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Product Lifetimes And The Environment

Ever-faster, ever-shorter? Replacement cycles of durable goods in historical perspective

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Abstract
Predicted by popular theories of acceleration, such as the theory of planned obsolescence and the rise of a throwaway society, the ever-faster replacement of durable goods is widely assumed in the literature. This paper confronts this assumption with long-term empirical evidence from three distinct cases – wheat seeds, automobiles, and mobile phones. The cases show that there is no dominant logic or force underlying historical changes in product durability, lifespans, and replacement cycles. Neither are such changes entirely unpredictable: There are clear patterns where these phenomena go up or down for sustained periods of time. The observed patterns in replacement cycles call for an empirically grounded theory that can explain both periods of acceleration and deceleration and connect durable goods replacement decision-making with developments at the aggregate level.

Introduction

The starting point of this paper is the observation of a profound disconnect between empirical research and the abstract theories informing the debate on product lifetimes and replacement cycles. In fact, the past two decades have seen a remarkable increase of research on product lifetimes and obsolescence. Researchers of various disciplinary backgrounds have explored the multifaceted nature of this phenomenon from a wide range of different perspectives (see the reviews of Cooper et al. 2015; Rivera and Lallmahomed 2015). Despite the substantial amount of studies that accumulated over the years, however, there is a striking dearth of research on historical changes in replacement cycles.

In part, this lack of research may be due to limited access to reliable, longitudinal data on replacement cycles. This would not explain, however, why this situation extends to durable goods for which historical changes in replacement cycles were already estimated and published. More plausibly, it may be argued that historical changes are understudied because the acceleration of consumption, in the sense of ever-shorter cycles of replacement, is widely taken for granted. The sense that consumer goods are replaced at an unprecedented rate is tightly connected with common assertions that 'we' live in a 'throwaway society' or 'take-make-dispose economy'. After all, such an acceleration of consumption is predicted by all major narratives and theories informing the debate on product lifetimes and replacement cycles.

This paper confronts the assumption of ever-faster replacements with existing empirical evidence on the historical evolution of replacement cycles. Such evidence is extremely scarce, but nonetheless provides sufficient ground to call the accuracy of theories of acceleration into question. The evidence presented in this paper stems from extant research on wheat seeds and automobiles and an ongoing study of replacement cycles in the British mobile phone market. The observations from these cases call for the need of a middle-range theory that connects replacement decision-making with patterns at the aggregate level and is able to explain both periods of acceleration and deceleration.

The paper proceeds with a brief overview of existing theories and research on changes in replacement cycles over time. This is followed by a description of the British mobile phone market and some key observations I made in studying the replacement cycles of mobile phones. Finally, I discuss the implications of the empirical evidence presented here for future research.

Theories of acceleration

Theories of the escalation of demand abound in the literature (see Sanne 2002; Shove and Warde 2002). Due to space limits, the following paragraphs present only the sources of change that are cited most frequently in the debate on product lifetimes and replacement cycles.

The idea of 'planned obsolescence' is perhaps the most influential theory in this literature and enjoys much attention in the public and political debate (see Wieser 2016). The theory was particularly popular in the heydays of critical theory (e.g. Baudrillard 1998; Galbraith 1958; Marcuse 1964; Packard 1961), but is still present in

contemporary thinking (e.g. Gorz 1999; Lodziak 2002; Maycroft 2009; Pope 2017; Slade 2007). The roots of this theory can be found in Marx's analysis of the driving forces of capitalism, in particular the observed necessity to speed up the circulation of capital. The basic argument is that the commodification of time creates pressure on individual capitalists to produce durable goods faster and faster, a development that needs to be accompanied by a parallel speeding up of consumption processes. Planned obsolescence, which can be regarded as a summary term for all practices of producers to accelerate the devaluation of consumer goods, is considered a key strategy to reduce the barriers to faster turnover times of capital (Harvey 1989). The replacement cycle of durable goods is thus essentially determined by manufacturers and predicted to shorten over time.

Another set of influential theories posit that the past decades have brought about a fundamental shift in the way things are appropriated. It is argued that the consumers relationship to things changed from one based on the principles of frugality, care, and stewardship, to one based on impatience, ephemerality, and low attachment to one's possessions. Modern hyperconsumerism of rapid product replacements is thus variably characterised by a throwaway culture (Toffler 1970), a culture of immediacy (Tomlinson 2007), an aesthetics of ephemerality (Appadurai 1996), or a desire for the new (Campbell 1992, 2015). A fundamental driver of this rise of a throwaway society is seen in advances in technology, which allowed for continuous reductions of the average cost of products (e.g. Campbell 2015; McCollough 2012; Schor 2013). Also, post-modern theories which interpret consumption as a means for the continuous renewal of the self are relevant here (e.g. Bauman 2005; Featherstone 1991; Giddens 1991). The aestheticisation of everyday life and import of fashion logics into markets which have traditionally been based on different values, are regularly quoted in these literatures as key drivers of this shift to fast consumerism.

