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Downsizing of Housing: Negotiating Sufficiency and Spatial Norms

Abstract

Housing is one of the major sources of the environmental impact of consumption. An aspect of housing that has rarely been considered in previous studies on sustainable housing is the size of the dwelling, even though research has shown the impact of dwelling size on the environmental impact of housing to be significant. This study analyzes socio-cultural meanings about downsizing as well as norms about dwelling size. The study analyzes naturally occurring, cultural texts (media texts and corporate communications about small-sized dwellings). The study offers a view on how the meaning of downsizing is negotiated, the (in)voluntariness of downsizing emerging as the main point to be negotiated. Additionally, the study offers understanding for how norms about dwelling size are negotiated in order to normalize smaller dwellings. In these ways, the study offers researchers insights about how downsizing can be advanced in order to reduce the environmental impact of housing.

Keywords

Dwelling size, spatial norms, sufficiency, sustainable consumption, sustainable housing

Introduction

Scientists agree that the environmental impact of human activity needs to be decreased to a sustainable level (e.g. Rockström et al. 2009; Steffen et al. 2015; WWF 2016). In recent years, macromarketers have joined practitioners and researchers from across academic disciplines in taking a focus on sustainability (e.g. Dolan 2002; Kilbourne, McDonagh, and Prothero 1997; Newholm and Shaw 2007; Papaoikonomou, Ryan, and Valverde 2011; Schaefer and Crane 2005). Recently, the *Journal of Macromarketing* published a two-part special issue on sustainability as a megatrend (McDonagh and Prothero 2014; Prothero and McDonagh 2015), which contained several articles on sustainable consumption.

Housing is one of the major sources of the negative environmental impact of human activity, as it accounts for 44 per cent of total energy use and around a quarter of households' greenhouse gas emissions (UNEP 2010). In Finland, housing accounts for 27 per cent of the environmental impact of the average consumer (Kotakorpi, Lähteenoja, and Lettenmeier 2008; Lettenmeier, Liedtke, and Rohn 2014). Accordingly, advancing environmentally sustainable housing should be a priority in improving sustainable consumption. Lettenmeier, Liedtke, and Rohn (2014, p. 496) suggest a need for an 85 per cent reduction in the material footprint of housing in the context of Finland.

Numerous researchers argue that consumption levels need to be reduced if consumption is to be environmentally sustainable (e.g. Jackson 2016; Lorek and Fuchs 2013; Lorek and Spangenberg 2014). In the context of housing, downsizing is one way to reduce consumption levels, reducing the amount of living space and thus natural resources used for construction, heating, and cooling. Research has shown the impact of dwelling size on the environmental impact of housing to be significant (Hille, Simonsen, and Aall 2011; Klunder 2004; Wilson and Boehland 2005). Lettenmeier, Liedtke, and Rohn argue that decreasing dwelling sizes is one of the key ways to reduce the environmental impact of housing, and they suggest that a fifty percent reduction in living space per person (in Finland) is needed (2014, p. 497). Despite this, dwelling size has rarely been considered in previous studies on sustainable housing. Extant research on dwelling size mainly focuses on the social dimension of dwelling size and the need for adequate living space (e.g. Madeddu, Gallent, and Mace 2015; Winston and Eastaway 2008). Decreases in dwelling size motivated by environmental sustainability have only begun to attract research interest, with a handful of studies only touching on the subject (Anson 2014; Hagbert 2016; Hagbert and Femenías 2016).

This article studies the downsizing of housing, particularly from a macro perspective so as to analyze the socio-cultural meanings about downsizing and norms about dwelling size. Jackson (2016) asserts that reducing consumption requires changing the social logic that drives consumer demand, while Cherry et al. (2015, p. 303) argue that socio-cultural understandings are critical in transitions towards more sustainable housing. Macromarketing acknowledges that culture shapes markets (Kilbourne and Mittelstaedt 2012; Mittelstaedt, Kilbourne, and Mittelstaedt 2006) and constrains and enables the actions of different actors in the market (Humphreys 2014). Understanding socio-cultural meanings and norms about downsizing is thus essential if we want to advance transitions towards smaller sized dwellings. Cultural analyses of sustainable consumption have previously been conducted with a macromarketing perspective in contexts such as meat consumption and plant-based diets (Beverland 2014), mobility (Dalpian, da Silveira, and Rossi 2015), ecovillages (Casey, Lichrou, and O'Malley 2017), and waste (Guillard and Roux 2014). This study extends previous research to analyze downsizing of housing.

The focus of this article is two-fold: 1) to analyze socio-cultural meanings about downsizing; 2) to analyze how downsizing negotiates dominant norms about dwelling size. This study suggests how the meaning of downsizing is negotiated, the perceived (in)voluntariness of downsizing being the crucial point of negotiation. This study further suggests how norms about dwelling size are negotiated to normalize smaller dwelling sizes. The findings suggest the potential of downsizing efforts to be received positively while also identifying a resistance towards downsizing, which efforts to reduce dwelling sizes need to address.

This study suggests macromarketers how reductions in consumption are met in the market, emphasizing the ongoing negotiation of the desirability of such reductions. Compared to previous research, particularly the body of research on voluntary simplicity (e.g. Alexander and Ussher 2012; Elgin and Mitchell 1977), this study presents an alternative finding—reductions in consumption are often seen by consumers as forced or as involuntary changes in their consumption patterns. It is important for macromarketers to understand that consumers may perceive some reductions in consumption as at least partially coerced.

Furthermore, previous research has suggested that reductions in consumption require that consumers must challenge dominant consumption norms (Gorge et al. 2015; Hagbert 2016). The findings of this study suggest that it is also possible to frame reductions in consumption as conforming to dominant norms. In this way, consumers do not have to challenge consumption norms, but rather interpret reductions in consumption to comply with existing norms. As such,

this article offers new insights for how downsizing in particular and reductions in consumption in general can be advanced by various actors in the market.

This article begins by discussing dwelling size and its relation to sustainability. This is followed by a presentation of the theoretical concepts of sufficiency (e.g. Gorge et al. 2015) and spatial norms (e.g. Hagbert and Femenías 2016), which are used to analyze downsizing in this study. The following section presents the methodology of the empirical study, which consist of an analysis of naturally occurring cultural texts (Moisander and Valtonen 2006) about small-sized, detached houses and apartments. This is followed by a presentation of the findings of the study. The article concludes with a discussion of the theoretical contribution and practical implications of the study, as well as limitations of the empirical study, and directions for future research.

Dwelling Size and Sustainability

Previous research on sustainable housing has rarely included dwelling size as a research topic. An overview of the literature on dwelling size is found in Figure 1. Raworth (2012) defines sustainability as the space between a minimum acceptable standard of living and a maximum limit placed by environmental boundaries. Following Raworth, sustainable dwelling size has, in this study, been conceptualized as sufficient space, defined as a dwelling size that meets the minimum acceptable dwelling size for an acceptable standard of living, but does not exceed the limits for what the planet can sustain. In such a frame, previous research on dwelling size can be divided into two streams of research: studies that are concerned with increasing dwelling size from one that is insufficient to a sufficient level, and studies that are concerned with decreasing dwelling size from excess space to sufficient space.

