sociological findings on precarisation, rising status anxiety and the falling behind of entire socio-economic groups are not seriously taken up by the relevant environmental or ecological literature, let alone its effects systematically explored. It is crucial that a thorough analysis of consumption and its patterns in relation to environmental impacts seriously takes income inequalities and the subsequent effects into account, particularly in today's societies with fast rising inequalities (Piketty 2014, Atkinson 2015), rising luxury consumption (Aguiar and Bills 2013; Frank et al. 2014) as well as precarisation, status anxiety and the "return of uncertainty" (Castel and Dörre 2009; Kraemer 2011, 2014; Paskov et al. 2012).

Turning to existing empirical literature on consumption and environmental impacts, we find that growing literature on product-based assessments of environmental impacts. This literature not only takes the direct but also the indirect environmental effects of consumption into account. Generally, two different methods can be distinguished: bottom-up and top-down assessments (Tukker and Jansen 2006). The existing empirical studies are not only varying by

methods and approach but also by scope. Some studies focus on specific regions (e.g. Barrett et al. 2005; Collins et al. 2006), whereas others have a national (e.g. Kerkhof et al. 2009b; Moll and Acosta 2006) or EU-wide scope (Huppes 2006; Labouze et al. 2003).

Having said this, Tukker and Jansen (2006) provide a useful and careful review of the different empirical studies on environmental impacts of products, thereby, "cover[ing] the most important studies from the European arena of the last 5 years" (Tukker and Jansen 2006: 160), 11 in total. With respect to energy use, Tukker and Jansen (2006) note that food, housing and transport are the categories responsible for approximately 70% of the overall impact across EU25. On a more detailed level, they argue that for food consumption which contributes to 20-30% of total impacts, it is particularly meat, meat products and dairy products that score highest in the different impact categories. Turning to the next category, "housing" accounts for 20-30% of total impacts. More precisely, it is energy used for heating and cooking but also the use of electric appliances, construction and maintenance that are the most important impacting categories. Within transport which accounts for 20-30% of total environmental impacts it is particularly individual transportation by car and air traffic being the most important contributors.

Turning to studies, which explicitly consider income groups, the study by Kerkhof et al. (2009b) is to be mentioned. They focus on income differences and the respective consumption patterns in the Netherlands. In line with previous studies, they conclude that housing, food and 'development, leisure and traffic' contribute significantly to overall environmental impacts; although the impact varies quite substantially across the different indicators. Relating this to the income groups, increased consumption generally increases environmental impacts, meaning that richer households pollute much more than poorer households simply because levels of consumptions increase. More particularly, Kerkhof et al. (2009b: 1164f.) observe a change in consumption patterns with increasing total expenditures: "[...] when the volume of the consumer basket increases, the demand for necessities, like many products in the aggregate product groups 'food' and 'house', levels off, while the demand for luxury goods, like some products in the aggregate product group 'development, leisure and traffic', increases more than proportionally."

Kerkhof et al. (2009a) analyse within and between country variations of CO2 emissions. Comparing the Netherlands, UK, Sweden and Norway, they find that average household CO2

emissions vary. In the Dutch, British and to some extent Norwegian case, CO2 emissions from housing and heating make up the majority of total emissions for the low income groups, but substantially fall with rising incomes. In contrast, CO2 emissions from housing stay constant with rising incomes in Sweden. Such differences can be mainly explained by the variations in the category housing, more particularly, due to different national provisioning systems of electricity (gas and goal vs. hydro-electric power, decentralised vs. district heating) resulting in quite different CO2 emissions intensities. For transport and to some extent recreation and culture similar patterns can be observed: with rising income, CO2 emissions as a share of overall emissions increase.

For Finland, Kotakorpi et al. (2008) find that resource consumption per capita is falling with household size, but rising with age and income. Important determinants for a relatively resource-heavy consumption are: cars ownership and resource-extensive recreational activities as well as the available living space per person and whether households live in single or multi-family houses, respectively. Similarly, Kristof and Süßbauer (2009) note that for resource-light consumption household income is an important determinant. Low households incomes are associated with sharing instead of owning things (such as cars), commuting via public transport and a relatively small size of the available living area. On the other hand, household with higher incomes are able to buy durable goods with a better quality but there is also considerably more money available for resource-intense holidays, private transportation and bigger houses in suburban areas.

2.3 Income inequality, consumption and environmental burden - synthesis

To sum up, theoretical considerations show that rising income inequality fosters changes in consumption patterns: "In short, both the things we feel we need and the things available for us to buy depend largely - beyond some point, almost entirely - on the things that others choose to buy [...]" (Frank 1999: 11), especially on those people that are just a little higher on the social ladder. As already noted above, these expenditure cascades are tantamount with Veblen's conspicuous consumption argument. Also, studies show that the exists at least some form of conspicuous consumption and an relation between income inequality and changes in consumption patterns towards consuming more luxurious goods. Literature on the environmental effects of consumption has underlined that it is luxury consumption like lavish

travels, holiday and bigger (secondary) houses resulting in high environmental pressures. Additionally, it is just the sheer amount of consumption of the higher income groups that adds to polluting the environment. Nevertheless, necessities such as food and general housing expenditures make up for a considerable amount of pollution. Thus, in order to shed led on the *environmental consumption cascades* we need to consider (1) the evolution of income inequality over time; (2) the changes of private consumption across different income groups in total and relatively with respect to consumption purposes; and (3) the impact of consumption for the environment.

