Tobias Ebbing

PRICING OF CONSUMER INNOVATIONS

Tobias Ebbing

Pricing of Consumer Innovations

PRICING OF CONSUMER INNOVATIONS

Vom Promotionsausschuss der

Technischen Universität Hamburg

zur Erlangung des akademischen Grades

Doktor der Wirtschafts- und Sozialwissenschaften (Dr. rer. pol.)

genehmigte Dissertation

von

Tobias Ebbing

aus

Hamburg

2022

Erstgutachter: Prof. Dr. Christian Lüthje

Zweitgutachter: Prof. Dr. Christopher Lettl

Datum der mündlichen Prüfung: 29. April 2022

Acknowledgements

This dissertation was made possible by many wonderful persons and organizations who consistently provided me with emotional, professional, and financial support. It is dedicated to everyone who was part of this journey. I am grateful for your help, patience, support, diversion, knowledge, trust, loyalty, love and for *you* being a part of my life.

Abstract

Research has documented the importance of consumers as a source of innovation. Consumers primarily innovate out of non-monetary motivations, such as use interest, learning and social rewards. Nonetheless, increasing numbers of consumer innovators are commercializing their work. Rooted in their different motivation to innovate, consumer innovators' pricing decisions may differ systematically from those of commercial firms. The consideration of this background may also affect price evaluations of customers. Investigating these aspects is relevant for (a) consumer innovators, to shape and validate marketing strategies, (b) business administration, to respond to consumer innovators as competitors, and (c) economists, to understand the market impacts of the commercialization of consumer innovations. By fusing extant pricing knowledge with consumer innovation theory, this dissertation investigates (1) how consumer innovators set prices and (2) how customers react to consumer innovation prices. The research questions are answered by two empirical, sequential mixed methods studies.

The first study compares firm and consumer innovation prices. A quantitative matched-pair analysis of 4,242 computer games reveals that, compared to firms, consumer innovators systematically set lower prices and align prices more to the provided customer value and less to the incurred development costs. A subsequent interview study with 29 commercializing consumer innovators provides clear support for the explanation that consumer innovators' different motivations to innovate are the reason for the observed differences in price setting.

The second study investigates product adoption as a function of price moderated by the presence of a consumer innovation label. An analysis of 2,340 matched pairs of computer games, either commercialized as consumer innovation or not, shows that the source of innovation moderates the inverse U-shaped relationship between price and demand: buyers develop lower reference prices for consumer-developed products. Further, deviations from the reference price have less severe negative consequences on the demand for consumer innovations. Two randomized between-subject experiments with 229 panel participants corroborate the field study's results and validate the theoretical underpinnings.

Both studies' findings are scaffolded by numerous robustness checks and auxiliary analyses, including a time-lag analysis and textual content analyses. The results contribute knowledge on the commercialization of consumer innovations by showing that consumer innovators set prices differently than firms and that customers evaluate their offers differently. Theoretical and practical implications of the findings are discussed and further research avenues identified.

Table of Contents

List of Tables

List of Figures

1 Introduction

Innovation was long considered to be an activity exclusively conducted by firm producers. Consumers on the other hand were thought to solely purchase and consume firms' innovations (Abernathy and Utterback, 1978; Schumpeter, 1987). More recent evidence from innovation research blurred this clear-cut separation. Research documented that also consumers are considerably engaged in new product development activities (von Hippel, 1988, 2017; Bogers et al., 2010). Their product development engagement is coined "Consumer Innovation" (de Jong et al., 2018, 2021). This dissertation covers consumer innovators' commercialization activities. In particular, it investigates consumer innovators' price setting and customers' perception of consumer innovation prices.

1.1 Research topic

While consumers have always innovated for themselves (Smith, 1976), social and technological developments led to a rise in their innovation activities. Today, consumers have more freely disposable time and income at their hands than ever, which increased their freedom to innovate (Davis et al., 2012). New technologies, such as 3D-printing, software development kits and innovation toolkits, further enhanced consumer's potential to innovate and enabled them to generate increasingly valuable products (Franke and von Hippel, 2003; Franke and Piller, 2004; Parmentier and Gandia, 2013). Several representative national surveys revealed that a significant percentage of consumers develop products and services on their own volition (Ogawa and Pongtanalert, 2011; von Hippel et al., 2011, 2012; de Jong et al., 2015; Kim, 2015). Some of their innovations are of such high quality that they can compete with producer firms' products (Di Gangi and Wasko, 2009; Hienerth and Lettl, 2011; West and Piller, 2014).

Furthermore, online and offline communities that inspire consumers to develop new products and allow them to easily share their creations with others are thriving (Burger-Helmchen and Cohendet, 2011; Autio et al., 2013; Halbinger, 2018; Claussen and Halbinger, 2020). Such consumer innovation sharing frequently happens without monetary transactions, which can be explained by consumer innovators' motivations to innovate (von Hippel, 2017). While firms innovate to reap commercial benefits, consumers' have other reasons to innovate. They are mainly driven by self-rewards, such as the benefits that they derive from the innovation process (e.g., fun, learning, altruism) or the use of the innovations they develop (von Hippel, 1986; Lilien et al., 2002; Nishikawa et al., 2013). At the beginning of their innovation activity, many of them experience a particular problem to which firms have not provided a fitting solution yet (von Hippel, 1994, 2005; Raasch and von Hippel, 2013b). Instead of waiting for a

firm to identify and solve their needs, consumer innovators invest their personal resources, skills and spare time to generate valuable solutions and satisfy their demand themselves. Initially, this is often done without an intention to sell the developed product (von Hippel, 2017).

Lacking the strong profit interests that drive firms to innovate, consumer innovators have also little motivation to conduct commercialization and diffusion activities. Many do not protect their innovations by intellectual property rights and do not inform others about their work. Those who share their innovations with others frequently do not charge prices for them (von Hippel, 2017). Widely known and impactful examples of such free innovation activities are open-source software, the maker movement or patient innovation communities (von Hippel and von Krogh, 2003, 2006; von Krogh and von Hippel, 2006; DeMonaco et al., 2018, 2019; Halbinger, 2018; Claussen and Halbinger, 2020).

Adopting a consumer innovated solution for free inevitably provides customers with a surplus compared to having to pay for a similar commercial innovation. Consumer innovation is consequently expected to have the potential to generate welfare (Henkel and Hippel, 2004; Gambardella et al., 2017). However, despite free revealing, the diffusion of consumer innovations often remains subpar. Without adoption, the welfare potential of consumer innovation is not realized, making the lack of diffusion one of the most pressing problems of the consumer innovation field (Füller et al., 2013; von Hippel et al., 2014; de Jong et al., 2015). One suggested cure for the diffusion shortfall is to encourage consumer innovators to yield to the commercial interest they have and charge prices, because prices add a reward to promote their innovations (de Jong et al., 2015, 2018; de Jong and Lindsen, 2021).

Indeed, not all innovation activities in the household sector meet the criteria of being free innovation. Research documented activities of commercially active consumers in several product fields (Baldwin et al., 2006; Fauchart and Gruber, 2011; Shah and Tripsas, 2012). In the commercialized sporting equipment industry for example, consumer innovators are accountable for 58% of the incremental innovations (Shah, 2000). In their convenience sample survey of consumer innovators, de Jong et al. (2018) found that the average willingness to commercialize reaches at least a medium level (average score of M = 3.6; SD = 1.8 on a 7-point scale). Thus, a considerable share of consumer innovators is not disinclined to also appropriate financial benefits, even if commercialization might not have been their plan in the first place.

It seems that consumer innovators see the value that their products provide to others and are at least receptive to the idea of offering their innovations for sale. For a long time however, doing so was a difficult process. In the pre-internet era, consumer innovators had mainly two options to reap monetary benefits from their innovations: either they

could engage in technology licensing in order to sell their knowledge to commercial producers, or they could exploit entrepreneurial opportunities by starting a small-scale business (Shah and Tripsas, 2007). More recently, a rise of marketplaces for consumer innovation added a third option that made it particularly simple for consumer innovators to sell their products (Kuznetsov and Paulos, 2010; Wolf and McQuitty, 2013; Kenney and Zysman, 2016). On these marketplaces, choosing a price and entering payout information is everything consumer innovators need to do in order to earn money with their innovation. While this is particularly comfortable for virtual products, such as computer games, 3D models or smartphone apps, also physical products, such as handmade and DIY products, are increasingly commercialized on online marketplaces. Customers accepted these marketplaces well and numerously purchase consumer innovations (Alba et al., 1997; Wolf and McQuitty, 2013; Church and Oakley, 2018; Beltagui et al., 2020; Claussen and Halbinger, 2020).

For example, CGTrader, which claims to be the world's largest marketplace for 3D models in 2021, is counting over one million consumer designed models. Three quarters of them are sold for a price rather than being freely distributed. CGTrader's community consists of 4 million registered 3D enthusiasts who adopt these models (CGTrader, n.d.). Another example for the successful rise of consumer innovation marketplaces is Etsy. Etsy started out as a small-scale marketplace for artisans in 2005. After various mergers and acquisitions, among others with the renowned marketplace DaWanda, in 2021 Etsy is listed on the stock market. The marketplace counts about 4.4 million consumer innovators selling handmade products and roughly 82 million registered customers. In 2020, the turnover that was generated with artisanal goods on Etsy exceeded US\$10.3 billion (Etsy, 2021).

Another exemplary marketplace is Steam, where computer games are traded. They do not publish financial reports, but 2020 was announced to be Steam's most successful year. Spurred by a pandemic-induced surge in computer game demand an average of 62.6 million users per day were playing games acquired on Steam, which gives an impression of the marketplace size (Valve Corporation, 2021). Steam does not exclusively list consumer innovated products. However, the entry barriers to sell a game are very low, leading to a constant influx of consumer innovated games. In 2020, 67% of the games on Steam were labelled by their developers as consumer innovated, but just 13% of all games were freely diffused (Kontus, 2020). The option to easily charge a price must appeal to consumer innovators. However, Kontus (2020) finds that 50% of Steam's consumer innovators never earn more than US\$4,000. It is thus important to note that these commercial activities are a side business for many consumer innovators. This indicates that their initial, non-commercial, motivations may have remained intact.

Overall, the rise of marketplaces led to a steep increase of consumer innovators' commercial activities. Their innovations have become direct competition to firm

products (Oo et al., 2018; Brem et al., 2019). The new position of commercializing consumer innovators as full-fledged market participants that compete for customers' money raises the question of how their role affects markets. Considering their different motivations, there is reason to believe that their functional role on markets systematically differs from that of firms. In this case, their numerous emergence requires particular attention. Otherwise, their market entry can be evaluated like that of other firms with common profit interests. The phenomenon thus calls for research exploring the extent to which commercializing consumer innovators' decision-making and customers' perception of their offers deviates from that of regular profit-seeking firms and their offers.

1.2 Research objectives

Present research on consumer innovation concentrated mostly on the instances in which the products are shared freely (Gault and von Hippel, 2009; von Hippel, 2017; de Jong and Flowers, 2018). In comparison to the works on freely diffused consumer innovation, research on the commercial side of consumer innovation remains scarce. In line with the growing importance of consumer innovation commercialization, researchers began investigating the general phenomenon, the individuals involved and the paths they take to commercialization (Shah and Tripsas, 2007, 2012; Bogers and West, 2010; Fauchart and Gruber, 2011; Oo et al., 2018; Brem et al., 2019). All these works call for further investigations of the issue. The raised questions include what sociodemographic factors (Brem et al., 2019), group identities and character traits (Oo et al., 2018) lead to consumer innovation commercialization and how reinforcing feedback and boundary conditions can facilitate it (Fauchart and Gruber, 2011; Bogers and West, 2010). The seminal works of Shah & Tripsas (2007, 2012) stress the importance to understand whether and how consumer innovators backgrounds affect their market behavior and success. Because of its more economic character, this dissertation contributes to the latter issue. Particularly, it investigates whether consumer innovators' motivational background is obliterated with introducing commercial rewards or whether the motivations persist in commercial settings. It aims to understand whether consumer innovators turn into regular, profit oriented entrepreneurs once they charge prices – or whether their origin affects their role on markets. Throughout this work, it is proposed that their background is persistent and that this influences both, consumer innovators' decision-making and how their products are perceived by their customers.

The investigations focus on prices for various reasons. Principally, any commercialized offer must have a price to fulfill the purpose of generating monetary revenues. This makes it the critical factor of commercialization (Shipley and Jobber, 2001; Nagle et al., 2014). A price is also the only marketing instrument that does not generate cost but revenue, which makes good pricing decisions vital for every commercial operation. The

importance of researching prices is further strengthened by their flexibility in use and their impact on purchase decisions (Grewal and Compeau, 2007; Ingenbleek et al., 2013). Since they are the main representation of what customers must give up in order to acquire the benefits of a good, they are a crucial aspect in evaluations of offers. Prices are also the pivoting point of most microeconomic market models, representing the direct link between suppliers' profit and customers' benefit interests (Smith, 1976; Case et al., 2012). This key function promises that documenting characteristic consumer innovation pricing patterns exceeds contributions to consumer innovation research and can provide impactful insights for economic as well as management theory and practice.

Despite being the essential and mandatory element of commercialization, prices have apparently not been researched in conjunction with consumer innovation commercialization so far. To grasp the issue of consumer innovation prices on markets, this dissertation investigates this interplay along two facets: First, how consumer innovators set prices in comparison to firms and second, how customers perceive these prices in their purchasing decisions.

The price setting research objective concentrates on the supply side. Consumer innovators entirely different motivations to innovate may affect important price determining factors. For example, research found that consumer innovators evaluate the costs of development differently than their firm counterparts (Raasch and von Hippel, 2013b). For many consumers, innovating is fun and rewarding in itself. Creating their innovation gives consumer innovators a perceived net benefit rather than a feeling of costs and expenses, which may lessen the dependency of consumer innovation prices on costs (Lakhani et al., 2002; Harhoff et al., 2003).

Furthermore, rather than actual payouts, consumer innovators' expenses are almost entirely opportunity costs (Lüthje and Stockstrom, 2016). There is no need to balance employee paychecks or pay other R&D expenses. The assets they use for innovation are frequently already owned and usually they have a different job that pays their personal bills (von Hippel, 2005; Fursov et al., 2017). Such moderate financial pressure also means that consumer innovators do not need to create a product that appeals to a large customer base in order to recuperate development costs. They can design their products to specifically meet the interests of a smaller group of adopters that experience similar needs like themselves (Shah and Tripsas, 2012). Unlike many firm producers, consumer innovators possess first-hand information about their customer base, which reduces the costs of market research and is also beneficial in terms of determining the product scope and estimating a product's value (von Hippel, 1994, 1998; Lüthje et al., 2005). These benefits should not only give them a deep understanding of customers' needs, but also of their price expectations. Even more, consumer innovators can accommodate these customer interests without corporate constraints. They are not bound to adhere to a firm

image, corporate pricing policies or performance indicators. Their pricing decisions can be made freely, based on what they deem appropriate to charge customers.

Research on non-commercial consumer innovation gives ample indication to assume that consumer innovators' special situation can impact their pricing decisions. Given that there are reasons to believe that the number of consumers selling their designs and products on markets is going to increase in the future, this is a meaningful aspect to explore. Systematic deviations of consumer innovator behavior from firm behavior would suggest that the commercial market entry of consumer innovators potentially changes market dynamics. Consumer innovators increase the number of complementary and substituting market offers and deviating prices may put price pressure on incumbents. Furthermore, their internal cost controlling is probably of an entirely different nature than that of firms. Given the importance of immaterial rewards for consumer innovators, applying conventional accounting measures would be insufficient to explain or predict their behavior.

There is also a social aspect in investigating whether consumer innovators background affects their price decisions. Figure 1 illustrates this importance. On the left-hand side, regular commercial firm pricing behavior is displayed. Firms' prices need to at least cover production costs and further aim to reap as much of the monetary surplus a transaction can give. The most prominent alternative to commercial diffusion of consumer innovation is free revealing, which is economically attractive for customers. As seen in the middle of Figure 1, adopters of free innovation can reap not only all available transaction surplus, they also do not need to reimburse innovators for their incurred costs. This promises substantial welfare gains (Henkel and Hippel, 2004; Gambardella et al., 2017; von Hippel, 2017). However, free innovators' lacking diffusion effort causes only few customers to adopt free innovations. The welfare potential is thus seldomly realized on markets (von Hippel et al., 2014; de Jong et al., 2015).

The fact that increasingly many consumer innovators opt to charge prices for their innovation indicates a loss of individual customer surplus when compared to freely revealed innovation. Whether this is detrimental for the overall welfare effect of consumer innovation depends on the price level they choose. Essentially, consumer innovators have two options: They can decide to neglect the process benefits that they received in creating their innovation as well as their social connection to the customer base and charge prices that resemble those of firms. This situation is indicated with the upper grey price level on the right-hand side of Figure 1. While they will make diffusion effort to increase profits, the welfare effects of consumer innovation are inevitably diminished.
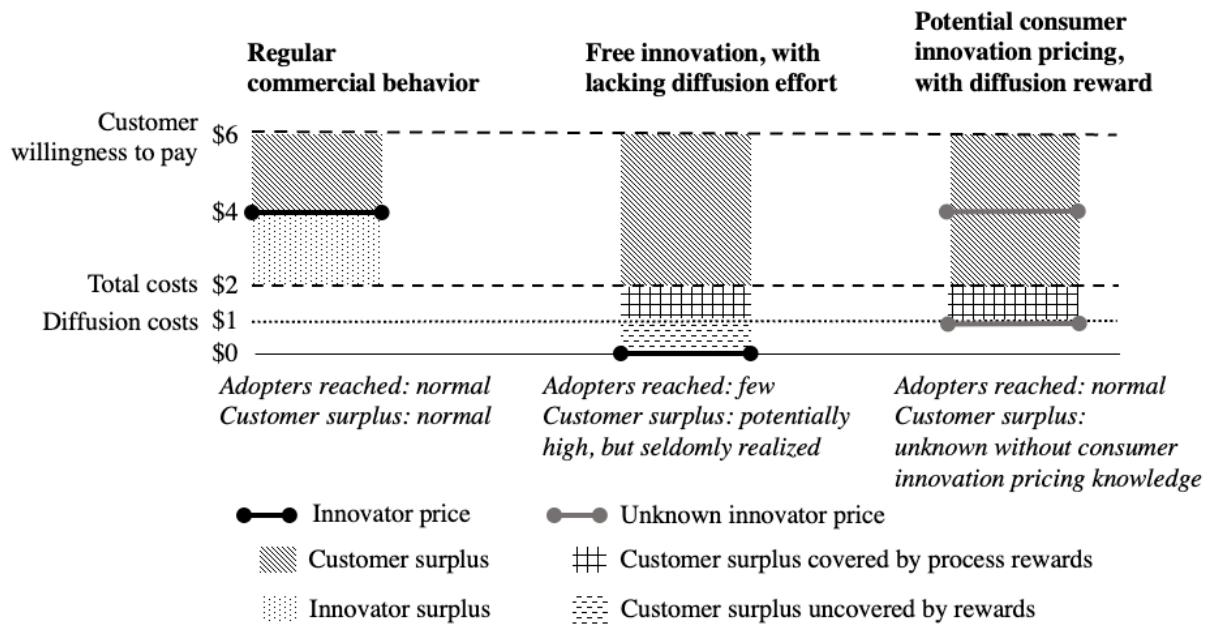
Figure 1: *Surplus distribution between customer and innovator based on diffusion model (Source: Own depiction)*

Alternatively, consumer innovators can decide to consider their process rewards and relationships to customers when making commercial decisions. The price may then be set at a level that only reimburses activities that do not entail process rewards – such as diffusion effort. This price level is indicated with the lower price level bar on the right-hand side of Figure 1. Since a price must be paid, the individual customer loses a degree of surplus to the innovator compared to free innovation. But when consumer innovators set their prices for similar products lower than firms, a potential customer surplus is still provided. Furthermore, adding a diffusion reward should increase the diffusion effort of consumer innovators or third parties. Thus, the number of adopters that are potentially reached and convinced to use the innovation should resemble that of regular commercial diffusion, which is indicated as "*Adopters reached: normal*" in Figure 1. Regarding the larger number of adopters compared to free innovation, consumer innovation commercialization can increase the overall customer surplus. To inquire whether this effect can be expected, knowledge about how consumer innovators make pricing decisions is necessary. The first research question of this dissertation thus asks:

RQ1: How do consumer innovators set prices – and does their price decision-making deviate from that of firms?

The second research objective addresses the demand side of commercialized consumer innovation. It follows a similar logic as the first research objective and investigates whether the consumer origin of an innovation affects how customers perceive its prices. Findings on the first research question will show that consumer innovators

systematically differ from firms in their price setting behavior. To assess whether their method of price setting is beneficial for adoption, it is also required to understand how customers react to these prices (Case et al., 2012; Ingenbleek et al., 2013). Since a purchasing decision is the most important response to a price evaluation, focus of the second investigation is the adoption of priced consumer innovation.

In general, prices that deviate from customers' price expectations negatively affect their adoption decisions (Kahneman et al., 1986a, 1986b; Kalyanaram and Winer, 1995; Mazumdar et al., 2005). This is true for prices that are too low as well as too high (Monroe, 1971; Kalyanaram and Winer, 1995; Ding et al., 2010). For example, prices that are suspiciously low can cause doubts whether a product fulfills its functions satisfactorily, is produced with care and whether the hedonic value fits the customers' social status – in other words, whether they want to be seen with the low-priced product (Curry and Riesz, 1988; Monroe and Dodds, 1988; Cronley et al., 2005). Conversely, too high prices may overarch customers' available funds and stir doubts about whether the product is worth the price (Monroe, 1971, 1973; Case et al., 2012). For an ideal adoption rate, the actual price should thus align well with customers' price expectations. The different approach that consumer innovators have towards pricing might lead to unexpected asking prices with adverse effects on purchase decisions. While the additional diffusion reward can lead to more customers being aware of the consumer innovation, these customers might disregard the consumer innovation in favor of a product that is priced closer to their expectations. Thereby, they forfeit the additional surplus that consumer innovators granted them. The hampered adoption might diminish the positive overall welfare effect of commercializing consumer innovation which the findings on the first research question suggest.