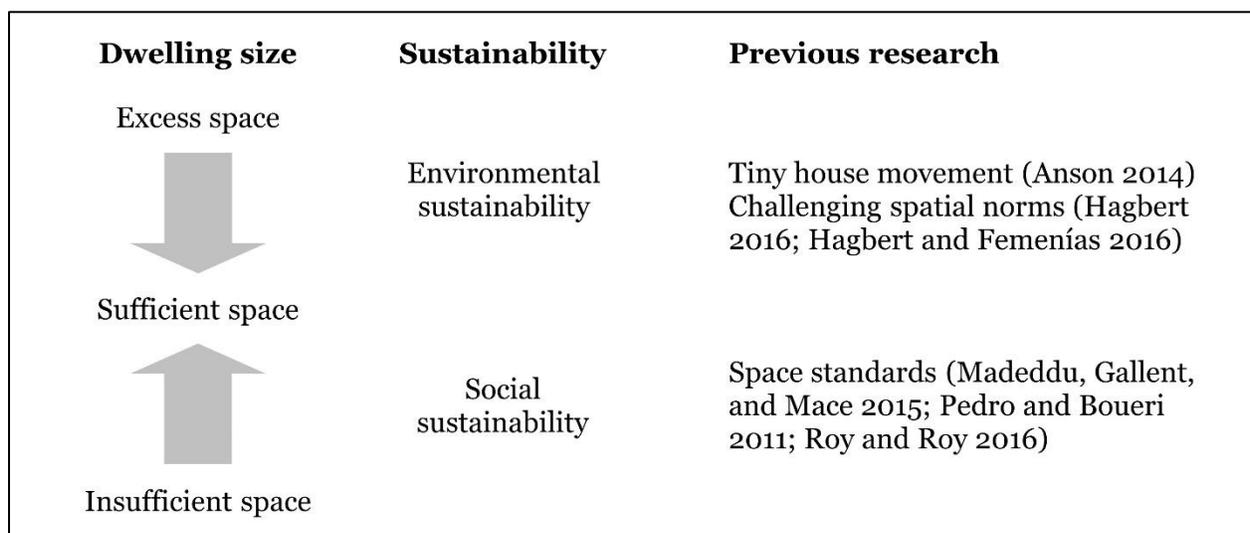


Figure 1 Overview of literature on dwelling size and sustainability

In previous research on dwelling size, the concern has mainly been to increase dwelling size from a space that is below an acceptable standard of living to a dwelling size that is considered sufficient for a decent standard of living. This stream of research is depicted in the lower half of Figure 1. Increasing dwelling size is a concern mainly related to the social dimension of

sustainability, as it is focused on the well-being of the people living in the dwellings. Winston and Eastaway (2008, p. 218) mention the number of rooms and size of living space per person, shortage of space, and overcrowded dwellings as points to consider when assessing the sufficiency of dwelling size.

Research on insufficient dwelling size has particularly focused on examining space standards and what an appropriate amount of space is. Space standards regulate the minimum allowed dwelling size (Madeddu, Gallent, and Mace 2015), often with the aim to ensure decent living conditions for low-income segments of the population (Pedro and Boueri 2011). Space standards may include regulations regarding the total floor area, number of rooms and size of rooms (Pedro and Boueri 2011). Space standards have been studied in many different contexts. For example, Madeddu, Gallent, and Mace (2015) study Italian space standards with the aim to consider the possibility of space standards improving living conditions in Britain. Pedro and Boueri (2011) compare space standards for affordable housing in Portugal and Brazil, while Roy and Roy (2016) study space standards for low-income housing in India.

However, dwelling size can also be studied with a focus on the environmental dimension of sustainability; the concern, then, is to decrease dwelling size from one of excess space to a sufficient level. This is a concern primarily in high-consuming societies (Hagbert 2016) and is the focus of this study. This stream of research is depicted in the upper half of Figure 1. The aim in this case is to decrease dwelling sizes to a level that is both socially and environmentally sustainable, by maintaining a dwelling size that is sufficient to ensure enjoyable living conditions, but that is also environmentally sustainable.

A number of authors stress the environmental impact of excessive dwelling size, citing mainly the effect dwelling size has on energy use (Hagbert and Femenías 2016; Hille, Simonsen, and Aall 2011), particularly in regards to heating and cooling of dwellings (Vale and Vale 2010; Wilson and Boehland 2005). Klunder (2004, p. 119) found that the use of energy, materials, and water increases with dwelling size. Hille, Simonsen, and Aall (2011) found dwelling size to be the most important factor affecting changing trends in energy use of Norwegian households. Comparing similar houses of different size, Wilson and Boehland (2005) found that a reduction in floor area by half resulted in a reduction in energy used for heating by over a half, while energy used for cooling was a third lower.

Thus, decreasing dwelling sizes can result in significant decreases in the environmental impact of housing. However, previous research has only touched upon the possibility of decreasing dwelling size. Most notably, Hagbert (2016) has analyzed people's potential willingness to live in smaller spaces and engage in voluntary simplicity, consuming less to preserve the environment. Her findings indicate an openness to downsizing, with two-thirds of respondents in a qualitative interview study reporting being willing to consider living in a smaller dwelling and 40 per cent reporting a willingness to engage in voluntary simplicity (Hagbert 2016, p. 295-296).

However, in another study, Hagbert and Femenías (2016) examined housing development and found that the decision to build smaller apartments was mainly due to the demand for affordable apartments. The authors conclude that downsizing seemed to be motivated by financial necessity rather than environmental concerns. Similarly, Anson (2014, p. 294) criticizes the rhetoric of economic freedom of the tiny house movement by acknowledging that living in small spaces is not a voluntary choice for everyone, contrasting the trendy tiny houses with less desirable apartment complexes and trailer parks. As such, research seems to suggest that downsizing can be perceived both as a voluntary choice and as an involuntary necessity.

Downsizing, Sufficiency, and Spatial Norms

Sufficiency

This study conceptualizes downsizing as a practice of sufficiency. Previous research on sustainable consumption has contrasted two alternative perspectives that argue for different solutions to achieve sustainable consumption, referred to as efficiency and sufficiency. Lorek and Fuchs (2013) suggest that efficiency, sometimes referred to as weak sustainability, is the dominant perspective in sustainable consumption. Efficiency assumes that incremental changes within the current economic system will suffice to achieve sustainable consumption (Bebbington 2001). It relies on technological innovations to make consumption sustainable, assuming no changes to consumption practices are necessary (Lorek and Spangenberg 2014).

In the context of housing, efficiency relies on green technologies such as improved insulation and renewable energy sources to improve the energy efficiency of dwellings and reduce CO₂ emissions (e.g. Audenaert, De Cleyn, and Buyle 2012; Knudstrup, Hansen, and Brunsgaard 2009; Whang and Kim 2014). Efficiency does not require changes to how we inhabit our dwellings.

Efficiency draws on the technological optimism of the dominant social paradigm. Kilbourne, McDonagh, and Prothero (1997) introduced the idea of the dominant social paradigm to macromarketing as “the social lens through which groups and individuals interpret their world” (Mittelstaedt et al. 2014, p. 255). This includes phenomena such as consumption. Kilbourne, McDonagh, and Prothero (1997) suggest that our current Western society is characterized by a dominant social paradigm in which an ideology of consumption equates high levels of consumption with a high quality of life. Economic, technological, and political structures support the ideology of consumption and the technological optimism prevalent in Western society promotes technology as a solution to all problems (Mittelstaedt et al. 2014), including environmental degradation. Efficiency as a means to advance sustainable consumption remains within the dominant social paradigm and allows the present ideology of consumption to remain. This encourages a reliance on technological development to solve environmental problems related to high levels of consumption.