3 Own Approach: Method and Data

Our approach, based on the literature above, is twofold: we first explore household expenditures and the evolution of income inequality in Germany over time to understand the inequality-consumption-nexus and shed light on the hypothesis that consumption changes in times of rising inequality. Then, we link the data on household expenditure to CO2 emission intensities based on previous studies (Kerkhof et al. 2009a, 2009b; Moll et al. 2005; Nijdam et al. 2005).

3.1 Household expenditure and income inequality

The analysis of incomes and income inequality in Germany is based on Socio-Economic-Panel (SOEPv28) data on net equivalent incomes for the years 1998 until 2008. Also, we collected data on annual household expenditures in different income groups from the Federal Statistical Office of Germany (Statistisches Bundesamt). More specifically, our analysis is based on the Income and Consumption Survey (Einkommens- und Verbrauchsstichprobe) for the years 1998, 2003 and 2008. The data is aggregated into 12 main consumption categories, based on the Classification of Individual Consumption by Purpose (COICOP). We excluded household data prior to 1998, because it was either aggregated into different consumption categories, not adjusted for the Euro or not available for the same income groups. Further, data on equipment ownership (Ausstattungsgrad) and the stock of equipment (Ausstattungsbestand) was retrieved from the dataset of the Income and Consumption Survey of 2003 and 2008. For the integrated analysis of household expenditures and CO2 emissions, the 2008 data on household

consumption classified into deciles was additionally collected - for the other year it was not available, unfortunately.

3.2 Household emissions and product groups

In order to analyse environmental impacts of household consumption, the CO2 emissions of the different products need to be determined. This is commonly done by a hybrid analysis collecting the life-cycle CO2 emissions of different products and their semifinished goods to capture the whole production process (Kerkhof et al. 2009a, 2009b, Moll et al. 2005, Nijdam et al. 2005). Unfortunately, such an analysis has not yet been conducted for Germany. Fortunately, there is longstanding product-oriented research in the Netherlands. The data we used was originally collected by Moll et al. (2005) and Kerkhof et al. (2009a, 2009b) and covers CO2 emissions intensities of different products categorised according to the COICOP framework.

For our analysis, we used the original Dutch data as a default database in accordance with previous studies. In this database, the emissions intensity of the basic products are derived from extensive LCA studies on the European or even worldwide level. Thus, we assume in line with previous studies that emissions intensities of basic products for Germany are similar to the Dutch case. For the emissions intensities of the transport category, we used the data calculated by Kerkhof (2009b) for the UK. Emission intensities of transport to a great deal depend on the population density of a country. Comparing different population densities of available data, we concluded that the British case is closest (see appendix). Further, comparing different CO2 emissions intensities of European countries in the category 'housing, water, electricity, gas and other fuels', it becomes apparent that cross-country variations are largely depending on the national heating supply system and related energy mix. The German final energy consumption of households with respect to housing and heating relies on gasoline (36.6%), electricity (19.8%), renewable energies (8.7%) and district heating (7.3%) (Eurostat 2015). Compared to available data from other European countries, German final energy consumption is less dependent on gasoline and using slightly less electricity compared to the Netherlands, but compared to Sweden less renewable energy and district heat is used. Thus, we use the mean of the Swedish and Dutch CO2 emission intensities in the category of housing, water, electricity, gas and other fuels' as an approximation (see appendix). After determining CO2 emission

intensities of the different product groups, we calculated the total CO2 emissions per income group, based on Kerkhof et al. (2009a, 2009b).

4 Findings

4.1 Household expenditure and income inequality

Figure 1 shows the changes in income inequality measured by the Gini index. It indicates a considerable rise in incomes inequality from 1998 to 2008, namely from 0.24 in 1998 to 0.28 in 2008. This is also supported by figure 2, which shows the development of income shares per decile. It indicates that income only increased for the upper 10 percent, whereas income in all other deciles stayed roughly constant (9th to 5th decile) or rapidly decreased (4th to 1st decile). Thus, rising income inequality as shown by the Gini index is far and foremost resulting from rising incomes in the top 10 percent of the population and income losses at the lower part of the income distribution, while the middle incomes roughly stayed the same.

