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Article

Economics of Waste Prevention: Second-Hand Products in Germany

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Abstract: Reuse is still seen as a “niche phenomenon” and consumers seem to waste economic opportunities linked to buying and selling second-hand products. For this reason, this paper focuses on incentives and barriers to sell and buy second-hand products, as indicated in the literature, and applies a theoretical framework of transaction costs to explain the existing consumption patterns. For this paper, a representative online survey was conducted in which 1023 consumers in Germany participated, age 16 and older. The data were analyzed for statistically significant deviations between different groups of economic actors selling or buying second-hand products. Results show that valuable unused products exist in households, but barriers such as uncertainties about the reliability of the buyer or the quality of the product hinder the transition into sustainable consumption. Different forms of transaction costs are important explanatory variables to explain why consumers nevertheless predominantly buy new products, although they are aware that second-hand would save money and make an individual contribution to climate protection.

Keywords: circular economy; second-hand; reuse; transaction costs



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1. Introduction

Against the background of steadily increasing consumption of natural resources and environmental burdens caused by the currently dominant linear patterns of production and consumption, circular economy approaches have raised significant attention in scientific literature and among policy makers (e.g., [European Commission 2020](#)). The transition towards a circular economy in which the value of products and raw materials are contained at the end of their use phase, is seen as a crucial precondition for an absolute decoupling of resource use and economic wellbeing, e.g., achieving the climate targets agreed on in the Paris Accord.

Although many circular economic strategies focus on optimized recycling processes, the European Commission's Circular Economy Action Plan places a specific emphasis on the reuse of products that are no longer needed ([European Commission 2020](#)). From an environmental perspective and thus according to the waste hierarchy, reuse offers higher resource saving potentials than recycling—a large part of the necessary efforts in the production phase of products can be avoided and only in a very few cases; e.g., a significantly reduced energy consumption of newer products would overcompensate these advantages ([Von Gries 2020](#)). Specific quantification of saved resources or mitigated GHG emissions depends on the specific framework conditions, e.g., to what extent second-hand products actually replace virgin products ([Keith 2011](#)). In addition, in terms of cost savings and other socioeconomic objectives, reuse of products seems to be an obvious solution for products that are no longer wanted. Taking the example of packaging, switching to 20% reusable solutions could lead to USD 10 billion of business opportunities ([Ellen MacArthur Foundation 2019](#)), according to Rreuse, an European association for reuse, 296 new jobs could be created by treating only 10,000 tons of municipal solid waste ([Rreuse 2015](#)).

However, despite this consideration of reuse as a win–win opportunity that should align environmental and economic objectives of a circular economy, product reuse is actually a “niche phenomenon” (European Environment Agency 2018) of limited economic relevance for most product groups. According to the European Environment Agency’s progress report on waste prevention, the total turnover of the European second-hand sector is below 1% of the total retail sector and below 0.01% of Europe’s gross added value. Official statistics exist for only a few product groups, such as electronic and electrical products, and only a few countries show a share of reused products of more than 1% (Eurostat 2020). Taking Germany as an example, a study initiated by the Environmental Protection Agency estimated an annual market volume of just 4 kg per capita, including online platforms, e.g., eBay (Von Gries et al. 2017).

Against this background, this paper takes the gap between pure market opportunities and the reality of reuse as a “niche phenomenon” as the starting point to focus on barriers for reuse. It builds up on several papers that have focused on specific drivers or barriers, but to the authors’ understanding, it does not provide a systematic framework on how these barriers translate into reduced economic incentives to sell or buy second-hand products. Farooq Baqal and Abdulkhaleq (2018) highlighted that second-hand products in general are gaining more prominence because “products produced today will be outdated tomorrow and in order to go for an advanced version, there is a need to sell used products”. Previous research on barriers for reuse has, e.g., highlighted differences between various products groups, such as whether products have traces of previous owners (Edbring et al. 2016). Behrendt et al. (2011) identified five types of eBay users who trade based on very different incentives, inter alia so-called “prosumers” that already consider the reselling potential of products when buying them. On average, Mukherjee et al. (2020) also identified economic incentives as an important driver of using second-hand products. Such incentives become even more relevant as the purchase of previously used merchandise has been transformed “from a second-class act” into a worldwide fashion trend related to buying something “cool” and “stylish” (Hristova 2019). Klug et al. (2015), inter alia, highlighted the issue of trust as an important barrier for purchasing second-hand products.

