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To each their own? The greenhouse gas impacts of intra-household sharing in different urban zones

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ABSTRACT

Decreasing household size is a global trend, driven by urbanization and multiple other socioeconomic trends. Going solo poses a great environmental challenge, as the possibility to benefit from scale economies in consumption and its greenhouse gas impacts is not taken advantage of. In other words, understanding of intra-household sharing patterns of different consumption categories is increasingly important in climate change mitigation.

This paper explores the relationship between household sizes, urban structures, and greenhouse gas impacts of lifestyles. When urban areas grow outwards, the household sizes also grow. As a result of this, the increase in intra-household sharing seems to alleviate the negative GHG implications of urban sprawl, which is highly logical but yet not comprehended. Thus, the rise of collaborative consumption offers potential to reduce the greenhouse gas emissions of solo dwellers, and compensate for the lower intra-household sharing with inter-household sharing.

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1. Introduction

Sharing is a fundamental part of human nature and economic behavior (Price, 1975). The benefits from sharing resources have affected the very birth of cities, and recently, new forms of sharing have originated in these hubs of people, knowledge, and resources where density allows for easy interactions. Car pools, couch surfing, community supported agriculture, online auctions and the increase of all kinds of renting possibilities have become more common and are often grouped under sharing economy or collaborative consumption (Belk, 2014). The rapid development of new ways of consumption has largely been enabled and complemented by the Internet and development of new marketplaces. Even though the collaborative consumption and novel ways of online-enabled sharing have increased the sharing between households, we are still much more likely to share resources within families than among strangers (Belk, 2014). It has been said that caring and sharing are the very ingredients that distinguish a family from a corporation (Belk, 2007).

Sharing is often economical and therefore rational, at least according to rational choice theory. In previous literature, the existence of household public goods leading to economies of scale in consumption has been established. For example, Lazear and Michael (1979) note that utilization rate of certain household goods, such as home electronics and other appliances, can be raised by increasing household size. This means that same standard of living can be achieved more easily when there are more household members. Nelson (1988) found that all groups of consumption goods—food, shelter, clothing, household furnishings and operations, and transportation—are all at least to some extent public within a household. They found the economies of scale to be highest for shelter, followed by household furnishings, food, clothing, and transportation in decreasing order.

In addition to these monetary benefits of consumption, those living in bigger households also get advantages of economies of scale in time use, as for example the amount of time dedicated to household chores does not grow linearly with household size. Also the term “economies of scope” has been used to describe situations where both time and money can be saved when doing things together (Browning et al., 2013). As social contacts are one of the central dimensions of subjective well-being (Stiglitz et al., 2009), it is likely that there are also social benefits when doing things together compared to doing them alone.

Decreases in household sizes and increases in demand for accommodating housing across the globe, driven by urbanization and multiple socio-economic trends, pose a great environmental challenge (Bradbury et al., 2014). The other way around, sharing within household—in other words, intra-household sharing—can be a

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very important phenomenon in mitigating greenhouse gas (GHG) emissions. Also, sharing beyond household, collaborative consumption and sharing economy have gained momentum from the increasing awareness of environmental problems, especially climate change. From an environmental sustainability perspective, the sharing of resources intuitively leads to lower resource use and less harmful environmental effects. Nevertheless, the monetary resources released by sharing allow more to be spent on something else; public and private goods alike (Deaton and Paxson, 1998). Behavioral responses to seemingly environmentally-beneficial changes, such as energy-efficiency improvements that lead to the reduced effective price of energy services, are called rebound effects (Druckman et al., 2011). Thus, we should be aware of the multiple effects whose impacts can be sometimes contradictory. For example, Ottelin et al. (2014) found a trade-off between car ownership and air travel in the middle-income class, meaning that households that do not own a car tend to use the saved money to go on multiple holidays, traveling by plane.