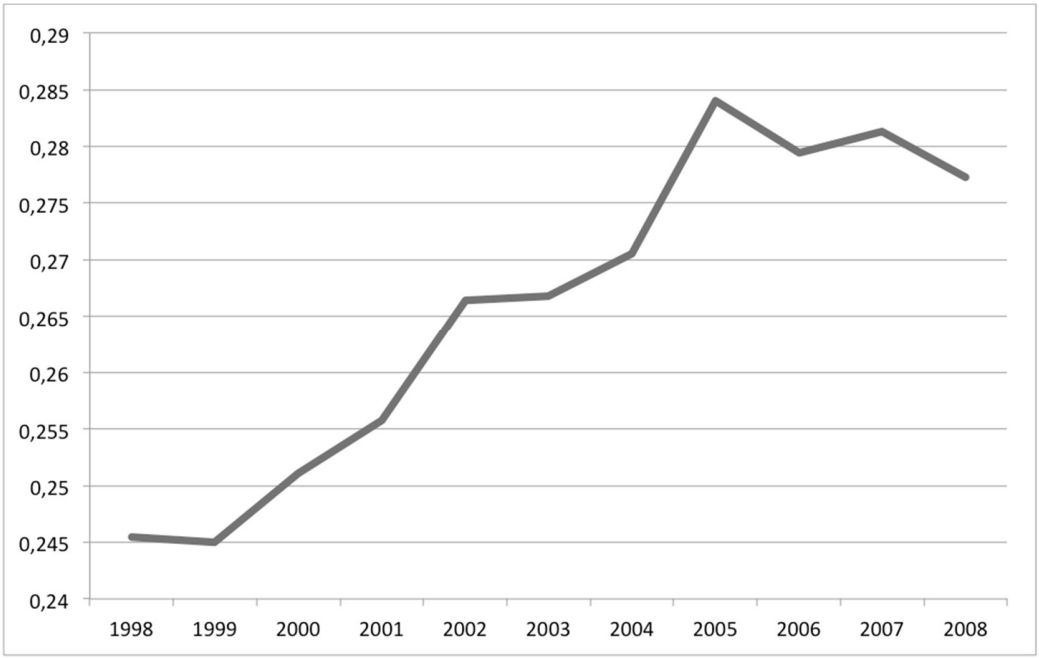

Figure 1: Income inequality measured by Gini index, 1998-2008 (source: SOEPv28, own calculations)

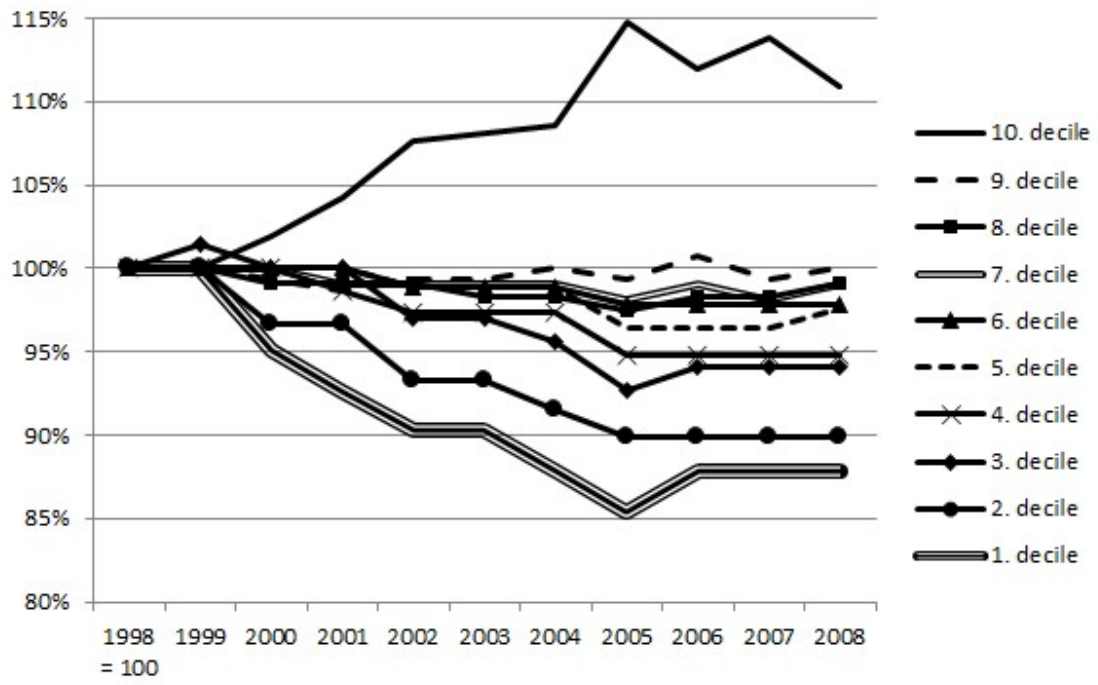

Figure 2: Evolution of income shares per decile from 1998 to 2008 (source: SOEPv28, own calculations)

Figure 3 shows the consumption by purpose for different income groups in 2008 in Germany. Generally, the category 'housing and energy' makes up the largest share of total consumption across all income groups, followed by 'food and beverages', 'transport' and 'recreation and culture'. However, we can observe stark differences between income groups. While households with a monthly income below 2000€ spend more than 50% of their consumption on necessities such as 'housing and energy' and 'food and beverages', for the highest income group these two categories amount to 39%. Consequently, higher income households spend an increasing share on 'transport' as well as 'recreation and culture'. The difference between low- and high-income consumption pattern is especially striking in the 'transport'-category. The five lowest income groups spend less than average, whereas consumption of the three highest income groups is above or close to average consumption. For instance, the share spend on 'transport' of highest income group is almost twice as high as the share of the second lowest income group. The share of 'recreation and culture' is more similar across income groups. Still, the lowest two income groups spend less than average within this consumption category, while the others spend above or on average.