In order to provide new insights on the actual relevance of incentive structures, this paper draws on economic transaction cost theories, a specific branch of literature within the so-called new institutional economics (NIE). The focus here is on the costs of using market mechanisms, e.g., for economic transactions such as the sale or purchase of second-hand products. This perspective contradicts the simplistic neoclassical assumptions that every market participant is fully informed about everything, now and in the future—at zero costs (Simon 1959; Coase 1998). Instead, so-called transaction costs occur, related to the gathering, validation, and processing of information, and can lead to path dependencies in which, from an economic point of view, inferior options (i.e., buying new products) have higher market shares than they should have in an optimal equilibrium, simply because standards and routines have evolved over decades to minimize such transaction costs (Yousuf 2017). Following Alston and Gillespie (1989), this paper differentiates transaction costs as analytical variables based on the different phases of market transactions: costs of finding suitable business partners, costs of negotiating contracts, and finally costs of monitoring whether the agreed products or services actually have the contractually agreed quality. Vakis et al. (2003) identifies these empirical approaches as an important research gap in the area of new institutional economics.

The aim of this paper is to contribute to current research by first providing an empirical basis for the actual relevance of the incentives and barriers mentioned in the literature above, and second, by applying a theoretical framework of transaction costs for both sellers and buyers of second-hand products to explain the gap described: How to explain the fact that consumers seem to waste economic opportunities linked to buying and selling second-hand products? How can the concept of transaction costs be operationalized in order to show its relevance for market exchanges?

For this purpose, the paper is structured as follows: Section 2 describes the materials and methods used—the data gathering and the theoretical framework for its analysis. Section 3 shows the results, Section 4 discusses the conclusions that can be drawn from the empirical results, and the last section draws conclusions, particularly regarding efficient policy formulation to support reuse, and further research needed to develop a consistent theoretical framework for the economics of waste prevention.

2. Methodology

For this paper, a representative online survey was conducted in which consumers in Germany participated, age 16 and older (Wilts and Fecke 2020). The participants were selected based on a standardized consumer panel in order to allow statistically significant conclusions differentiating gender, age groups, living conditions (urban, periurban, and rural) and spatial location within Germany (north, south, east, west). The participants were approached in September 2020 and thus between the two major COVID-19 waves and linked shutdowns, which might have influenced responses due to economic uncertainties or increased importance, e.g., hygienic concerns (Sueßbauer et al. 2020). On average, it took the participants 12 min to fill in the questionnaire; only completed questionnaires were taken into account.

The data sample included 1023 persons, selected from a predefined panel allowing for weighting of variables listed above in relation to national mean values. The panel of interviewees had a share of 52% females, 53% were age 50 and older, 79% were living in the western part of Germany, 32% had a university degree, and 38% indicated a net household income of EUR 2500 or higher. Fifty-one percent of the interviewees had bought at least second-hand item during the last 12 months and 46% offered products for reuse.

The questionnaire was developed in cooperation with eBay Kleinanzeigen, which is one of the largest online platforms for second-hand products in Germany. It included a total of 31 questions, 9 of which referred to general demographic aspects of the participant. The remaining 22 questions focused on selling used products, the purchase of second-hand products, and perceptions of climate and sustainability issues. The interviewees were given five different options to assess their agreement with specific statements (fully agree, partly agree, etc.). In a last step, the answers were weighted with regard to the factors indicated above. For the analysis, the answers were structured using cross-correlation analysis in order to show deviations from average answer patterns.

Based on the conceptual literature on transaction costs, the following matrix structure in Table 1 was developed that structures potential transaction costs that might hinder the market development for second-hand products. The framework differs between the phases of exchange as described in Section 1, specifically for buyers and sellers of second-hand products. This Table 1 was used to develop the questionnaire for the empirical part of the research presented in the section that follows.

Table 1. Transaction costs in different phases of market exchange.

