Quantifying the sharing economy: An approach for measuring the ecological, social, and economic effects

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The sharing economy is often considered either the most promising “pathway to a sustainable market economy” or, conversely, a “hyper-capitalistic” exploitation of natural and social resources. Such contrasting images can influence the societal valuation of sharing economy models, thereby misleading or hindering processes of transformation. Approaches toward quantifying the sharing economy have the potential for enriching societal knowledge and, in the process, fuelling societal transformation as the ecological, social, and economic effects of such developments as carsharing become apparent.

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Since the emergence of the sharing economy, academics and the public discuss about its contribution to a more sustainable society (Schor 2016). On the one hand, proponents emphasize that sharing models have the potential to enhance sustainability in ecological, economic, and social terms. This is because sharing allows, for instance, a more efficient use of natural resources (Botsman and Rogers 2010), leads to lower prices for consumers (Huefner 2015), or makes products and services affordable to a larger number of people, thus enhancing social inclusion and participation (Bardhi and Eckhardt 2012). On the other hand, it is increasingly questioned whether these potentials can actually be realized or whether negative effects outweigh the positive ones. Existing work points to downsides that arise from increasing commercialization of private life (Martin 2016) and from reusing saved resources for activities that have negative effects (Leismann et al. 2013). Instead of leading a pathway toward a more sustainable economy and society (Heinrichs 2013), the sharing economy might thus lead to a “nightmarish form of neoliberalism” or “hyper-capitalism” (Martin 2016, Scholz 2016).

Such different positions influence valuation processes (Lamont 2012), in which society assigns meaning and legitimacy to a phenomenon like the sharing economy or to particular forms within that domain. An increase of legitimacy can lead to an increased use of a certain sharing practice and to the diffusion of the respective organizational form. Positive social evaluations of sharing models can thus serve as “window of opportunity” and make it more likely that user preferences and practices co-evolve accordingly (Geels 2002). In contrast, a devaluation of a form might trigger regulatory interventions. For instance, municipalities come under pressure to regulate accommodation-sharing platforms when problems on the housing market are connected with these platforms (Vith et al. 2019). Having assigned values is consequential, in the sense that it shapes the behavior of various societal actors (Engels and Wang 2018).

Quantification can negatively and positively influence societal valuation processes: A potentially negative influence emerges from the fact that numbers and figures are easier to communicate and are more likely to be remembered, picked up, and spread further than complex arguments. Hence, actors who want to influence societal debates are tempted to communicate numbers even when these numbers are only weakly supported by scientific research. Positive influences on societal valuation processes stem from three opportunities the quantification provides:

Comparing: Quantification allows metrical relationships to be created between different and seemingly incomparable objects (Engels and Wang 2018). This means that by using quantifiable indicators, we can compare different sharing models with each other and with established forms of economic activities.

Aggregating: Quantitative results of different research projects can be combined and aggregated to a certain extent when the underlying mechanisms of data collection were reported in a transparent manner. Aggregating results from scientific inquiries can enhance the social stock of knowledge on this complex phenomenon.

Reporting: Reporting new results can trigger an update of existing social valuations (Engels and Wang 2018) and stir up societal de-
bates (Lamont 2012). With changes in the social stock of knowledge, the development of regulatory frameworks to support societally desirable sharing models is enhanced, and users are more likely to adapt their behavior.

To make use of these opportunities, we developed an approach to quantify the sharing economy. We start with a summary of its goals, present the steps, and discuss its contributions and limitations.

Goals and challenges of quantifying the sharing economy

To advance quantification of the sharing economy, we identified three major goals and connected challenges.

**First**, we need a deeper knowledge of the scope and size of the sharing economy (Martin 2016). Quantitative data helps to define and evaluate the phenomenon’s relevance to society and the economy. A challenge for quantifying its size is that there is no commonly shared definition of “the sharing economy”. Ever since its emergence, experts have described the sharing economy as a “fuzzy” (Plewnia and Guenther 2018) or broad “umbrella concept” (Acquier et al. 2017); one scholar has outright stated that “the sharing economy lacks a shared definition” (Botsman 2013). The question of who is part of the sharing economy and who is not has led to heated debate, including attempts to distinguish “real sharing” from “pseudo-sharing” (Belk 2014) or the sharing economy from concepts such as “on-demand economy”, or “access-based economy” (Frenken and Schor 2017). Despite continuing efforts to find a common definition (Codagnone and Martens 2016), recent work suggests the issue has not yet been resolved (Mair and Reischauer 2017). Acknowledging the lack of a commonly shared definition, most researchers take a pragmatic approach when quantifying the size of the sharing economy and focus their analyses on selected key sectors (PricewaterhouseCoopers 2014, European Commission 2018). As a result, existing work includes different sharing models in the analyses, which leads to diverging observations. For instance, while PricewaterhouseCoopers (2014) identified 275 sharing platforms, the study of the European Commission (2018) observed that approximately 600 platforms were active in the same region, although the overall number of platforms might be lower because platforms can be active in several regions. In addition, current researchers have focused on online platforms and for-profit organizations in their quantification efforts. As a result, we have little knowledge on nonprofit organizations and offline models, such as community gardens (figure 1) or neighborhood platforms. The lack of knowledge on the size of these relevant parts of the sharing economy calls for further attempts at quantification.