However, several researchers argue that efficiency efforts are insufficient to achieve environmentally sustainable consumption and that we need to question current consumption practices (e.g. Jackson 2016; Lorek and Fuchs 2013; Lorek and Spangenberg 2014). Kilbourne, McDonagh, and Prothero (1997) argue that the environmental problems resulting from current high consumption levels require a transformation of the dominant social paradigm and a radical change in the ideology of consumption. Researchers have suggested that efficiency be complemented by an approach of sufficiency, alternatively referred to as strong sustainability (e.g. Jackson 2016; Lorek and Fuchs 2013; Lorek and Spangenberg 2014). Sufficiency entails changing consumption patterns and reducing consumption levels (Fuchs and Lorek 2005). It requires more fundamental systemic change (Bebbington 2001) and questions current consumption norms (Gorge et al. 2015). Sufficiency thus questions the technological optimism of the dominant social paradigm and suggests a radical change to the ideology of consumption central to the dominant social paradigm.

In the context of housing, sufficiency would entail reducing the amount of per capita living space. Research has identified a number of possibilities to achieve this. The focus of this study is downsizing, reducing the overall size of dwellings. Others have considered the effect of

household size on the environmental impact of housing (Williams 2007), suggesting such living arrangements as extended family households (Klocker, Gibson, and Borger 2012) and peer-shared households (Williams 2007) to increase household sizes. Sharing living spaces among households in arrangements such as cohousing (Jarvis 2011) has previously been studied.

A concept related to sufficiency is that of voluntary simplicity. Voluntary simplicity refers to a voluntarily made lifestyle choice by individuals that mainly entails consuming in lower quantities (Peyer et al. 2017), with the dual aim to preserve the environment and increase the well-being of the individual pursuing voluntary simplicity (Elgin and Mitchell 1977). Alexander and Ussher (2012, p. 76) found the most common motivation to engage in a lifestyle of voluntary simplicity to be environmental concern. Studies have shown voluntary simplicity to be linked to higher life satisfaction (Boujbel and d'Astous 2012; Rich, Hanna, and Wright 2017) and happiness (Alexander and Ussher 2012). Thus, the literature on voluntary simplicity points to reductions in consumption being possible without compromising well-being. Downsizing could be one aspect of a lifestyle of voluntary simplicity, which would entail individuals making the voluntary choice to live in smaller dwellings, motivated by a concern for the environment, but also aiming to increase their own well-being.

However, Gorge et al. (2015) argue that efforts towards sufficiency cannot be limited to only voluntary behavioral change. For change to occur, obligatory measures may be necessary. Furthermore, while voluntary simplicity focuses on individual consumers (Schaefer and Crane 2005, p. 86), Lorek and Fuchs (2013, p. 39) argue that sufficiency requires structural change beyond the lifestyle choices of voluntary simplifiers.

Spatial Norms

Gorge et al. (2015) suggest that sufficiency as a concept questions dominant consumption norms. Downsizing can thus be expected to challenge dominant spatial norms. Norms here are defined as “shared expectation[s] of behavior that [are] considered culturally desirable and/or appropriate” (Scott 2014, p. 519). Spatial norms thus refer to normative valuations of the size of living space that is considered desirable or appropriate in a specific cultural context. In such, spatial norms are context-bound (Hagbert and Femenías 2016, p. 6). Perceptions of insufficient, sufficient, and excess space are not universal, but dependent on the dominant spatial norms in a specific cultural context. For example, Pedro and Boueri’s (2011) comparative study suggests that space standards for a minimum, adequate dwelling size differ greatly between the cases of Portugal and Brazil, with Brazilian dwellings being much smaller in size.

Previous research indicates that small-sized dwellings are evaluated against dominant spatial norms. Comparing studies that have measured the satisfaction of dwelling size in in Portugal and Brazil, Pedro and Boueri (2011) found that occupants’ satisfaction with the dwelling size is higher in Brazil than in Portugal, despite the smaller size of the dwellings in Brazil. Furthermore, Hagbert (2016) found that people’s willingness to downsize was negotiated against norms of what is considered a good home, whereas Hagbert and Femenías (2016) found that housing developers stay within dominant spatial norms, not considering alternatives such as voluntary simplicity. The work of Hagbert and colleagues (Hagbert 2016; Hagbert and Femenías 2016) points to a need to challenge current norms for spatial needs in order for downsizing to become a viable mainstream option.

However, changes in spatial norms have remained mostly unexplored in previous research. Hagbert (2016) explores the potential to challenge spatial norms but does not consider changes

in dwelling sizes. Anson (2014) touches upon the topic in her discussion of the tiny house movement. The tiny house movement is a mode of living that seems to have succeeded in challenging spatial norms. Anson (2014, p. 294) asserts that the tiny house movement has rebranded small spaces as desirable and aesthetically pleasing, in comparison with the negative connotations of equally small dwellings in apartment complexes or trailer parks. However, many of the central themes of Anson's analysis, such as mobility, self-reliance and escapism, are specific to the tiny house movement; as such, her discussion cannot be directly applied to small-sized dwellings in general, and further research is needed to fully understand how downsizing challenges spatial norms. This study addresses this question.

Research Methodology

The empirical study analyses small-sized, detached houses and apartments in Finland—a suitable context to study downsizing. As a high-consuming society, Finland is one of the affluent countries that researchers call for to implement sufficiency (Lorek and Fuchs 2013), including downsizing (Hagbert 2016). Due to the country's Northern location, Finland experiences cold winters and thus the need for heating is substantial—over a third of the environmental impact of housing in Finland coming from heating (Kotakorpi, Lähteenoja, and Lettenmeier 2008). This indicates a substantive potential to decrease the environmental impact of housing by downsizing and thus decreasing the amount of space that needs to be heated. Furthermore, much attention in Finland is given to the energy use of buildings; all new detached houses and apartment buildings require an energy certificate, indicating that the environmental sustainability of housing is an issue of high interest.

In 2015, the average living area per person in Finland was 40.4 m² (Tilastokeskus 2016) according to national statistical data. Lettenmeier, Liedtke, and Rohn (2014) suggest this needs to be decreased to an average living space of 20 m² per person. Half of the population in Finland lives in detached houses, whereas just over a third of the population lives in apartments (Suomen virallinen tilasto 2015). Both detached houses and apartments were therefore included in the empirical study in order to capture the housing structure of the Finnish context.

The empirical study analyses naturally occurring cultural texts (Moisander and Valtonen 2006, p. 69) about small-sized detached houses and apartments. Naturally occurring cultural texts are data in the form of textual materials that are produced in a specific cultural context independent of the researcher. They are analyzed to understand the cultural context in which they have been produced (Moisander and Valtonen 2006). Thus, the unit of analysis is not the individual actors producing the texts, but rather what the texts reveal about the socio-cultural meanings and norms of the cultural context in which the texts are produced.

The empirical data in this study consists of media texts and corporate communication about small-sized, detached houses and apartments. Media texts have previously been analyzed as indicators of cultural understandings and norms (Humphreys 2014). Similarly, in this study, the media texts are analyzed as cultural texts. As the current public discussion in Finland about small-sized housing has been initiated largely by companies bringing small-sized, detached houses and apartments to the market, it was considered important to include corporate communication about these housing offerings. Also, company-produced material is often indicative of broader cultural discourses (Moisander and Valtonen 2006). As such, corporate communications are treated as cultural texts in this study. Kastelli Cubic for detached houses and Sato StudioKoti for apartments represent two of the most prominent small-dwelling

offerings and are included in the data, as they have been marketed and publicly discussed as small-sized dwellings.

