



PLATE

Product Lifetimes And The Environment

3rd PLATE Conference

September 18–20, 2019

Berlin, Germany

Nils F. Nissen

Melanie Jaeger-Erben (eds.)

Whalen, Katherine; Milios, Leonidas: **Circular economy policy at a crossroads: encouraging durable products or enabling faster recycling of short-lived products?** In: Nissen, Nils F.; Jaeger-Erben, Melanie (Eds.): PLATE – Product Lifetimes And The Environment : Proceedings, 3rd PLATE CONFERENCE, BERLIN, GERMANY, 18–20 September 2019. Berlin: Universitätsverlag der TU Berlin, 2021. pp. 843–848. ISBN 978-3-7983-3125-9 (online). <https://doi.org/10.14279/depositonce-9253>.

This article – except for quotes, figures and where otherwise noted – is licensed under a CC BY 4.0 License (Creative Commons Attribution 4.0). <https://creativecommons.org/licenses/by/4.0/>.

Universitätsverlag der TU Berlin



Circular Economy Policy at a Crossroads: Encouraging Durable Products or Enabling Faster Cycling of Short-lived Products?

Whalen, Katherine A.; Milios, Leonidas

International Institute for Industrial Environmental Economics, Lund University, Lund, Sweden

Keywords: Circular Economy; Policy; Product-Service System; Non-Ownership; Business Model.

Abstract: Non-ownership models, where firms rather than consumers remain product owners, are advocated as a way for firms to prolong product lifetimes and contribute to a more Circular Economy. However, it has been suggested that such models could actually encourage 'faster cycling', meaning earlier product replacement and shorter product lifetimes. Within recent policy discussions, product durability to prolong product lifetimes has become a key focal point. This paper focuses on how policy can encourage product durability and prolonged life for products distributed through non-ownership models. The paper explores the relationship between policy related to product lifetimes and non-ownership models through a review of existing and proposed policy for two product categories: mobile phones and office furniture. The results suggest there is a gap in policy regarding non-ownership models. While existing policies may address some concerns of faster cycling, additional policy propositions from the European Commission should be considered. In particular, while relevant policies related to either studied product group are identified, the policies with most potential come from outside the existing legislative framework on eco-design and resource efficiency measures. Thus, the findings are not only useful for academics and policymakers in the field of Circular Economy and circular business models, but also to practitioners working in firms where these policy frameworks are relevant.

Introduction

Concerns about the environmental impacts of resource production and consumption have sparked a variety of new policy discussions and legislative proposals within the European Union (Milios, 2018). With the goal of contributing to a more Circular Economy, one focus has been on extending the value of products and resources (European Environment Agency [EEA], 2017). Particular emphasis has been placed on the 'inner loops' of the Circular Economy concept, or how to extend product lifetimes, as keeping existing products in use for longer periods of time can theoretically slow consumption and displace new production (International Resource Panel, 2018).

Within the political discussion, one aspect of achieving extended product lifetimes has focused on designing more durable products. New EU regulations have begun to address durability by providing minimum lifetimes for vacuum cleaners, domestic washing machines, and lighting products (Bundgaard, Mosgaard, & Remmen, 2017). By creating products that are more durable or easily repairable, consumers may be encouraged to use products longer or

even buy second-hand instead of new (Bakker, Hollander, Hinte, & Zijlstra, 2014).

At the same time, the idea of Circular Economy has sparked a resurgence of interest in product-service systems (PSS), specifically PSS non-ownership models that provide 'access over ownership' (Bocken, Pauw, Bakker, & Grinte, 2016; Lacy, Keeble, & McNamara, 2014). In fact, moving towards a 'lease society' has been mentioned within the political debate (Merkies, 2012). In non-ownership models, firms, instead of customers, remain product owners over the product's use.

Non-ownership models could help make the business case for firms to undertake product redesign, create more durable products, and contribute to extending product lifetimes (Tukker, 2004). The argumentation is that these models incentivize firms to create more durable products in order to decrease service costs over product lifetimes and reduce the need for new manufacturing (Stahel, 2001). However, these models could also encourage earlier product replacement and shorter product lifetimes by making it easier for customers to

switch to the newest and latest product models (Wieser, 2016).

This paper will explore existing and proposed EU policy instruments to better understand how they address product durability and longer lifetimes in the context of non-ownership models. We present a review of EU policies related to two different products as a starting point for our investigation. Policymakers, business developers, and academics may use the findings to help facilitate discussions around non-ownership models and product lifetimes.