However, there is reason to expect that customers learned to interpret consumer innovator prices differently from firm prices. Cue utilization in purchase decision-making suggests that customers vary their expectations based on the presence of certain sale cues, such as sale labels or store locations (Rao and Monroe, 1988, 1989; Teas and Agarwal, 2000; Miyazaki et al., 2005; Akdeniz and Talay, 2013; Das et al., 2018). Once a label or other sign informs customers about the origin of an innovation as consumer made, this indication may evoke specific associations in customers and lead them to alter their price expectations (Lichtenstein et al., 1991; Grewal and Compeau, 2007; Fuchs et al., 2013; Dahl et al., 2015).

Studies investigating products that were co-created with consumers indicate that a label of the co-creation influences customers' product perception. Stating that consumers were involved in a firm's product development process improved the overall product perception (Fuchs et al., 2013, 2015; Dahl et al., 2015). Admittedly, this might be caused by associations that customers relate to the integration of consumers into the firms' development processes rather than knowledge and convictions about consumer

innovators alone. Nevertheless, research suggests that previous experiences with a certain label is sufficient for customers to adjust their expectations towards similarly labelled products according to previous experiences (Bitta and Monroe, 1974; Baucells and Hwang, 2017). This means that while knowledge about consumer innovator backgrounds should strengthen specific consumer innovation price expectations, customers who are unaware of these backgrounds should be equally influenced by a consumer innovation label if they made rememberable experiences with similarly marked products.

This dissertation illuminates two aspects in order to understand how the proposed deviations in price setting may affect consumer innovation adoption. The first is whether customers expect a different price when products are sold as consumer innovations. An alignment of the deviations in consumer innovation price setting and price expectation would suggest that a negative backlash on adoption caused by deviating consumer innovation prices must not be expected. The second aspect is to understand whether customers' reactions to deviations from price expectations differ in their magnitude, depending on whether a consumer innovator or a firm sells a product. Even assuming a general alignment in prices and price expectations based on the presence of a consumer innovation label, consumer innovators may include factors in their pricing that are hard to predict for customers. For example, the extent to which the fun consumer innovators had in product development or the community support they received was regarded in pricing is hard to assess. This may cause consumer innovator prices to deviate more widely from price expectations. Conversely, possible knowledge about consumer innovators' motivational background and their closeness to customers give reason to assume that customers may be less sanctioning towards price deviations. The second research question hence asks:

RQ2: Are customers aware of consumer innovation characteristics – and how does that influence customers' perception of their prices and innovation adoption?

1.3 Course of investigation

The investigation of the issues at hand is structured as follows: Chapters 2 and 3 recapture the theoretical background on pricing and consumer innovation that scaffolds the empirical studies. Next to embedding the research contributions into the current state of theory, these chapters also provide readers who are new to the fields of pricing or consumer innovation with the theoretical concepts required to put the empirical studies in context. In Chapter 4, the establishment of the two research questions is protocolled in more detail and their relevance for theory and practice is displayed. Transitioning to the empirical work, the requirements that the research questions pose to an empirical research field are defined in the chapter's last part 4.3. These requirements include a high prevalence of consumer innovation activity, a tendency of consumer innovators to

commercialize their developments and a marketplace on which their products are sold side by side with regular innovations. The computer game industry is introduced as one empirical field that meets these requirements.

The centerpiece of this dissertation consists of two empirical studies that aim to answer the research questions. Both studies employ a sequential mixed methods approach. In this approach, various research methods are employed consecutively. This allows more detailed and multifaceted insights than one method alone could generate. Furthermore, it incorporates the respective strengths of various methods, which helps to compensate potential weaknesses of single methods (Castro et al., 2010; Creswell and Plano Clark, 2018). The main findings of each study are drawn from large scale quantitative analyses conducted with actual market data from a marketplace of the chosen empiric field. To examine the findings more deeply, additional qualitative and experimental analyses are employed. Figure 2 displays an overview of the methods applied in the empirical chapters. In addition to the central analyses, various robustness checks were executed.

Empirical Mixed Methods Study I	Empirical Mixed Methods Study II
OLS-Regression n = 4242 pairs of firm and consumer innovations	**Quasi Poisson-Regression** n = 4680 pairs of firm and consumer innovations
Qualitative Analysis n = 29 interviews with commercializing consumer innovators	**Experiment I** n = 64 involved customers / **Experiment II** n = 165 involved customers
Auxiliary Analyses Content analysis of n = 2000 product reviews / Time lag analysis on n = 434 price change effects	**Qualitative Analysis** n = 89 essays on customers' consumer innovation perceptions (from Experiment II)

Figure 2: *Empirical procedure (Source: Own depiction)*

Chapter 5, "Pricing Decisions of Consumer Innovators", investigates the first research question on how consumer innovators set prices – and whether their price decision-making deviates from that of firms. Drawing from research on consumer innovation literature, four hypotheses on how consumer innovators' price setting might deviate from that of firms are proposed. Hypothesis 1 concerns differences in the general price level, while H2 - H4 cover the importance of the three major pricing determinants, development costs, customer value and competition, in the pricing decisions of consumer innovators in comparison to firms.

The first main quantitative analysis (n = 4,242) tests the hypotheses by using actual prices consumer innovators and firms have set for their products as the dependent variable in an ordinary least square regression. Proxies for the price determining factors are employed as independent variables. As the moderator of these factors' influence on prices, the source of innovation is employed. The two included sources are firm and consumer innovators. This distinction is based on whether a legal corporation was formed or not. The registration of a legal entity is a first indication of an innovator's transition towards a more full-time, profit-oriented innovation activity, which characterizes a firm's primary mission. To minimize inferences caused by possibly different products of each developer group, the products of each group were matched in order to be similar in development effort and value they deliver to the customer. To further reduce spurious results, a variety of control variables were included to account for further product and environment characteristics.

In order to understand whether the market observations are valid, four robustness checks were conducted in which the measurement of the price level, the subsample, and statistical analysis was varied. Further, the appropriateness of the price determining proxies was controlled with a content analysis of 2000 written product reviews and tested for reverse causality in a time-lag analysis of 434 price-change events. To examine whether the theoretical account based on consumer innovators' innovation motivation is causing the observed effects, written and telephone interviews were conducted with 29 commercializing consumer innovators from the quantitative sample. They lasted one hour on average.

Overall, the results confirm the hypotheses and the theoretical account for them. The initial motivations to innovate throw a long shadow, also on commercializing consumer innovators pricing decisions. In consequence, they set lower prices for products of similar customer value, regard the costs of development in pricing less and the value they provide to the customer more. Furthermore, they do not try to escape competitive pressure by diversification but were inclined to lower their prices to increase adoption.

Chapter 6, "Price Perception of Consumer Innovation", investigates the second research question on whether customers are aware of consumer innovation characteristics – and if this influences their perception of consumer innovation prices. Adoption rates are used as price acceptance measure and aggregated to model a price-demand curve. Fusing pricing and consumer innovation literature, three hypotheses are proposed. First, that in online marketplaces for hedonic products customers follow an inverse U-shaped price preference rather than a "cheaper is always better" or "whatever it costs" mentality. The second hypothesis states that customers' reference price expectations for similar offers are lower, when labelled as consumer innovation. Third, it is proposed that customers penalize consumer innovators less than firms for deviations from the expected reference price because they expect them to have set a fair price rather than an exploitative one.

In the main quantitative analysis (n = 4,680), the influence of price as independent variable on the count of product adopters is tested. Price is introduced as a squared variable in a quasi-Poisson count regression model of product adoption to allow the proposed inverse U-shaped influence on adoption. A label indicating the origin of a product as consumer made is employed as moderating variable. To ensure that the products of both developer groups are comparable, the sample again consists of matched pairs of products labelled as consumer innovated vs. not. Additionally, a series of control variables is included to rule out altering explanations.

The stability of the results is tested with seven statistical robustness checks, covering alternating statistical models, varying sample sizes and differences in the measurement of the dependent variable. To overcome possible issues of product comparability and to understand the reasons why customers perceive product prices of consumer innovators and firm differently, two randomized experiments with a total of 229 online panel participants were conducted.

The first experiment tests whether customers' price expectation is lowered by adding a consumer innovation label to a product presentation that is otherwise held steady. The second experiment assesses customers' sensitivity towards deviations from expected prices. Next to structured questionnaires, the customers associations with the consumer innovation label were collected in a free writing exercise. The textual responses were codified according to consumer innovation characteristics from theory in order to understand whether customers' can be assumed knowledgeable of consumer innovator backgrounds.

The empirical findings confirm the hypotheses. An inverse U-shaped relationship of prices with adoption is present, which documents a customer preference for a reference price. This price expectation is lower when a consumer innovation label is added, both in the controlled experimental setting and in the marketplace observation. The more lenient reaction to deviating consumer innovator prices was also confirmed in both settings. The experimental assessment of product perceptions confirms that customers perceive prices of consumer innovators in general as more justified than those of firms. A significant change in product quality perception is not induced by the consumer innovation label. Finally, the textual responses resemble the research on consumer innovation well. This confirms that the approach to transfer consumer innovation theory onto product and price perception research is applicable.

The empirical Chapters 5 and 6 each include a brief recapture of the relevant theoretical background sections and are enriched with current research insights. After a detailed explanation of the employed methods, each chapter concludes with a preliminary discussion on theoretical and practical implications as well as limitations that relate specifically to each study.

Finally, in the last Chapter 7, the findings of both studies are integrated. The contributions made to theory and practice by conducting both studies are consolidated, and wider implications are proposed. While recapturing and discussing the findings of both studies and their relationship to each other, issues for which each study on its own could only provide incomplete insights are corroborated. The reader is left with suggestions for following research which may contribute, strengthen and expand the knowledge on consumer innovation pricing that this dissertation provided. Figure 3 displays the dissertation's structure graphically.
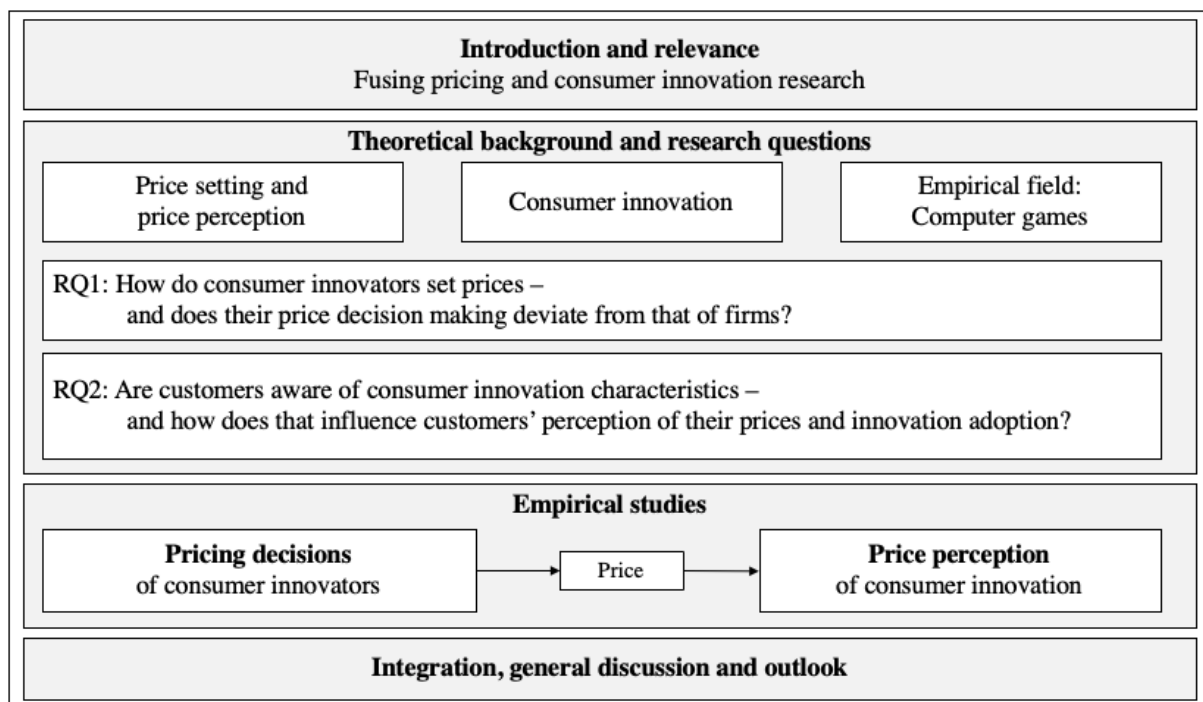
Figure 3: *Structure of the dissertation (Source: Own depiction)*

2 Price Functions, Price Setting and Price Perceptions

In most modern economies, the exchange of goods is implemented via prices. Prices are linking the interests of suppliers and customers. Conventionally, suppliers set prices and customers receive the price and form a purchase decision based on it. Customers repeated positive or negative reactions to prices via their purchase decision has an influence on the next supplier price. The so established market price is hence a compromise between the supplier's profit interests and the customer's interest to increase customer rent by spending as little as possible. There are two general perspectives on understanding this interplay. The microeconomic perspective is dealing with market mechanisms, equilibrium prices and other classical models of supply and demand. It is necessary to understand the fundamental functions of prices and the underlying interests of the economic agents. The marketing perspective adds to understanding customers' price perceptions and to making profit maximizing pricing decisions. This chapter revisits these perspectives.

Face-to-face marketplaces, where prices are haggled out in direct communication between producer and buyer, have become rare. More frequently, price formations occur via indirect supply and demand market signals based on which equilibrium prices evolve. Chapter 2.1 outlines the basic economic principles that lead to this outcome. This provides an understanding of market price functions that are fundamental to understand most price models (Smith, 1976; Schuppar and Homburg, 2006; Simon and Fassnacht, 2016).

Firm suppliers aim to set profit maximizing prices (Monroe, 1990; Nagle et al., 2014). In order to realize this, they make use of various pricing tools and tactics (Tellis, 1986; Diamantopoulos, 1995). In Chapter 2.2 a selection and classification of such pricing practices is presented. This concludes the part of this chapter dealing with the supplier side of prices. Afterwards, the demand side is covered. Since the price is the major sacrifice factor for receiving a good, customers weigh it against the benefits that they expect from a purchase (Teas and Agarwal, 2000; Suri and Monroe, 2003). A positive evaluation of this price-benefit trade-off decision leads to a purchase. In Chapter 2.3 the rational and behavioral aspects that influence this decision-making process are described.

2.1 Microeconomic market price dynamics

In economic theory, the extent of customer demand is a direct response to the price that suppliers ask for. Vice versa, the price is a response to the extent of customer demand (Case et al., 2012). Naturally, profit-maximizing firms would like to realize the highest possible profit (Coase, 1937; Marshall, 1988; Case et al., 2012). This is reflected in their interest to set high prices. However, only a few customers might be willing or able to

pay these high prices. The large profit margin of each sale then mends this quantitative scarcity of sales.

However, such high margins attract competitors. New firms will enter the market as long as they can realize profits with lower prices. To attract customers, they undercut the previous asking price. Even those customers who may have accepted a higher price before, will tend to favor the lower priced offer. As a result, the incumbent supplier loses customers and is forced to lower prices as well (Marshall, 1988; Case et al., 2012). Ideally, the increased sales quantity induced by the lower price compensates for the lower margin per sale. The more competitors enter markets that are willing to sell products at lower prices, the larger the price pressure becomes. Despite firms' overarching desire to have vast margins, in the long run the average market prices will thus decline in functioning markets (Smith, 1976).

This downward correction of prices conventionally comes to an end when prices approach the costs required to produce and distribute goods in a quality that customers demand. This long-term price floor was coined by Adam Smith as the "natural price" of a good (Smith, 1976). For firms, whose sole purpose is profit generation, it is existential to not undercut this realistic price. Since the profit margins decrease once market prices approach the natural price, fewer new competitors enter the market. The prices and traded quantities stabilize at this price-quantity point and the market is cleared of excessive demand or supply (Nagle et al., 2014).

Considering consumer innovation, the presence of process rewards may artificially reduce the long-term price floor. As depicted earlier in Figure 1, consumer innovators' might thus not link their prices as strongly with costs as firms have to. This should increase the price pressure consumer innovators can put on markets. Even if a consumer innovated product is not a perfect substitute for a firms' product, it may still attract customers. After all, many firm products try to serve more customer needs at the same time to address a large customer base (Gupta et al., 1987; Wind and Mahajan, 1997). This way, each customer cross finances the functions that only other customers need. Every customer that is satisfied with an available leaner, more personalized consumer innovation is not paying into this mixed price calculation anymore. This means that other customers, who have broader needs or no alternative to choose, ultimately need to pay higher prices. Given their limited budgets, this might cause them not to pay at all, which again increases price pressure or requires incumbents to change their product in order to maintain profitable in the new market situation.

2.2 Price setting strategies and tactics

Prices are a substantial element to firms' profitability because they have an immediate effect on their sales revenue (Shipley and Jobber, 2001; Liozu and Hinterhuber, 2013). For example, Hinterhuber (2004) states that "on average, a 5% price increase leads to a 22% improvement in operating profits—far more than other tools of operational management". Because they are a very effective element in maximizing profitability, firms have an acute interest in setting profit maximizing prices (Marn and Rosiello, 1992; Liozu and Hinterhuber, 2013). In pursuit of accomplishing this, marketing researchers and practitioners have developed an arsenal of pricing methods (Dean, 1976; Tellis, 1986; Kienzler and Kowalkowski, 2017).

Pricing decisions are multifaceted issues that are influenced by a variety of internal and external factors on a decision-to-decision basis. Researchers frequently categorize the different approaches to pricing decisions along their dominating price determining factors: costs, customer value and competition (Ohmae, 1982; Narver and Slater, 1990; Hinterhuber, 2008; Liozu et al., 2012; Kienzler and Kowalkowski, 2017). Colloquially these factors are referred to as the three "C"s of pricing (Ohmae, 1982). Each "C" represents the main information source on which the pricing decision is made. They were also translated into the three basic pricing strategies: cost-based, value-based, and competition-based pricing.

2.2.1 Cost-based pricing

One of prices' primary purposes is the recuperation of expenses. In a survey of 125 managers from Fortune 1000 companies, 83 managers stated that their firms' pricing plans primarily emphasize cost recovery (Lancioni, 2005). Pricing strategies that follow this target are called cost-based pricing strategies. They work as follows: Firms calculate a minimum viable price point for a product based on in-house accounting data about fixed and variable production costs resulting from a sales prognosis. On top of this starting point, they add their desired profit margin, which results in the cost-based price (Hanson, 1992; Dholakia, 2018). Cost-based pricing methods can be rated as highly risk averse and comparatively simple in application, as they rely on readily available information (Guiltinan, 1976; Christopher and Gattorna, 2005; Hinterhuber, 2008). This makes cost-based pricing one of the most widely used pricing strategies by firms (Guilding et al., 2005; Hinterhuber, 2008).

Contrasting their wide popularity in practice, marketing researchers heavily criticize cost-based pricing approaches (Hall et al., 1997; Guilding et al., 2005; Liozu and Hinterhuber, 2013; Larson, 2019). One concern is associated with its mathematical approach. To estimate the ratio of fixed cost distribution, the sales volume is required.

This value is difficult to predict. As outlined in the chapter on microeconomic market dynamics, the price influences the sales volume (Case et al., 2012). A price change affects the extent of customer demand, which in turn requires a different fixed cost allocation ratio. The new ratio requires the re-estimation of the cost-based price, which again affects the demand, that requires another re-estimation of the cost allocation ratio. The major flaw of this approach is hence that the sales volume estimate of the cost-based price formula is a moving target that depends on the outcome of the very formula it is used in (Dean, 1976; Nagle et al., 2014).

Furthermore, cost-based prices neglect the actual benefit a product provides to customers (Hinterhuber, 2008). This may lead to underpricing in markets where a product provides great customer benefit at low production costs. Similarly, where market prospects and provided benefits are weak, prices based on costs are likely set too high. The sales will not reach the estimated demand and revenues might never cover the costs of the sold goods (Holden and Nagle, 1998; Nagle et al., 2014). The security that cost-based prices seem to promise is thus treacherous and may come at the costs of lost profits, if not losses. Instead of cost-based prices, marketing theory suggests setting prices based on the benefit products provide to customers.

2.2.2 Value-based pricing

Value-based pricing strategies are customer-oriented. Such strategies aim to set prices that represent the monetary equivalent of the value a product provides to customers, rather than covering the costs it poses to the producer (Ingenbleek, 2007; Grewal et al., 2012; Kienzler, 2018).

Customer value is a complex concept to grasp and an exact monetary value equivalent even more difficult to estimate (Zeithaml, 1988; Hinterhuber, 2008). First, the term "value" is ambiguous. Many researchers have conceptualized it as the benefit buyers receive from a purchase minus the costs involved in obtaining it (Bowman and Ambrosini, 2000; Li and Hitt, 2010; Liozu and Hinterhuber, 2013). This is in line with the colloquial use of the term "value for money". To set a price, however, an estimation of the value before the price and other costs are deducted is necessary. The separation of benefit generation and the costs of obtaining it is crucial to balance these values (Liozu et al., 2012). In order to avoid confusion with the colloquial understanding of value, it is less ambiguous to speak of the benefit of a product, its utility or the perceived quality in meeting expectations (Grewal and Marmorstein, 1994; Priem, 2007; Li and Dinlersoz, 2012). In consumer behavior literature, perceived quality depicts the customers' perception of the overall excellence and superiority of products and services, thus the gross benefit that consumers derive from it (Zeithaml, 1988). This aggregation of benefits is not corrected for the disutility to obtain a product or service (Bolton and Drew, 1991). Most notably, this conceptualization excludes the actual price that

customers must pay to acquire the goods (Bowman and Ambrosini, 2000; Li and Hitt, 2010; Liozu and Hinterhuber, 2013).