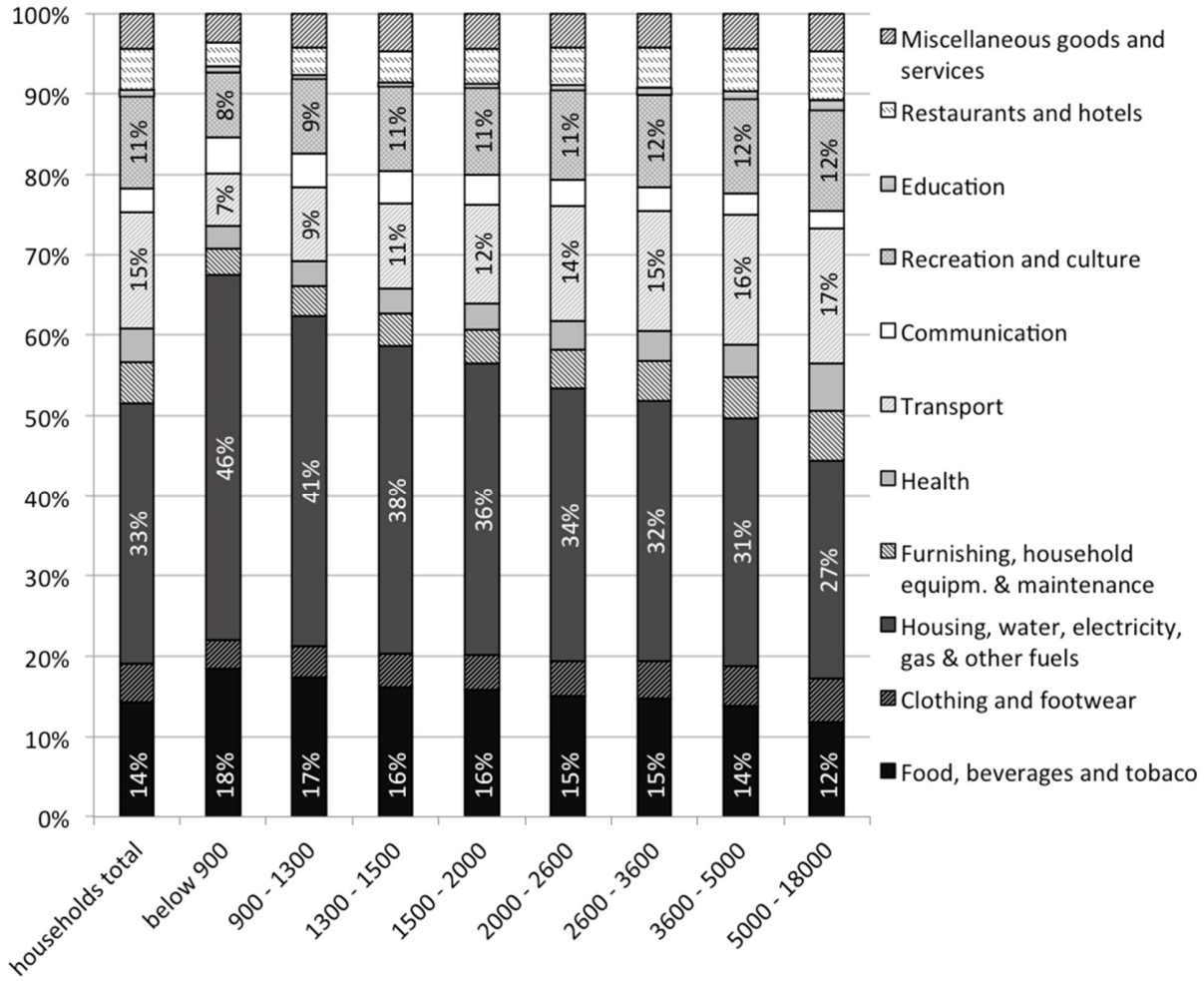

Figure 3: Consumption by purpose and income groups 2008 (source: EVS 2008)

Although not displayed by the figure, total absolute private consumption increases across all income groups between 1998 and 2008. The highest income households spend more than five times as much on private consumption compared to the lowest income households.