Few commentators would nowadays agree on the statement that the fast pace of product replacements is driven by a single dominant factor. A more common argument is that the consumers' desire for the new and the capitalists' pursuit of profits perfectly complement each other and mutually reinforce processes of acceleration (e.g. Jackson 2009; Rosa 2015). The argument advanced in this paper is neither to deny that many spheres of life are accelerating, nor that the theories quoted in this section have anything interesting to say. Rather, I suggest that theories of acceleration provide an impartial picture of changes in replacement cycles and the widespread reliance on them has narrowed the gaze of empirical researchers. In particular, the assumption of ever-shorter replacement cycles of durable goods is rarely questioned by theorists of acceleration.

Historical patterns in replacement cycles

As stated in the introduction, there is very little evidence on changes of replacement cycles over time. The bulk of research that aims to explain the length of replacement cycles is on the consumers' replacement decision-making processes (see Guiltinan 2010), emotional attachment and product longevity (see Page 2014), or on corporate practices and marketing (e.g. Bayus 1988; Spinney et al. 2012). The disconnect between this research and the theories presented in the previous section is evident in the little commonalities between those theories and the ones applied in studies of replacement cycles, the latter being by far and large rooted in economics and social psychology.

More recently, a few studies estimated historical changes in replacement cycles for various consumer goods (Bakker et al. 2014; Huisman et al. 2012; Prakash et al. 2016). They consistently show that replacement cycles have become shorter over time, but were able to estimate the development for short periods of time (5-10 years) only. Given the susceptibility to the selection of the period when studying such short periods, I limit the following discussion to research which studied the development of replacement cycles or comparable measures over a substantial period. There is no objective criterion for what counts as a long-time period, but it is meaningful to consider the length in relation to the overall industry life cycle. Plant seeds and automobiles are two interesting goods for which comparable data was estimated and analysed for such a long period.

Plant breeding

Plant breeding is largely overlooked, yet one of the most intriguing cases of obsolescence. The case is unusual as it goes beyond the predominant attention to fast-moving consumer goods in the high-technology sector. The seeds' natural life cycles were already manipulated in the 19th century to adapt them to commercial cycles (Moskowitz 2009). In a rare and insightful study, Rangnekar (2002) investigated the historical evolution of the durability of wheat seeds in the period from 1960 to 1995. In the case of seeds, durability is measured in terms of their resistance to diseases. The durability of a product is not the same as its replacement cycle, but the two are intricately connected.

According to Rangnekar's estimations, the seeds' durability significantly shortened until 1973, followed by a long period of relative stability (see figure 1). Rangnekar shows that the compromises in durability were paralleled by a proliferation in the number of varieties, revealing the double-strategy of breeding companies to shorten turnover times. Although the author prefers to call this a form of planned obsolescence, it is important to note that such compromises in durability were not made without improvements in other dimensions. The lower durability is at least in part a consequence of the higher efficiency of the new seeds as the author remarks.

Tellingly, the second half of the studied period did not receive much attention from the author. Why did the durability of wheat seeds stabilise? In his conclusions, Rangnekar suggests that there might be a 'lower bound to strategies of planned obsolescence'. Too frequent

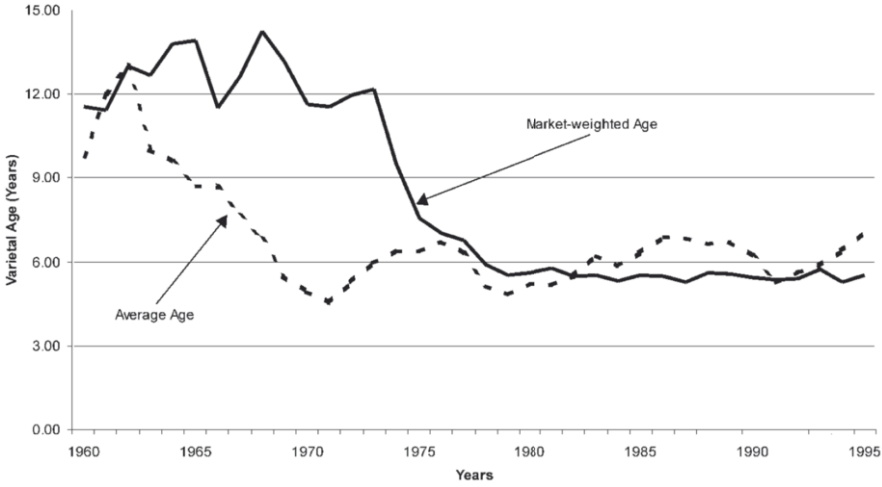

Figure 1. Average age of wheat seed varieties (1960-1995); source: Rangnekar (2002).