Non-ownership models

What happens over a product's lifetime during a non-ownership model is not always transparent or clear. Evidence is scarce that firms design such models with a systems approach in mind (Mont, 2002) and product redesign is not always undertaken (Whalen, 2017). There are also no guarantees that the product is actually redistributed again or used for the entirety of its potential product life, as highlighted by recent media and documentaries (Korus, 2019; Huang, 2018).

Although products within the EU that are not used for the entirety of their possible lifetimes may be directed to other uses and purposes (such as exported to other countries for reuse), the exact fate of these products and their final use or disposal is unknown (EEA, 2012; 2014). Moreover, even if such products were collected for recycling, the system would most likely experience significant efficiency loss due to inefficient recycling technology and limited recovery of materials (Andre, Ljunggren Söderman, & Nordelöf, 2019).

A possible lack of accountability can be discerned in such non-ownership model practices, and it is unclear if existing and proposed policies aimed at encouraging product lifetime extension address these concerns. Although numerous policy instruments are being discussed related to extending product lifetimes (Maitre-Ekern & Dalhammar, 2016) and macro-level policy is seen as a way to encourage circular business practices (Whalen & Whalen, in press), it has yet to be seen how existing and proposed policies encourage product lifetime extension in non-ownership models. In this paper, we aim to develop a better understanding of this by answering the following question: *How do existing and proposed EU policy instruments*

address durability and longer lifetimes in the context of non-ownership models?

Cases Studies: Mobile Phones & Office Furniture

As policy measures are often product-focused, we investigate this question by conducting a case study of two specific product categories that have received recent interest from policymakers: mobile phones and office furniture. We first review existing and proposed legislation related to each product category and then reflect on how each would address product life extension (product life extension) in non-ownership models.

Results

Existing regulatory frameworks targeted at product life extension for mobile phones and office furniture are focused on ownership models (see 'Existing policy measures' in Tables 1 and 2). In fact, a variety of frameworks already exist that encourage product life extension on the consumer-side such as minimum guarantees of two years (Svensson et al., 2018) or mandatory availability of supply parts in some countries (EEA, 2016). However, these rules vary from country to country and, even then consumers are often unaware of such measures (European Commission, 2015). Thus, many proposed policy measures aim to increase awareness of consumer rights, such as by labeling (Gåvertsson, Milios, & Dalhammar, 2018).

Other identified *proposed policy measures* can be found under 'General policy recommendations for product life extension' in Tables 1 and 2. These include additional consumer-oriented approaches to protect consumers and encourage product life extension such as guaranteed access to spare parts (Whalen, Milios, & Nussholz et al., 2018; Watson et al., 2017; Sanfelix Forner, Mathieux, & Fulvio, 2014). Green Public Procurement (GPP) is also part of the policy discussion (Öhgren, Milios, Dalhammar & Lindahl, 2019; Forrest, Hilton, Ballinger & Whittaker, 2017). Green Public Procurement (GPP) can be a powerful policy approach as it creates demand for environmentally advantageous options in public purchases, thus creating a pull effect in the market by scaling-up relevant business operations (Renda et al., 2012). The findings are summarized in Tables 1 and 2.

Core aim	Existing policy measures	General policy recommendations for product life extension	Recommendations to address product life extension in non-ownership models
Enable customers to extend product lifetimes by creating awareness of product lifetimes & designing longer lasting phones	<ul style="list-style-type: none"> • Minimum legal guarantee: EU Consumer Sales Directive: 2 years; Sweden: 3 years; Norway: 5 years; Finland: expected lifetime • France: The Act (Law no. 2014-344) addresses durability and lifespan of consumer goods, including the introduction of extended product guarantees from 6 months to 2 years 	<ul style="list-style-type: none"> • Enforce sellers to inform customers of their rights, labeling of warranty rights, and declaring expected lifespans • Create specific eco-design criteria for mobile phones • Ensure software support through minimum guarantee period 	<ul style="list-style-type: none"> • GPP criteria requiring longer use of products for extended number of years (by product category, e.g. minimum 3 years for mobile phones) • Mandatory priority of software upgrade over hardware upgrade
Enable widespread reuse & increase consumer confidence in second-hand products		<ul style="list-style-type: none"> • Adopt refurbishment certification standards • Quality labeling for re-used ICT equipment and re-sale opportunities • Non-destructive disassemblability of key components • Adjust WEEE schemes and lower VAT or tax breaks for repair/refurbished electronics 	<ul style="list-style-type: none"> • National re-use targets, to enable a stable market for good quality second-hand products and increase sourcing from 'non-ownership' models • Re-use/recycling certificates – auditing, to ensure responsible treatment and re-use opportunities for EOL products • Data erasure protocols and commonly accepted methodology for protecting the privacy and confidentiality of customer data and enabling re-use of ICT equipment • EPR rules to recognize the need for retrieving functional spare parts from EOL products and redirecting them to repair services and second-hand markets
Increase availability of spare parts	<ul style="list-style-type: none"> • France: The Act (Law no. 2014-344) - obligation of retailers to inform customers about the time horizon that spare parts will remain available for a product 	<ul style="list-style-type: none"> • Provide access to spare parts for expected lifetime 	<ul style="list-style-type: none"> • EPR rules to recognize the need for retrieving functional spare parts from EOL products and redirecting them to repair services and second-hand markets
Address the variable quality and supply of phones coming back		<ul style="list-style-type: none"> • Information campaigns on the value of used electronics • Encourage leasing models (starting with public sector) 	<ul style="list-style-type: none"> • Re-use/recycling certificates – auditing. Within this policy approach, there is a possibility for auditing each EOL batch and depending on age and quality it could be either redirected to re-use or recycling • Strategic use of GPP tenders to include more PSS requirements and provisions for extended use-phase of products purchased (with associated repair services)