To estimate a price based on perceived quality, marketing managers first need to assess an offer's aggregated benefits and translate them into a monetary amount. Estimating the aggregated benefits that a product provides to customers is complex since the potentially provided benefits are manifold. They can be of objective monetary and subjective psychological nature (Anderson and Narus, 1998; Stylidis et al., 2020). Monetary benefits of a product are relatively easy to assess and translate into prices. Efficiency gains or cost savings are explicit and calculable (Nagle et al., 2014). Compared to business-to-business markets, such benefits are regularly less relevant in consumer markets. Unlike for e.g., machines, there are rarely considerable expenses to save or efficiencies to create with energy efficient washing machines or fuel saving vehicles that can wholly justify the price of a good. Subjective psychological benefits, on the other hand, are of considerably higher importance. Customers enjoy using or consuming products, value them as status symbols or indulge in their other hedonic aspects (Zeithaml, 1988; Bowman and Ambrosini, 2000; Alba and Williams, 2013). Such tacit benefits are difficult to measure and hard to translate into a price (Nagle et al., 2014).

Acquiring the necessary subjective information to set value-based prices is costly and comes with limited accuracy. This is one of the major downsides of this pricing method (Ingenbleek, 2007; Hinterhuber, 2008). Consequently, considerable effort was invested in developing techniques to identify and quantify product benefits (Gale and Wood, 1994; Woodruff and Gardial, 1996; Holbrook, 1999). Examples are conjoint or tradeoff analyses (Wittink et al., 1994; Green et al., 2001), quality function deployment (Abu-Assab and Baier, 2009), expert interviews, focus group assessments or value-in-use interrogations (Leroi-Werelds et al., 2014).

Well executed value-based pricing should result in prices that perfectly resemble the aggregated perceived customer benefit. This allows innovators to capture the maximum surplus in a transaction, without harming customer relations or appearing greedy. Figure 4 provides a depiction of the surplus distribution of value-based pricing in comparison with a cost-based pricing outcome. The right-hand side shows an ideal value-based price. It meets the aggregated benefits that customers see in a product perfectly and thereby captures the entire possible innovator surplus. The left-hand side shows a cost-based price with the innovators' desired profit margin. Since cost-based pricing does not account for the benefit a customer can draw from the adoption of a product, this method is prone to result in prices that do not reap the entirety of the possible monetary reward. Another non-depicted outcome may also be prices that exceed the aggregated perceived customer benefit. This may harm sales and stir dissatisfaction among those who have purchase the product once they learn that they have overpaid.

19
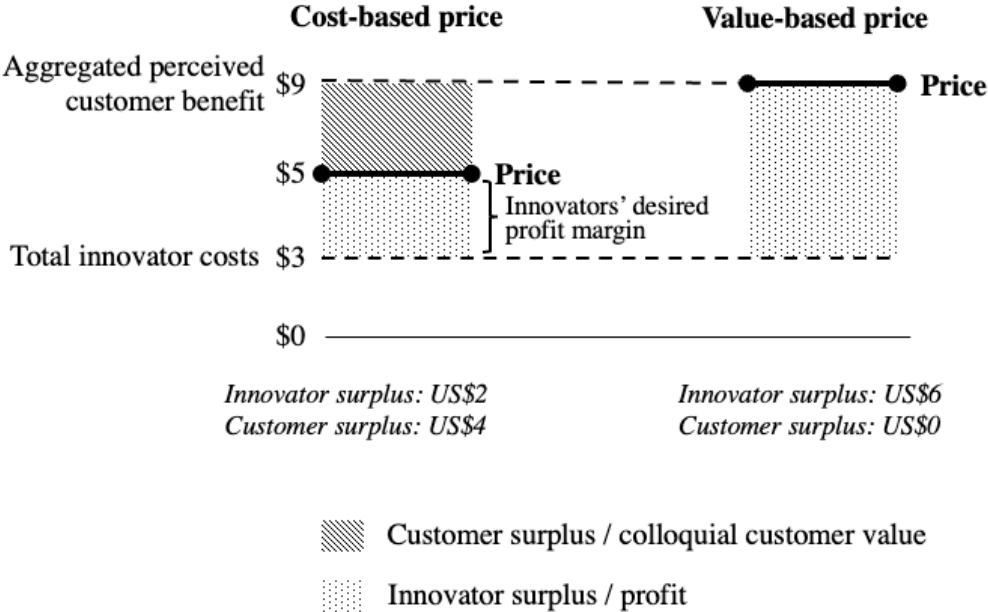
Figure 4: *Surplus distribution in cost- and value-based pricing (Source: Own depiction)*

Despite all efforts to develop tools to reliably acquire knowledge on customers' desires and translating this information into prices that meet the experienced customer benefit, this activity remains costly and error prone (Wittink et al., 1994; Bowman and Ambrosini, 2000). Results of various information acquisition methods in the same setting show inconsistencies in their findings and generalizability (Moore, 1980; Natter and Feurstein, 2002; Pullman et al., 2002). The methods seem most valuable when combined into expensive, complementing hybrid models (Green et al., 1981; Green, 1984). Additionally, the tasks imposed on participants in these assessments are extensive and straining, which further reduces the reliability of responses (Herzog and Bachman, 1981; Huber et al., 1993; Green et al., 2001).

These operational difficulties mix with firm internal obstacles. Many organizations are concerned with price sensitivity in their customer segmentation (Han et al., 2001; Wakefield and Inman, 2003). With price sensitivity in mind, managers refrain from charging value-based prices as they may seem rather high when costs and competitor prices are known (Shen et al., 2012). Hinterhuber (2008) empirically assessed why firms refrain from applying value-based pricing strategies despite their wide popularity in theory. He finds that many managers do not believe that a value-price-paying customer segment exists or is accessible. A senior managers' experience with convincing his colleagues of installing a new, value-priced product is quoted: "All I kept hearing was: 'The customer cares only about price! […] forget your premium prices'" (Hinterhuber, 2008).

20

Hinterhuber (2008) also identified frictions with sales departments as factors that oppress value-based pricing. Temporary price reductions are one of salespersons most effective instruments to fulfill sales targets (Nagle et al., 2014). Countering salespersons convenience, the success of a value-based pricing strategy depends on the consistency of prices at customer benefit levels (Madan and Suri, 2001; Popescu and Wu, 2007). Once customers understand that suppliers did not base their prices on a tangible cost-based floor but set them to maximize profits, customers have incentives to provide false information about the benefits they draw from a product in order to receive lower prices. Customers might also perceive the supplier as unfair and willingly taking advantage of them once discounts are discontinued or selectively applied (Campbell, 1999; Darke and Dahl, 2003; Gelbrich, 2011). As a result, value-based pricing strategies are the least implemented in corporate reality despite being superior from a theoretical point of view (Hinterhuber, 2008; Liozu et al., 2012).

2.2.3 Competition-based pricing

Competition-based pricing strategies gather their price setting information from observing other suppliers on the market (Hinterhuber, 2008). These strategies are attractive for firms because this information is often easy to acquire and competition-based prices are frequently followed by very direct purchase responses (Liozu and Hinterhuber, 2013). The goals of competition-based pricing are usually linked to attaining market shares (Nagle et al., 2014). This is commonly pursued by undercutting competitors' prices to lure customers away from them (Dean, 1976; Spann et al., 2014). The general principle of competition-based pricing assumes that larger market shares promise larger profits in the long run. Prominent examples for this approach are penetration, loss leader, or captive pricing strategies (Tellis, 1986; Kienzler and Kowalkowski, 2017). Companies that use competition-based pricing strategies see pricing as the key approach for generating a competitive advantage.

Competition-based pricing is particularly feasible on business-to-consumer markets. While business-to-business prices are often individually negotiated and not communicated, many business-to-consumer suppliers publicly broadcast sales prices to invite purchases and differentiate from competitors. This makes price information readily available for everyone (Russo et al., 1975; Suri et al., 2004; Hinterhuber et al., 2021). Electronic marketplaces pervaded almost all industries and improved the price information availability even more. Today, most prices can be easily tracked and processed automatically by firms and customers alike (Kung et al., 2002; Xia and Monroe, 2004). Customers were found to extensively engage in price comparisons (Fisher et al., 2017). This has made price competition between retailers even fiercer and competition-based pricing an even more convenient choice for business-to-consumer suppliers.

To employ a competition-based pricing strategy, firms first need to identify relevant competing offers. The relevance is determined by the degree to which customers consider other products as alternatives. To evaluate this, firms mimic the customers' search process in order to find other suppliers' products with comparable attributes (Tellis and Gaeth, 1990; Nagle et al., 2014). Next comes an assessment whether matching or undercutting competitors' prices is economically possible, necessary and how strong the undercut shall be. To estimate this, price elasticity measures should be collected beforehand in experiments, because historical data is often contaminated with unobserved events such as demand shocks or stockout situations of competitors (Fisher et al., 2017). The changed price is then communicated and in today's comparatively price transparent business-to-consumer markets, demand responses usually follow price changes at once (Ellison and Ellison, 2009; Zhang et al., 2018). This makes competition-based pricing a highly effective tool to increase sales volumes in a short time with an almost immediate gratification for managers (Holden and Nagle, 1998). Competitor undercutting prices are promptly rewarded by purchases, making it easy to reach sales targets in the short term, which is why competition-based pricing strategies are frequently used in practice (Johansson et al., 2012; Liozu and Hinterhuber, 2013).

However, marketing theory opposes these strategies (Hinterhuber, 2004; Liozu et al., 2012). The advantages that undercutting competitor prices promises are frequently of short longevity. This approach is only viable with absolute certainty that competing firms cannot match the set price in the long run. The flexible cost structure of consumer innovators may give them such an advantage. Otherwise, the long-term costs of using price as a competitive weapon usually exceed its short-term gains (Rao, 2009). Price reductions will cause other suppliers with competition-based pricing strategies to react and trigger a chain reaction, or price war, with swiftly decreasing price levels (Holden and Nagle, 1998; Rao et al., 2000). Examples for notable price wars can be read up in Rao et al. (2000). Once a price war begins, competition-based pricing strategies are reactive and provide little managerial maneuvering room. They are the pricing-strategy-equivalent of "letting the tail wiggle with the dog" (Nagle et al., 2014).

Exiting the downward spiral of prices without suffering severe sales losses is rarely possible (Rao et al., 2000; Van Heerde et al., 2008; Rao, 2009). Firms that did not quit markets in the price war have little chance to raise prices to levels that can recover incurred losses in the long run. Once profit margins make the market attractive again, new and unscarred competitors enter the market. Because of their potentially obliterating consequences, competition-oriented pricing strategies were vividly referred to as "Kamikaze pricing" (Holden and Nagle, 1998).

To conclude, prices are a fundamental factor in the functioning of economies. An overview of strategies with which marketers try to realize profit maximizing prices is provided in Table 1. Value-based pricing is the most acclaimed strategy by marketing

researchers (Liozu, 2017; Amaral and Guerreiro, 2019). However, it also requires the highest practical effort to implement and encounters the most substantial resistance in organizations (Hinterhuber, 2008). Its alternatives, cost- and competition-based pricing strategies, do not promise to generate the highest possible profit in the long run and are therefore not recommended by marketing theory. However, they score with easily available information and operational simplicity (Nagle et al., 2014), which makes them the predominantly used ones by firms (Liozu, 2017).

Table 1: *Overview of pricing strategies (Source: Adapted from Hinterhuber, 2008)*

	Cost-based	**Customer value-based**	**Competition-based**
Definition	Accounting-based pricing strategies with focus on cost coverage or the realization of pre-defined margins.	Customer benefit-oriented pricing strategies, aiming at prices that reflect what a customer segment will gain from the product or service.	Pricing strategies that are guided by or copied from anticipated or observed competitor market prices.
Examples	Cost plus / markup pricing (Guiltinan, 1976; Christopher and Gattorna, 2005; Guilding et al., 2005; Hinterhuber, 2008) Target-return pricing (Abratt and Pitt, 1985; Avlonitis and Indounas, 2005)	Perceived value pricing (Forbis and Mehta, 1981; Ingenbleek, 2007) Prestige pricing (Vigneron and Johnson, 1999; Yeoman and McMahon-Beattie, 2006) Seasonal pricing (Bitran and Mondschein, 1997) Price discrimination (Varian, 1989; Li and Dinlersoz, 2012)	Comparative pricing (Barone et al., 2004) Predatory below cost pricing (McGee, 1980) Penetration or market share pricing (Holden and Nagle, 1998; Liu, 2010)

2.3 Price perception and purchasing decisions

To comprehend the second empirical study of this dissertation, a deeper understanding of how prices influence customers' purchase decision-making is required. In order to assess whether they should buy a product or service, customers weigh its promised benefits against what they must give up in order to acquire it. The price informs customers how much of a monetary sacrifice must be made, which is commonly the largest customer waiver in a purchase (Cheng and Monroe, 2013). Side and opportunity costs, such as time, procurement costs and other tradeoff decisions, are frequently low

compared to the asking price. Based on this logic, rational customers can be expected to acquire a(nother) unit of a good if the marginal benefit it creates is greater than its price (Case et al., 2012).

Under certain conditions however, customers do not form their purchase decisions based on this logic (Hogarth and Reder, 1987; Guhl et al., 2017). Empirical research observed systematic deviations from this economic principle of rationality (Homburg and Koschate, 2005; Hinterhuber, 2015; Bolton, 2018). Observed customer behavior did not always comply to the perfectly rational homo economical behavior that economists long prescribed to economic agents. These findings inspired researchers to investigate how customers actually do behave (Thaler, 2000; Henrich et al., 2001). Their efforts formed the field of behavioral economics (Mullainathan and Thaler, 2000; Thaler, 2015). Customers' behavioral deviations from rationality turned out to be particularly well observable in price perception and purchasing decisions (Rao, 2009). This is because in purchase situations, the rationally superior option is often calculatable and seems obvious to the neutral observer, yet customers frequently opt for a suboptimal solution. As a result, behavioral pricing emerged as a separate discipline within the field of behavioral economics (Maxwell and Estelami, 2010; Bolton, 2018).

Empirical research on behavioral pricing repeatedly provided evidence that customers' assessments of price-related information are affected by cognitive biases (Monroe, 1973; Thaler and Sunstein, 2008; Manning and Sprott, 2009; Kahneman, 2011; Bagchi and Davis, 2012). Several theoretical contributions helped to explain the irrationalities that were observed in these empirical studies (Monroe, 1973; Cheng and Monroe, 2013). Amongst them, prospect theory confirmed that gains and losses are not perceived equally strong. Losses, such as paying a price, are perceived up to twice as strong as gains (Tversky and Kahneman, 1981, 1992). Mental accounting research confirmed that customers do not treat money as a universal mean to pay expenses. They rather balance their money in separate imaginary accounts with varying purposes and corresponding risk and spending behaviors. They are, for example, more relaxed about spending money that they found on the street compared to money they earned. In a similar vein, a majority would rather take up a credit to pay bills than misusing money from a college fund, regardless of the economic downsides of this choice (Thaler, 1985; Baucells and Hwang, 2017). Another example for irrational economic behavior is the Weber-Fechner law applied in pricing. It states that customers judge prices not in an absolute manner, but relative to other prices. Customers who just purchased an expensive vacation are less concerned about also purchasing a costly restaurant dinner the same day. The restaurant bill will appear small in comparison to the price paid for the holiday. The Weber-Fechner law also applies to discounts. The same absolute saving of US$5 appears large when purchasing a book priced US$15, but insignificantly small when purchasing a US$500 refrigerator, even though in both cases the customer owns five dollars more at the end of the transaction (Grewal and Marmorstein, 1994).

This chapter covers selected aspects of behavioral pricing. First, humans' "dual processing" framework as a fundamental principle of behavioral decision-making is described. Building on this framework, three constructs that are elementary in the explanation of behavioral reactions to prices are provided: price-quality inferences, reference prices and price fairness.

2.3.1 Dual mental process theory

The "dual process" theory of the human mind is a pivotal principle in the analysis of human decision-making processes (Epstein, 1994; Evans, 2002, 2003; Samson and Voyer, 2012). According to it, humans possess two ways of approaching decisions. First, a rational, analytical and cognitively demanding way of reasoning. This way of making decisions is in line with how non-behavioral economic theory expects humans to behave. Second, an intuitive, emotional, unconscious, belief-based way of making decisions.

Humans are capable of using both of these decision-making approaches but can and do not always consciously decide which one they use (Sloman, 1996; Stanovich and West, 2008). For example, they have only limited capabilities to conduct controlled, systematic thinking. Economic theory refers to this limitation as "bounded rationality" (Simon, 1972; Conlisk, 1996; Rubinstein and Dalgaard, 1998). This is critical to acknowledge, because decision outcomes depend systematically on the taken approach (Osman, 2004). When the boundaries of rationality are reached, or probably never stirred in order to save cognitive resources, intuition, heuristics and biases govern decision-making. Such decisions frequently violate judgements that are assessed as normatively correct (Tversky and Kahneman, 1974; Gilovich et al., 2002).

Particularly well acclaimed accounts of this dual process theory were the works of Daniel Kahneman, Richard Thaler and their colleagues (Thaler, 1985; Kahneman and Miller, 1986; Kahneman et al., 1986b, 1990; Thaler and Sunstein, 2008). Here, the two processes are metaphorically described as two working systems in the mind (Kahneman, 2011; Stanovich, 2011). The first System 1 is an intuitive and unconscious way of processing thoughts. It is the default or "lazy" way of thinking. Using it requires little effort and rewards quickly by providing pleasant, short-term gratification. An example is riding a bike. Unless something unexpected happens, the mind is almost on autopilot, subconsciously deciding what to do based on heuristics and known procedures. This way of mental processing is contrasted by System 2. System 2 describes a rational, reasoning, calculating and long-term anticipating approach to decision-making. Humans perceive thinking with System 2 as effortful and demanding. Furthermore, the rewards from System 2 processing often unfold only in a long-term perspective. This system handles complex choice problems, reason and concentration (Kahneman, 2011).

Customers' price and transaction perceptions are influenced by which of these dual process systems is active (Kahneman et al., 1986b; Kalapurakal et al., 1991; Homburg and Koschate, 2005; Samson and Voyer, 2012; Cheng and Monroe, 2013; Bolton, 2018). Empirical research found that more than often, the pleasure seeking, lazy heuristics-based System 1 is used by customers in price evaluations, leading to deviations from the rationally expected results (Tversky and Kahneman, 1974; Gilovich et al., 2002; Griffin et al., 2012). Three essential and repeatedly confirmed behavioral patterns in customer price perception with System 1 are price-quality inferences, the use of internal reference prices and price fairness considerations (Han et al., 2001; Homburg and Koschate, 2005; Koschate-Fischer and Wüllner, 2017).

2.3.2 Price-quality inference

Price-quality inferences are a staggering example of the relevance of considering behavioral pricing perspectives in theory and practice (Dawar and Parker, 1994; Brucks et al., 2000). According to rational theory, a lower price of a good should directly translate into higher purchase intentions. However, customers refrain from purchasing goods at uncommonly low prices (Gabor and Granger, 1979; Ding et al., 2010). Behavioral research found that customers do not view prices separately from a product's utility, but rather also use the price as an indicator of the benefit they will receive from the product (Monroe, 1971; Dawar and Parker, 1994; Teas and Agarwal, 2000; Madan and Suri, 2001).

To form a purchasing decision, customers need to assess product benefits. This requires certainty in what they expect from the purchase, usually based on a thorough evaluation of the product at hand as well as knowhow on potential alternatives and the product category in general (Rao and Monroe, 1988). Confronted with such demanding tasks, humans often apply heuristic processing and tend to use the price as convenient and intuitive proxy for the benefits they will perceive (Wolinsky, 1983; Rao and Monroe, 1988; Kirmani and Rao, 2000). Instead of engaging in a potentially straining examination of benefits, a simple heuristic seems more appealing: What is cheap cannot be good and what is expensive must be good (Weijters et al., 2018). This established the understanding of prices' dual role in purchasing decisions. While it is intended to inform customers about the sacrifice they must make, they also interpret the price as a quality signal (Rao and Monroe, 1989; Völckner, 2008; Lalwani and Shavitt, 2013)

Research has repeatedly proven that the actual relationship between price and quality is low, however, the price-quality heuristic remains present in customers' minds (Gerstner, 1985; Kirchler et al., 2010; White and Yuan, 2012). There are various reasons for this. The concessions made in transactions, monetarily, material, or immaterial, commonly need to be high enough for both parties to agree to an exchange. When purchasing from firms, this implies that the price needs to be high enough to cover all incurred costs for

providing the good. Accordingly, customers expect a lower priced good to be the result of less effort in production, probably resulting in inferior quality (Stiglitz, 1987; Zeithaml, 1988). Previously experienced covariance between price and quality further consolidates these inferences (Gabor and Granger, 1966, 1979; Pechmann and Ratneshwar, 1992). Customers may, for example, have found cheaper furniture to break more often, more expensive holiday resorts to provide the better experience or more expensive computers to calculate more rapidly.

The strength of the quality inferences customer make from prices depends on a variety of factors. For example, in three experiments that Kardes et al. (2004a), respondents were asked to judge the quality of priced wines and digital cameras under varying conditions of information load, information structure and decision pressure. The participants first learned about the product field by being presented a real list of products with quality ratings and prices. The actual correlation between price and quality in these lists ranged between r = .20 and r = .25. After having studied the list, they were asked to rate the quality of 10 hypothetical products. Already in the control condition, with a reduced information load of a 10-product list and exerting little pressure by instructing the participants to take their time and carefully consider their answers, the correlation of price and quality was twice as high (r = .46) as the factual list suggested. Those respondents that received a list of 100 randomly ordered products, simulating a high information load, and were pressured to make a quick judgement, gave quality ratings that correlated almost perfectly with the price (r = .92). Next, the researchers ordered the 100-product list based on quality ratings, which should make it easier to spot that the correlation between price and quality is actually low. But the high correlation between price and quality ratings remained the same (r = .92). This is less surprising in the light that even detailed previous knowledge of a product category was repeatedly not found to reduce customers' price-quality inferences (Lichtenstein et al., 1988; O'Neill and Lambert, 2001). More examples of empirical price-quality research can be read up upon in Kardes et al.'s (2004b) literature review.