Transaction Costs of	Finding Partners	Negotiation	Monitoring
Selling	products must be described, photographed, and uploaded/submitted to market platforms; often necessary registration and confirmation process; sometimes also direct costs such as handling fees	time-consuming communication with potential buyers; information gathering to assess market prices	
Buying	variety of different platforms that must be checked for best offers; e.g., auctions require specific attention uncertainty about seller reliability	time-consuming communication with potential sellers, e.g., with regard to product qualities	uncertainties about the actual quality of the product offered risk of fraud by the seller, e.g., product not delivered

3. Results

The following presents the results of the online survey that are divided into three parts: data on selling (Section 3.1) and buying second-hand products (Section 3.2); general attitudes on sustainability aspects as drivers for sale/purchase second-hand products (Section 3.3); and the final step (Section 3.4), which focuses on the relevance of specific barriers based on a statistical analysis of these data.

3.1. Selling Second-Hand Products

The survey results show that consumers own a significant number of products that they consider no longer used or needed. When asked about specific product groups that the survey interviewees have not used in at least 12 months but still nevertheless keep in their households, 62% mentioned CDs, DVDs, or Blue Ray Discs, 58% indicated books, and 57% clothing and shoes. Interestingly, 6% also mentioned cars as completely unused property. Figure 1 shows how the participants assessed the total value of these items that were unused for at least twelve months. The majority of participants estimated the value to be between EUR 250 and 499; nevertheless, the percentages are rather equally distributed between less than EUR 100 and up to EUR 2499, resulting in an average amount of EUR 1289. It should be noted that such self-assessments bear significant uncertainties, e.g., regarding the value of product depreciation years after the actual purchase. Nevertheless, the results in terms of number and value of products are consistent with previous analyses, e.g., [Huisman et al. \(2017\)](#).

Taking into account the economic potential that a household could realize by selling these unused products, it seems surprising that only 46% of participants reported selling at least one of these products, and only 30% sell one or more products at least every three months. Twenty-three percent of consumers, asked in the survey, do not get rid of products at all, and thus these items occupy an increasing amount of space in their flats or houses. Forty-seven percent of them simply discard unused products as waste, despite their economic value—this refers mainly, but not only, to broken products. When asked why they do not take advantage of the opportunity to turn such products into additional income, 12% answered that they are not aware of channels for selling used products, 24% mentioned the necessary efforts as an important barrier. Concerning this additional effort, 49% emphasized the time required, 34% lack information about the residual value of the products they want to sell, 32% have trust issues with potential buyers and are afraid of fraud, and 31% noted that communication with potential buyers simply takes too much time.

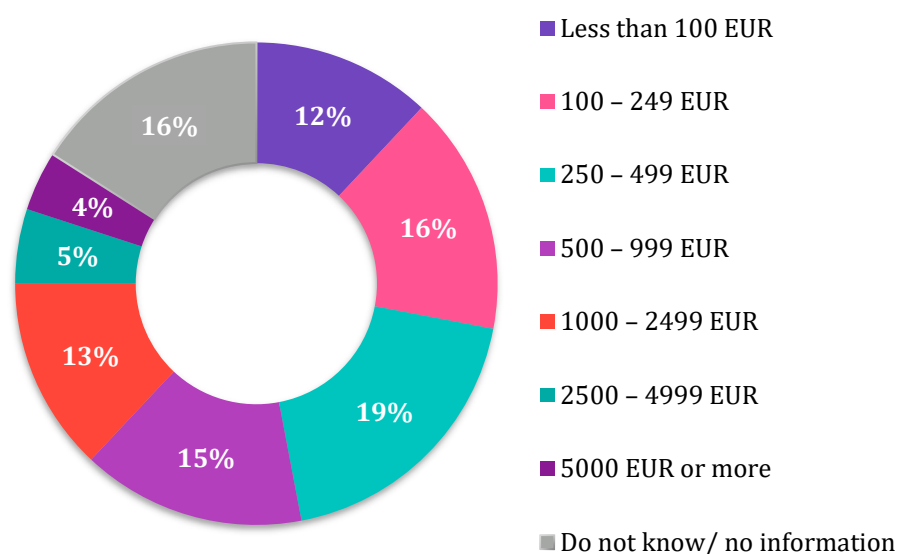


Figure 1. Estimated average value of unused products in the household. Source: authors' results.