introductions of new varieties with higher efficiency might discourage customers to buy the new variety, making it more attractive to wait until its price falls. Annual introductions of new varieties do not appear to drive replacements in this market, however, considering that varieties were replaced only every six years on average. As Rangnekar notes, reduced durability is a stronger motivation for customers to replace a variety. Although the reasons for the stabilisation of the seeds' durability remain eventually unexplored, the study is interesting for finding evidence in support of the theory of planned obsolescence, but also against it – showing that the durability of a good can be held constant for a sustained period of time.

Automobiles

The automotive industry, specifically the conflict between Ford and General Motors, is regarded as the birthplace of planned obsolescence (Slade 2007). The rise of 'Sloanism', the strategy of accelerating obsolescence by means of annual introductions of new styles, has been studied in great detail (Cader 2012; Flink 1988; Frank 1997; Gartman 1994). The fast pace of new model introductions had its counterpart in rapid replacements. According to the estimations of Hundy (1976), the average lifespan of a car was 8 years before the Second World War and fell down again to 11 years after it had increased during the war period. What is rarely acknowledged, however, is that the average lifespan of cars has not reached such a low level since the 1960s. Hamilton and Macauley (1998) found that the average age of cars increased by 30% until 1991 (see also Steffens 2001) and more recent data show that this upward trend continued in many countries in the 2000s (Oguchi and Fuse 2015).

The ever-longer lifespan of cars is intriguing in light of their cultural importance, but also considering the significant efforts that governments around the world put into removing old, emission-intensive cars from the roads. Car scrappage schemes are designed to deliberately accelerate obsolescence, either to reduce overall emissions or stimulate new car sales (see Van Wee et al. 2011). The market of automobiles is further interesting because it is characterised by declining product release cycles since the 1970s. In the UK, new products with major facelifts were introduced every 5 years in the 1990s, compared to every 7 years in the early 1970s (interestingly, release cycles were under 4 years in the mid-60s) (Holweg and Greenwood 2001). The past decades thus defy some key predictions of theories of acceleration.

In search of explanations for the deceleration trend, Steffens (2001) found that in the Australian market, increasing real prices for new cars explain much of the variation. A study of the UK market, however, found that prices for new vehicles were actually falling and can thus not explain their increasing age (Hamilton and Macauley 1998). The study looked at two additional variables beyond the price for new vehicles: their durability and the costs of repair and maintenance. They conclude that the longevity of cars had indeed increased during this period, but this is rooted in falling costs for repair and maintenance services induced by increased competition, rather than in improvements in car durability. Their results suggest that car lifespans are essentially determined by the total costs per mileage. The different findings of these two studies show that it is important to pay attention to variations across countries or regions. Furthermore, results need to be interpreted with caution, as both studies investigated only a very small set of variables.

Mobile Phones

The data on the historical development of replacement cycles of mobile phones stems from my ongoing research of the British mobile phone market. The case study design on which this study is based, allows for a more comprehensive appreciation of the contextual conditions within which replacement cycles develop, informed by expert interviews and a detailed review of market research reports, trade journals, and business newspapers.