2.3.3 Reference prices

Behavioral pricing research has shown that customer do not assess prices in absolute terms, but rather compare a focal price with reference prices to arrive at a price judgement (Kalyanaram and Winer, 1995; Moon et al., 2006). The concept is derived from that of physical stimuli and assumes that humans compare new stimuli, such as pain, effort, temperature, light or prices, against a level that they got accustomed to (Cheng and Monroe, 2013). As suggested when explaining the Weber-Fechner law in Section 2.3, this contradicts rational theory. Just as temperature is an absolute measure of heat, lumen is an absolute measure of visible light, a price is an absolute measure of money to spend. Judging its height against references can lead to wrong conclusions.

Compared to 0ºC water, 10ºC water may seem warm, but will still freeze a swimming human to death within 2 ½ hours (Brooks, 2003). A light bulb of the same luminosity appears dim in daylight and bright at night. Similarly, a car priced US$200,000 remains a high-priced car, despite being presented amongst more expensive US$500,000 cars. Likewise, a 90% discount remains a high discount, even if another customer received a 93% discount. Judging price stimuli against references can be fallacious, particularly if the reference is maladjusted. Still, customers are prone to make misjudgments based on reference prices.

The term reference price denotes the price to which customers compare a new price stimulus. Reference prices can be externally supplied or internally established (Mayhew and Winer, 1992; Mazumdar and Papatla, 2000; Chen, 2009). External reference prices are provided to the customer from the outside, whereas internal reference prices describe customers' own expectation of how much a good is supposed to cost. External reference prices are often used by sellers to influence customers at the point of sale or in advertisements. Frequently encountered external reference prices are those from price lists, price comparison websites or price reports of peers. But also sellers state reference prices in the form of recommended retail prices along the actual sales prices or position products next to other products in order to create a specific reference price environment (Biswas and Blair, 1991; Kopalle and Lindsey-Mullikin, 2003). The reason is that a good that is, in absolute terms, high priced, can appear relatively acceptably priced when positioned amongst even higher priced products. In a similar vein, a regularly priced offer appears like a good deal when presented along with high recommended retail prices (Grewal and Compeau, 1992; Grewal et al., 1998; Mazumdar et al., 2005).

Internal reference prices describe reference prices that are maintained by customers themselves in a predominantly subconscious process (Mayhew and Winer, 1992). They are mental concepts of prices that are established based on previous experiences with externally provided prices and knowledge about the focal product (Baucells et al., 2011; Baucells and Hwang, 2017). Customers' internal reference prices denote the prices that customers presume to be normal because they have adapted to them (Kahneman and Miller, 1986). In purchase situations, they are used as neutral comparison points against which the new price stimulus is judged (Lattin and Bucklin, 1989; Putler, 1992; Bell and Lattin, 2000). When an offers' price is acceptably close to a customer's internal reference price, in other words, when it meets their personal expectations, the price is accepted (Tversky and Kahneman, 1991). Accordingly, an understanding of how customers form and retrieve these internal reference prices is crucial to meet price expectations and thereby foster product adoption (Kalyanaram and Winer, 1995; Meyer and Johnson, 1995).

Theory commonly relates the formation of reference prices to adaptation level theory (Bitta and Monroe, 1974; Lichtenstein and Bearden, 1989; Mayhew and Winer, 1992).

Adaptation level theory states that humans adapt their expectations of future stimuli on what they have previously experienced (Helson, 1964). How strong the reference level is formed by previous experiences depends on their "recency, frequency, intensity, area, duration and higher order attributes such as meaningfulness, familiarity and ego-involvement" (Avant and Helson, 1973; as quoted by Kahneman and Miller, 1986). For example, prices that are seen subconsciously when shopping for an entirely different good have a comparatively weak influence on internal reference prices (Rajendran and Tellis, 1994). On the other hand, previously paid prices for a particular focal product in high involvement situations as well as frequently paid prices have a powerful influence in shaping a reference price (Winer, 1986; Helgeson and Beatty, 1987).

Customers store the prices that they encounter in fuzzy mental categories based on product and purchase attributes. Such mental categories can be very narrow or broad. A narrow category may refer to one specific product at a certain store, whereas broad categories are formed by general attributes, such as certified organic food, a handmade label or the relative price level of a store or brand (Winer, 1985; Hardie et al., 1993; Bridges et al., 1995; Mazumdar et al., 2005).

Whenever customers must judge a product's price, they conduct a subjective mapping of the focal product's attributes with their internally available mental categories in order to retrieve their corresponding internal reference price (Monroe, 1973). Should no matching reference be retrievable, e.g., in the case of entirely novel products or first-time purchases, they make inferences from the available categories (Reed, 1972; Medin et al., 1984; Kuester et al., 2015). For example, an average reference price of the product category that resembles the focal product closest is retrieved and adjusted with contextual moderators such as the differentiating product attributes, a general store price level, special purchase occasions or stock-out conditions (Kumar et al., 1998; Wakefield and Inman, 2003; Mazumdar et al., 2005).

To understand how a price is judged against a retrieved reference price, an understanding about the form of representation is necessary. In compliance with adaptation level theory, research first considered reference prices to be actual price points (Monroe, 1973; Lattin and Bucklin, 1989; Kalyanaram and Winer, 1995). In order to identify it, customers were asked for the last price they paid for a product, the price they remember as normal, or a series of previous price experiences out of which a weighted mean is calculated (Helgeson and Beatty, 1987; Briesch et al., 1997; Baucells et al., 2011). In relation to such a point of comparison, new price stimuli are usually lower or higher, but rarely meeting the price expectations (Helgeson and Beatty, 1987; Briesch et al., 1997). This did not resemble the actual situation very much.

An understanding of reference prices as ranges was found to be a more realistic representation of how customers maintain internal reference prices (Monroe, 1971;

Kalyanaram and Little, 1994; Janiszewski and Lichtenstein, 1999; Niedrich et al., 2001, 2009). Using a range of prices means that new prices can be judged as acceptably low or high. Only leaving the reference price range will cause a new price to be perceived as unacceptable, triggering a negative reaction towards the price stimuli. This is the case for negative and positive deviations from the reference price range. On the low end, for example, because the price causes doubts in quality or the purchaser fears to harm their personal image with a cheap purchase. On the high-end, prices can harm adoption due to feelings of being exploited or a lack of funds to pay them (Monroe, 1973). This notion of upper and lower threshold prices enclosing a reference price range can be plotted as an inverted U-shape demand curve. The inverted U-shape is thus the commonly accepted form of the price-demand curve in behavioral pricing research (Lichtenstein et al., 1988; Kalwani and Yim, 1992; Kalyanaram and Winer, 1995; Ofir, 2004; Ding et al., 2010).

2.3.4 Price fairness

Next to rating the price solely against personal expectations, customers also assess price fairness in transactions. There are many factors that can influence fairness judgements beyond the price itself. Transaction aspects that serve as price justification can add to the perceived fairness. Some examples are transaction partner characteristics, the current situation of the buyer and the seller, previous transactions and external factors that influence the asking price, such as extraordinary costs or shortages (Campbell, 1999; Xia et al., 2004). Customers price fairness ratings thus go beyond self-interested utility maximization and a confirmation of personal expectations. They include what customers deem appropriate to grant the other party in a transaction in relationship to what they perceive as fair to receive themselves. Once the interests of all involved parties in a transaction are adequately considered, it is deemed "fair", "equitable" or "just" (Kahneman et al., 1986b; Kalapurakal et al., 1991; Bolton et al., 2003).

While this general principle of fairness is understood, a positive definition of the exact conditions with which price fairness is achieved remains difficult to provide (Gielissen et al., 2008). In literature, various concepts and aspects have been discussed (Kalapurakal et al., 1991; Frey and Pommerehne, 1993; Campbell, 1999; Maxwell, 2002; Vaidyanathan and Aggarwal, 2003; Ferguson et al., 2014). One common understanding of price fairness is closely linked to the reference price concept. It prescribes that a new price will be perceived as fair when it conforms to the "normal conditions" that customers have adapted to (Urbany et al., 1989). However, this seems tautologic. Fairness might as well be the reason why customers adapted to certain conditions in the first place. A more autonomous description defines transaction fairness as "the extent to which outcomes are deemed reasonable and just, […] to the extent to which sacrifice and benefit are commensurate for each party involved." (Bolton et al.,

2003). This still does not inform, e.g., about acceptable profit ratios or conditions under which a price can be raised or needs to be lowered in order to appear fair. Research found it hard to gather a universal and general estimation of fairness constraints (Finkel, 2001; Xia et al., 2004).

Conversely, pointing out unfairness is something humans can do very well and unanimously. Unfairness usually appears crisp and intuitively easy to spot. "People know what is unfair when they see or experience it, but it is difficult to articulate what is fair" (Xia et al., 2004). The commonly agreed upon cause of transaction unfairness perception is whenever a firm is taking advantage of its customers (Kalapurakal et al., 1991; Campbell, 1999). In order to maintain an image being fair as producer, it thus seems more practical to avoid being perceived as unfair by customers than striving to appear extraordinarily fair according to the manifold and unprecise fairness expectations. A multifaceted conceptual framework to navigate the aspects of price (un)fairness can be read up in Xia et al. (2004).

An important contribution of price fairness research was the finding that customers are considerate of suppliers' interests in transactions (Thaler, 1985; Urbany et al., 1989; Kalapurakal et al., 1991). Particularly, customers do entitle suppliers to their share of profits, just as they see themselves entitled to a share of customer surplus. Kahneman et al. (1986a) coined this the "principle of dual entitlement". Surprising as this may seem, it is not a purely selfless approach to transactions. Providing all transaction partners with an appropriate share of surplus contributes to the economic survival of all parties, increasing the chance that they remain available and willing to conduct future transactions.

An approximate amount of what a fair surplus share is can be most easily operationalized via reference transactions and their surplus distributions (Urbany et al., 1989). Changing the surplus distribution has the potential to raise unfairness perceptions. This is for example the case when firms merely raise prices to increase their surplus share at the cost of customers' surplus share. However, Kahneman et al. (1986a) found that a price increase will be judged as fair if it is explained by the firm's objective to maintain their previously realized surplus share, e.g., when additional production costs need to be covered. In this case, the customer-entitled fair profit share of the firm remains the same and so does the fairness perception of the transaction. Conversely, the same research found that suppliers can reduce their production costs without changing prices accordingly and not elicit feelings of unfairness. Since customers retain the reference surplus level that they feel entitled to, the increase in supplier profit does not affect their fairness perception (Thaler, 1985; Kahneman et al., 1986a).

The takeaway of this is that customers entitle suppliers to forward cost increases and to keep additional profits if they do not reduce the customer surplus. This relationship was subject of extensive research. Moderating factors and other findings on the principle of dual entitlement are included in Lu et al.'s (2020) recent review of the topic. Overall, the dual entitlement principle shows that notion of price fairness is not just a false pretense of customer surplus interest. It is a complex construct with the objective of balancing interests between all involved parties and maintaining mutually beneficial transactions (Oliver and Swan, 1989; Cox, 2001; van den Bos et al., 2006).

3 Consumer Innovation

After having introduced price as the first central theoretical component of this dissertation, this chapter introduces this dissertation's second essential element: consumer innovation. Following a short introduction of the consumer innovation phenomenon, Chapter 3.1 provides a definition of how the consumer innovation concept is operationalized throughout this work and how it differs from other concepts of the field, mainly user innovation. Chapter 3.2 provides an overview of consumer innovators' predominant motivations to innovate: Use interest, process rewards, and social or altruistic rewards. Concluding the introduction of consumer innovation, Chapter 3.3 broaches the dominant modes of consumer innovation diffusion: Free innovation sharing and consumer innovation commercialization.

Scholarly innovation research has widely focused on innovation activities of firms with specialized R&D departments and professional innovation functions. For a long time, consumers were largely not considered as an important source of innovation (Case et al., 2012; Tidd and Bessant, 2013; von Hippel, 2017). Not only in economic theory, but also in the dominant perspectives of innovation and marketing research, consumers experience needs but depend on firms to discover these needs and satisfy them with their research and development activities (Rothwell et al., 1974; Tidd and Bessant, 2013).

In deviation of this paradigm, Adam Smith showed already early that not only firms innovate (Bogers et al., 2010). He tells the story of regular workers, ordinary consumers, that improve and develop machinery on their own terms:

> *"Whoever has been much accustomed to visit such manufactures, must frequently have been shewn very pretty machines, which were the inventions of such workmen, in order to facilitate and quicken their own particular part of the work. In the first fire-engines, a boy was constantly employed to open and shut alternately the communication between the boiler and the cylinder, according as the piston either ascended or descended. One of those boys, who loved to play with his companions, observed that by tying a string from the handle of the valve which opened this communication to another part of the machine, the valve would open and shut without his assistance, and leave him at liberty to divert himself with his playfellows. One of the greatest improvements that has been made upon this machine, since it was first invented, was in this manner the discovery of a boy who wanted to save his own labor." (Smith, 1976, p. 10)*

Considering consumers as a viable source of innovation was induced again by the research of Eric von Hippel (von Hippel, 1976, 1977, 1988). Von Hippel surmises that innovations are developed by those who benefit the most of them (von Hippel, 1986; Urban and von Hippel, 1988). Sometimes, those benefitting most from an innovation are the ones who want to use them. A self-developed innovation provides consumers ample benefit by being a tailormade solution to their personal problem. For firms, innovations must promise a sufficient return on investment based on the total costs and the potential customers addressed by them in order to be developed (Tidd and Bessant, 2013). Therefore, customer needs often remain unsatisfied by firm products, which prompts consumers to engage in innovation activities themselves (von Hippel, 2005; Bogers et al., 2010; Baldwin and von Hippel, 2011).

The dissonance of firm and customer interests that drives customers to innovate is visible in Adam Smith's exemplary story as well. The little boy operating the valves likely did not cost his employer much. Replacing him with an automaton did not provide much benefit for the firm, particularly considering the required research and development expenditures. For the boy, however, the benefit of inventing the solution must have appeared sheer endless. Replacing his own work with a machine promised the chance to play with his friends. Being an expert in his profession and knowledgeable of the machine's workings, he was predestined to develop a workable solution for his problem, and he thereby generated an innovation that was valuable for many.

Next to not being profitable enough, some customer needs will never be discovered by firms. Depending on their absorptive capacities, they must bear considerable knowledge transfer costs in order to acquire customer need knowledge (Cohen and Levinthal, 1990; Zou et al., 2018). The information that can be gathered by firms is thus limited by their budget. Even more severe than just costly to acquire, implicit or tacit customer information is almost impossible to codify, transfer and process (Mascitelli, 2000; Polanyi and Sen, 2009; Sakellariou et al., 2017).

Since firm innovators are not able to profitably grasp and fulfill the entirety of customers' needs, consumers are left on their own to generate solutions that meet their individual interests best. Today, research confirms that an average of 4.6% of developed nations' population engages in such consumer innovation activities. A summary of recent national surveys is displayed in Table 2. In certain product areas, over 30% of the consumers engage in product development work (Franke and Shah, 2003).

Table 2: *Extent of consumer innovation in six countries (Source: von Hippel, 2017, p. 21)*

	UK (n = 1,173)	US (n = 1,992)	Japan (n = 2,000)	Finland[a] (n = 993)	Canada (n = 2,021)	S. Korea (n = 10,821)
Number of consumer innovators in the population aged 18 and over (percentage of the population)	2.9 million (6.1%)	16.0 million (5.2%)	4.7 million (3.7%)	0.17 million (5.4%)	1.6 million (5.6%)	0.54 million (1.5%)
Source	(von Hippel et al., 2012)	(von Hippel et al., 2011)	(von Hippel et al., 2011)	(de Jong et al., 2015)	(de Jong, 2013)	(Kim, 2015)

[a] *In Finland, the age range was 18-65.*

3.1 Defining consumer innovation

The research of consumer innovation goes by a variety of names that each set a particular focus. Along with "consumer innovation" (Stock et al., 2016; de Jong et al., 2018; Halbinger, 2018; Claussen and Halbinger, 2020) another frequently used term is "user innovation" (von Hippel, 2005; Baldwin and von Hippel, 2011; de Jong, 2016a; Roszkowska-Menkes, 2017; Bradonjic et al., 2019). Some other names describing a similar phenomenon are leisure or slack time invention (Davis et al., 2012; Agrawal et al., 2018), weekend hobbyist work (Dahlin et al., 2004; Lettl et al., 2009; Pollok et al., 2021), serious leisure (Stebbins, 2001; Gould et al., 2008) or amateur innovation (Boudreau, 2018; Freeman et al., 2020). Throughout this dissertation, the term "consumer innovation" is used. In order to provide a common understanding of consumer innovation, first the term "consumer" in innovation is zoned from other relevant names, foremost the frequently used "user" innovator. Next, the term "innovation" is fathomed in the context of consumer innovation.

The term consumer innovation puts an emphasis on consumers as the source of innovation (Claussen and Halbinger, 2020) whereas the term user innovation stresses the use benefit of the innovator. Economic theory defines consumers as the non-firm or household sector of an economy. "In contrast to the business or government sectors, the household sector is the consuming population of the economy, in a word all of us, all consumers" (von Hippel, 2017).

In contrast, user innovation highlights the "user" status of the innovator rather than their originating economic sector (von Hippel, 1976; Franke et al., 2016). Innovation out of use interest is not entirely exclusive to the consuming household sector. Firms can innovate out of use interest as well (Riggs and von Hippel, 1994; von Hippel, 2009). For example, they may optimize their production line for in-house use, which qualifies as user innovation. Still, a firm's functional role remains the generation of profit, meaning that also firm user innovations serve this superordinate profit interest (Tidd and Bessant, 2013; West and Piller, 2014). Because the extent of profit interest is of higher importance for prices than a possible use interest, this work concentrates on consumer innovation.

Prior to a change in the OECD definition of innovation in 2018, innovations by consumers were not fully covered by the standard innovation definition. In order to be considered as innovation, products or services need to be new or improved and "introduced on the market", i.e., commercialized (OECD and Eurostat, 2005). With the advent of innovation platforms on the internet, plenty new and improved products were made available to the public without commercialization (Hars and Ou, 2002; Benkler, 2006; von Hippel, 2017). Consumers do create significantly improved or novel products with value for others (Franke et al., 2016; de Jong et al., 2018). But oftentimes, they do not commercialize them and thereby, these new products did technically not count as innovations (de Jong, 2016b; Gault, 2016).

With the latest revision of the OECD manual on innovation, commercialization is no longer defined as the only way to implement inventions. The introduction of an innovation is now defined as "the point in time when a significantly different product or business process is first made available for use" (OECD, 2018). With the concept of implementation based on use availability, also new products that are shared without monetary transactions count as innovation. Thereby, this definition now also encompasses all published consumer innovations.

3.2 Motivations to innovate

The previous chapter outlined that the crucial difference between consumer and firm innovation is the fundamentally different motivation to innovate. Traditional economic theory understands innovation as a value generating activity that is mainly conducted by firms with the goal of generating profits (Teece, 1986; Schumpeter, 1987; von Hippel, 2017). Consumer innovators frequently do not aim to appropriate monetary benefits from an innovation. Without profit prospects, economists wondered why these innovation activities were conducted (Hars and Ou, 2002; Lakhani and Wolf, 2003).

Research found that consumer innovators draw a variety of other benefits from innovation. As explained along the term user innovation, the primary interest of many consumer innovators lies in using the created product themselves. Some other factors that provide rewards are the innovation process, containing fun and learnings, social rewards from sharing the innovation and an increased reputation. The most prevalent motivations of consumers to innovate can be categorized into use, process and altruistic motivations (Raasch and von Hippel, 2013a).

3.2.1 Use benefit

When asked for their motivations, 51% of Finnish consumer innovators (de Jong et al., 2015) and 61% of the international consumer innovators in whitewater kayaking (Hienerth, 2006) stated that they create novel solutions because they personally needed them. For consumers there is often no need to sell the innovation in order to gain profits from innovating. Consumer innovators benefit immediately by using their innovations themselves (von Hippel, 2005).

Two consumer characteristics make developing a product for personal use particularly beneficial. First, consumers have a desire to possess and use solutions that are perfect for their use case. When studying the security related use needs of web server consumers, Franke and von Hippel (2003) developed a list of 45 possible security functions in a questionnaire in order to ask customers which of these features they need. They thought to have created an exhaustive list of possible features. As a precaution, the option to state other desired use needs was still added to the questionnaire. When evaluating the responses, Franke and von Hippel found that an astonishing 50% of the respondents made use of that option. A total of 92 additional needs, not counting duplicates, were added by the customers (Franke and von Hippel, 2003).

Commercial innovators cannot accommodate the entirety of these individual use interests. To be profitable at a given margin, sufficiently many customers must demand a product in its given version. A firm producer thus weighs the potential profit that a new feature may generate in sales against the total investment needed to create it (Tidd and Bessant, 2013). With their needs not perfectly met, some consumer innovators will customize the present supply in order to suit their individual use interests better. In a study conducted by Lüthje (2004) in the outdoor sports product field, 70.2% of consumer innovators were found to generate such improvements of existing products by modification or the addition of new elements.

To answer more specific customer needs and thereby increase use benefits, some firms make use of customization options and toolkits for innovation (Franke and von Hippel, 2003; Franke and Piller, 2004; Prügl and Schreier, 2006). In a series of studies on product customization, Franke et al. (2009b) found that more design freedom and a

higher preference fit increased customers' mean willingness to pay for a customized product by more than 50% – from 19.21 Euro to 30.34 Euro (n = 66). A later study confirmed the results in various product groups with increases in willingness to pay of more than 100% (Schreier, 2006). Creating a product that precisely suits individual interests creates a substantial use benefit for customers (Franke et al., 2009a). However, it rarely is the source of radically new products.

Second, there are consumers whose use needs are far ahead of those of the general public and even their product community (Hienerth and Lettl, 2011). This group was coined lead users (Hienerth and Lettl, 2017; Brem et al., 2018). Addressing their needs frequently does not only improve the personal fit of an already existing solution, but it also solves a problem that only few to no-one has encountered or tackled so far (Lettl et al., 2004). This promises lead users a particularly high use benefit of their innovation, which also makes them particularly motivated to develop new products (von Hippel, 1986; Hienerth and Lettl, 2011). With needs that are ahead of the trend and a high use benefit of potential solutions, lead users' potential to create breakthrough innovations is above average, which is a good example strong use interest effects (Urban and von Hippel, 1988; von Hippel, 1986; Morrison et al., 2000; Lettl et al., 2008).