Kastelli is a Finnish company selling prefabricated, detached houses (see www.kastelli.fi). In January 2016, the company introduced its Cubic line of houses, which is marketed for its small size. The six houses in the line range in size from the smallest 49 m² to the largest 105 m². As a comparison, the average size of a detached house in Finland is 111 m² (Tilastokeskus 2016). The Kastelli Cubic houses thus fall well below the average-sized, detached house in Finland, with the smallest Cubic house – and the one that has attracted the most attention in the media – having a size less than half of the average size of detached houses in Finland. Furthermore, according to national statistical data, the average living space per person in detached houses in Finland is 43.6 m² (Suomen virallinen tilasto 2015). Based on the number of bedrooms, the living space per person in the Kastelli Cubic detached houses ranges from 19.4 m² to 27.8 m², significantly less than the national average and just reaching the goal of 20 m² determined by Lettenmeier, Liedtke, and Rohn (2014) for the lowest in the range.

Sato is a Finnish housing investment company providing rental housing (see www.sato.fi). In 2016, the company introduced a new housing concept, StudioKoti (translated to studio home). StudioKoti apartments are exceptionally small, dwelling size measuring 15.5 m² plus a loft for sleeping of 6 m². In the Helsinki metropolitan area, Sato is currently building the first apartment building with StudioKoti apartments. As the average size of apartments in Finland is 56.4 m² (Tilastokeskus 2016), the Sato StudioKoti apartments are substantially smaller than apartments on average in Finland. The average living space per person in apartments in Finland is 35.0 m² according to national statistical data (Suomen virallinen tilasto 2015). Sato markets the StudioKoti apartments to single and two person households, the average living space per person including the loft area being substantially below average at 10.8/21.5 m² and almost reaching the goal of 20 m² (Lettenmeier, Liedtke, and Rohn 2014).

The empirical material in this study consists of four sets of data:

- media texts about small-sized, detached houses
- media texts about small-sized apartments
- corporate communication from Kastelli about the Cubic line of detached houses
- corporate communication from Sato about the StudioKoti apartments

All the empirical material analyzed is listed in Appendix 1. The media texts analyzed were gathered from a database containing all Finnish daily newspapers, with some additional relevant media sources added, such as the website of the Finnish national broadcasting company Yle. The empirical material contains a total of 41 media texts published in the years 2014-2016 on the topics of small-sized, detached houses and apartments. The corporate communication analyzed includes all publicly available marketing material from the two case companies Kastelli and Sato about their housing offerings Kastelli Cubic and Sato StudioKoti. The empirical data includes the companies' websites, published press releases, a promotional YouTube video (Sato), a promotional brochure (Kastelli), and a customer magazine (Kastelli). References to the empirical data throughout the remainder of the article are made according to the identifiers given to each piece of empirical material as found in the appendix. All quotes from the data used in presenting the findings of the study have been translated from Finnish by the researcher.

The empirical data was analyzed by coding the data into emerging categories (Spiggle 1994). Following Gioia, Corley, and Hamilton (2013), these categories are called first-order concepts.

The first-order concepts were abstracted into theoretically relevant higher-order constructs (Spiggle 1994), referred to as second-order themes (Gioia, Corley, and Hamilton 2013). The analysis was an iterative process, moving back and forth in the data, refining categories as the analysis proceeded. The focus of the analysis was to identify themes that persisted throughout the data, and as such reflect not any specific actor—but cultural phenomena, instead. Only first-order concepts and second-order themes that appeared frequently throughout the data were included in the final analysis. In the final stage of analysis, aggregate dimensions were identified (Gioia, Corley, and Hamilton 2013) and the abstracted second-order themes were integrated to form a theory of downsizing (Spiggle 1994). The result of the analysis is a theory of downsizing, suggesting how meanings of downsizing and norms about dwelling size are negotiated, which is presented in the following section.

Negotiating the Meaning of Downsizing and Spatial Norms

This section presents the findings of the empirical study. Following Gioia, Corley, and Hamilton (2013), the findings have been structured into first-order concepts, which have been identified from the data, second order themes, which are theoretical abstractions of the first-order concepts, and aggregate dimensions, which suggest how the second order themes relate to each other. The first-order concepts, second order themes, and aggregate dimensions of the analysis are summarized in Figure 2 and are described in more detail in sections to follow. The identified second order themes and aggregate dimensions have been integrated to form a theory of downsizing, as depicted in Figure 3.

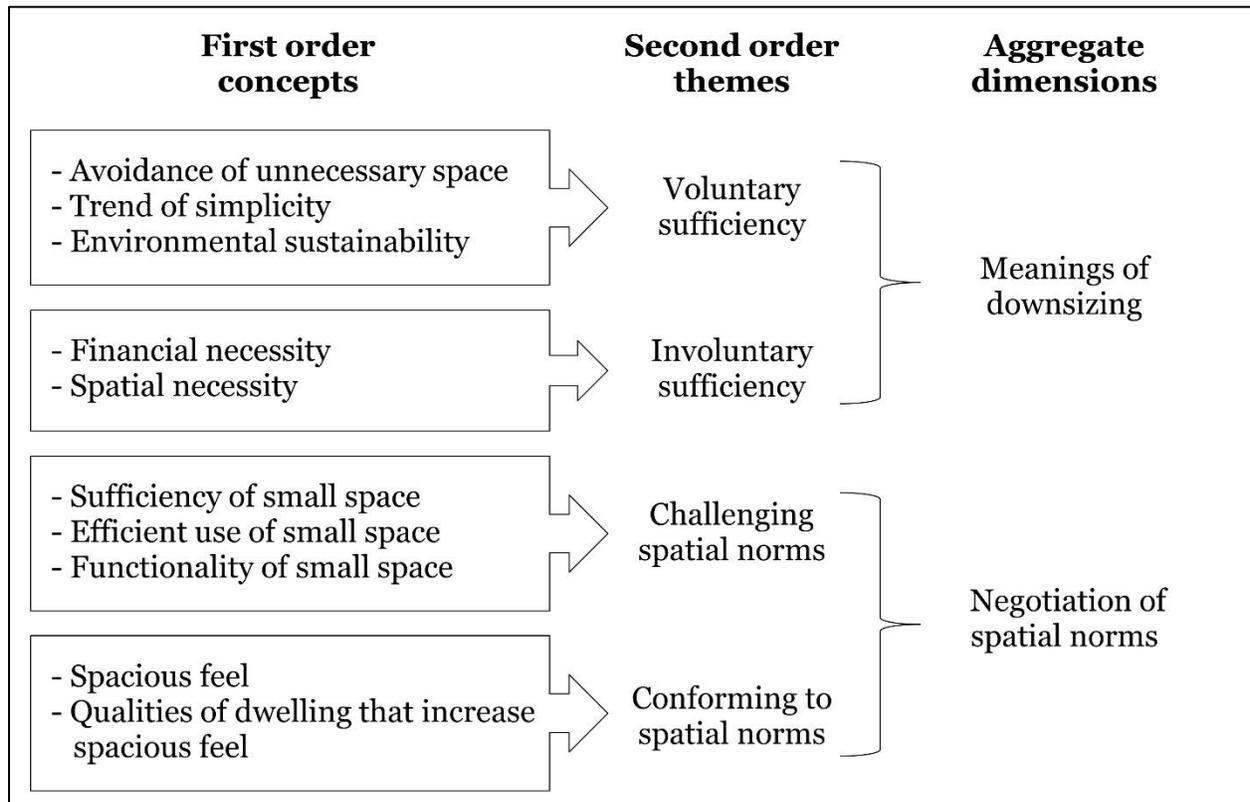


Figure 2 Summary of the findings of the empirical study (data structure following Gioia, Corley, and Hamilton 2013).