**FIGURE 1**: Approaches for quantifying the sharing economy mostly focus on online models and for-profit models – therefore there is a need to integrate knowledge on nonprofit organizations and offline models, such as neighborhood platforms or community gardens. The photo is taken at the Prinzessinnenengarten in Berlin.
Second, we should make differences visible between different sharing models. Quantifying effects of different models will help us understand which sharing models deserve support because they involve positive effects for economy, society, or the natural environment and which models might require stronger surveillance and regulation. The diversity of sharing models represents a challenge to quantification. Diversity, in particular, occurs because sharing organizations are active in several areas of application, including mobility, accommodation, private and professional services, consumer goods, food and agriculture, and others, therefore offering different products or services (Owyang 2016). Thus, we cannot easily compare or aggregate the differing outputs of these diverse sharing organizations, which complicates the quantification of effects. One consequence from this challenge is that existing work has so far focused on single areas of application, with accommodation (e.g., Aznar et al. 2017, Zervas et al. 2017) and mobility (e.g., Firnkorn and Müller 2011, Martin and Shaheen 2011) having received the most attention. Existing work interested in effects of different sharing models, mostly relies on expert evaluations (Bierwirth et al. 2018). As a result, we need more work measuring and comparing effects across diverse sharing models.

Third, we need to measure economic, social, and ecological effects of sharing economy organizations at the same time. For instance, one expectation is that local initiatives like community gardens or repair cafés are crucial for strengthening social cohesion in neighborhoods but may not reduce environmental pollution on a larger scale and have few economic contributions. Quantitative data would systematically explore and verify or reject such expectations. A challenge for such work is developing a measurement model that conceptualizes social, economic, and ecological effects at the same time and in one model (Robinson and Tinker 1997). What complicates such studies is the lack of an established set of indicators applicable in the context of the sharing economy. Studying traditional companies, we can fall back on a wide range of existing indicators (Roca and Searcy 2012) like those provided by the Global Reporting Standards Initiative. However, comparable standard sets of indicators are not available for the sharing economy, and existing sets of indicators fail to represent particularities in sharing models (Trenz et al. 2018). The lack of an integrated measurement model has led to situations in which most studies focus only on one dimension of sustainability. We find researchers studying either economic (e.g., Horn and Merante 2017, Hub 2017, Petropoulos 2016), social (e.g., Greenwood and Wattal 2017, Schor 2017), or ecological effects (Firnkorn and Müller 2011, Ludmann 2018), and few studies considering two of these dimensions (e.g., Wachsmuth and Weisler 2018).

i-share approach to quantification

To address the three goals and the connected challenges, we developed in the research project i-share an approach to quantify the sharing economy in its diversity of forms and effects in five steps.

Theorizing: Because of the newness of the sharing economy as a field of scientific inquiry, theoretical elaborations lag behind societal debates and practical developments, meaning there is a growing need for theorizing on sharing models and effect mechanisms (Heinrichs 2013). To initiate this process, we started our inquiry with an exploratory study and analyzed diverse sharing organizations based on interviews and data from their websites. On this...
basis, we identified key features characterizing different sharing models and distilled generic operating principles and influence indicators therein.

**Mapping:** In the second step, we identified and mapped sharing economy organizations in Germany. Our solution to deal with the lack of a shared definition was working with a broad conceptualization of the sharing economy by encompassing various existing definitions. To do so, we conducted a systematic analysis of academic literature on the sharing economy to identify application areas for sharing models (for a detailed description see Wruk et al. 2019). This allowed us to identify a range of 20 different sharing models, including accommodation platforms, carsharing providers, lending and renting platforms for consumer goods, coworking spaces, community gardens, and others (figure 2). The broad scope made sure that no potentially relevant aspect of the phenomenon was omitted. Such an approach is in-line with recent publications arguing for a broad understanding of the sharing economy (Plewnia and Güenther 2018, Trenz et al. 2018). We identified sharing economy organizations active in one of these areas of application through desktop search, media analyses and using a Web crawler.