3.2.2 Process rewards

In studies on the motivations of consumer innovators, a further 32% (de Jong et al., 2015), respectively 35% (Hienerth, 2006), stated that their major motivation is the enjoyment experienced during the innovation creation and the learnings they took away. When highly skilled software developers were first observed to voluntarily contribute to open-source software projects, process rewards were identified as their main motivation (Hars and Ou, 2002; Lakhani and von Hippel, 2003; Lakhani and Wolf, 2003; Benkler, 2006; Fitzgerald, 2006). From a rational, economical perspective, these professional developers should not contribute their skills and time free of charge. After all, on labor markets they are highly valued and reimbursed for their skills. Research found them to code for free anyway, because they were in no financial distress and thoroughly enjoy software development (Hertel et al., 2003; Bitzer et al., 2007).

Experiencing enjoyment is the key source of intrinsic motivation (Deci and Ryan, 2000; Ryan and Deci, 2000). Csikszentmihalyi identified five categories of activities that elicit enjoyment in people: Friendship and Relaxation, Risk and Chance, Competition, Problem Solving, and Creativity (Csikszentmihalyi, 1975, p. 29). Consumer innovation can check all these boxes. It requires creativity and investments with uncertain returns, can be conducted with social peers and may involve competition, particularly in settings like innovation contests (Franke and Schreier, 2010; Hienerth and Lettl, 2011; Raasch and von Hippel, 2013a; Füller et al., 2014; Brem et al., 2019; Fursov et al., 2017; Pollok et al., 2021). Most distinctively though, consumer innovation qualifies as a creative

problem-solving activity (Hienerth et al., 2014b; von Hippel and von Krogh, 2016; Robson et al., 2019). Indulging in innovation processes with their purposeful, goal-directed activities can provide "a sense of discovery, exploration, problem solution – in other words, a feeling of novelty and challenge" (Csikszentmihalyi, 1975, p. 30). Thus, innovation activities can elicit process enjoyment like other demanding activities, such as mountain climbing, playing chess or solving crossword puzzles (Raasch and von Hippel, 2013a).

High levels of process enjoyment can cause a highly rewarding state of intense concentration and motivation known as "flow" (Csikszentmihalyi, 1990). When persons enter this state, they are only aware of the conducted activity. Even the feeling of time is lost. 95% of contributors to open-source software projects reported that they experience "flow" at least sometimes when programming (Lakhani and Wolf, 2003). The presence of such extraordinary process enjoyment in dealing with the product was confirmed in various areas of intense consumer innovation like sports and other leisure time activities, i.e., Lego, Playmobil, movies, basketball, mountain biking or working on the Wikipedia (Lüthje et al., 2005; Hienerth, 2006; Antorini, 2007; Füller et al., 2007; Nov, 2007; Chen et al., 2010).

Conducting innovation activities can also be a mean to expand personal abilities. Learning something new constitutes another benefit from the innovation process (Jeppesen and Molin, 2003; Lakhani and von Hippel, 2003; Stahlbrost and Kareborn, 2011; Acar, 2019). Attaining and improving personal skills can also enable the innovator to approach more demanding problems and thereby increases the obtainable process reward. It also allows innovators to satisfy more complex personal use needs. Besides being an enjoyable activity on its own for some, learning further involves tangible advantages. Economically, the acquisition and mastery of relevant skills increases an innovator's human capital. Constant training, practice and learning can lead to better job opportunities with higher salaries or more fulfilling tasks (Hars and Ou, 2002; Sluis and Poell, 2003).

3.3.3 Social benefit

13% (de Jong et al., 2015), respectively 10% (Hienerth, 2006) of surveyed consumer innovators state that helping others was their primary motivation to innovate. They utilize their skills to satisfy and solve the needs and problems of third parties (Füller, 2006; Stahlbrost and Kareborn, 2011). This can be very rewarding and is frequently observed in various settings, such as solving societal problems or engaging in online support forums (Fehr and Fischbacher, 2003; Alexander and Christia, 2011; Cornwell et al., 2017). Helping others can also be a very efficient way of solving problems. A problem commonly gains relevance due to a lack of necessary skills to solve it. IT novices, for example, frequently face problems with their computer. Overcoming them

is not within their scope. Gaining the skills to develop a solution requires substantial investments. A seasoned IT expert, however, may be able to solve the requirement in less than no time. This puts the knowledgeable expert into an attractive position to solve the use need of another user in exchange for a social, intrinsic reward. The helping person may value the warm glow of helping more than the comparatively little effort needed to achieve it (Schroeder et al., 1995; Haruvy et al., 2003).

It is debatable whether such motivations are entirely self-oriented (Cornwell et al., 2017; von Hippel, 2017). After all, altruistic activities may be conducted with a hope or expectation of reciprocation. Providing help and knowledge to a person that needs it today may put the helper in good books when assistance may be needed from that person in return (Kathan et al., 2015). Helping others may also be done in order to increase the personal reputation in social communities with the target of achieving societal advantages (Kitcher, 2011). Still, such social innovation efforts are not directly compensated, so it does not qualify as barter. The essence of social gratification is the feeling of having contributed something to society without immediate expectations of compensation (Haruvy et al., 2003; von Hippel, 2017). In sum, use interest, process rewards and social, altruistic aspects provide sufficient benefits to encourage more than a handful of consumers to innovate.

3.3 Diffusion

When the consumer innovator's individual motivational goal is satisfied, the consumer innovation's purpose is largely fulfilled. Since use, process and social rewards reimburse the value generating consumer innovation activity, the need for further amends from diffusion may have vanished (von Hippel, 2017). However, empirical research indicates that it may be worthwhile to diffuse a significant share of consumer innovations. When sampling the Finnish population, de Jong et al. (2015) found that 44% of all consumer innovators rated their innovations to be beneficial also for others than themselves. Sharing them thus possesses the potential to improve the life of others and has a promising potential to spread economic welfare (Henkel and Hippel, 2004; Gambardella et al., 2017). To realize this potential, the innovation should ideally be widely diffused.

Alas, diffusion activities promise only mediocre rewards to consumer innovators. Marketing and distributing the own solution are often not as rewarding as tinkering. For creative consumer innovators, diffusion related activities, such as providing manuals, complying with regulations or giving customer support, rarely fall into the category of fulfilling leisure-time activities. A market mechanism that links adopter benefit with innovator rewards is missing. The resulting lack of diffusion is one of consumer innovations' major issues (von Hippel et al., 2014; de Jong et al., 2015; de Jong and Lindsen, 2021).

Of the consumer innovations that innovators deem to be useful for others, they only share one quarter (de Jong et al., 2015). Fortunately, this means that at least some consumer innovators do decide to diffuse their valuable work (Füller et al., 2013; de Jong et al., 2015; Schweisfurth and Dharmawan, 2019; Claussen and Halbinger, 2020). The reason is that some incentives still reward innovation sharing. Considering use interests, giving the solution to other users with unique skills enables them to improve it. There is a chance that the improved innovation adds further use benefit for the original innovator as well (Claussen and Halbinger, 2020). Regarding process rewards, some intrinsic motives are also best realized by sharing the own work. For example, frequent feedback increases process enjoyment (Csikszentmihalyi, 1975). Also, the mere involvement of social peers can make work more rewarding (Benkler, 2006). And social goals are by definition only realized if the innovation is shared with beneficiaries.

Theory differentiates between two general modes of consumer innovation diffusion based on the presence of pecuniary transactions: Free innovation and consumer entrepreneurship. Free innovation is defined "as a functionally novel product, service, or process that (1) was developed by consumers at private cost during their unpaid discretionary time (that is, no one paid them to do it) and (2) is not protected by its developers, and so is potentially acquirable by anyone without payment—for free. No compensated transactions take place in the development or in the diffusion of free innovations" (von Hippel, 2017). Eric von Hippel's (2017) book on free innovation provides a thorough overview on this issue.

Consumer entrepreneurship is understood as consumer innovators who "attempt to appropriate financial benefit from his or her innovation by commercializing it […] as opposed to simply benefiting through use and letting manufacturers exploit any potential commercial value" (Shah and Tripsas, 2012). 10.7% of newly registered companies in the US show this background of the founders initially not having commercial motivations for product development (Shah et al., 2012). Some examples have made it to wide popularity such as Dropbox, rolling board-luggage as well as snow- and skateboards. Drew Houston developed Dropbox because he kept forgetting his flash-drive. Being a computer science graduate, he solved the problem for himself and decided to share it against a fee (Eisenmann et al., 2014). Rolling hand luggage, or "roll-aboards", were invented by Robert Plath, an airline pilot with a dire need to lighten his pilot-life quite literally (Robbins, 2006). Passionate surfers, who did not have water access, developed Snow- and skateboards to transfer the surfing experience onto streets and slopes (Stebbins, 2009).

Still, most consumer innovations in both diffusion modes maintain a low profile and are rarely adopted. With the ascent of online platforms and marketplaces consumer innovation diffusion recently began to unfold its potential (Boudreau, 2018; Church and Oakley, 2018; Claussen and Halbinger, 2020). These platforms lowered the required

effort to diffuse an innovation considerably. They alleviated the need to engage in marketing activities, convince retailers to include the own product into their assortment or establish a separate legal entity. Everything consumer innovators need to do in order to make their innovation available to others now is listing it on an online platform.

Sharing platforms that follow the philosophy of free innovation are, for example, github.com, thingiverse.com or patient-innovation.com. Platforms with marketplace-functions are Steam, Etsy or CGTrader. These marketplaces allow consumer innovators to charge a price and foster consumer innovation commercialization. In order to generate additional pecuniary profits from their work, consumer innovators just need to decide on a price when listing their innovation on such marketplaces. This way consumer innovators who have not actively aspired it can easily start a business (Rotefoss and Kolvereid, 2005; Shah and Tripsas, 2007, 2012). They started their innovation journey out of non-commercial motivations and the opportunity to also make money from their passion work came along as a convenient option on the road (Baldwin et al., 2006; Agarwal and Shah, 2014).

Becoming a commercializing consumer innovator thus profoundly deviates from the commonly observed entrepreneurial process. In conventional entrepreneurial models, personal use needs are inferior in driving product development. The primary reason to become an entrepreneur is a general aspiration to run a business. To achieve this, aspiring entrepreneurs then deliberately identify, evaluate and exploit a business opportunity (Rotefoss and Kolvereid, 2005; Fueglistaller et al., 2016; Volery et al., 2016). Following an entirely different approach to the entrepreneurial process, consumer innovators likely possess a unique entrepreneurial identity (Tajfel et al., 1971; Fauchart and Gruber, 2011). More precisely, since many consumer innovators do not work towards a future as business owners, it stands to discussion whether the nature of commercializing consumer innovators can be categorized as entrepreneurial per se. The effects that this specific profile has on their decision-making and how market participants perceive this novel type of suppliers and their work form the core of this work.

4 Research Questions and Empirical Field

The previous chapters introduced the two central subjects of this work, prices and consumer innovation. Within them, two upheavals in economic research were covered. First, consumers engage in innovation activities out of personal interests instead of solely adopting firm products (von Hippel, 2005, 2017). Second, rather than by mere rational assessment, customers perceive prices in a behavioral, heuristic and belief-based manner (Tversky and Kahneman, 1974; Bolton, 2018). In this chapter these fields are fused, and the resulting research questions formulated.

4.1 First research question

Leisure time has increased massively in the recent decades. Nowadays consumers can dedicate significant amounts of time into the generation or modification of products (von Hippel, 2005; Davis et al., 2012). Since many citizens of developed economies are embedded in secure systems with well-paying jobs, these innovation activities are conducted voluntarily and without the goal to contribute to their living wages (Hars and Ou, 2002; Shirky, 2010). Until recently, these developments were under the radar of economic theory. Despite the large extent of consumers' innovation activities, they were scattered, rarely communicated and hardly visible for the majority (Franke et al., 2016). As long as consumers primarily innovated in their hobby rooms and without actively diffusing their innovations, the effects on economies were neglectable. Consumer innovation activity was known as neighborly help or tinkering. Even if more adopters were interested in their works, the production scales were too low to contest firm incumbents market shares seriously. For consumer innovators alone it was often too costly to mass produce their innovations. Consequently, firms considered consumer innovation as a source of inspiration, not as a threat or substitute (Bilgram et al., 2008; Di Gangi and Wasko, 2009; Bogers and West, 2012). Consumer innovations that improved existing products even fueled firms' sales and some firms started to support and integrate consumers' efforts into their product lines (Hienerth et al., 2014a). Some examples of such symbioses are IKEA hacks, LEGO ideas or the Elder Scrolls Nexus community.

Even if consumers were able to ramp up the production on their own, which is for example easy with virtual products, for a long time it was hard to reach a considerable number of customers. Without access to a larger customer base, their activities largely remained of little relevance. The emergence of the internet marked a watershed in this situation. Virtual marketplaces and sharing platforms bundled consumer innovation activities and made them accessible to the common public (Füller et al., 2007; Autio et al., 2013; Wolf and McQuitty, 2013; Church and Oakley, 2018). They connected a worldwide customer base with consumer innovators from around the globe (Alba et al.,

1997; Bakos, 1997; Nieborg and Poell, 2018). The opportunity costs of distributing own innovations were reduced to negligible levels. Today, consumer innovators can address a global audience within a couple of clicks. Everyone can benefit from the passion work of hobbyists, regardless of the vicinity to them.

The phenomenon gained even more importance when these platforms enabled consumer innovators to charge prices for their work. Consumer innovators now compete for firms' major interest: customers' money. They turned from being complementors and sidekicks of firms into actual competitors (Sen, 2007; Gambardella et al., 2017). Despite the massive popularization of online marketplaces with consumer innovation, there exists little knowledge on how this influx of innovators will affect market dynamics (Boudreau and Jeppesen, 2015; Boudreau, 2018; Srinivasan and Venkatraman, 2018).

There is reason to believe that the market entry of consumer innovators has different effects than the market entry of firms. As introduced in Chapter 3, consumer innovators possess a variety of characteristic features that separate them from firms and may affect how they influence markets (Fauchart and Gruber, 2011). For example, the inferior profit interest provides consumer innovators with considerable managerial freedoms, which firms lack in their pursue of profit maximization (Nagle et al., 2014). Consumer innovators can set prices freely, with little apprehension of running out of funds to conduct their activities (von Hippel, 2017). This means that for them, no rigid price floors exist. Consumer innovators can also alter their products to their personal liking, without concerns about market shares, a firm image or customer segmentation (von Hippel, 2005). The hybrid status of being innovator and consumer in one may bestow consumer innovators with further benefits. It radiates that they have customer interests in mind, that they possess superior knowledge about customer needs and are well integrated in customer communities (Hienerth et al., 2014b).

Furthermore, easy access to monetary reimbursement grants consumer innovators new possibilities to unfold their potential. By forwarding some expenses to customers, their financial burden is reduced. Conversely, the intrinsically compensated innovation process likely still does not need to be compensated by monetary rewards (Raasch and von Hippel, 2013a). This can lead to lower prices. The generated revenues can also be used to scale up consumer innovators' production. The hobbyist workshop can turn into a more professional workshop, able to serve more than just a handful of customers. A new computer may allow quicker rendering and more powerful 3D-printers more sophisticated designs. Such upgrades and efficiency gains can further facilitate process rewards (Csikszentmihalyi, 1975). These assets also have the potential to increase an innovations' quality, speed up the innovation work and allows extra features. Also marketing expenditures are beneficial in order to reach more customers and promote consumers' innovations.

Consumer innovators can initiate these benefits simply by setting a price. Since they are not primarily motivated by commercial rewards, they may set this price differently than regular firm market entrants. However, when assessing the promises that commercialization holds for consumer innovation critically, a resemblance with commercially motivated nascent entrepreneurs is visible. Accumulated capital can be used to pay material bills, increase production capacities and qualities and in order to conduct marketing. Thus, it may be presumptuous to assume that the different innovation origin has a profound effect on consumer innovators' commercial market behavior.

Consumer innovators' decisions to commercialize their innovations may imply that they ultimately opted to follow profit-oriented paths, equal to those of profit-oriented entrepreneurs and firms (Delmar and Davidsson, 2000; Carter et al., 2003). Regardless of their origin, consumer innovators that ask for a price may then behave like conventional firms in their decision-making. Their unique characteristics could have vanished and been replaced with commercial interests as soon as potential profits have come into play. The effects of commercialized consumer innovation on markets would then be equivalent to those caused by regular firm market entrants. In this case, firms can rely on extant strategies to cope with their market entry and research can apply existing theory on firms to explain and model commercial consumer innovator behavior. A special treatment of consumer innovators that decided to charge a price is then unnecessary. But if it was not, applying what is known about firms onto commercializing consumer innovators would be fallacious.

To understand whether commercializing consumer innovations behave like firms in their managerial decision-making processes motivates the first part of this research. One important area of managerial decision-making is pricing. As outlined in Chapter 2, pricing is a fundamental decision that must be made by every commercializing economic entity. Consumer innovators and firms alike must decide on a price. This makes pricing a decision that is well contrastable between both innovator groups.

Pricing is not only particularly interesting to investigate as an exemplary managerial decision process, but also an expedient research object. The outcome of pricing decision are prices. Business-to-consumer prices are often displayed publicly, which makes them easy to observe. Furthermore, substantial knowledge on firms' pricing decisions and predominant pricing strategies exists. Relying on this knowledge allows to identify possible deviations of consumer innovators' pricing decisions from those of firms. An empirical work that examines such deviations needs to assess how consumer innovators set prices and compare this behavior to present knowledge about firm pricing. How consumer innovators set prices has not been researched so far though.

This dissertation's first research question thus asks:

RQ1: How do consumer innovators set prices – and does their price decision-making deviate from that of firms?

4.2 Second research question

While the first research question aims to understand how consumer innovators behave in commercialization decisions, the market impact of these decisions essentially depends on how customers process and react to their decisions (Monroe, 1973; Monroe and Chapman, 1987; Henrich et al., 2001). According to the behavioral heuristics and biases presented earlier, customers expect a certain behavior from suppliers and positively react to behavior that meets their expectation, e.g., with purchases. The first research question will surface a deviation of consumer innovators pricing decisions from customers' expectations towards firm supply, which may have adverse effects on their purchase decisions (Kahneman and Miller, 1986). Consequently, the second research question investigates whether an altering behavior of consumer innovators induces such inadvertent effects. Answering this question should allow a judgement on the impact of consumer innovators' alternating decisions on the adoption of consumer innovation.

The price is again chosen as an exemplary attribute for customer judgements of consumer innovation. Prices have an unquestionable importance in customers' evaluation of innovations and strongly determine the extent of new product adoption (Ingenbleek et al., 2010; Hinterhuber, 2015). Applying the same expectations that customers hold towards firms' products when judging consumer innovation should frequently cause discrepancies between expectation and reality. This may lead to inadvertent effects, such as an inhibited adoption rate.

Chapter 2.3.3 introduced reference price ranges as normality expectation in price perceptions. Considering that consumer innovators experience process rewards, asking for comparatively low or even free prices is reasonable for them (von Hippel, 2017). When customers judge such low prices against a firm reference price, that is expected to be higher, the discrepancy can cause negative purchasing decisions for various reasons, such as quality doubts or perceived unfairness. Consequently, not judging consumer innovation prices within their own reference frame will almost necessarily lead to wrong conclusions about a consumer innovation. This has the potential to severely inhibit the adoption of priced consumer innovation. Thereby, many customers would deprive themselves of the welfare benefits that are obtainable from purchasing consumer innovations (Gambardella et al., 2017; de Jong et al., 2018).

In order to maintain a different set of expectations towards consumer innovations, these products must be identifiable for customers. In some industry sectors, such as movies, games or craftwork, many consumer innovators clearly label their products as consumer made (Shultz, 2015; Whitson et al., 2018). Just as other labels or cues that come with an offer, also a consumer innovation label should influence customers' product perception (Teas and Agarwal, 2000; Grewal and Compeau, 2007). Given sufficient exposure and adaptation to these labels, customers may have established appropriate expectations towards such products (Helson, 1964; Baucells and Hwang, 2017). Likely associations with such labels that align with consumer innovation theory are the consumer innovators' superior closeness to customers and their inferior profit interest (Schreier et al., 2012; Fuchs et al., 2013). Customers may recall that solving problems and diffusing innovation is not a mean to the end of generating profits for consumer innovators, but rather the result of self-help and a high-minded aspiration to let others benefit from the own creativity (von Hippel, 2017). This might be beneficial for the perception of consumer innovation, including its prices, and thereby for its adoption.

In freely diffused consumer innovation, such characteristics are easy to recognize and immaculate in their manifestation. A useful product that lacks a price is a violation of normality. The consumer innovation label provides an appropriate explanation for why this unusual behavior occurs. A consumer innovation that is shared without asking for money is almost necessarily the result of a non-commercial background (Hars and Ou, 2002; Gault and von Hippel, 2009; von Hippel, 2017). Consumer innovators that charge a price temper with the clarity of the signal that free innovation sends. The price is a contradicting signal that certainly gives reason to doubt whether commercial interests overcast potential consumer innovators' high-minded aspirations (Miyazaki et al., 2005). Charging a price might thus obliterate any favorable indications that customers have of consumer innovation. A label might not be convincing enough to suggest that a consumer innovation is any different from a firms' offer. After all, there are many firms that claim, for example, to be particularly concerned about customer interests while having commercial interests on their agenda.

To make adoption maximizing marketing decisions as a consumer innovator, it is of critical importance to understand whether customers assess the own commercialized innovation like that of a firm or that of a consumer innovator. The second research question thus sets out to understand whether consumer innovators can rely on a dedicated customer image in their marketing decisions. Furthermore, it investigates what customers associate with a consumer innovation label that is set alongside a price and whether these associations interact with price perceptions and purchase reactions.