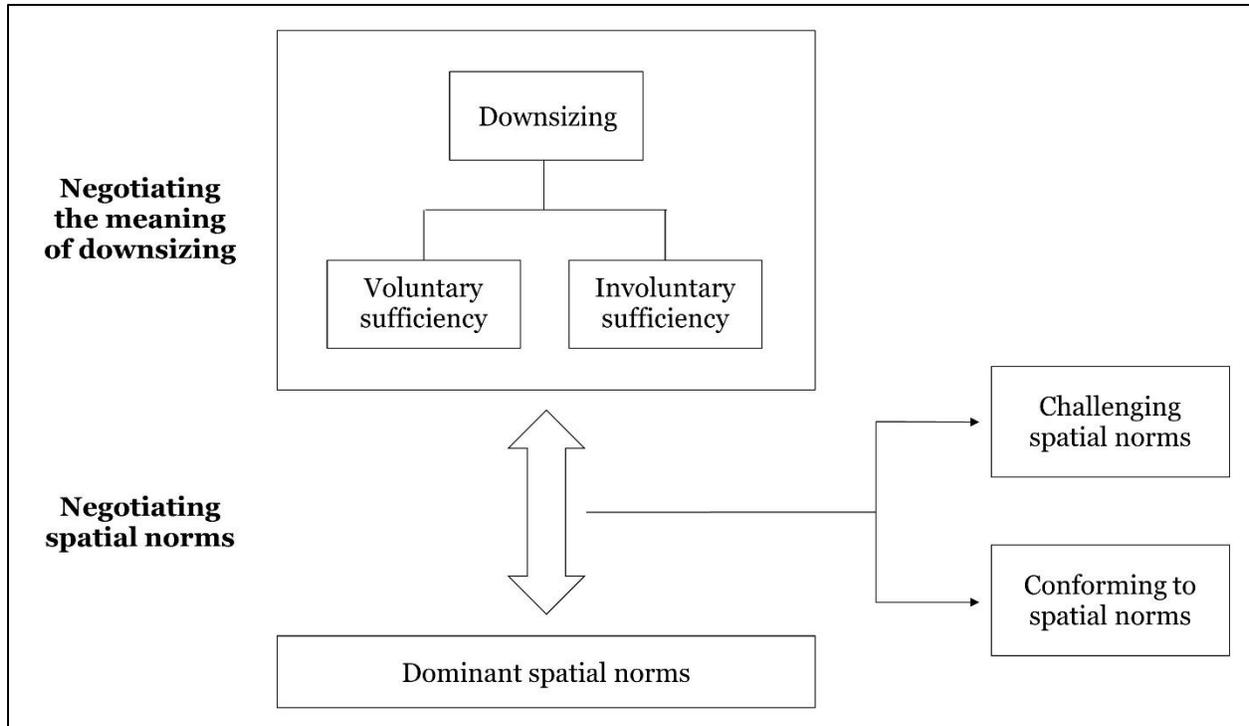


Figure 3 Negotiating the meaning of downsizing and spatial norms

The findings suggest how the meaning of downsizing is negotiated, as depicted in the upper box in Figure 3. The analysis identified two distinct meanings of downsizing, referred to as voluntary sufficiency and involuntary sufficiency. The findings further suggest how downsizing negotiates dominant spatial norms, as depicted in the lower half of Figure 3. The two-way arrow in the figure signifies the interplay between downsizing and dominant spatial norms, which brings about the negotiation of spatial norms. The analysis identified two different ways in which dominant spatial norms are negotiated, challenging or conforming to dominant spatial norms. The following sections present these findings in more detail. First, the two meanings of downsizing identified in the data are discussed. The following section discusses the negotiation of spatial norms. The discussion follows the structure depicted in Figure 2.

Negotiating the Meaning of Downsizing

The findings suggest that the meaning of downsizing is not fixed—it is in a state of negotiation. Two distinct meanings of downsizing were found to coexist in the data, as depicted in the upper box of Figure 3. Voluntary sufficiency frames downsizing as voluntarily made reductions in dwelling size. Involuntary sufficiency sees downsizing as an involuntary reduction in dwelling size, framing downsizing as a necessity rather than a choice. The main difference between these two interpretations of downsizing is the perceived desirability of downsizing. Specifically, voluntary sufficiency suggests a willingness to reduce dwelling size, whereas involuntary sufficiency reflects a reluctance to do so. These two meanings of downsizing appear conflicting, but nevertheless coexist in the data to form a tension over the meaning of downsizing. In the data, the two meanings of downsizing are often intertwined, but for clarity, they are discussed separately.

Voluntary Sufficiency

The small-sized, detached houses in the data are commonly framed as voluntary sufficiency. The apartments, perhaps because of their much smaller size, are only occasionally interpreted as voluntary sufficiency. Both the media texts and the corporate texts analyzed present the small size of the detached houses as a willing choice to simplify. Kastelli makes multiple references to their Cubic line of houses as being of “reasonable” size (the Finnish word “kohtuullinen” closely resembling the Finnish word for voluntary simplicity, “kohtuullistaminen”). Both in Kastelli’s communication and in various media texts, the amount of living space needed is questioned and the small-sized, detached houses are presented as avoiding unnecessary space, as in the following excerpts from articles published by Yle and *Iltalehti*:

Big is not always beautiful. [...] people more carefully consider what square meters are needed for (M2.03).

Buyers are precise about the size of dwellings and don’t accept wasted space (M2.09).

There are also numerous references to a trend of simplicity and an acknowledgement that “Less is enough” (M2.05) and that “Bigger is not always better” (M2.03). The following quote from Kastelli’s communication illustrates how the small size of dwellings is presented as reflective of a trend favoring simplicity:

Comfort of living is no longer measured by an abundance of space. The idea of reasonable living is to enjoy a functioning whole and smaller expenses (C2.04).

Even though downsizing is frequently framed as voluntary sufficiency in the data, few references to environmental sustainability are made in the analyzed texts. Though environmental sustainability is central in research on sufficiency (e.g. Lorek and Spangenberg 2014) and environmental concerns have been identified as a main indication of a lifestyle of voluntary simplicity in previous research (Alexander and Ussher 2012; Elgin and Mitchell 1977), small-sized dwellings in the data rarely presented as environmentally sustainable. There are no instances of small-sized apartments framed as environmentally sustainable in the data, and only a few references to environmental sustainability are made about small-sized, detached houses. Kastelli does not present the small size of their Cubic houses as environmentally sustainable; there is only one instance in the corporate communication analyzed, at the end of a press release, which mentions the houses being ecological due to their small size without further explanation:

[...] the homes of our new line are compact, and therefore less expensive and more ecological to build (C2.05).

The data rather includes mentions of the environmental sustainability of the small-sized, detached houses that relate to other aspects of the houses than their small size, such as ecological construction materials or energy efficiency of new buildings. The only isolated acknowledgement that small-sized dwellings have less space to heat, in an article by *Helsingin Sanomat*, focuses on savings in heating costs rather than the positive environmental impact of having less space to heat: “Because the amount of square meters to heat is reasonable, living costs aren’t high” (M2.18).