In Figure 4, we looked closer into percentage changes of the shares of selected expenditure categories. From 1998 to 2008, the share of 'housing and energy' in overall consumption expenditures increased by 2% on average. However, regarding the three lowest income groups, expenditures for 'housing and energy' as a share of total expenditures rose quite considerable, namely by 12% (under 900€), 13% (900-1300€) and 12% (1200-1500€). Similarly, the second highest and the third highest income group spend more in this category, though the change is

more moderate. It is only the highest income group that spends relatively less on 'housing and energy' in 2008 compared to 1998.

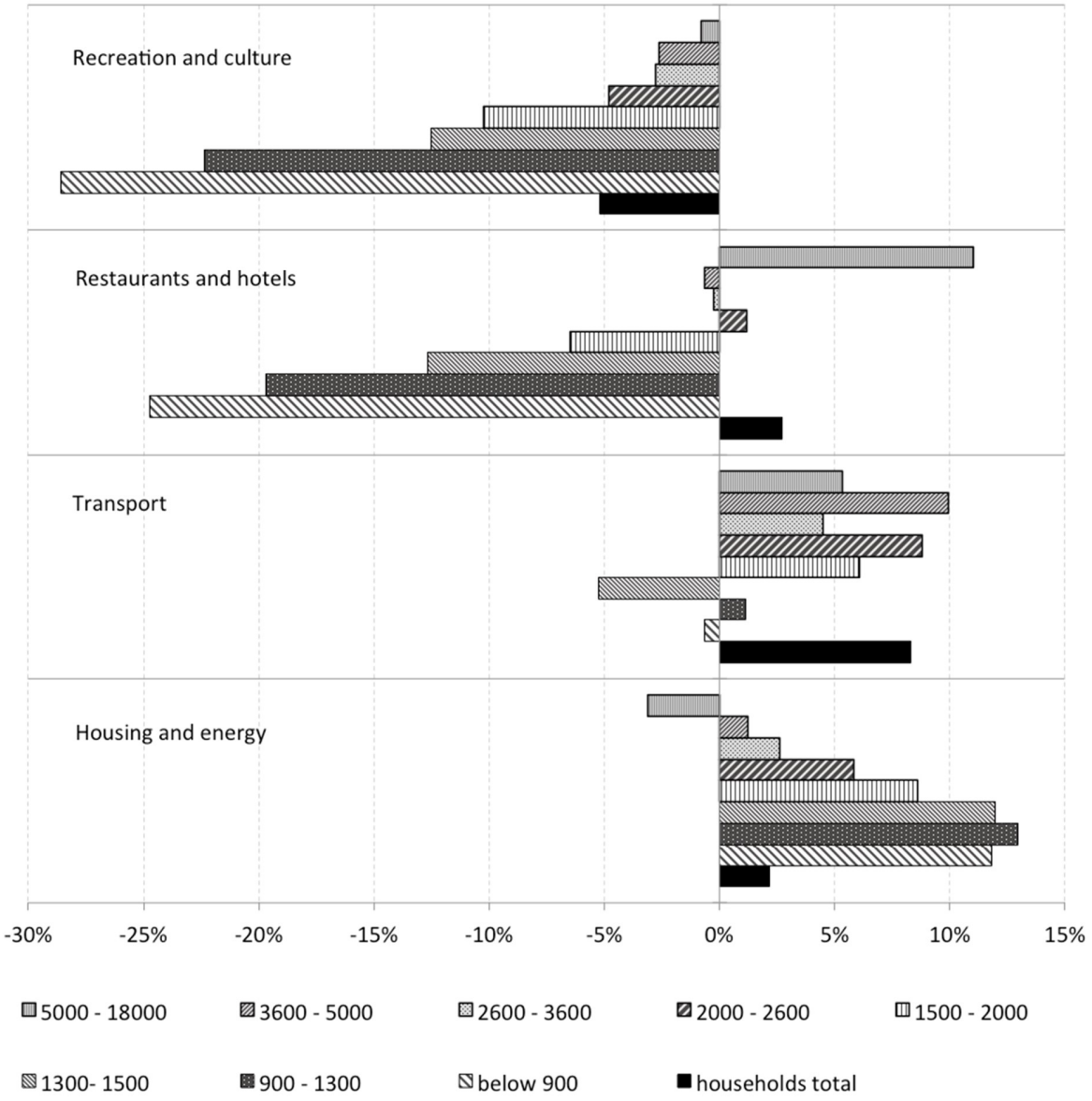

Figure 4: Percentage change of share of selected consumption by purpose and income groups from 1998 to 2008 (source: EVS 1998, 2008)

Another interesting pattern can be observed in the 'transport' category. Expenditures for 'transport' as a share of total expenditures rose by 8% between 1998 and 2008 on average. For monthly incomes above 1500€ the share of expenditure spend on 'transport' revolves around

the average. With respect to lower income groups, we can exemplify quite the contrary: expenditures for 'transport' as a share of total expenditures fall by 1% for monthly incomes below 900€. For monthly incomes between 900€ to 1300€ the share only increased by 1%. For the income group 1300-1500€ the share of expenditures spent on 'transport' even falls by 5%. Within the category 'transport', it is not expenditures on cars or other motor vehicles, but rather rising absolute expenditures on fuel, 'person-related transport service' and 'other services' which add to the increase in expenditures for the high income groups. This is particularly important, since air travel and flights are part of the 'transport service' category. This evidence is supported by supplement data on degree of equipment ownership (Ausstattungsgrad) and the stock of equipment (Ausstattungsbestand) of cars and motor vehicles, which does not change considerably between 1998 and 2008.