Such information on how customers perceive commercialized consumer innovation is also of high relevance for firm incumbents. By now, consumer innovation overstocks various markets, such as the computer game industry, mobile phone applications and

3D designs (Boudreau, 2018; Srinivasan and Venkatraman, 2018; Hukal et al., 2020; Lee et al., 2020). In order to elaborate a strategic response, firm incumbents need to ascertain whether and which consumer innovations are considered by customers as valuable and direct alternatives to their products (Fisher et al., 2017).

The qualification of a product as competition depends on whether customers perceive it as a viable alternative. A competition assessment must thus consider potential differences in customer perception between consumer and firm innovation and then adjust the selection criteria for what counts as competition accordingly (Weitz, 1985). For example, a product that is significantly lower-priced than the own might conventionally not be judged as competition by firms. From a managerial point of view, the other product appears to target a different customer base. When this product is of consumer origin however, this might be fallacious. Customers that otherwise shop higher priced products might consider the lower priced consumer innovation as well, because they apply a different reference price range for consumer innovated products.

In order to understand customers' associations with commercialized consumer innovation, to enable better pricing decisions of consumer innovators, and give advice to incumbents on how to treat the novel consumer competitors, this dissertation's second research question asks:

RQ2: Are customers aware of consumer innovation characteristics – and how does that influence customers' perception of their prices and innovation adoption?

4.3 Empirical field

The formulated research questions pose specific demands to an empirical field of research. Concerning the investigation of consumer innovation, the field needs to show a high share of innovating consumers. Not all industry sectors are equally prone to consumer innovation. Consumer innovation activity is common in industries that are characterized by a high customer product involvement, very specific customer demands, and easy access to means of modifying existing or developing new products. These requirements are fulfilled in fields such as extreme sporting equipment (32.1% of the consumers innovate, Franke and Shah, 2003), kite surfing (31.7%, Franke et al., 2006), mountain biking (19.2%, Lüthje, 2002), medical equipment (76%, Shaw, 1985), scientific instruments (44%, Riggs and von Hippel, 1994) or software (23%, Urban and von Hippel, 1988; 26%, Morrison et al., 2000; 19.1%, Franke and von Hippel, 2003).

However, high chances to encounter consumer innovation alone are insufficient to investigate the proposed research questions. To investigate the pricing aspect, the consumer innovations also need to be commercialized frequently. Furthermore, to estimate differences between consumer innovation and regular firm innovation, firms

and consumer innovators need to be active suppliers in the same field. The products they offer need to be comparable and sold side by side at equal conditions. At last, concerning the second research question, customers should at best be aware of the functional role of consumer innovators or at least be familiar with industry specific consumer innovation labels.

The computer game industry was identified as an empirical field that fulfills all these stated requirements. Computer game players are heavily involved in their games (Kirriemuir and McFarlane, 2004; Boyle et al., 2016). So much so, the addiction to playing video games was defined as a clinical condition (Billieux et al., 2019). Particularly involved and successful players also have emerged as international celebrities in eSports (Taylor, 2018). What was once a belittled part time activity has grown to a billion-dollar industry with many customers (Dreunen, 2020). Computer game players have very particular demands towards their games. These needs are hard to assess and satisfy for firms, because requirements such as "fun", "identification with the protagonist" and "absorbing" are hard to codify (Mascitelli, 2000; Callele et al., 2005; Polanyi and Sen, 2009). As a response, firms in the video game industry allowed individualization of their games very early (Lee et al., 2020). In many video games the player can choose between various main characters or customize an own one. Private music can be added to the gameplay as soundtrack and choice-dependent storylines develop around individual player decisions as the game progresses. The result is a unique experience for all players that is based on their personal preferences (Teng, 2010; Turkay and Adinolf, 2010).

The pinnacle of allowing customers to fulfill their individualization demands towards computer games themselves was the option to freely modify firm developed games (Sotamaa, 2010; Scacchi, 2011; Unger, 2012). So called "Mod Kits" provide consumers with the possibility to change and add content to existing games or create an entirely new game experience based on current game mechanics (Postigo, 2007; Lee et al., 2020). Particularly successful customer modifications emerged as own games. Popular examples are "Counter Strike" and "Portal", which are based on "Half Life" or "Defense of the Ancients", which is a modification of "Warcraft III".

Consumer innovation in computer games is not limited to modification of existing games. The creation of computer games from scratch has become attainable for everyone in the last years (Bertolini, 2018; Hamilton, 2020). The frameworks required to create professional computer games are feasible for everyone. For example, "Unity3D" and the "Unreal Engine" are computer game development tools that many professional firms use. Some billion-dollar games that were created with these frameworks are "Pokémon Go", the "Tom Clancy" series or "Tekken". These frameworks are freely available to use for the public (Trenholme and Smith, 2008; Toftedahl and Engström, 2019). Fees are only charged once the games created with them

generate substantial revenues. For example, Unity3D is free to use for development until the game generates at least US$100,000 of revenue. Also, tutorials on game development with these tools are widely available on the internet and distributed free of charge (Unity Technologies, n.d.). Today, anyone with a computer has the option to create a game for it.

Given the high customer involvement, very specific customer needs and the wide availability of tools for innovation, consumer innovation activity is particularly high in the computer game industry (Abrate and Menozzi, 2020; Lee et al., 2020). Many consumer innovators also decide to sell the games they created, fulfilling another requirement for a fitting empirical field (Burger-Helmchen, 2008; Del Bosco et al., 2020). Computer game sales have largely moved to the internet. Games can be bought on online marketplaces such as "Steam", "GOG" or "itch.io" and downloaded immediately. 83% - 92% of the computer game purchases are made this way (Chalk, 2014; Entertainment Software Association, 2019). The total computer game sales volume averaged on about US$35 billion per year between 2018 and 2020 (Entertainment Software Association, 2019; Newzoo, 2021). Market analysts estimate that about three quarters of these sales take place on the market leading video game marketplace Steam (Edwards, 2013). These marketplaces pool most of the customers. Selling a computer game means selling it there.

Favorably for consumer innovation diffusion, the game marketplaces have very low entry barriers. Most of them allow anyone who has developed a game to upload and sell it. Steam, the largest and most renown computer game marketplace, for example opened game submissions to third-party developers in 2005. At first, employees manually evaluated and selected submissions for publication. Later, they changed the admission process to a community-based evaluation and from 2017 on, they published all games without any further evaluation.

Computer game marketplaces also have low to non-existent listing fees. They earn money by charging commissions from sales revenues. Steam, for example, asks for a submission fee of US$100 per game and further charges 30% on all generated revenue. Once a game has generated more than a thousand US-dollars in revenue, they reimburse the US$100 submission fee. When the game is diffused for free, some platforms, like itch.io, waive the fees completely. As a result, professional innovation is distributed side by side with consumer innovations, fulfilling another requirement to be a suitable empirical field.

The last condition to satisfy the requirements as an empirical field for the presented research questions is customer awareness of the consumer innovation phenomenon. External views on the computer game industry commonly focus on the so called "triple A" or "AAA" developers (Keogh, 2015; Whitson et al., 2018; Dreunen, 2020). These

firms generate a large share of computer game revenues and have a high visibility, also to those outside the industry. Examples of triple A games are "World of Warcraft" from Blizzard, "FIFA" from EA Sports or "Tomb Raider" from Ubisoft and Square Enix. These firms and their popular games also received the most research coverage in the past (Cohendet and Simon, 2007; Tschang, 2007; Huntemann and Aslinger, 2016; Bernevega and Gekker, 2021).

Consumer innovators in the computer game industry are known as "indie developers". Research interest in their work has increased only recently (Diver, 2016; Garda and Grabarczyk, 2016; Crogan, 2018; Pereira and Bernardes, 2018; Freeman et al., 2020; Ruffino, 2021). Similar to other "indie" producer groups, e.g., indie film or music making, also indie game development lacks a clear definition (Garda and Grabarczyk, 2016; Mathews and Wearn, 2016). The New York Times outlined indie computer games as: "a do-it-yourself culture and a rebellious spirit — something like a 'zine movement for video games. New and cheap technologies have enabled the movement's rise. New tools for production and distribution […] now make it possible for individuals to conceive, develop and publish their own games" (Bearman, 2009). The platform itch.io, which specializes on indie computer games, wants to attract "independent digital creators [… and] enables anyone to sell the content they've created.". Wilson (2005) provides a slightly more theoretical definition. From his perspective, "indie practitioners are variously start-up entrepreneurs, producers of politically engaged inflections of current game genres, hackers and modifiers of existing game software and hardware, vintage gameplay revivalists and explorers of the possibilities [… ,] a crucial driver of innovation in game design, a parallel sphere of artisanal digital craft" (Wilson, 2005).

Amongst computer game players, indie games are a well-known phenomenon. Many game marketplaces give developers the option to tag their games as "indie". Personality cults have evolved around particularly successful indie game developers such as IceFrog, the creator of the critically acclaimed "Defense of the Ancients" series, short DotA (Dean, 2014; Orland, 2017). There are contests that curate indie games and their developers with considerable prizes (Summerley, 2020; Urbaniak et al., 2020). The interest in indie games can be seen in the infrastructure that evolved around them as well. For example, e-sport competitions for DotA are held worldwide. In 2020 the participants could win more than US$40 million in prizes for winning such tournaments (Ocal, 2020). Various media outlets have specialized in indie game testing and recommendation, giving consumer innovators in computer games a popular stage (Rose, 2011). In 2012, a well-acclaimed movie also informed the non-gaming public about indie game developers' backgrounds (Böhm, 2012; Ravid et al., 2012). This satisfies the last condition to qualify as an empirical field in exploring this works' research questions. Customers of indie games can be expected to be aware of the specific backgrounds of consumer innovation in computer games, coined as indie games.

There are common limitations associated with concentrating on one empirical field. Mainly, the conditions in which observations are made are very specific and results may thus not transfer well to other fields. Concerning the computer game industry, it is certainly not only the encouragement of producers to modify games that made computer game players prone to innovate. Computer games are entirely digital and there are almost no expenditures necessary to become a computer game developer. Game development costs are mostly personnel costs. For consumer innovators, personnel costs are mainly opportunity costs, because they innovate on their own and out of passion in their own discretionary time. Diffusion costs are low when compared to physical products, which need shipping and handling. Overall, in the computer game industry consumer innovators can thrive in a very nurturing environment. This makes it a suitable area to observe their activities, but also makes it necessary to keep in mind that consumer innovators might not flourish similarly well in other industries.

Even more than being a nurturing place to create consumer innovation, the computer game industry also encourages consumer innovation diffusion. Consumer computer game developers are embedded in an ecosystem that strongly supports the dissemination of their works. Customers are aware of their efforts and various institutions aid consumer innovators in creating new products that diffuse well. The presence of well-known, central and easily accessible marketplaces makes it easy to reach customers and charge a price. Overall, consumer innovators can unfold their potentials to a particularly high degree in the computer game industry and translate them into commercial products with little effort.

While the conditions that the computer game industry provides are very specific, the consumer innovators in this industry are not. Indie computer game developers stand exemplary for consumer innovators across all industries. Their work and their products come along with all characteristic traits of consumer innovation, which is why this empirical field has enjoyed great popularity in consumer innovation research (Jeppesen and Molin, 2003; Prügl and Schreier, 2006; Readman and Grantham, 2006; Burger-Helmchen, 2008; Haefliger et al., 2010; Burger-Helmchen and Cohendet, 2011; Parmentier and Gandia, 2013; Parmentier and Mangematin, 2014; Koch and Bierbamer, 2016; Abrate and Menozzi, 2020; Lee et al., 2020).

Still, it needs to be noted that the following conducted empirical works contain observations of consumer innovation in an almost ideal environment and should be interpreted as such. It is likely that motivated consumer innovators in, e.g., the automotive industry will not face the same conditions and therefore cannot act out their innovative passion similarly well. Altering conditions likely require consumer innovators to adapt their behavior. This harms the degree to which the upcoming results are transferable.

The lingering question is then whether conditions that foster consumer innovation creation and commercialization are desirable. In economic terms, whether they are positive for markets and welfare. This would provide an argument to support the creation of similarly supportive environments elsewhere. Should this be realized, the number of fields into which this works' results can be ported should increase. The empirical research presented in this dissertation provides additional evidence to continue a substantiated discussion on this matter.

5 Study I: Pricing Decisions of Consumer Innovators[1]

Research has documented high levels of innovation activities performed by non-firms, i.e., innovators who are not directly paid for their engagement and who are not innovating in and for a legal entity (Bogers et al., 2010; de Jong, 2016b). Here they are referred to as consumer innovators, encompassing all innovating members of the economic household sector (ESA, 2010; Gault, 2018; OECD, 2018). This dissertations' first empirical study investigates the price decision process of consumer innovators who seek to capture economic value of their innovations by offering them for sale. This group can be seen as an intermediate or hybrid innovator type, positioned between free innovation, with its purely self-rewarding nature, and traditional firm innovation, which has the core objective of generating profits by selling innovations to others (von Hippel and von Krogh, 2006; von Hippel, 2017). Only a small research stream investigated how consumer innovators behave in the pursuit of commercialization.

Extant research, partially introduced in the previous chapters, primarily contributed knowledge to three areas: First, the early studies highlighted the emerging nature of users' entrepreneurial processes. It was found that user innovators usually engage in innovation to meet personal needs and only opt for commercialization after receiving signals that their inventions are also valued by others (Shah and Tripsas, 2007). Second, research has explored the knowledge type and the nature of intangible assets that support consumers in their innovation and commercial exploitation processes. These studies document the importance of communities as a complementary asset for industry entry and commercialization (Haefliger et al., 2010; Fauchart and Gruber, 2011; Shah and Tripsas, 2012; Agarwal and Shah, 2014; Oo et al., 2018). Third, literature proposes that the knowledge context and the nature of available assets influence how consumer innovations are commercialized. Consumer innovators have been shown to often avoid direct competition with incumbents by pioneering in emerging fields or by positioning themselves in unserved complementary niches of existing markets (Baldwin et al., 2006; Agarwal and Shah, 2014).

Research into consumer innovators' paths to commercialization is sparse to the present day. There is little knowledge about the marketing- and sales-related decisions that these innovators take after deciding to sell their innovations. This is particularly true for pricing, which is a key managerial decision in the commercialization of new products and services. There does not yet appear to be an empirical study of how consumer innovators set prices and whether their prices differ systematically from those set by firms.

---

[1] Large parts of this chapter were previously published in:
Ebbing, Lüthje (2021): Pricing decisions of consumer innovators, Research Policy, Volume 50, Issue 8, 104169.

In order to answer the first research question of this dissertation, the pricing practices of consumer innovators are investigated in relation to those of firms. Making progress to understand the pricing behavior of consumer innovators seems promising considering the existence of numerous online (maker) marketplaces for digital and physical goods (Kuznetsov and Paulos, 2010; Crogan, 2018; Whitson et al., 2018). These markets have boosted and will boost the number of commercially active consumers, which in turn makes consumer innovators' pricing decisions a relevant research topic. These online platforms open an easily accessible and low-cost path to markets, alleviating the burden for consumers to invest in diffusion (Baldwin and von Hippel, 2011; Halbinger, 2018; Claussen and Halbinger, 2020). Further, the expectation of monetary returns creates incentives for consumers to actively disseminate their innovations (de Jong et al., 2015; von Hippel, 2017). Under these favorable cost-return conditions, even consumer innovators who primarily innovated for self-rewards (e.g., fun, learning, usage benefits) eventually decide to sell their products.

Platform-based markets also facilitate opportunity recognition and exploitation for consumer innovators. Online marketplaces make the commercialization of consumer innovations widely visible. By being exposed to commercialized consumer innovations, other consumers may observe the growing social acceptance of consumer entrepreneurship. Online marketplaces provide an ideal ground to encounter such examples of commercially active and successful consumers. The recognition of third-person opportunities can trigger consumers to develop own opportunity beliefs and ultimately engage in entrepreneurial actions (Autio et al., 2013, 2014).

Consumers' pricing further has the potential to significantly change the dynamics in markets that are characterized by a mix of amateur consumers and professional firms (Markman and Waldron, 2013). Pricing is comparatively flexible in use and, in most markets, pricing effects manifest strongly and swiftly in new product success (Ingenbleek et al., 2010). Most notably, if innovating consumers significantly undercut the prices that professional firms charge for products of similar types and quality, this would have clear implications for welfare and price dynamics. An increasing number and variety of available alternatives, in conjunction with lower prices, enable customers to better satisfy their needs at a higher customer surplus (Jeppesen and Frederiksen, 2006; Boudreau and Jeppesen, 2015; Halbinger, 2018). At the same time, deviating pricing decisions of consumer innovators put pressure on the prices of incumbent firms that offer their innovations in the same markets (Busso and Galiani, 2014).

However, these welfare effects and price dynamics only exist if consumer innovators in fact significantly and systematically deviate from firm innovators' pricing practices. Exploring such potential differences between consumers and firms is taking a first step towards a better understanding of changes that the market entry of crowds of consumer innovators may induce.

The study framework builds on user innovation research showing that consumers' innovation activities tend to be initially stipulated by a mixed set of expected self-rewards (e.g., enjoyment and learning, solving own problems) that precede or complement interest of monetary returns (Hertel et al., 2003; Shah and Tripsas, 2007; Stahlbrost and Kareborn, 2011). This study posits that, rather than being obliterated by commercial interest, these self-rewards remain salient and impact consumers' pricing decisions and commercialization activities down the road. This compact theoretical logic allows to develop basic hypotheses regarding differences in price levels that consumers and firms charge for innovations.

The first hypothesis proposes differences of the overall price level for similar innovations between firms and consumer innovators. This proposition is complemented by expectations regarding the role of price determinants that may influence pricing decisions of firms and consumer innovators to different extents. Three hypotheses are developed regarding the relative impacts of costs, perceived quality, and product competition on both innovator groups' pricing. The hypotheses are tested in an explanatory sequential mixed methods study (Johnson et al., 2007). The research sequence begins with analyses of quantitative data, followed by a qualitative phase helping to validate the explanations that underpin the quantitative research model (Creswell and Plano Clark, 2018).

The quantitative main study draws on rich data from the computer games marketplace *Steam*. 2,121 matched pairs of novel firm-developed and consumer-generated computer games published on the platform were compared. The analysis confirmed that consumer innovators charge lower prices than their firm counterparts for computer games of similar size and quality. The findings also showed that innovating consumers account for key price determinants differently than firms. Development costs are less important for consumers than for firms, while perceived quality plays a significantly stronger role in consumers' pricing decisions than in those of firms. Contrary to the last expectation, competitive intensity did not show a stronger effect in consumers' price setting than in firms' pricing.

The qualitative follow-up study analyzes data collected in interviews with 29 consumer innovators, adding in-depth explanatory insights to the research model. The analysis of interview responses provided clear support for the proposed motivational explanation. Most respondents' innovation efforts were in fact not dominated by monetary expectations but driven by the mix of self-rewards that were found to stimulate most user- and community-based innovations. The results also support the validity of the motivational explanations regarding the weaker importance of costs and the stronger role of perceived quality as determinants of consumers' pricing decisions. The qualitative data also shed light on the nonsignificant result regarding the impact of competitive intensity on the pricing of consumers and firms.

This is one of the few studies on innovating consumers' exploitation of business opportunities. Thus, a contribution to research on the motivational basis of consumer innovation is made. The results also add to the consumer entrepreneurship research by highlighting the role of non-monetary expectations to explain decisions in value capturing. The findings on different pricing practices of consumers vs. firms also provide a starting point for a better understanding of innovating consumers' effects on the dynamics of marketplaces and welfare creation. Finally, the study results have practical implications for firms that compete with an increasing number of innovating consumers.

5.1 Theoretical background and hypotheses

5.1.1 Linking innovation-related motives and pricing decisions

Price setting research is frequently based on normative frameworks that assume rational decision-making (Tellis, 1986; Diamantopoulos, 1995; for an overview see Kienzler and Kowalkowski, 2017). Stimulated by research on customers' behavioral decision-making, a much smaller research stream found that also price setting decisions often deviate from assumptions of perfect rationality (Liozu and Hinterhuber, 2013; Kienzler, 2018). One broad theme is that deciders in pricing may not conform to a standard utility framework that solely includes the maximization of monetary payoff. For instance, several types of social preferences such as fairness orientations or generosity and interpersonal relationships were shown to influence how price decisions are made (Kahneman et al., 1986a; Uzzi, 1997; Mandel, 2006).

To extend this scant research work, a behavioral lens was adopted to propose differences in the managerial decision-making between consumer innovators and firms. The theoretical framework of this study builds on the key assumption that consumer innovators' pricing is influenced by the same motivations that stimulate them to innovate in the first place (Stahlbrost and Kareborn, 2011; Hienerth et al., 2014b; Stock et al., 2015). Such personal dispositions can be expected to influence consumer innovators' pricing more strongly than firms' pricing. After all, consumers do not need to align their decisions to company strategies and organizational structures (Homburg et al., 2012; Liozu et al., 2014). Two basic considerations underpin this central assumption.

First, it is questioned that commercializing consumer innovators are initially motivated by expectations of financial return. As laid out in previous chapters, this contrasts classical entrepreneurship research, where purposive entrepreneurial action always starts with the aspiration, discovery and evaluation of business opportunities (Shane and

Venkataraman, 2000; Autio et al., 2013). This implies that strong commercial objectives need to be present to trigger innovation work (Carter et al., 2003).

However, Shah and Tripsas' (2007) results on consumer entrepreneurship paint a completely different picture, suggesting that most consumer entrepreneurship activities can be termed accidental. Consumers often first discover non-commercial opportunities that do not require compensated transactions on markets; most start to innovate for self-rewards such as own use or enjoyment, as was presented in Chapter 3.2 (von Hippel and von Krogh, 2006; Stahlbrost and Kareborn, 2011). It is only after receiving positive feedback to their innovations that innovating consumers may decide to exploit their innovations' commercialization potential (Haefliger et al., 2010). A similar pattern was documented among participants in makerspaces (Halbinger, 2018; Claussen and Halbinger, 2020). Empirical evidence also strongly suggests that consumer innovators who eventually decide for commercialization are not primarily or not at all driven by the expectation of monetary profits when they initiate their innovation activities (Shah and Tripsas, 2007; Haefliger et al., 2010; Oo et al., 2018).