Table 1. Existing and proposed policy measures related to product lifetimes of mobile phones.

Discussion & Recommendations

In terms of how existing and proposed policy measures address product life extension in the context of non-ownership models, it appears there are limited policies that target life extension when the shift of ownership changes

from customer to company. In fact, non-ownership models could perhaps even provide a means for companies to protect themselves from proposed policies. For example, a product producer required to provide guarantees for five years could instead provide the product via a

non-ownership model that upgrades the customer to a new product every two years, thus avoiding the minimum legal guarantees. This gap in policy could be addressed by taking a lifecycle perspective for non-ownership models. The authors propose some measures in the final columns of Tables 1 and 2, and conclude this paper by expanding on three proposed recommendations:

Service-Oriented GPP

Currently, GPP criteria mainly focus on the use phase of the product throughout its life within the public organization; elements of resource efficiency in production and disposal after use are not entirely considered (Wasserbaur & Milios, 2019). Additionally, public sector requirements can also be in direct contradiction with product life extension as is now the situation for ICT equipment (e.g. laptops and mobile phones) upgrades in Sweden where replacement happens in regular intervals, irrespective if the product is fully functional or damaged (Crafoord, Dalhammar, & Milios, 2018).

Furthering developing GPP criteria that take the product's entire lifecycle into account could help ensure a selection of non-ownership offerings that contribute to product life extension. New methodologies could be developed to calculate impacts in GPP, by using a mixed method of LCA and LCC and rating systems of IO-MFA (especially on critical raw materials and hazardous substances). Admittedly, this is an enormous task for public authorities to perform individually, so it is essential that a central authority with a strong mandate both from government and industry can liaise with scientific partners to develop such a methodology.

Mandatory national re-use target

Currently, legislation provides only national targets for 'preparation for re-use and/or recycling' without making a distinction between the two operations. In fact, it is most common practice in EU Member States to calculate the target by measuring the amount of waste collected for recycling (not the actual amount being recycled) and excluding any operations related to re-use as these are particularly hard to measure (EEA, 2013).

Core aim	Existing policy measures	General policy recommendations for product life extension	Recommendations to address product life extension in non-ownership models
Enable customers to extend product lifetimes by creating awareness of product lifetimes & designing longer lasting furniture	<ul style="list-style-type: none"> • Minimum legal guarantee: 2 years for manufacturer or retailer warranty is implied under EU consumer law • Sweden: Eco-labels (i.e. Nordic Swan and Möbelfakta) • Sweden: National guidelines on GPP for furniture, developed by National Agency for Public Procurement (Upphandlingsmyndigheten) 	<ul style="list-style-type: none"> • Longer mandatory warranty (i.e. 5 years) to encourage more durable furniture • EU wide Green Furniture Mark (GFM) and labeling of products based on eco-design requirements, GPP or EU Ecolabel 	<ul style="list-style-type: none"> • Reduce or substitute certain chemical additives (mainly flame retardants). This can extend furniture lifetimes by enabling multiple uses and enhancing indoor environment quality • Re-use/recycling certificates – auditing • National re-use targets
Encourage longer product lifetimes by incentivizing repair and reuse	<ul style="list-style-type: none"> • Sweden: Tax breaks for repairing household appliances at home, including furniture (the so-called 'rut-avdrag') 	<ul style="list-style-type: none"> • Incentivize product return (i.e. vouchers by firms (e.g. IKEA) encourage customers to return furniture after use) • Utilize modular design principles to enable better repair and component replacement 	<ul style="list-style-type: none"> • Mandatory partnership of OEMs with re-use sector

Table 2. Existing and proposed policy measures related to product lifetimes of office furniture.