3.2. Buying Used Products

In a second part, the participants were asked about their role as purchasers of used products. Of the 1023 interviewees, the majority indicated economic incentives as important advantages of buying second-hand products in comparison to virgin products: 56% agreed that they were able save costs and 36% indicated that they would not have afforded the products at the original retail price. Environmental benefits and avoiding unnecessary wastage of natural resources was indicated by 42%, and a third key driver seems to be the availability of products that are no longer for sale (34%).

Despite these economic incentives, only 29% of the survey participants bought more than one used product during the last twelve months. The results show that a large percentage of second-hand purchases is done by a relatively small group of participants who buy a product on a weekly or even daily basis. Table 2 illustrates the important barriers that were recorded—most refer to uncertainties about the reliability of the buyer or the quality of the product. Consistent with the abovementioned analysis by [Hristova \(2019\)](#), only 4% mentioned a general reluctance towards second-hand products as something that is only relevant for those who cannot afford new products. Potential buyers do not seem to be held back by unjustified prices, but by specific risks and uncertainties that would require them to invest more time in the validation of given information on the products for sale. Taking these barriers into account, the interviewees mentioned various product groups that less than a quarter would even consider buying second-hand. This includes inter alia smartphones, large electronic appliances, or car spare parts—all are considered as particularly resource-intensive and often contain critical raw materials ([Sander et al. 2019](#)).

Table 2. Key barriers in buying used products. Source: authors' results.

Key Barriers in Buying Used Products	in %
I do not know if the products are functional	52%
I do not know if the seller is trustworthy	46%
I do not know if the products are really as described/pictured	34%
I have no information on how the product was used before	33%
I do not know if the products are hygienically safe	21%
I just feel more comfortable with new products	17%
The search for used products costs a lot of time	14%
Buying used products is more time consuming because I do not have the wide selection/availability as with new goods	9%
Communication with the salesperson is exhausting	8%
Used products are something for people who cannot afford new goods	4%
Other	2%
Do not know /no information	6%

3.3. Attitudes towards Sustainability and Climate Protection

A third group of questions referred to the personal attitudes towards sustainable consumption and climate protection and their relevance for the willingness to buy second-hand products. Table 3 shows the significantly different answers of those who actually bought a second-hand product during the last twelve months and those who completely focused on buying virgin products. Here, 66% compared to only 28% who did not buy a second-hand product agreed with the statement that used products are an attractive alternative to new products; 55% compared to 25% mentioned that buying second-hand products is seen as an element of sustainable consumption.

However, even of those interviewees who did not buy a single second-hand product in the last year, 55% agreed that second-hand products are good for the environment. There is also little difference between the shares of interviewees who mentioned that sustainable consumption should include buying less—it could be argued that this is an indication to second-hand as a consistency rather than a sufficiency strategy for sustainability. Almost half of the survey participants do not seem to see a necessity to question consumption patterns as long as the products purchased have a lower environmental footprint (Sachs 2015). Those consumers who already bought a used product in the past also indicated a higher willingness to buy more second-hand in the future (63% compared to 30%).

Table 3. Agreement to specific statements related to sustainability depending on previous purchases of second-hand products. Authors' results.

Agreement to Specific Statements Related to Sustainability Depending on Previous Purchases of Second-Hand Products	No Used Products Bought in the Last 12 Months	Purchased Used Products at Least Once in the Last 12 Months
Sustainable action is becoming more important not only in consumption, but also in every day	67%	75%
Used products are good for the environment	55%	73%
Used products are an attractive alternative to new products for me	28%	66%
Sustainable action in everyday life is becoming more important for me	53%	66%
In everyday life, I pay a lot of attention to conserving resources	58%	64%
Buying second-hand will be an economically better alternative to buying new in the future	35%	57%
For me, sustainable consumption means buying less	50%	56%
For me, sustainable consumption means buying used products	25%	55%
Second-hand products are something for people who cannot afford new goods	27%	16%
N (total)	478	519

3.4. Relevance of Specific Barriers for Reuse

Based on these data, Tables 4 and 5 show an analysis of the relevance of specific barriers for (a) buying and (b) selling second-hand products. For this analysis, data on relevant barriers were checked for statistically significant deviations between regular buyers/sellers (more than four products per year) and those who indicated not to buy/sell any second-hand products. The table highlights deviations with a β error of $p \geq 0.1$.