Second, it is suggested that when consumer innovators commercialize their work, the initial innovation-related personal and social goals do not fade away. Psychological research found that motives can change when individuals are exposed to new contexts and social environments for long periods (Good, 2007). However, particularly values and preferences, which form the basis for key personal goals or a person's social identity, rarely change fundamentally; if they do, such changes take long (Kasser et al., 1995; Burroughs and Rindfleisch, 2002). Motivations that have been proven to drive users and community problem-solvers to innovate can in fact be interpreted as direct expressions of central values and internalized norms (Hitlin and Piliavin, 2004). Against this background, this study's expectation is that the original innovation motives cast a long shadow on the commercialization decisions of aspiring consumer entrepreneurs.

This study investigates, exemplary for these commercialization decisions, how consumer innovators' pricing decisions differ from those of commercial firms. Besides the general price level differences (H1), expectations of how strongly development costs (H2), perceived quality (H3), and competitive intensity (H4) affect the pricing decisions of consumers compared to firms are developed. Figure 5 depicts the resulting research model.
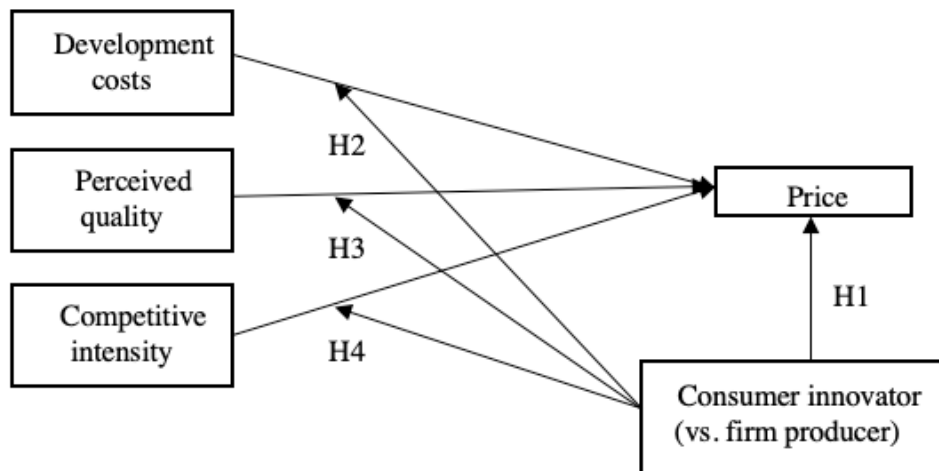
Figure 5: *Research model of Study I (Source: Own depiction)*

5.1.2 Price differences between comparable consumer- and firm-innovations

The innovation activities of firms and consumers have different rationales. Innovating firms are solely rewarded by appropriating economic benefits. Even if employees in firms may derive other rewards from innovation-related work, the firm as a whole benefits by generating sales and profits (von Hippel, 2017). Realizing profit-maximizing prices is a key objective for firms (Tellis, 1986; Diamantopoulos, 1995; El-Ansary, 2006). This implies that if companies identify room to increase their profit by setting higher prices, they will likely exploit this opportunity.

The presented theoretical background gives reason to believe that consumer innovators deviate from this practice. While consumer innovators' decision to commercialize can be interpreted as a manifestation of self-interested behavior, innovating consumers are not solely or primarily driven by the goal to maximize profits. Innovating consumers have been found to be motivated by a mixture of different benefit expectations (Raasch and von Hippel, 2013a; Hienerth et al., 2014b; Stock et al., 2015). Some self-rewards are directly tied to the innovation work and eventuate independently from markets. Most notably, many consumer innovators report having started to innovate because they hoped to develop a solution for their own use (von Hippel, 2005; Hienerth et al., 2014b). They often also indicate seeing their engagement as fulfilling, generating personal enjoyment and offering multiple learning opportunities (Lakhani and Wolf, 2003;

Raasch and von Hippel, 2013a). Other self-rewards that drive individuals to innovate are linked to the social context insofar that they require interactions with others to be realized. These motivations may include the desire to contribute to a community or to solve others' problems (Hars and Ou, 2002; Lakhani and Wolf, 2003). They are often activated by socially endorsed norms (e.g., altruism or reciprocity) in which appropriate behaviors are instrumental to achieving social rewards such as appreciation and allegiance amongst peers or communities (Benkler, 2006). Such innovation behaviors may even become part of the consumers' social identity and may reinforce these motivational aspects (Kathan et al., 2015).

In alignment with motivational theories, innovation-related rewards are proposed to stand in a synergistic, compensatory relationship to one another: a higher reward of one type compensates for a lower level of another reward, and vice versa. In other words, all rewards constitute elements of an additive or multiplicative utility function (Vallerand, 1997; Cialdini et al., 1998). This implies that different types of rewards combine to the total benefits that consumers may appropriate along their innovation work. The need to set prices to maximize pecuniary profit is alleviated, because innovating consumers already benefit in various other ways from the development process (Shah and Tripsas, 2007; Gambardella et al., 2017).

In addition, setting low prices, with its effect of increasing adoption, is also directly instrumental to satisfying socially activated motivations, since harvesting these self-rewards is enhanced by diffusion (Harhoff et al., 2003; Hau and Kim, 2011). For instance, increasing one's status within a community of peers is not possible without positive feedback from others. Similarly, satisfying altruistic motives needs a minimum level of adopters to benefit from an innovation. Innovating consumers should be inclined to charge lower prices to increase the number of sales, even at the costs of pecuniary profits. Thus, H1 proposes:

H1: Consumer innovators charge lower prices than firm innovators for similar products.

5.1.3 Relationship between development costs and prices

As presented in Chapter 2.2.1, cost-informed pricing starts from the variable and fixed costs for the development, production, and marketing of a product, and adds a profit margin to arrive at the sales price (Ingenbleek et al., 2003; Nagle and Müller, 2018). Amongst firms, this approach enjoys constant popularity despite its frequently discussed theoretical inferiority (Hall et al., 1997; Larson, 2019). Thus, a strong correlation between the innovation-related costs and the prices that firms charge for their innovations is likely.

While consumer innovators also incur costs of development, production, and diffusion, they have been found to operate in low-cost corridors in the design and development stage of their innovation projects (von Hippel, 2005; Hienerth et al., 2014b; Lüthje and Stockstrom, 2016). For innovators whose primary purpose is not return on investment, it does not seem appropriate to invest heavily in the acquisition of new and dedicated resources (Riggs and von Hippel, 1994). Making considerable investments may even be detrimental for achieving high self-rewards. For instance, designing solutions that can only be developed at high risk and high expenditures may decrease the prospects of successful completion and thus the likelihood to benefit from the innovation process and outcomes (Csikszentmihalyi, 1990).

Consumer innovators' tendency to rely primarily on available or easily accessible resources implies that the largest share of innovation-related costs should be associated with the time consumers spend on development activities (Hienerth et al., 2014b). This is particularly so for digital products that are typically associated with low or no production and distribution costs and that primarily incur development costs in the form of human effort (Huang and Sundararajan, 2010; Jones and Mendelson, 2011).

The time consumers invest in the creation of innovations constitutes costs, but it primarily has the character of opportunity costs rather than de facto payouts. Other than firms with employees, developing consumers do not need to compensate their innovation efforts by cash inflows in order to avoid monetary losses and to ensure financial solvency (Baldwin and von Hippel, 2011). Thus, compared to commercial firms, consumer innovators should have lower pressure to (over-) compensate invested means of production by revenues from product sales (Bowman and Ambrosini, 2000).

Innovating consumers can be assumed to not even consider the opportunity costs of time when thinking about appropriate prices. Most consumers innovate in areas of high personal involvement and interest (Bogers et al., 2010; Roszkowska-Menkes, 2017), such as sports and other leisure time activities (Lüthje et al., 2005; Hienerth, 2006). The high enjoyment and learning motivation should distort the perception of time spent on developing innovations and move opportunity costs out of the set of information that consumers use to inform their pricing decisions (Csikszentmihalyi, 1990; Shah and Tripsas, 2007; Raasch and von Hippel, 2013b). With many other rewards, costs may even be perceived as negative by consumer innovators (Harhoff et al., 2003).

In sum, consumer innovators incur negligible monetary expenses in the development process, alleviating the need to charge cost-covering prices. Further, consumers should rarely consider their working time as costs that must be compensated by revenues. Thus, H2 concludes:

H2: Consumer innovators relate prices less strongly to the development costs than firm innovators.

5.1.4 Relationship between perceived quality and prices

Value-informed pricing has gained high popularity among marketing researchers, as outlined in Chapter 2.2.2. This approach puts the benefits that are created for customers at the center of pricing decisions (Hinterhuber, 2008; Kienzler and Kowalkowski, 2017). In the consumer behavior literature, customers' perceptions of the gross benefits of a product or service are termed *perceived quality*, defined as the subjective evaluation of excellence of goods that excludes the disutility or cost to obtain them (Zeithaml, 1988; Priem, 2007). Notably, by excluding the price to pay for the benefit, the conceptualization used here and in other pricing research differs from the concept of *net value* or the colloquial notion of *value for money* (Bowman and Ambrosini, 2000; Li and Hitt, 2010; Liozu and Hinterhuber, 2013). Perceived quality reflects an overall assessment or second-order construct that results from a multi-attributive evaluation process, including the entire spectrum of criteria that are important for a consumer to accomplish favorable ends (Zeithaml, 1988; Woodruff, 1997; Stylidis et al., 2020).

Consistent with the presented baseline assumption, the tendency to focus on perceived quality in pricing is proposed to be particularly high among consumer innovators since this inclination is determined by innovation-related goals. Again, socially activated motivations, such as receiving approval and respect from the peer group, have been shown to be important for the activities of consumer innovators in empirical settings such as crowdsourcing, open-source software development, and user forums (Hars and Ou, 2002; Hertel et al., 2003; Lakhani and Wolf, 2003). Since most consumer entrepreneurs start their innovation activities as consuming users, they can be expected to consider how their commercialization decisions are interpreted by other consumers, particularly by the future buyers of their innovations.

One of the most salient interpretations of prices by customers in this regard is the perceived price fairness. Buyers subjectively assess whether a price is reasonable, acceptable, and justifiable (Bolton et al., 2003; Xia et al., 2004). Such distributive justice is perceived if the sum of perceived product benefits is at least proportional to the payment. Identifying with the social group of users, consumer innovators can be expected to set prices that are interpreted as a fair reflection of quality to maintain a positive self-image (Halpern, 1997; Mendes-Da-Silva et al., 2008). To further benefit from diffusion and maintain social rewards, consumer innovators should be interested in avoiding the negative backlash of setting prices perceived as unfair. Numerous ramifications, such as dissatisfaction, altruistic punishment, and negative word-of-mouth are not in consumer innovators' interest (Finkel, 2001; Cox, 2001).

In contrast, in classical economic business logic, implementing prices is mainly a competitive zero-sum game in which suppliers and customers fight to maximize their own surplus: "What is gained by the firm is lost by the customer and vice versa"

(Hinterhuber, 2004). A profit-oriented firm is less likely to strongly socially identify with prospective buyers. Thus, socially endorsed norms are unlikely to complement the orientation toward clear financial performance indicators of firms when firms set prices (Burkert et al., 2017). This does not presume that quality-informed pricing is irrelevant in firms' pricing decisions. But even firms that deploy quality-informed pricing often lack the intimacy with their customers to develop a valid understanding of the drivers of perceived quality (Liozu et al., 2012; Töytäri et al., 2015). Consumer innovators, with their hybrid role, are in a much better position to arrive at accurate benefit estimations

It is therefore proposed that consumer innovators charge prices for their innovations that mirror the perceived quality more accurately than prices set by commercial firms:

H3: Consumer innovators relate prices more strongly to the perceived quality of their product than firm innovators.

5.1.5 Relationship between competitive intensity and prices

Most theoretical models of imperfect competition predict that a higher number of substitutes correlates with lower price levels by putting more competitive pressure on suppliers in a market (Day and Montgomery, 1999). One explanation for this effect is that vendors are willing to accept lower margins to uphold their sales volume and market shares (Shipley and Jobber, 2001; Liu, 2010).

Yet, reacting to higher competition levels with lower prices can lead to price battles that are wise to avoid as outlined in Chapter 2.2.3. Thus, firms tend to consider other options before adjusting their prices to competition (Geylani et al., 2007; Cachon and Swinney, 2008). Firms can, for instance, take advantage of economies of scope in communication activities to increase their brands' reputations. They also use their marketing budgets to build a stronger awareness about the differentiation value of their products. By achieving a unique position on customers' perceptual maps, innovators can work on partly detaching from the number of available substitutes to avoid price reactions (Leuthesser and Kohli, 1993).

This suggests that firms will more often decide for these nonprice-related marketing measures, whereas consumer innovators have a higher inclination to adapt their prices to competitive intensity. De-commoditization of own products via marketing activities should not be a viable option for consumers who widely lack appropriate assets (e.g., sizeable financial resources and managerial execution excellence) to conduct such activities beyond their communities (Burger-Helmchen, 2008; Agarwal and Shah, 2014).

Even more importantly, consumers should not even have a high interest in eluding competition as a factor in their pricing decisions. Some of the most salient reward expectations can only be met if a consumer innovation reaches a minimum adoption level in the market. Direct competition only negatively impacts on the likelihood of widespread adoption when prices are higher than those of the substitutes. As H1 presumes, consumer innovators can set intriguingly low prices. Thus, consumer innovators may tend to purposefully react to competitive intensity by setting lower prices to boost the adoption of their innovations. Just as a competition-based pricing strategy suggests. To conclude, H4 expects:

H4: Consumer innovators relate prices more strongly to competitive intensity than firm innovators.

5.2 Method

This research is based on a sequential explanatory mixed methods design in which the main quantitative study is followed by a qualitative study (Creswell et al., 2003; Johnson et al., 2007). Combining them aims to incorporate the strengths of both methods (Creswell and Plano Clark, 2018). The first main study relies on quantitative data gathered in a large sample of new product releases to statistically compare the determinants and the outcomes of pricing decisions between consumer innovators and firms. The qualitative study follows, with the purpose of providing detailed explanations of the rationale behind the consumers' pricing decisions. Open-ended interviews with consumer innovators were conducted to fully reveal the motivations that triggered them to innovate and to illuminate the considerations that influenced their pricing in more depth. While the qualitative phase primarily serves as a check of the validity of the theoretical explanations that underpin the quantitative study, the interview results slightly expand the quantitative findings by highlighting some interesting differences among consumer innovators and by illustrating some outlier results (Morgan, 2017).

This chapter starts with an explanation of the empirical setting used in both studies. Next, the method that underpins the quantitative study (data collection, variables, analysis) is presented. It concludes with a brief explanation of the qualitative research method.

5.2.1 Empirical setting and quantitative dataset

As outlined in Chapter 4.3, the product area of computer games was chosen as empirical field. The computer games industry has seen a surge of platform-based marketplaces on which amateurs and hobbyists offer their games alongside professional computer game companies. The games market platform Steam, which is run by the Valve Corporation, is by far the most prominent among them. For the quantitative main study, a cross-

sectional dataset of 13,969 computer games available on the US Steam platform in April 2018 was compiled.

The API of the Steam store was used to extract game titles, most recent prices, developer names, publisher names, languages supported, website and support e-mail, minimum system requirements/file size, release date, number of recommendations, game genre, descriptive tags, game description, and the number of screenshots provided in the storefront presentation. The data from this first source was complemented by information provided on the third-party sites Steam Spy and Steam DB; from these sources, the rating score, the average playtime, and the history of past prices was extracted. 11,986 games that at some point were sold for a non-zero price and that offered no in-game purchases were identified. This group of games formed the basis for the following three-step screening process.

To categorize the game developers as consumer innovators or firm innovators, the foundation of a legal business entity administered as per corporate law was used as the key criterion. In step 1, the developer names of all games were linked to information from three further databases that provide information on game developers (Indiedb, Moddb, Wikipedia entry titles). By reading through 500 randomly selected developer profiles, two lists of terms were created that describe a legal institution in the business sector (e.g., firm, corporation, enterprise) and legal company suffixes (e.g., LLC, GmbH, S.A., Ltée, N.V.). Next, the developer profiles were machine-scanned and all entries matching at least one term in the lists were categorized as firm. For now, all remaining game developers with no match were categorized as consumer innovators. This led to a preliminary categorization of the sample into 1,426 firm developers with 3,535 games and 5,916 non-firm developers who created 8,451 games.

The next step 2 was an extensive manual screening to reduce the risk of false positives in the consumer innovators group. The internet was searched for relevant information to ensure that no game firms were erroneously categorized as consumer innovators. To keep the effort to an acceptable level, the manual screening was concentrated on a random subsample of 3,001 of the preliminary identified consumer innovators. This subsample is representative of all games published on Steam regarding size and game ratings. The developer names were entered into a search engine in combination with the suffix "game" and the first 10 search results were read for any indication of an existing firm (e.g., company suffix, explicit reference to a firm's establishment). In the 520 cases of matches, the developers were re-assigned to the group of firms, which yielded 1,946 confirmed firms (1,426 + 520) that are responsible for 4,412 games. This second screening confirmed 2,481 developers (83% of the pre-identified sample) to be consumer innovators, having published 3,622 games.

In step 3, all games commercialized by publishers rather than the games' originators were excluded. Since an innovator does not need to hand over all games to a publisher at once, this was not done before the screening. Handing a game to a publisher moves the pricing decision away from the game developer and thus decouples the innovation work from commercialization decisions. This should have significant effects on pricing. For instance, publisher prices are likely affected by strategic considerations concerning the management of a broad portfolio of games from different developers. Further, publishers have no own development costs. This makes it less likely that cost-informed pricing influences publishers' pricing. The exclusion of publisher games leaves 2,649 firm-developed and 2,725 non-firm-developed games remaining. These two sub-samples constitute the basis for the subsequent matching procedure.

5.2.2 Sample of matched pairs

As common in retrospective cross-sectional studies that include categorical variables, the units of analysis are not randomly assigned to the different categories (Brazauskas and Logan, 2016). In consequence, the categories may differ systematically concerning the other observed variables influencing the dependent variable and thus may not be directly comparable. To reduce the likelihood of receiving biased estimates owing to imbalanced observable variables between the two game categories, a matched-pair sample was built by applying a nearest neighbor propensity score matching algorithm (Rubin, 1979). The game size in MB and the games' average user ratings were selected as continuous matching variables. These two characteristics are strong price determinants on the game level, and they also show the highest difference in the mean value across the two developer groups. The resulting sample of 2,121 product pairs does not show significant differences among the chosen matching variables of size $(t(4238.9) = 0.696, p = 0.486)$ and user ratings $(t(4215.3) = 1.1055, p = 0.269)$ anymore. For descriptive statistics and the t-test results, see Table 3. A comparison of the genre distributions between the two developer groups is attached as Appendix A1.

5.2.3 Variables of quantitative research

Dependent variable: Game prices

New computer games are often published at a discounted introduction rate to encourage early purchases before they are sold at a regular price (Nair, 2007). To avoid distortion by these short-term promotional prices, the first recorded undiscounted price in US$ was chosen as dependent variable in the analysis. Notably, prices are subject to changes over time, both in the form of long-lasting price changes and short-term discounts. While dynamic pricing patterns constitute another interesting research field, the focus here is the initial pricing decision after innovating.

Table 3: *Descriptive statistics per developer group and group comparisons*

Variable	Firm (n = 2,121)		Consumer (n = 2,121)		t-test between groups		
	Mean	*SD*	*Mean*	*SD*	*t*	*df*	*p*
First undiscounted price (US-cents)	1270.11	1025.31	863.50	689.80	15.2	3713	<0.001
Perceived quality (ratings 0 to100)	76.94	17.66	76.32	19.06	1.11	4215	0.269
Development effort (MB)	2269	3289.14	2198	3343	0.70	4239	0.486
Competitive intensity (# of similar games)	24.88	60.04	45.17	84.10	-9.04	3835	<0.001
Commercialization effort 1 (# of screenshots)	10.69	6.25	9.98	5.87	3.78	4223	<0.001
Commercialization effort 2 (# of languages)	3.76	4.01	3.32	4.70	3.26	4139	0.001
Median playtime (minutes)	239.5	493.9	203.0	417.3	2.61	4125	0.009
Developer experience (# of previously published games)	3.88	5.30	1.92	2.10	15.8	2766	<0.001

Notes: Firm-developed and consumer-developed games were matched to equal in file size and user ratings. The results of a Welch t-test per variable between the groups are reported in the columns t, df and p.

Developer type: Consumer innovator vs. firm innovator

As indicated, a formal criterion for distinguishing between the two focal types of game developers was employed. All separately identifiable legal entities were categorized as firm innovators; these serve as the reference level in the analysis. All game developers in the sample for which no indication for the existence of a company was found were grouped as consumer innovators. By this, the definition of the statistical office of the European Union Eurostat (2010) was followed: "[…] the households sector consists of individuals or groups of individuals as consumers and as entrepreneurs producing market goods and non-financial and financial services (market producers) provided that

the production of goods and services is not by separate entities treated as quasi-corporations. It also includes individuals or groups of individuals as producers of goods and nonfinancial services for exclusively own final use."

Admittedly, the foundation of a legal entity is no perfect separator between the two innovator groups. The world is hybrid, and the wide range of users, hobbyists, amateurs, indie developers, professional innovators, entrepreneurs, start-ups, SMEs, and large corporations makes it difficult to draw an exact line between consumer innovators and firms. The creation of a legal commercial entity is still the clearest observable event of moving toward a paid, professionally organized, and more time-consuming commercial activity aimed at profit generation.

Programming effort: Games' file size

Assessing software development costs is deemed to be a difficult task (Jørgensen, 2004). In the IT project management literature, the most frequently mentioned measurable cost driver is software program size (Mislick and Nussbaum, 2015).