Involuntary Sufficiency

The small size of both the detached houses and the apartments is frequently presented in the data as an involuntary necessity. Thus, rather than presented as a willingly made choice to

simplify and downsize, small-sized dwellings are framed as involuntary sufficiency, downsizing due to necessity—rather than choice. This does not view downsizing in itself as desirable, but rather as a choice that has to be made due to limiting circumstances. Small-sized dwellings in the data are presented as either a financial necessity or a spatial necessity, as discussed below.

Financial necessity refers to a demand for small-sized dwellings due to the financial situation of the individual, which limits them to consider only small-sized dwellings as they cannot afford dwellings of bigger size. The small-sized apartments in the data are presented as a response to a demand for affordable housing, as in the quote below from *Kauppalehti*; meanwhile the demand for small-sized, detached houses appears to relate to the current economic climate, which is said to impair the possibilities of home owners to buy larger houses, as can be seen below in an excerpt from *Ilta-lehti*:

The building of mini-sized apartments is a response to the growth in single households and the expensive living costs in the Helsinki metropolitan area (M1.10).

The detached house is the Finnish dream. In economically uncertain times, however, people cannot afford grand houses of several hundred square meters, but now people get smaller houses (M2.05.)

Furthermore, throughout the data, both the small-sized, detached houses and apartments are framed as affordable, low-price housing, repeatedly being described as “affordable” and “reasonably priced.” For example, though there is some controversy in the analyzed media texts over the cost of the small-sized apartments, Sato uses the affordability of the apartments as a prominent marketing point in its communication, as in the below excerpt from Sato’s website:

Affordable living. Sato StudioKoti offers studio apartments for a price that is currently not available on the market (C1.01).

Spatial necessity refers to constraints placed on the size of dwellings by the finite available space in the built environment. Limited available construction land, particularly in the urban environment, places limitations on the size of dwellings. In the analyzed data, both the small-sized, detached houses and apartments are presented as a solution to a shortage of available housing, particularly in the Helsinki metropolitan area, as in the following excerpts from articles in *Helsingin Sanomat* and *Vantaan Sanomat*:

Sato wants to build affordable [...] apartment buildings with small apartments to alleviate the shortage of housing in the Helsinki metropolitan area (M1.07).

[...] the tiny studio apartments could bring relief to the shortage of housing in the Helsinki metropolitan area (M1.12).

Throughout both the corporate communication of Kastelli and the analyzed media texts, the small size of the detached houses is presented as beneficial because the houses fit on small plots of land; this is exemplified in the following excerpt from a press release by Kastelli:

There is an acute demand for small, detached houses. There is a shortage of plots on good locations in cities and the available plots have reduced in size considerably. (C2.05).

Negotiating Spatial Norms

The small size of the dwellings is extensively brought up in the analyzed texts. Both the detached houses and the apartments are referred to in regards to their small size, consistently being described as “small”, “tiny”, “mini”, and “compact”. The dwellings are in the empirical data

commonly referred to with the terms “mini house” and “mini apartment”. Kastelli positions and markets its Cubic line of detached houses specifically as small-sized, referring to it as “A new line of small-sized, detached houses” (C2.01; C2.03). Furthermore, even though Kastelli’s Cubic houses come in a range of sizes, the smallest of the available sizes, 49 m², gains by far the most mentions both in the media texts and in Kastelli’s own communication. The emphasis on the small size of the dwellings analyzed is exemplified by the following headline for one of Kastelli’s press releases as well as the below excerpt from *Vantaan Sanomat*:

Kastelli launches a new line of small-sized, detached houses – the new Cubic line contains a mini house of 49 m² (C2.05).

The mini studio apartments received attention a year ago, when Sato announced wanting to try building exceptionally small, 15.5 m², studio apartments (M1.12).

The small dwelling size has given rise to some controversy in the media, which has criticized the apartments and houses. The dwellings are described as for example “cramped” (M1.12), “non-functional” (M1.16) and as “cottages”, rather than houses (M2.20). This raises doubts about whether the small dwelling-size is sufficient. The most prevalent point of discussion in the media texts is that the size of Sato’s small-sized apartments is below building regulations, which specify the minimum allowed apartment size to be 20 m². Sato has obtained an exception permit to build the first StudioKoti apartments, but this has added to the media attention. A number of the media texts analyzed emphasize that the apartments are smaller than building regulations allow, as in the below excerpt from an article published in *Helsingin Sanomat*. At times, the apartments are referred to as illegally small:

The studio apartments are very exceptional in their smallness. Building regulations stipulate that apartments need to be at least 20 square meters (M1.07).

This is what an illegally small mini studio apartment looks like (M1.04).

The consistent references to the small size of the dwellings as well as the controversy over the small dwelling size indicates that the detached houses and apartments in this study fall below dominant norms for dwelling size. References to and discussion of the small size are so prevalent throughout the empirical data to suggest that the apartment’s and houses’ difference from spatial norms is distinctive. This distance from normative valuations of sufficient dwelling size is negotiated in two different ways in the analyzed texts, and the findings suggest that the small size of the dwellings can be interpreted as both challenging and conforming to dominant spatial norms. This can be seen in the lower half of Figure 3 and discussed below.

Challenging Spatial Norms

The texts in this study highlight the small size of the dwellings, while arguing for their sufficiency. Thus, the small dwelling size is presented as a departure from dominant spatial norms that is still sufficient for an enjoyable living experience. This challenges dominant spatial norms regarding sufficient space. By challenging dominant spatial norms, the decreased dwelling size is normalized as sufficient.

Both the small-sized, detached houses and apartments are presented as containing everything needed, despite their small size, and are thus portrayed as sufficient. Some of the analyzed media texts even emphasize this in their headlines, as in the following two article headlines, about the Cubic detached houses by *Iltalehti* and about Sato’s StudioKoti apartments by *Yle*:

Mini detached houses of 49 square meters are here: “Nothing is missing” (M2.06).

A whole home fits in 15 square meters (M1.14).

The dwellings are further presented as using the small space efficiently. In multiple texts, they are even described as “spatial wonders” (e.g. F2.04; M1.05). Efficient use of the small space enables fitting the same functions of a home in a smaller space and maximizes the use of the small space, thus arguing for its sufficiency, as in the following quote from Kastelli’s marketing material: “The homes of the Cubic line have carefully polished floor plans and well thought out use of space. Therefore more fits in the same space” (C2.03).

Furthermore, both the small-sized, detached houses and apartments are repeatedly described as “functional”, thus presenting the small space as sufficient for an enjoyable living experience. The argument is that the small space is sufficient due to careful planning of how to best utilize the limited space. The small-sized apartments are further described as multi-functional, as the small space can serve multiple functions due to innovative design solutions. The following excerpts from a press release by Sato and an article by Yle illustrate how the small-sized dwellings are described as functional:

The 15 square meter StudioKoti is a charming studio apartment, the emphasis laying on its functionality and imaginative solutions for furnishings and décor (C1.03).

With the small size, the goal has been to still achieve functionality that enables the enjoyable living of one or two people (M1.04).