The results highlight that different barriers seem to be of different relevance based on the frequency of selling/buying second-hand products. Interestingly, the perceived relevance of some barriers seems to increase, whereas others seem to decrease when consumers gain experiences with second-hand products. Experienced consumers put a stronger emphasis on insufficient descriptions of second-hand products and in general more often confirmed that buying second-hand products is more time consuming than regular purchases of new products. On the other hand, concerns about hygienic conditions of products and a general reliance on new products seem to decrease when consumer purchase second-hand products on a more regular basis. Concerning selling second-hand products, it is not surprising that the challenge of finding suitable market places is perceived as less relevant when consumers are used to offering their products more than four times a year. In addition, the general mistrust in buyers seems to decrease. On the other hand, experienced sellers emphasized the time-consuming communication with potential consumers.

Table 4. What are the three most significant disadvantages of buying used?

q12	All	q15	
		I Repeatedly Buy Products Used Yes in %	No in %
I do not know if the products are really as described/pictured	34%	41	29%
I do not know if the products are functional	52%	52%	51%
I do not know if the products are hygienically safe	21%	13%	26%
I have no information how the product was used before	32%	35%	32%
The search for used products costs a lot of time	13%	17%	11%
Communication with the salesperson is exhausting	8%	10%	7%
Buying used products is more time consuming because I do not have the wide selection/availability as with new goods	9%	12%	8%
Used products are something for people who cannot afford new goods	4%	3%	5%
I just feel more comfortable with new products	17%	8%	25%
I do not know if the seller is trustworthy	46%	48%	42%
Other	2%	3%	2%
Do not know/no indication	6%	6%	8%
N (total)	1023	289	485

Table 5. What are the three largest barriers to selling used products?

q22	All	q18	
		Less Frequently than 1 × per Year in %	More than 4 × a Year in %
The sale of used products is time consuming	49%	54%	59%
Communication with the buyer is exhausting	31%	33%	45%
I do not know the price I used product is still worth	34%	35%	28%
I do not know how and where to sell used products	7%	10%	4%
I am afraid of being cheated	32%	33%	26%
Selling to strangers is too unsafe for me	20%	14%	6%
Other	7%	3%	11%
Do not know/no indication	17%	15%	14%
N (total)	1023	80	139

4. Discussion

The empirical results of the online survey and its analysis confirm various points of the existing literature on drivers/barriers for second-hand products. There seems to be a high willingness and acceptance amongst consumers to consider second-hand products as an alternative to buying new products—with economic incentives and environmental benefits as key drivers, see (Klug et al. 2015; Mukherjee et al. 2020; Budică et al. 2015). In this regard, the survey focusing on Germany seems to be consistent with international data (Bortoleto 2015). It should nevertheless be taken into account that overall reuse figures in Germany are quite low compared to neighbor countries such as, e.g., Belgium and France, inter alia due to high shares of exports for second hand goods (Borusiak et al. 2020). This specific gap between intention and actual behavior also seems to confirm the guiding research hypothesis on different forms of transaction costs as an important explanatory variable in order to explain why consumers nevertheless predominantly buy new products

although they are aware that second-hand would save money and make an individual contribution to climate protection, also taking into account the ratio of price and depreciated value of the product (OECD 2006).

The data presented seem to indicate that these general conclusions are based on perceptions that clearly diverge between different subgroups: younger cohorts emphasized the economic advantages and less the environmental benefits; they also indicate a lower willingness to modify consumption patterns for environmental objectives such as resource or climate protection compared to interviewees aged 60 and older, for example. This questions conclusions, e.g., by Rubik et al. (2019), who highlighted the increasing environmental awareness especially of children and younger people. Despite such differences between different social subgroups, the overwhelming majority of interviewees support the concept of extending use phases of products by reuse and in practice buy only a small share of previously used products and also do not offer significant amounts of products for sale, although they are unused and of considerable monetary value, see Urbański and Ul Haque (2020).