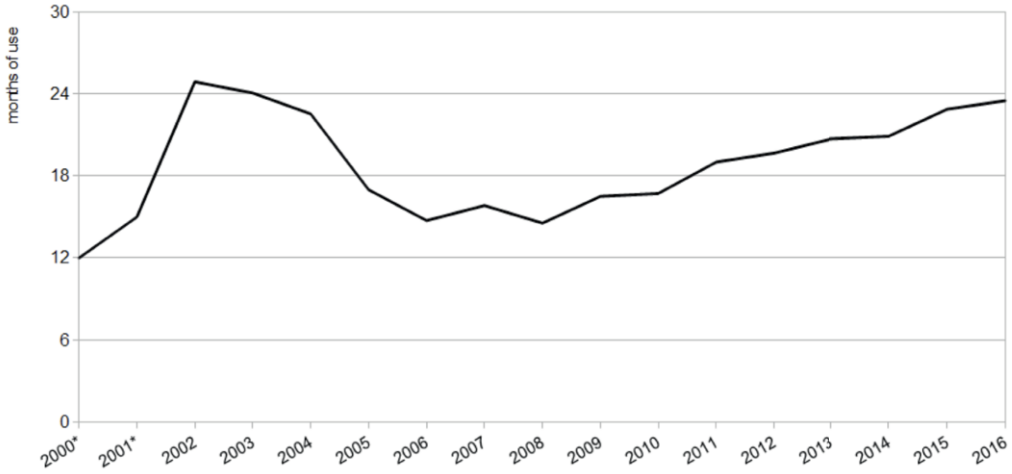

*Figure 2. Mobile phone replacement cycle in the UK (2000-2016); own calculations; *based on estimates of industry sources.*

The relatively short history of mobile phones makes it possible to estimate the development of replacement cycles for the whole saturation period. In the UK, more than 50% of the adult population possessed at least one phone in 2000. Figure 2 depicts the development of the replacement cycle since then, revealing a slight upward trend until 2002, a period of acceleration between 2003 and 2006, a short period of stabilisation (2007-2008), and a final period of steadily lengthening cycles until 2016.

This up and down of replacement cycles cannot be explained by any theory of acceleration, but needs to be understood in light of the competing interests and strategies of various actors on the one hand, and variations in the perceived pace of innovation and obsolescence on the other. Whereas the leading manufacturers and retailers constantly tried to shorten replacement cycles, mobile operators fairly successfully worked in the opposite direction for most of the study period, continuously lengthening service contracts to bind existing customers to their network. Only since 2012/3, due to innovations in service contracts, have their interests converged. However, even the orchestrated efforts of leading manufacturers, retailers, and operators at accelerating the replacement of mobile phones had limited success so far, as replacement cycles continued to increase in most recent years.

The consumers' perceived pace of innovation and obsolescence is key for understanding this development. Since the release of the first iPhone, which brought about a dominant design in mobile phone technology (cf. Giachetti and Marchi 2010), many consumers do not see much difference between each new model launched on the market and thus prefer to keep their phones longer (Milanesi and Guenveur 2016), despite falling prices and fast product introduction cycles. Contrary to the idea of consumers having a throwaway mentality and insatiable desire for the new, consumers evaluate phones in different ways and replace their phones only when they consider a replacement to be worth it (cf. Wieser and Tröger submitted). The phone's durability is a dimension that has become more important, reflected in the recent trend towards increasingly waterproof and shock-resistant phones. The period of fastest replacements (2003-2008), by contrast, saw the diffusion of highly popular features like inbuilt cameras and music players. A downside of this trend, however, was an extremely low battery life, limiting the potential longevity of phones. What the case shows, in sum, is that there may be competing interests related to replacement cycles and that no single stakeholder group can determine their length on its own.

Conclusions

The three cases presented in this paper – wheat seeds, automobiles, and mobile phones, show that there is no dominant logic or force underlying historical changes in product durability, lifespans, and replacement cycles. Neither are such changes entirely unpredictable: There are clear patterns where these phenomena go up or down for sustained periods of time. As for the larger literature on acceleration and the sociology of time, however, clearly more empirical work is needed to create a counterbalance to the dominance of abstract theory (see Wajcman 2008). Such research, when conducted in various contexts, could significantly enhance our understanding of replacement cycles.

The observed patterns in replacement cycles further call for an empirically grounded theory that can explain both periods of acceleration and deceleration and connect durable goods replacement decision-making with developments at the aggregate level. Possible candidates are middle-range theories such as social practice theory (as proposed by Jaeger-Erben et al. 2016), actor-network theory, or institutional theories. A case in point is Shove et al.s' (2007) use of a range of theories to understand the dynamics of kitchen renewals. Theories like these further highlight the contributions of various actors beyond consumers and manufacturers, including various intermediaries, but also non-human devices

which participate in the performation of temporal order. Moreover, a theory of replacement cycles or product lifetimes would need to take seriously the multiplicity of interests and valuations in a given context, conflicts which are at the roots of variations in replacement cycles.

From the perspective of environmental sustainability, the evidence presented here provides some ground for optimism. Not only does it show that there is no necessary drive towards acceleration, but also that businesses can survive and make profits during sustained periods of shortening replacement cycles. Hence, long replacement cycles and economic imperatives may not be mutually exclusive.

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