We need a better understanding of the dynamics of low-carbon and sustainable lifestyle changes (Mont et al., 2014). Some authors see only household income and size as relevant in explaining emissions (Wier et al., 2001). Indeed, several studies have shown that a higher number of household members significantly reduces carbon footprints (Heinonen et al., 2013; Minx et al., 2013; Ala-Mantila et al., 2014; Ottelin et al., 2015) and energy consumption (Lenzen et al., 2006; Wiedenhofer et al., 2013) per capita. However, the effect of household size depends on the type of emissions considered. It is rather evident that the most GHG-intensive commodities—like heating energy, electricity, and transport fuels—are also commodities and thus likely to be shared within households. Less GHG-intensive goods and services, on the other hand, are more rival, in other words, less sharable (meaning that the indirect expenses inherently compete with each other as each household member requires at least some separate goods and services—such as clothes and footwear—and such consumption by one member means less consumption by another member) (Underwood and Zahran, 2015.) Thus, even though larger households have higher expenditures in the most GHG-intensive categories (such as energy) they benefit more from economies of scale and cause fewer emissions, mainly thanks to sharing. However, the smaller households, which are often also more affluent, steer their consumption more towards rival expenditures and cause an upward pressure on indirect carbon dioxide emissions (Underwood and Zahran, 2015) (where *indirect* refers to emissions embodied in the consumption of products and services) (Bin and Dowlatabadi, 2005; Druckman and Jackson, 2009).

Besides household size, spatial location also matters. For example, Baur et al. (2015) conclude that the average household size and the edge density of discontinuous dense urban fabric alone can explain up to 86% of the variance of the GHG emissions of EU cities. According to Minx et al. (2013), population density reduces the footprint to some extent, but its power is limited compared to socio-demographic, infrastructural and geographic characteristics. Consequently, debate about the environmental effects of urbanization remains active, and both positive and negative consequences have been brought out (e.g., Glaeser and Kahn, 2010; Sovacool and Brown, 2010; Wiedenhofer et al., 2013). However, a substantial fraction of the debates can be traced down to methodological issues, namely, the choice between production and consumption base accounting for emissions and differences in dependent variables and geographic scales (see Jorgenson et al., 2014). In previous literature, more rural areas are usually associated with higher emissions, at least when controlling for other factors (Shammin et al., 2010; Büchs and Schnepf, 2013; Ala-Mantila et al., 2014). However, the connection seems to be non-universal and depend on, for example, the level development of a country (Jorgenson et al., 2014). Within the context of cities, urban sprawl has been connected to higher GHG emissions due to higher car-dependency and more spacious apartments (e.g., Glaeser and Kahn, 2010).

We believe that even if variables (such as household size) in themselves are important in explaining GHG emissions, it is essential to understand multiple mechanisms and their interplay. Thus, in our paper, we analyze consumption-based GHG consequences of different lifestyles and investigate the effects of household sizes, structures, and the spatial context. We analyze the effects of intra-household sharing on carbon emissions caused by different consumption categories.

We add to the previous literature on the analysis of the relationship between area structures and household sharing, instead of looking the two separately. The purpose is to estimate to what extent different goods and services are shared in different types of household and urban structures, and how this sharing affects their carbon footprints. Knowing the significance of sharing in alleviating the GHG consequences of different consumption groups, we aim to quantify the relationship between sharing and a household's spatial location and structure (the number of adults, the number of children and the elderly. When urban areas grow outwards, household sizes also tend to grow, and the built-in increase in sharing is thus likely to mitigate the GHG consequences of living at the urban edges. We also draw conclusions about where collaborative consumption, or inter-household sharing, has the highest mitigation potential.

The main policy implication of the study is that the sharing, even within a household, should mitigate carbon footprints to much larger extent as it currently does, and there is a lot of work ahead in order to redeem the promise related to the rise of contemporary sharing activity. The trend of declining household size coupled with continuing urbanization, pose challenges as well as create possibilities, as smaller households located in the city centers tend to consume more and share less but, on the other hand, could easily make use of the possibilities that proximity offers for inter-household sharing. Thus, the rise of collaborative consumption offers a potential to reduce the GHG emissions of cities, and compensate for intra-household sharing with inter-household sharing. In addition, it seems that certain consumption goods are shared within households to a surprisingly low degree, which indicates that increasing within-household sharing has potential to mitigate the emissions caused by lifestyles everywhere.

The article is constructed as follows: first, we will describe the materials and methods, and then we move on to results. In Chapter Four we discuss our results and finish with conclusions.

2. Materials and methods

We restrict our analysis on households located in urban areas in order to investigate households with more similar preferences and lifestyles. Furthermore, our choice is justified as Finland is very sparsely populated and our focus allows us to understand urban sprawl and get results that have relevance in urban policy making beyond our case country.

Households in our sample are located in either the capital (Helsinki), inner-, outer-, or peri-urban zones. The last three zones are based on an urban–rural classification system developed by the Finnish Environment Institute in which the main criteria for an area to be described as an urban area is a population size higher than 15 000 residents. Each of these agglomerations consists of a core urban area, which is divided into an inner- and outer-urban area. Surrounding the core urban area is a peri-urban area, which is an intermediate zone between urban and rural. The limit values for the

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