Concerning the research question of this paper, the consideration of transaction costs leads to plausible insights into certain drivers and barriers for the second-hand market, but of course raises the question of quantifying these costs for the use of the market mechanism. This issue has been highlighted by several authors who criticize the fact that transaction costs tend to be measured rather indirectly as divergence from an assumed optimal market equilibrium: “while the body of descriptive and theoretical literature on transactions costs is extensive, the empirical literature has been lagging” (Vakis et al. 2003). Especially, when transaction costs are prohibitively high and, in our case, virgin products offer a viable alternative, it is challenging to assess the absolute value of these additional costs.

The analytical perspective of transaction costs seems to be helpful for explaining this gap (Yousuf 2017). The costs of gathering and validating information on exchange partners and specific products seem to be of such relevance that those actors who focus on economic advantages decide that virgin products offer the better cost–benefit ratio. Furthermore, even those actors indicating environmental reasons as an important driver for buying/selling second-hand seem to conclude that other options to reduce their resource or climate footprint offer easier and thus more efficient ways to save the planet. The analysis presented here adds a dynamic perspective on such transaction costs. The relevance of specific barriers for reuse seems to change if market actors—as buyers as well as sellers—engage in more frequent transactions, including second-hand products. With an increasing number of products that are offered/bought every year, some barriers caused by such transaction costs gain in relevance, others are perceived as less important.

5. Conclusions

This paper analyses the relevance of specific transaction costs as a barrier for market transactions for second-hand products, and thus for the development of a reuse market segment that could contribute to resource conservation and climate change mitigation. Obviously, transaction costs are only one variable among many that determine the decision to sell/buy second-hand products, but they lead to a lower market equilibrium than would be optimal if all information about the trustworthiness of buyers/sellers and the quality of the products offered were available at zero or lower costs.

Taking into account the aggregated level of transaction costs that would have to be added to the actual price for which a product is bought or sold, this perspective allows a better understanding of why the market volume for second-hand products is still small compared to virgin products. The data on sustainability attitudes of buyers as well as sellers of second-hand products also lead to the hypotheses that a large share of the market volume is due to actors with a higher intrinsic motivation, which could compensate these additional transaction costs to a certain extent.

The analysis allows for drawing conclusions on specific policy instruments in this context. Taking into account the level of transaction costs linked to purchasing or selling

second-hand products, policies to support reuse should aim to decrease the necessary time and efforts to gather, evaluate, and monitor information, e.g., concerning the quality of products. Standardized regulations, i.e., regarding warranties or return options, could significantly increase incentives to consider second-hand as a viable alternative for new products. Considering that 66% of interviewees who already bought a used product during the last twelve months indicated their willingness to engage in additional second-hand transactions, it could be an option to subsidize the first purchase of a second-hand product, e.g., by providing vouchers. Similar incentives schemes for repair services have proven to be very effective (Stadt Wien 2021) because consumers gain insights on how to use relevant channels, and because the thresholds are lowered, transaction costs are reduced.

The results presented here are of course limited and preliminary as they are based on national data for Germany alone; as discussed above, even regional differences might be of significant relevance and results may differ in countries with more established reuse structures. In addition, the data are based on an online survey, the perception of transaction costs and barriers might thus be biased and subjective. Future research should therefore focus on more standardized empirical approaches to measuring transaction costs as a basis for assessing the economics of waste prevention, e.g., by taking into account the time required, the number of decisions to be made, and the number of stakeholders to be involved. The current lack of comparable data on the efficiency of waste prevention matters is also reflected in waste prevention policies, which rarely use market-based instruments, inter alia due to uncertainties about the relevance of transaction costs and thus about the actual effects of supporting second-hand products by reducing VAT rates (Wilts 2015), for example. The conceptual approach developed here for understanding second-hand markets could be a starting point for such a much more comprehensive analysis of the effectiveness and efficiency of waste prevention policies.

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