Conforming to Spatial Norms

The small-sized dwellings are also often presented as conforming to dominant spatial norms, which value larger-size dwellings. In these instances, the dwelling is, despite its small size, presented as spacious. This framing of the small-sized dwellings does not challenge dominant spatial norms, but rather argues that the small-sized dwelling fulfils desires for spacious dwellings. The small-sized dwellings are described as “homes bigger than their squares” (C2.01) and as small spaces that “look and feel bigger” (M2.13). In particular, the Cubic detached houses are presented as conforming to spatial norms, repeatedly being described as “large,” “spacious,” and “roomy” in Kastelli’s communication.

Across the data, the small-sized, detached houses and apartments are interpreted as being within dominant spatial norms because of their spacious qualities. Both the detached houses and the apartments have a higher room height than Finnish standards. This is emphasized across the data and is said to make the dwellings appear more spacious, as in the following excerpts from articles by Yle and *Pieksämäen lehti*:

The small floor space is compensated by an exceptional room height of four meters (M1.04).

Skilful design has achieved even a small space looking and feeling larger as the room height grows (M2.13).

Furthermore, across the data, both the small-sized, detached houses and apartments are repeatedly described to have large windows, which let in a lot of natural light and make the dwellings feel light and airy, and thus more spacious. Small dwellings may evoke ideas of being dark and cramped, a perception that is countered by emphasizing the lightness of the dwellings, as in the following excerpts from Kastelli’s marketing material and a press release by Sato:

The big windows of the kitchen-living room area start from the floor up bringing in plenty of light and spaciousness (C2.03).

The apartment building contains 68 light and airy, compact homes equipped with a small balcony, big windows and smart storage solutions (C1.04).

Discussion

Theoretical Contribution

The results of this study suggest that sufficiency is not one unified perspective within the realm of sustainable consumption, as previous research suggests (e.g. Bebbington 2001; Lorek and Fuchs 2013). Instead, the results suggest that rather different socio-cultural meanings of sufficiency coexist and the meaning of sufficiency is negotiated. Gorge et al. (2015) propose that sufficiency can be either a voluntary or an involuntary change in consumption patterns. The findings of this study support this distinction, identifying the voluntariness of sufficiency as a main point of contestation, at least in the context of downsizing housing. Whereas much previous research, particularly the body of research on voluntary simplicity (e.g. Elgin and Mitchell 1977; Peyer et al. 2017), has analyzed sufficiency as voluntarily made changes in consumption patterns, this study points to the prominent role of involuntary change. Interpretations of downsizing as involuntary sufficiency, due to either financial or spatial necessity, were prominent in the analyzed texts. Previously, Hagbert and Femenías (2016) have indicated financial necessity to be a motivating factor for downsizing. This study also suggests that limitation in available space is a key factor in considerations of dwelling size.

In contrast to much previous research on sustainable consumption, on sufficiency, and on voluntary simplicity, the findings of this study suggest an almost complete lack of environmental framing of downsizing. Much previous research on sustainable consumption studies consumers motivated by sustainability concerns (e.g. Casey, Lichrou, and O'Malley 2017; Dalpian, da Silveira, and Rossi 2015; Guillard and Roux 2014). The promotion of environmental sustainability is central in previous research on sufficiency (e.g. Gorge et al. 2015; Lorek and Spangenberg 2014). Research on voluntary simplicity understands environmental concerns as a central motivating factor for lifestyles of voluntary simplicity (Alexander and Ussher 2012; Elgin and Mitchell 1977).

However, this study found an almost complete lack of references to environmental sustainability in the analyzed texts. Downsizing was presented as a desirable change for the individual or a necessity unrelated to environmental concerns. This suggests that downsizing is not perceived as a facet of environmentally-sustainable housing. Research has demonstrated that dwelling size can have a substantial impact on the environmental impact of housing (Hille, Simonsen, and Aall 2011; Wilson and Boehland 2005). However, it seems that this is not recognized in practice. It may be that the current focus on the energy efficiency of buildings dominates understandings of sustainable housing, leaving little room for alternative interpretations of sustainable housing. Understandings of downsizing and sustainable housing thus need to change to establish downsizing as one way to advance the environmental sustainability of housing in order for dwelling size to be considered in sustainable housing efforts.

This study further suggests that reductions in consumption do not necessarily challenge dominant consumption norms, as previous research suggests (Gorge et al. 2015; Hagbert 2016), but sufficiency can also be presented as conforming to dominant consumption norms. The findings of this study do show that challenging spatial norms are a prominent way to negotiate dominant spatial norms, thus supporting previous research. However, this study found that

downsizing can also conform to spatial norms, thus interpreting the small-sized dwelling from within dominant spatial norms and as conforming to ideals of spacious dwellings. In this case, norms about high levels of consumption are not challenged.

Practical Implications

The findings of this study suggest that small-sized dwellings that fall below dominant spatial norms are often perceived unfavorably, considered an involuntary necessity that is likely avoided if possible. Actors in the market are thus unlikely to actively advance downsizing unless recognizing its value. Previous research has shown a variety of changes in consumption patterns to be driven by ethical concerns (e.g. Alexander and Ussher 2012; Dalpian, da Silveira, and Rossi 2015; Guillard and Roux 2014). This suggests that framing small-sized dwellings as “environmentally-sustainable housing” can drive reductions in dwelling sizes. However, even though previous research has identified downsizing as an important way to reduce the environmental impact of housing (e.g. Lettenmeier, Liedtke, and Rohn 2014), the findings of this study suggest a lack of environmental framing around downsizing. Actors in the market thus need to be made aware of downsizing’s potential to reduce the environmental impact of housing.

This is particularly true for public policy. As housing is quite highly regulated, public policy can have a substantial role in advancing downsizing. Policy efforts to reduce the environmental impact of housing in Finland currently focus on improving the energy efficiency of buildings. These should be complemented with regulations and initiatives that aim to advance downsizing, which is unlikely unless policy makers become aware of the effect dwelling size has on the environmental impact of housing. Also, other actors in the market, such as companies and the media, can be influential in shaping public perceptions of small-sized dwellings as environmentally sustainable housing, and need to become aware of the environmental impact of downsizing.

If considerable change is to be achieved, public policy efforts to advance downsizing need to address both new construction and the existing housing. As the findings suggest, current building regulations in Finland hinder rather than advance downsizing, regulations specifying a minimum dwelling size of 20 square meters. Removing or relaxing regulations on minimum dwelling size would allow construction companies to build smaller dwellings without having to obtain an exception permit, as in the case of the Sato StudioKoti apartments. With three quarters of all households in Finland being single or two-person households (Suomen virallinen tilasto 2015), public policy should also support a shift in focus from large family homes to a larger proportion of studio and one bedroom apartments in new apartment buildings. City planning could support the downsizing of detached houses by allocating plots of land for small-sized, detached houses or even planning clusters and whole neighborhoods of small-sized detached houses.

As the turnover of the housing stock is very slow, policy makers also need to address possibilities to downsize within the existing housing stock. Initiatives to investigate how this could be achieved are needed. It may be possible to redesign existing dwellings for an increased number of occupants by dividing large rooms into several smaller ones and thus increasing the number bedrooms. It may also be worth considering whether it would be possible and financially viable to divide large dwellings into several smaller ones. Policy makers could encourage such redesigns and renovations of existing dwellings by offering financial incentives to do so, for example by offering financial support to cover some of the costs of such renovations.