Setting a separate and well-defined target for re-use could be considered an institutional reinforcement for re-use in non-ownership models as it does not preclude that product producers would not already re-use their products without the target. Instead, firms operating non-ownership models would find themselves in an advantageous position to redirect their products to re-use, since there would be a guaranteed demand and probably reasonable monetary compensation. Furthermore, a separate target for re-use would send a clear message to the market and related stakeholders that there will be a new stream of resources available that needs to be re-used (which would otherwise end-up in recycling).

Re-use or recycling certificates / auditing

Currently, re-using and/or recycling of products in non-ownership business offerings are not regulated by any means other than internal company policies. Following in the steps of supply-chain auditing and certification schemes, there could be additional controls by independent authorities to prove (and measure) the flows of EOL products. Voluntary certification could be used as a business advantage by firms to engage with customers or even address new GPP criteria as proposed in the previous section.

On the other hand, the authorities could require mandatory certificates for all EOL units. A predetermined list of EOL treatment options and recognized EOL operators could be approved by a specialized public agency (e.g. EPA) and yearly auditing concerning all firms offering non-ownership solutions could be mandated by the agency. Although such a practice might increase the overall administrative costs, it would also enhance the transparency and accountability of EOL products both domestically and abroad. Taking into account that disposal and recycling operations (waste) are more costly and administratively demanding, the re-use option might seem as the preferable option for firms who ultimately look for profit (or at least reduced costs). This could lead to lower costs and increased resource efficiency for product producers and provide a stable stream of good quality second-hand equipment to the re-use market in EU Member States.

Acknowledgments

This research was supported by the Mistra REES (Resource Efficient and Effective Solutions) program, funded by Mistra (The Swedish Foundation for Strategic Environmental Research).

References

- André, H., Ljunggren Söderman, M., & Nordelöf, A. (2019). Resource and environmental impacts of using second-hand laptop computers: A case study of commercial reuse. *Waste Management*, 88, 268-279. doi:10.1016/j.wasman.2019.03.050
- Bakker, C., Hollander, M., den, H., E., & van, Z., Y. (2014). *Products that Last: Product Design for Circular Business Models*. Delft, The Netherlands: TU Delft.
- Bocken, N. M. P., de Pauw, I., Bakker, C., & van der Grinten, B. (2016). Product design and business model strategies for a Circular Economy. *Journal of Industrial and Production Engineering*, 33(5), 308-320. doi:10.1080/21681015.2016.1172124
- Bundgaard, A.M., Mosgaard, M.A., & Remmen, A. (2017). From energy efficiency towards resource efficiency within the Ecodesign Directive. *Journal of Cleaner Production*, 144, 358-374.
- Crafoord, K., Dalhammar, C., & Milios, L. (2018). The use of public procurement to incentivize longer lifetime and remanufacturing of computers. *Procedia CIRP*, 73, 137-141.
- European Environment Agency (2012). *Movements of waste across the EU's internal and external borders (Report No. 7/2012)*. Luxembourg: Publications Office of the European Union.
- European Environment Agency (2013). *Managing municipal solid waste – a review of achievements in 32 European countries (Report No 2/2013)*. Luxembourg: Publications Office of the European Union.
- European Environment Agency (2014). *Environmental Indicator Report 2014 – Environmental impacts of production-consumption systems in Europe*. Luxembourg: Publications Office of the European Union.
- European Environment Agency (2016). *More from less—material resource efficiency in Europe (Report No 10/2016)*. Luxembourg: Publications Office of the European Union.
- European Environment Agency (2017). *Circular by design. Products in the Circular Economy (Report No 6/2017)*. Luxembourg: Publications Office of the European Union.
- European Commission (2015). *Consumer market study on the functioning of legal and commercial guarantees for consumers in the EU*. Retrieved from: http://ec.europa.eu/consumers/consumer_evidence/market_studies/docs/legalguaranteesfinal_report_en.pdf
- Forrest, A., Hilton, M., Ballinger, A., & Whittaker, D. (2017). *Circular economy opportunities in the furniture sector*. Brussels: EEB.