Expenditures for 'restaurants and hotels' mark even more striking changes as the expenditure share fell quite heavily for all income groups except for the highest group. In the lowest income group, the share of expenditures going to 'restaurants and hotels' fell by 25%. Contrarily, it increased by 11% in the highest income group. For the category 'recreation and culture', we find again that low-income groups reduced their consumption quite heavily. In the monthly income group below 900€ expenditure shares for 'restaurants and hotels' went down by 29%. In the monthly income group 900€ to 1300€ it decreased by 22%. In contrast, the share for 'restaurants and hotels' only decreased by 1% and 3% in the highest and second highest income group, respectively.

4.2 Consumption and household emissions

Turning to the environmental dimension, figure 5 shows CO2 emissions per decile group in 2008 for the different consumption purposes. In line with previous studies, we find that 'food and non-alcoholic beverages', 'transport' as well as 'housing and energy' are the most CO2 emitting consumption categories. On average, the three categories combined make up for 71.1% of total CO2 emissions. With respect to the different deciles, it is interesting to compare the CO2 emission of 'food and non-alcoholic beverages' and 'housing and energy' amounting to 69.5% of total emissions in the 1st decile. For the same categories, this goes down to 43.1% of total emission of the 10th decile. Conversely, 'transport', 'restaurants and hotels' and 'recreation

and culture' make up for 19.3% of total emission of the 1st decile, whereas it goes up to even 40.9% of the 10th decile, respectively.

These patterns are similar to what we can observe in figure 2: Necessities make up for the greatest amount of expenditures and CO2 emissions. Also, with rising income the share of non-necessity goods such as 'transport', 'recreation and culture' and 'restaurants and hotels' increases in expenditure and CO2 emissions.

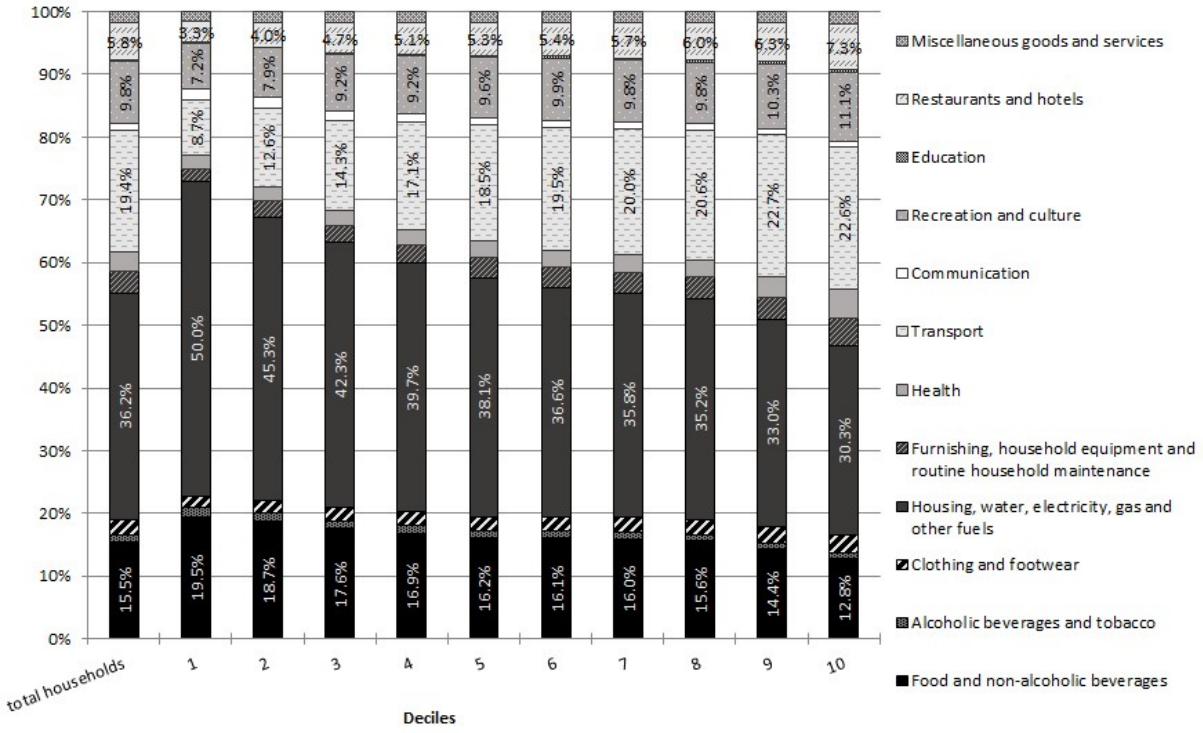

Figure 5: Share of CO2 emissions by consumption purpose and deciles 2008 (source: EVS 2008)