**Our attempt to quantify the sharing economy is an invitation to other researchers to improve our methods. Each additional study increases scientific knowledge about the sharing economy and provides an opportunity to refine societal debates.**

**Modeling:** We developed a generic model and a set of indicators that are applicable to all kinds of sharing organizations by adapting the established IOOI model, which considers the elements input, output, outcome, and impact (figure 3). The basic idea of the model was to capture the relations between invested resources (input), an organization’s activities and services (outputs), its effects on target groups (outcome), and their consequences for the economy and society as a whole (impact) (Bagnoli and Megali 2011, Khandker et al. 2009).

As shown in figure 3, major inputs refer to the groups participating in sharing organizations. Employees and/or volunteers are typically responsible for establishing and maintaining digital and physical infrastructure and for managing the community of users that take over the role of consumers and providers. The number of employees, volunteers and the number and composition of registered users, therefore, represent key input indicators.

Users typically contribute to the provision of sharing services by offering their private cars, apartments, spaces, time, professional skills, or other resources. As a result, making apartments, cars, etc. available as capacities that can be accessed by registered users is one of the outputs of sharing organizations. Other outputs are social interactions and transactions. The number of social interactions – which can be, for instance, direct or online encounters between users – represents an output indicator. Indicators to capture transactions depend on the area of application. This is the number of passenger kilometers per year in the case of carsharing organizations or the number of overnight stays in the case of accommodation sharing.

The model defines social, economic, and ecological outcomes in two ways. First, to capture whether sharing economy organizations, for instance, enhance social inclusion, we can determine in absolute terms how many people above a certain age or with a migration background participate in interactions and transactions, which represents an outcome indicator in the social dimension. Second, in order to interpret these absolute numbers, it is also relevant to know how many people from these social groups participate in sharing organizations compared to traditional offers and, thus, calculate outcomes in comparative terms.

To capture outcomes in the ecological dimension, we used CO₂ emissions in kilogram per time unit as our key indicator. This is because CO₂ equivalents can be calculated for various outputs that sharing organizations produce. This includes, for instance, vehicle-kilometers in the mobility context (Firnkorn and Müller 2011) or saved items of clothing for clothing-sharing offerings (Behrendt et al. 2017). Economic outcome indicators are the income generated for employees and the organization or for external providers in peer-to-peer models.

Such organizational outcomes in all three sustainability dimensions can be aggregated on different levels to calculate the aggre-
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Measuring: In the next step, data on the indicators in the model is collected. The main data source is a survey among sharing organizations in Germany that were identified in the mapping process. Through this data source, we are confident in receiving information on input and output indicators from the participants. Additional data sources and statistics allow us to calculate outcome and impact indicators. This is especially important in cases where organizations are not able to make a valid assessment or where we want to evaluate comparative effects. For instance, we assume that sharing organizations have no exact knowledge on the CO₂ emissions of their activities.

Interpreting: Finally, the mapping of sharing organizations, the measurement model and the gathered data result in a quantification of the sharing economy. For instance, we can quantify the size of different sub-sectors and of the sharing economy in Germany as a whole, with their inputs and outputs social, ecological, and economic outcomes. To do so, we develop a simulation tool that allows us to analyze the effects on different levels and for different assumptions. As such, it also enables us to generate different scenarios considering the potential development of the sharing economy and its effects. This helps us to make well-informed interpretations of our empirical results.

Conclusion

Our approach helps us to find answers to the central questions about the extent and effects of the sharing economy outlined above. First, mapping sharing organizations and collecting data about them provides us with valuable information about the size of the sharing economy. Applying a broad understanding to the sharing economy, thereby, helped us to deal with the definitional issues. Second, we teased out differences between sharing models and, at the same time, made sure that we can compare and aggregate the observed effects. Third, we developed a model with indicators regarding the three dimensions of sustainability. However, the current version of the model does not capture second-order effects or unintended consequences that result from user or provider decisions and behavior. For instance, understanding rebound-effects (Santarius 2015) was beyond the scope of our current model.

Although we cannot consider all quantification issues, our attempt to quantify the sharing economy is an invitation to other researchers to improve our methods of theorizing, mapping, modeling, measuring, and interpreting data. Each additional study increases scientific knowledge about the sharing economy and provides an opportunity to refine societal debates.

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References


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