- Gåvertsson, I., Milios, L., & Dalhammar, C. (2018). Quality Labelling for Re-used ICT Equipment to Support Consumer Choice in the Circular Economy. *Journal of Consumer Policy*. doi:10.1007/s10603-018-9397-9
- Huang, F. (2018, December 31). The Rise and Fall of China's Cycling Empires. *Foreign Policy*. Retrieved from <https://foreignpolicy.com/2018/12/31/a-billion-bicyclists-can-be-wrong-china-business-bikeshare/>
- International Resource Panel (2018). *Re-defining Value – The Manufacturing Revolution. Remanufacturing, Refurbishment, Repair and Direct Reuse in the Circular Economy*. Nairobi: United Nations Environment Programme.
- Korus, S. (2019, February 19). Electric Scooters: The Unit Economics May Spell Trouble [Blog post]. Retrieved from <https://ark-invest.com/research/electric-scooters>
- Lacy, P., Keeble, J., & McNamara, R. (2014). *Circular Advantage: Innovative Business Models and Technologies to Create Value in a World without Limits to Growth*. Retrieved from https://www.accenture.com/t20150523T053139__w_/us-en/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Strategy_6/Accenture-Circular-Advantage-Innovative-Business-Models-Technologies-Value-Growth.pdf
- Maitre-Ekern, E., & Dalhammar, C. (2016). Regulating planned obsolescence: a review of legal approaches to increase product durability and reparability in Europe. *Review of European, Comparative & International Environmental Law*, 25(3), 378-394.
- Merkies, J. (2012, June 13). The end of ownership. *Politico*. Retrieved from <https://www.politico.eu/article/the-end-of-ownership/>
- Milios, L. (2018). Advancing to a Circular Economy: Three essential ingredients for a comprehensive policy mix. *Sustainability Science*, 13(3), 861–878.
- Mont, O. K. (2002). Clarifying the concept of product–service system. *Journal of Cleaner Production*, 10(3), 237-245. doi: 10.1016/S0959-6526(01)00039-7
- Öhgren, M., Milios, L., Dalhammar, C., & Lindahl, M. (2019). Public procurement of remanufactured furniture and the potential for procuring product-service systems (PSS) solutions. Paper presented at the 11th CIRP IPS2 Conference, Hong Kong, China.
- Renda, A., Pelkmans, J., Egenhofer, C., Schrefler, L., Luchetta, G., & Selçuki, C. (2012). The Uptake of Green Public Procurement in the EU27. Retrieved from the European Commission: <http://ec.europa.eu/environment/gpp/pdf/CEPS-CoE-GPP%20MAIN%20REPORT.pdf>
- Sanfelix Forner, J., Mathieux, F., & Fulvio, A. (2014). Integration of resource efficiency and waste management criteria in European product policies – second phase: analysis of durability (final) (Report No. 1). Retrieved from the European Commission: <https://publications.europa.eu/en/publication-detail/-/publication/5f7f22f5-a457-452e-9a7c-5023e755b0d5/language-en>
- Stahel, W. (2001). Sustainability and services. In M. Charter & U. Tischner (Eds.). *Sustainable Solutions: Developing Products and Services for the Future* (152-164). Sheffield: Greenleaf.
- Svensson, S., Luth Richter, J., Dalhammar, C., Maitre-Ekern, E., Pihlajarinne, T. E., & Maigret, A. (2018). The emerging 'Right to Repair' legislation in the EU and the US. Paper presented at Going green - Care Innovation 2018, Vienna, Austria.
- Wasserbaur, R., & Milios, L. (2019). Spurring remanufacturing through public procurement – A case study in the Swedish automotive industry. Paper presented at the 4th International Conference on Remanufacturing (ICoR), Amsterdam, Netherlands.
- Watson, D., Gylling, A. C., Tojo, N., Throne-Holst, H., Bauer, B., & Milios, L. (2017). *Circular Business Models in the Mobile Phone Industry*. (TemaNord No. 2017:560). Copenhagen: Nordic Council of Ministers.
- Whalen, K. A. (2017). Classifying circular business models: a practice-based review. In C.A. Bakker & R. Mugge (Eds.), *PLATE: Product Lifetimes and the Environment*. doi: 10.3233/978-1-61499-820-4-417
- Whalen, K. A., Milios, L., & Nussholz, J. (2018). Bridging the gap: Barriers and potential for scaling reuse practices in the Swedish ICT sector. *Resources, Conservation and Recycling*, 135, 123-131. doi: 10.1016/j.resconrec.2017.07.029
- Whalen C.J., & Whalen, K.A. (in press). Circular business models: A critical examination. *Journal of Economic Issues*.
- Wieser, H. (2016). Beyond Planned Obsolescence: Product Lifespans and the Challenges to a Circular Economy. *GAIA - Ecological Perspectives for Science and Society*, 25(3), 156-160. doi: 10.14512/gaia.25.3.5