Computing CO2 emissions ratios for the different deciles, we find the following patterns for the D10/D1-ratios: With respect to the categories 'food and non-alcoholic beverages' and 'housing and energy' D10/D1 ratios are 3.3 and 3.1, meaning that the 10th decile emits about 3 times as much as the 1st decile due rising overall levels of consumption. Even more striking is the difference regarding the categories 'transport', 'restaurants and hotels' and 'recreation and culture', where D10/D1 ratios are as high as 13.1, 7.8 and 11, respectively. Hence, the 10th decile emits between just below 8 times as much in the category 'restaurants and hotels', and well above 10 times as much in the categories 'transport' and 'recreation and culture'.

5 Discussion

Overall we see that higher income groups pollute relatively more via consumption on goods that are not necessities: the share of 'transport', 'recreation and culture' and 'restaurant and hotels' increases with income, while especially the share of CO2 pollution caused by 'housing' decreases. Yet, looking at absolute CO2 emissions higher income groups pollute more. Across all consumption purposes the upper 10 per cent pollute five times more CO2 than the lowest decile.

Findings on consumption and inequality have shown that especially 'transport' has increased for higher incomes between 1998 and 2008. This could be interpreted as an increase in status or conspicuous consumption displayed through lavish travels and flights. Here we also find hints for consumption emulation, since it is not only the highest income groups which increased their consumption on 'transport' considerably, but the income groups above a monthly income of 1500€ as well. As 'transport' has the highest CO2 emission intensities, absolute higher consumption within this category as well as a relative shift of consumption patterns towards 'transport' instead of less resource-intensive consumption categories, contributes to higher absolute CO2 pollution.

For expenditures on 'restaurants and hotels' we find that only the highest income group increased its relative share (compared to other consumption purposes) as well as total expenditures in this category between 1998 and 2008. This implies that consumption not only increased in absolute terms, but that we can also observe a shift of consumption patterns towards luxury goods. Although we do not observe a change in consumption patterns for other income groups, we find that households above a monthly income of 2000€ still show an increase in absolute consumption in this category. This points towards consumption emulation by the income groups below the highest. A rise in 'restaurants and hotels' can be viewed as an indicator that people tend to travel more in recent years. This is in accordance with our findings on 'transport', where especially the sub-category on 'transportation services' (including expenditures on flights) increases - again, a rather resource-intensive way of spending money.

However, for both categories, 'transport' and 'restaurants and hotels', we find that for income groups below a monthly income of 1500€ and 2000€ consumption patterns are quite the contrary: the share of total expenditure on 'restaurants and hotels' decreased between 6% and

25% for the four lowest income groups. Regarding 'transport' shares either decrease slightly or are close to zero for the three lowest income groups. Thus, expenditure cascades are only evident for middle to higher income groups, but not for the lower ones. This seems quite reasonable, as we have seen that increasing shares of consumption are going to necessities such as 'housing' - not leaving much to spend on leisure and travel. Yet, further investigation is needed in order to specify this argument.

Our results are, thus, largely in line with previous studies: higher incomes lead to higher environmental pressures. However, our findings do not clearly support the idea of relatively resource-light consumption with increasing incomes, since we find that even they spend (relatively) more on 'transport' (Berthe and Elie 2015; Gough 2015; Kerkhof et al. 2009a, 2009b). Further, we do not find evidence for an environmental Kuznets curve at the level of household consumption as suggested by some scholars (e.g. Heerink et al. 2001, Scruggs 1998). In our analysis we focused on environmental effects of private consumption, and thus, did not include savings rates and wealth, both being higher with rising incomes. Including such a dimension would most likely further add to the environmental pressures from high incomes, since savings can be either understood as future consumption or seen as investment in new production possibilities, in any case leading to higher environmental burdens (for an extended argument see Bigun 2012).

Finally, it needs to be pointed out that several important factors influenced our results: With respect to CO2 emissions intensities, we adapted the data obtained by Kerkhof et al. (2009a) in absence of studies on the German case. This might cause a considerable bias; our results with respect to the CO2 emissions need to be understood as first hints rather than cast in stone. Also, emission intensity values per product group are assumed to be constant over the different income groups and expenditure levels. Such an approximation does not take differences in emissions for similar products into account as only average pollution of the production are taken into account. Hence, vegan shoes for 100€ are assumed to have a similar environmental impact as Nikes for a similar price. Ultimately, sustainable lifestyles cannot sufficiently be captured by the data. Additionally, the data we obtained from the Federal Statistical Office of Germany (Statistisches Bundesamt) on Income and Consumption excludes households above income levels of 18000€ as no representative data for this income group could be obtained in

the survey. Although this might not severely affect average numbers, it has an impact on our results and possibly underestimates the consumption of high incomes.