Small-sized dwellings can be perceived unfavorably, so perceptions of small living-spaces need to change for downsizing to increase in popularity. In order for downsizing to be perceived as a desirable option for individual consumers, we need to change how we think about the sufficiency of living spaces, changing dominant spatial norms to recognize the sufficiency of small-sized dwellings. Design solutions can have a considerable impact in increasing the desirability of small living spaces. The success of the tiny-house movement in presenting small living spaces as desirable (Anson 2014) indicates the potential to design appealing small-sized dwellings. The findings of this study point to some ways in which both design of new dwellings and the redesign of the existing housing stock can help make small-sized dwellings more appealing.

The findings suggest that small-sized dwellings need to be designed to be functional and to use the available space efficiently, maximizing the use of the small space by designing the space to be multifunctional. Furthermore, the design of small-sized dwellings needs to ensure that they still contain all functions of a modern home, despite their small size. If space for some living functions is reduced too drastically or eliminated altogether, there is a risk of rebound effects if living functions move to spaces outside the home. This can of course also be intentional, for example by creating communal spaces such as in co-housing (Jarvis 2011).

The findings of this study further indicate that the desirability of small-sized dwellings can be improved by designing the small space to appear as spacious as possible. However, the design solutions identified in this study are somewhat problematic as they increase energy use. Increasing room height increases the amount of space that needs to be heated, while large windows have poor insulation. These design solutions counteract the goal of reducing the environmental impact of the dwelling. Making the small space appear spacious will likely remain an important issue to consider when designing small-sized dwellings.

Limitations and Directions for Future Research

This study analyzed the media and corporate texts as cultural texts that can reveal broader cultural trends. This follows previously established methodology for cultural analysis (Humphreys 2014; Moisander and Valtonen 2006), but the choice of empirical material might still raise questions of whether the analyzed texts in fact are representative of Finnish culture. To avoid reflecting any one specific actor in the market, the data includes a number of different media and corporate sources and the findings only include themes that were present throughout the data rather than attributable to any specific actor. Nevertheless, it is possible that a broader data set might have provided a more nuanced understanding of downsizing in the Finnish context, leaving room for future research to build on the findings of this study.

This study focused on two specific types of small-sized dwellings. These are more aligned with current housing of the urban middle class than more radical changes in housing such as the tiny house movement (Anson 2014), eco villages (Casey, Lichrou, and O'Malley 2017), or low impact developments (Pickerill and Maxey 2009). This choice was motivated by a desire to study small-sized dwellings that have the highest potential to reach mainstream success and thus have a considerable impact on the environmental impact of the housing stock as a whole. Future research would likely benefit from addressing a broader variety of small-sized dwellings to capture the full potential of downsizing as a way to reduce the environmental impact of housing.

This empirical study analyzed the downsizing of both detached houses and apartments, but does not address a potential consumer shift between different types of dwellings. As apartments on average tend to be substantially smaller than detached houses (Tilastokeskus 2016), a shift from

detached houses to apartments would likely contribute to reducing the average size and thus the environmental impact of dwellings. Future research is needed to analyze the environmental impact of a potential shift from detached houses to apartments as well as how this could be achieved, particularly in a culture in which the detached house is still often considered the dream.

Future research could also address changes to the housing market that may result from downsizing. Hagbert (2016) found small-sized dwellings to be considered a solution for certain periods in life, such as when being a student. Additional research could investigate how downsizing can accommodate people in different life situations. Adapting dwelling sizes to a variety of life situations may require a more diverse housing stock and may also lead to increases in the frequency with which people need to move for their dwellings to accommodate their changing life situations. Future research is needed to analyze potential rebound effects of such a higher turnover in the housing market.

This study analyzes sufficiency in the context of housing. The findings can be applied to sufficiency in other consumption contexts. However, more research is needed to study sufficiency in different consumption contexts to see whether the findings of this study are generalizable to sufficiency in general, or whether different consumption contexts present distinct characteristics. This study has offered one empirical insight into sufficiency; more empirical research is needed to strengthen our understanding of sufficiency as a way to advance environmentally sustainable consumption.

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Appendix. List of empirical material**Corporate communication****Code Source****Corporate communication, Sato (apartments)**

- C1.01 Website: www.sato.fi/studiokoti (accessed September 30, 2016)
 C1.02 Youtube video: youtu.be/G2I2c2njH4w (accessed September 30, 2016)
 C1.03 Press release, February 1, 2016
 C1.04 Press release, June 21, 2016

Corporate communication, Kastelli (detached houses)

- C2.01 Website: www.kastelli.fi/Talot/Cubic (accessed September 26, 2016)
 C2.02 Website: www.kastelli.fi/Talot/Pienet-talot--LUONNOKSIA1/Cubic-4961 (accessed September 26, 2016)
 C2.03 Brochure: Uutuudet 2016 [New products 2016]
 C2.04 Customer magazine, 2016
 C2.05 Press release, January 7, 2016
 C2.06 Press release, April 1, 2016

Media texts**Code Source****Date of publication****Media texts, apartments**

- | Code | Source | Date of publication |
|-------|-------------------------------|---------------------|
| M1.01 | yle.fi | March 13, 2015 |
| M1.02 | vantaansanomat.fi | March 24, 2015 |
| M1.03 | kauppalehti.fi | June 10, 2015 |
| M1.04 | yle.fi | June 10, 2015 |
| M1.05 | Helsingin Sanomat (hs.fi) | June 15, 2015 |
| M1.06 | Helsingin Sanomat (hs.fi) | June 23, 2015 |
| M1.07 | Helsingin Sanomat | December 14, 2015 |
| M1.08 | Turun Sanomat | December 19, 2015 |
| M1.09 | Vantaan Sanomat | December 19, 2015 |
| M1.10 | kauppalehti.fi | December 28, 2015 |
| M1.11 | Vantaan Sanomat | January 30, 2016 |
| M1.12 | Vantaan Sanomat | March 9, 2016 |
| M1.13 | Aamuposti | March 20, 2016 |
| M1.14 | yle.fi | May 11, 2016 |
| M1.15 | kauppalehti.fi | May 18, 2016 |
| M1.16 | Helsingin Sanomat | May 19, 2016 |
| M1.17 | Viikko-Uutiset Keski-Uuusimaa | May 28, 2016 |
| M1.18 | Helsingin Uutiset | June 18, 2016 |
| M1.19 | Länsiväylä | June 18, 2016 |
| M1.20 | Vantaan Sanomat | June 18, 2016 |
| M1.21 | Etelä-Suomen Sanomat | July 22, 2016 |

Media texts, detached houses

M2.01	menaiset.fi	August 27, 2014
M2.02	yle.fi	February 8, 2015
M2.03	yle.fi	February 12, 2015
M2.04	Helsingin Sanomat (hs.fi)	May 17, 2015
M2.05	iltalehti.fi	October 26, 2015
M2.06	iltalehti.fi	January 7, 2016
M2.07	Aamuposti	January 10, 2016
M2.08	Helsingin Sanomat	January 25, 2016
M2.09	iltalehti.fi	January 25, 2016
M2.10	Helsingin Uutiset	March 9, 2016
M2.11	Vantaan Sanomat	March 9, 2016
M2.12	Tuusulanjärven viikkouutiset	March 12, 2016
M2.13	Pieksämäen lehti	March 18, 2016
M2.14	Aamuposti	March 20, 2016
M2.15	Paikallislehti Sisä-Savo	March 22, 2016
M2.16	Uusimaa	April 3, 2016
M2.17	tekniikkatalous.fi	April 4, 2016
M2.18	Helsingin Sanomat	June 12, 2016
M2.19	tekniikkatalous.fi	July 14, 2016
M2.20	Helsingin Sanomat	September 19, 2016