6 Conclusion

Environmental impacts stemming from consumption increase substantially with rising household expenditures. Even though the composition of private consumption differs over the different income groups and changes overtime within income groups, environmental impacts still increase.

The relative importance of environmental impacts resulting from consumption of necessities and luxury goods is in our findings twofold: on the one hand, we find that share of recreational activities, expenses for 'hotels and restaurants' are higher for higher incomes and also increase over time. Here, we find hints for status and conspicuous consumption, but lower income groups only imitate this trend on a limited scale. For 'transport' we definitely see traces of conspicuous consumption: the highest income groups increased their share of 'transport'-related expenditures. This trend is emulated by lower income groups up until a certain threshold. Ultimately, we do find first hints for environmental consumption cascades i.e. that rising income inequality fuels resource-intensive status consumption leading to greater CO2 emissions.

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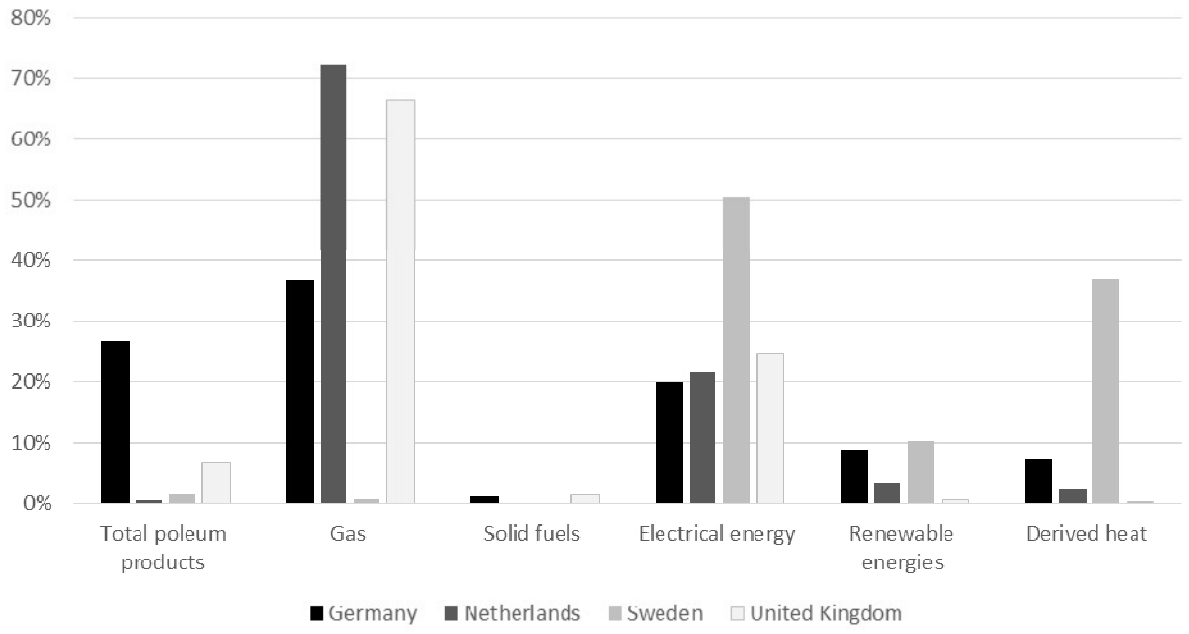
8 Appendix

8.1 Population density

Country	Population density (per m²)
Germany	231,8
Netherlands	447,5
Norway	15,4
UK	258,9
Sweden	21,1

Source: UNdata (2015) Country Profile for Germany, Netherlands, United Kingdom and Sweden, data is for 2012

8.2 Final energy consumption in households by fuel



Source: Eurostat (2015), http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=de&pcode=t2020_rk210, data retrieved 4 September 2015

8.3 CO2 emission intensity (kg CO2/Euro)

Product groups	NL	UK	SE	NO	DE
Food and non-alcoholic beverages	0,86	0,66	0,7	0,67	0,86
Alcoholic beverages and tobacco	0,41	0,31	0,17	0,35	0,41
Clothing and footwear	0,35	0,31	0,16	0,3	0,35
Housing, water, electricity, gas and other fuels	1,23	1,33	0,31	0,2	0,77
Furnishing, household equipment and routine household maintenance	0,47	0,5	0,2	0,43	0,47
Health	0,51	0,77	0,09	0,25	0,51
Transport	1,06	0,92	0,99	0,82	0,92
Communication	0,28	0,37	0,08	0,22	0,28
Recreation and culture	0,6	0,34	0,25	0,37	0,6
Education	0,24	0,21	0,12	0,1	0,24
Restaurants and hotels	0,8	0,87	0,57	0,2	0,8
Miscellaneous goods and services	0,28	0,63	0,12	0,25	0,28

Source: Kerkoff et al. (2009a: 1511): CO2 emission intensities of the 12 main categories of COICOP for the Netherlands (2000), UK (1998), Sweden (2002) and Norway (1997); Germany: own calculations