There are also valid criticisms of the use of software size as an indicator of the programming hours it required (Boudreau, 2018). For instance, it has been noted that a comparatively smaller file size can be the result of a developers' attempt to create elegant and clean code, which in turn is usually associated with a higher programming effort (Boehm and Papaccio, 1988). Today disk space is no longer very limited, so that the returns for using extensive programmer time in order to lower the amount of code has considerably decreased. Even if reducing the lines of code still forms part of the professional ambition in software programming, it is no priority in games (Koster, 2005).

Further, in today's game development, a very high share of the total programming time is consumed by the creation of complex multi-media content to design immersive 3D or 2D game scenarios. The level of sophistication and detail of self-programmed graphics relate closely to the time required to create them. Higher sophistication of such assets directly translates into a larger game file size (Jackson and Hannah, 1993). The relationship with effort may change in future with increasing use of machine learning in asset creation (Rebouças Serpa and Formico Rodrigues, 2019). Until these techniques pervaded the industry though, a strong relationship between game asset development effort and file size can be expected.

The validity of the file size as an indicator for design effort has further increased by the widespread use of development engines. A study by Koster (2018) shows that the use of popular engines leads to uniform cost per byte ratios across game developers. As explained in Chapter 4.3, consumer innovators can be expected to program with the same game development engines as firms. In sum, the file size of a computer game

captures the effort invested in its development sufficiently well. The minimum disk space needed to install a game was thus extracted and used as measure of development effort.

Perceived quality: User ratings

Following the outlined conceptualizations, perceived quality is defined as a consumer's global judgment relating to the superiority of a product or service (Parasuraman et al., 1988; Zeithaml, 1988). The overall quality perception results from the subjective evaluation of the array of attributes that a consumer considers relevant and thus constitutes a valid measure of the reviewer's perceived quality. On Steam, game ratings can be either positive or negative, represented by a thumb up or a thumb down. The total Steam score is calculated as the percentage of positive ratings on all the ratings of a game. this percentage of positive evaluations was employed as the measure of perceived quality.

Notably, there is substantial discussion in the literature that casts some doubt on the validity of unidimensional ratings as a measure of quality perception. A problem would arise if ratings did not only reflect the gross benefit derived from the game but were also significantly influenced by the evaluation of the price paid. However, studies on this matter were conducted for product categories in which specific and quantifiable functional parameters dominate the product ratings (e.g., cameras; Li and Hitt, 2010). For utilitarian purchases, buyers can develop clear expectations about appropriate quality-price ratios based on previous purchase experiences and by comparing the focal product to similar product alternatives. In turn, this could make it more likely that prices matter in the ratings.

This dissertation suggests that the price paid plays a weak role in the post-purchase ratings of hedonic experience goods, such as computer games. The evaluation of hedonic products is mainly affective and is primarily associated with abstract, intrinsic experiential attributes such as pleasure and excitement. This makes it harder to get a clear idea of a typical relationship between benefits and purchase price (Alba and Williams, 2013).

Three additional analyses were conducted to explore the appropriateness of the measure. Two of them check the sensitiveness of reviews to prices by 1. a content analysis of the textual review parts and 2. an analyses of review score changes after price changes. The third analysis tests in another content analysis of the reviews whether the ratings are confounded with non-quality related issues and therefor an unreliable proxy for quality.

The first analysis drew on a content analysis of a random sample of 2,000 text reviews. For this purpose, a keyword list was created by reading the first 500 reviews and extracting often-included words in sentences that refer to price aspects (e.g.,

price/prices, worth, money, paid). The complete list is attached as Appendix A3. The textual part of all 2,000 reviews was scanned and 340 reviews that matched one or more of the keywords identified. All extracted reviews were read to check whether they did in fact reflect a clear influence of price-related considerations. Reviews were excluded if the matching keyword lacked any relationship to the game price and thus was not used for the evaluation of the game. Specifically, sentences were excluded when the keywords did not refer to the game's price (e.g. "You will pay for it in blood to make it to the next level."), when the price information was not related to the evaluation of the game (e.g. "I bought this game while it was on sale […]"), when the price formed part of a general buying recommendation (e.g. "Pick it up if it's on sale and you're interested."), or when it was obvious that the quality rating would not change for other prices (e.g. "I wouldn't play this if you PAID me $25 an hour to do so.").

As a result, 144 or 7.2% of all reviews embodied an indication of price-related considerations. Notably, in most of these reviews, the focus was still on the evaluation of the games' strengths and weaknesses. Often, the price-related phrase is just a minor comment within an extensive evaluation of quality attributes. Also fairly often, the meaning and the context of the relevant phrases do not suggest a direct and strong effect of the price paid on the evaluation (e.g., "Nevertheless, it's still a fairly good game that I was happy to support for the price."; "I recommend you buy this trilogy it is a wise use of time and a wise use of money you will enjoy every hour."). The takeaway remains that almost 93% of the 2,000 reviews contained no reference to prices or did not relate prices to the evaluation of the quality. There is no indication of reverse causality. The process and more sample quotes are displayed in Appendix A4.

In a second analysis, the shifts in user ratings after the games' prices were changed were investigated. This analysis included 434 permanent price-changing events, not marked as temporary sale, for which there were at least 25 ratings before and 25 ratings six weeks after the price alteration. The absolute difference in ratings was low (-0.21 on a 100-point scale) and non-significant.

Admittedly, this non-significant difference may be explainable by buyer self-selection. If laggards buying after a price change were more price-sensitive than early adopters buying before a price change, a lack of difference in the ratings would not necessarily indicate a weak role of prices in the evaluation of perceived quality. Therefore, the analysis was repeated for other periods around the price change event to lower the likelihood of systematic variations in the adopter type (only reviews within a four-, six-, and an eight-week period). No significant differences between the means of game ratings for any of the periods (two-tailed paired t-test) were found. The absolute differences between the mean pre-change and post-change ratings were only -0.23 (4 weeks) and 0.26 (8 weeks) on a 100-point scale.

The third analysis tests whether the perceived quality measurement was negatively affected by noisy ratings. Some customers may have given a rating based on experiences that are unrelated and irrelevant to a game's quality. For instance, questions regarding the handling of a game do not form part of a quality evaluation. Similarly, also the ratings of buyers who experienced technical problems during downloading and/or launching hardly reflect a quality assessment. To estimate the relevance of noisy ratings, keywords indicating one of these issues (e.g., support, help, fix, bug, crash) were extracted by reading 500 reviews. Of the 2,000 reviews in the random sample, 384 reviews that contained at least one of the keywords. Reading these reviews led to the identification of 43 cases (2.15%) in which the reviewer reported problems while launching the game, so that their reviews cannot be a judgement of the game's quality. The analysis and sample quotes are presented in Appendix A5. Further, 16 reviews (0.8%) were identified to contain contact or support requests. Exemplary review quotes are attached as Appendix A6. To conclude, most of the reviews (97.05%) can be assumed to refer primarily to the games' quality attributes.

Competitive intensity: Similar games available at release

Competitive intensity is often defined as market concentration captured by the distribution of market shares of the suppliers in a market (Dufwenberg and Gneezy, 2000). Steam is a marketplace with low entry barriers and a large variety of suppliers in every game category. Thus, the concentration of game suppliers per game genre or game type is negligibly small. It was therefore decided to capture the intensity of direct product competition rather than using a market concentration measure.

For each game in the sample, a determination of how many similar games were released on the platform within 180 days prior to the focal game's release was conducted. For identifying the substitutes, a list of the 350 most frequently used tags that Steam customers assigned to games to describe the genre (e.g., action), the game's thematic environment (e.g., soccer), and the playing mode (e.g., shooter) was used. Of each game *A* in the sample the tags (mean = 8.44 tags assigned; SD = 5.5) were compared to the tags of all games released in the previous six months. A game *B* was categorized as a potential competitor of the focal game *A* if more than two-thirds of game *A*'s tags matched game *B*'s tags.

Control variables

Most importantly, to account for inflation and technical progress, the release year of the game as a categorical variable was controlled for. Further, genre fixed effects were used to unambiguously control for cross-genre variation. To arrive at appropriate genre classifications, a k-mode cluster analysis of the genres was conducted, which aggregated the games into eight genre clusters: action, action-adventure, adventure, casual,

roleplaying, simulations, sports and racing, and strategy games. A covariate for the average playing time was included to account for relevant game characteristics. Next, the number of games a game developer had developed before introducing the focal game was included to account for the market and sales experience. Finally, the number of game screenshots provided in the description and different languages available was integrated as an indicator of the professionalism in a game's presentation.

5.2.4 Quantitative analysis method

An ordinary least square regressions (OLS) analysis was used to estimate the determinants of computer game prices. Table 4 reports the descriptive statistics. The correlations between independent variables were rather low ($< |0.15|$), indicating that collinearity did not present a problem. The correlation matrix is presented in Table 5. Similarly, the linear variance inflation factor (VIF) ranged between very acceptable levels of 1.02 and 1.82. Visual control of the Q-Q plot and residuals vs. leverage plot hinted at one outlier. However, despite a comparatively high Cook's distance ($D = 1.5$, compared to a very low maximum of $D = 0.115$ for all other cases), the case's leverage was very low (< 0.1), so all observations were kept. Visual control of the residuals vs. fitted plot indicated a good fit of the linear model. The residuals were slightly asymmetrical yet centric (mean $= 0$, skew $= 1.38$, median $= -0.13$, se $= 0.02$). The Durbin-Watson statistic indicated the absence of autocorrelation (DW $= 1.88$). Owing to the good and intuitive linear specification and a large sample size, fit-increasing transformations were not applied in order to allow an easier interpretability. This however makes it likely that heteroskedasticity concerns remain, which is confirmed by a significant Breusch-Pagan test. In consequence, the results and significance levels are reported with robust standard errors (Lumley et al., 2002).

Table 4: *Descriptive statistics*

	Variables	Mean	SD	Min.	Max.
1	First undiscounted price (US cents)	1066.14	897.03	59	19999
2	Perceived quality (ratings 0 to 100)	76.62	18.37	5	100
3	Development effort (MB)	2235.30	3317.16	10	59000
4	Competitive intensity (# of similar games)	35.05	73.78	0	463
5	Commercialization effort 1 (# screenshots)	10.34	6.07	2	76
6	Commercialization effort 2 (# languages)	3.54	4.37	1	27
7	Median playtime (minutes)	221.18	457.61	1	10595
8	Developer experience (# previous games)	2.90	4.15	1	39

Table 5: *Correlation matrix*

	Variables	1	2	3	4	5	6	7
1	First undiscounted price (US cents)							
2	Perceived quality (ratings 0 to 100)	-.01						
3	Development effort (MB)	.41**	-.13**					
4	Competitive intensity (Number of similar games)	-.20**	-.08**	-.06**				
5	Commercialization effort 1 (# screenshots)	.24**	-.07**	.15**	-.14**			
6	Commercialization effort 2 (# languages)	.07**	.06**	.04**	-.08**	.03		
7	Median playtime (minutes)	.22**	.03*	.04**	.00	.03	.01	
8	Developer experience (# previous games)	.09**	-.00	-.01	-.02	-.02	.05**	.09**

*Notes: * $p < .05$. ** $p < .01$, n = 4,239*

5.2.5 Qualitative follow-up study

To examine the validity of the theoretical propositions that underpin the quantitative study, the qualitative phase of this research focused on obtaining deeper information on the motivational structure of innovating consumers in the innovation and pricing process (Castro et al., 2010).

Returning to the consumers of the initial sample, a new random sample of 200 consumers who had recently commercialized a computer game on Steam were contacted. They were asked to answer a set of open-ended questions in a telephone interview. In the reminders, the option to answer the interview questions in writing was offered in order to increase the number of participants. Telephone interviews were always preferred whenever they were offered. Still, it was unavoidable that some respondents only agreed to answer in writing. The stated reasons for doing so were, among others, limited fluency in spoken English or time constraints. After sending two reminders, 29 consumer innovators took part in the study (adjusted response rate: 16.3%): 10 participants opted for an interview and 19 for a written reply. Information about the participants will be provided along the results in Table 14. The phone interviews had durations between 30 minutes and 2 hours and lasted on average 56 minutes.

The first part of the interview focused on the consumers' functional role at the outset of their innovation endeavors. They were asked to specify their initial motivations and the personal resources invested in the game's development. Further, they were asked to describe when and how they arrived at the decision to sell their computer games. Finally, the respondents were inquired about the factors and information they had considered in the pricing process. The recorded interviews and written answers were analyzed, text fragments extracted and assigned to the content categories of innovation-related motivations, types of personal investments, triggers to sell the game, and price determinants considered by the consumers.

5.3 Results

5.3.1 Quantitative research findings

The results of the OLS regression models, predicting the computer game prices, are reported in Table 6. In the first column the estimates of the baseline Model 1 with the control variables are documented. Model 2 includes all independent variables whose main effects on prices did not form part of the hypotheses (file size, user rating score, and number of substitutes). In Model 3, the developer type (consumer vs. firm) was added. Model 4 includes the interactions between the developer type and the three potential price determinants. This last model tests the hypotheses. The model fit for the complete Model 4 was adequate (Adjusted $R^2 = 33.7\%$; F = 70.47; $p < 0.001$). Adding the main effects in Model 2 and the hypothesized main and interaction effects in Model 4 to the baseline model led to a significant increase in the explained variance (~99% and ~8.4%, respectively).

In the following, only the results of the complete Model 4 are considered. As one could expect, file size as a proxy of development cost was significantly positively related to prices (b = 0.123; $p < 0.01$). In line with conventional expectation, the number of similar games available on the platform (competitive intensity) showed a negative association with prices (b = -1.549; $p < 0.01$). There was no significant relationship between the mean user rating and game price (b = 0.772; p = n.s.). In line with numerous investigations of the correlation between prices and quality, the prices of games in the sample did not unconditionally reflect a game's quality as perceived by the players (Curry and Riesz, 1988).

The coefficient estimate on the developer type variable complies with the predictions formed from theory. The main effect was negative and significant. Fulfilling the first expectation (H1) in the matched-pair sample of comparable games, consumer innovator games were priced significantly lower than firm-developed ones (b = -429.75; $p < 0.01$).

Consistent with the prediction in H2, the interaction term of developer type and development effort was negative and significant (b = -0.040; $p < 0.01$). The file sizes, and thus the development costs, had weaker relationships with the prices in consumer-developed games than with prices in firm-developed games. In other words, consumer innovators seemed to have a lower inclination to price in their development effort than their firm counterparts.

Table 6: *OLS regression models of computer games' prices*

Dependent variable:	Initial undiscounted price (US cents)			
	(1)	**(2)**	**(3)**	**(4)**
Constant	2105.424*** (585.751)	1774.777** (646.872)	1840.055** (666.637)	1960.562** (686.250)
Development effort		0.104*** (0.008)	0.102*** (0.008)	0.123*** (0.010)
Perceived quality		2.696*** (0.756)	2.461** (0.748)	0.772 (1.305)
Competitive intensity		-1.424*** (0.116)	-1.353*** (0.113)	-1.549*** (0.212)
Consumer (vs. firm producer)			-277.099*** (23.012)	-429.747*** (128.553)
Consumer x development effort				-0.040** (0.014)
Consumer x perceived quality				3.028* (1.482)
Consumer x competitive intensity				0.304 (0.236)
Release years	y	y	y	y
Commercialization effort 1: Number of languages	12.587*** (3.233)	7.097** (2.653)	5.941* (2.528)	4.316+ (2.474)
Commercialization effort 2: Number of screenshots	29.582*** (2.976)	19.516*** (3.036)	19.316*** (3.002)	19.365*** (2.953)
Developer experience	19.645*** (4.307)	19.096*** (3.375)	12.216*** (3.382)	11.723*** (3.284)
Median playtime	0.383*** (0.088)	0.354*** (0.082)	0.343*** (0.079)	0.339*** (0.077)
Genre: Action and adventure	-2.509 (35.671)	-35.653 (31.185)	-26.881 (30.516)	-18.019 (30.609)
Genre: Adventure	-61.371+ (34.319)	-63.046* (30.320)	-49.197 (30.021)	-45.490 (29.906)
Genre: Casual game	-366.304*** (61.030)	-285.652*** (60.523)	-268.593*** (60.101)	-266.230*** (58.140)
Genre: Role playing game	5.525 (49.978)	13.332 (45.476)	14.164 (45.512)	15.362 (46.264)
Genre: Simulation	317.937*** (58.716)	283.784*** (51.818)	254.799*** (51.275)	257.523*** (51.200)
Genre: Sports and racing	363.251** (135.588)	215.996+ (115.190)	200.466+ (113.047)	178.284 (112.156)
Genre: Strategy	68.172 (58.868)	129.034* (55.126)	132.400* (53.708)	131.748* (53.444)
Observations	4,239	4,239	4,239	4,239
R^2	0.161	0.315	0.335	0.342
Adjusted R^2	0.156	0.311	0.330	0.337
Residual standard error	824.104 (df = 4214)	744.553 (df = 4211)	734.000 (df = 4210)	730.429 (df = 4207)
F statistic	33.633*** (df = 24; 4214)	71.870*** (df = 27; 4211)	75.701*** (df = 28; 4210)	70.474*** (df = 31; 4207)

Notes: *** $p<0.001$; ** $p<0.01$; * $p < 0.05$; + $p < 0.10$.
Unstandardized coefficients are shown. Huber-White robust standard errors are in brackets (Lumley et al., 2002). Release years are integrated as categorical control variables, indicated by 'y'(es) in the table, but not individually reported for reasons of comprehensibility.

The results regarding the interaction effects of perceived quality and developer type provided support for H3. The interaction term of the user ratings and the developer type on prices was strongly positive and significant (b = 3.028; p < 0.01). The largest share of the strong and positive main effect of perceived quality on price in Model 3 without interaction effects can in fact be traced back to the group of consumer-developed games. A relationship between user ratings and prices was almost non-existent for firm-generated games, while it was clearly significant and positive for games developed by consumers. This result confirms that consumer innovators show a much stronger inclination than firms to account for perceived game quality in their pricing decisions. The interaction effects described in H2 and H3 are depicted in Appendix A2.

The quantitative results did not support H4: The interaction term of the developer type dummy and competitive intensity was not significant (b = 0.304; p = n. s.). Thus, consumer game developers and professional game companies seem to be similarly reactive to the number of substitutes available at the time of market introduction.

Various explanations could apply. In contrast to the motivational explanation that underpinned H4, consumer innovators may not perceive a clear advantage in adapting prices to competitive intensity. Conversely, and like the game developing firms, the consumer innovators may try to at least partly escape from competition-based pricing by promoting the uniqueness of their games via promotional activities.

However, the data did not provide support for this explanation. When comparing the commercialization efforts of both innovator groups, consumer innovators put significantly less effort than their firm counterparts into showcasing their games to a wide range of customers (e.g., languages, screenshots; see Table 3). The question why there is no support for a stronger effect of competitive intensity on the consumer innovators' prices remains unanswered; this calls for additional explanation. The follow-up qualitative study with interviewed consumer innovators shall serve to explore this result in more depth (Castro et al., 2010).

Prior this, a series of conducted robustness checks is reported. A first check accounted for price dynamics and strategic considerations when setting the market entry price. As indicated by empirical research on computer game markets, some vendors may intentionally set a base price that leaves room for later sales promotions and discounts (Nair, 2007). If deciders often follow this type of dynamic pricing, such a suggested retail price would not fully represent their intentions. To check the stability of the relationship between the explanatory variables and the price over a game's lifetime, the coefficients were re-estimated by using the average price as dependent variable. For each game, the different observed prices were weighted by the days they had been valid, and the sum of daily prices was divided by the total number of recorded days. This variation did not alter the findings, as listed in Model 1 presented in Table 7.

While the number of games published by the innovators was controlled for, there may be unobserved changes to the vendors and to the demand side that accompany the number of previously published games. Some developers with a track record of game publications may, for example, have built a reputation or a loyal customer base (Bloemer and Ruyter, 1998; Kressmann et al., 2006). To reduce the risk of getting spurious correlations, the analysis was rerun, exclusively including the first game from each developer represented in the sample. Model 2 in Table 7 documents that the findings are unaffected by this change.

Consumer reviews and ratings have been suggested to be a useful indicator of perceived quality. However, as noted, ratings are not exempt from human behavior and biases. For instance, several studies have documented empirical evidence of herding, which often manifests in a J-shaped distribution of ratings with a clear majority of very positive or extremely negative ratings (Hu et al., 2009; Li and Hitt, 2010; Muchnik et al., 2013). While several scholars also documented differentiation effects that counteract herding and the tendency toward extreme ratings, the possibility that bandwagon behaviors biased the ratings in the sample cannot be excluded (Moe and Schweidel, 2011; Wu, 2013; Lee et al., 2014; Gao et al., 2015). To relieve this concern, the 30% best-rated and the 30% worst-rated games were excluded in a recalculation. The results remain stable, as can be seen in Model 3 in Table 7.

To account for unobserved characteristics of game developers and to further reduce the concern of omitted variable bias, the developer was introduced as a random-effect coefficient (Huang, 2018). This allows the intercept to vary for each innovator and accounts for potential unobserved developer-level differences (Snijders, 2005; Hox et al., 2017; McNeish and Kelley, 2019). The results are steady, as seen in Model 4 in Table 7.

Table 7: *Tests of robustness on the regression models on the prices of computer games*

Dependent variable:	Mean price (US cents)	Initial undiscounted price (in US cents)		
Model:	**OLS**	**OLS**	**OLS**	**Lin. mixed effects**
Variation:	Lifetime mean price as dependent variable	Only integrating the vendors' first released game	Excluding the 30% best and the 30% worst-rated games	Adding the developer as random effect
	(1)	**(2)**	**(3)**	**(4)**
Constant	1062.726*** (295.442)	1839.016* (724.672)	20273.500*** (747.843)	2179.758*** (390.714)
Development effort	0.091*** (0.003)	0.089*** (0.008)	0.112*** (0.008)	0.116*** (0.005)
Perceived quality	-2.849*** (0.633)	-0.942 (1.376)	-7.540* (3.269)	-0.546 (0.919)
Competitive Intensity	-1.315*** (0.190)	-0.884* (0.358)	-2.152*** (0.541)	-1.728*** (0.273)
Consumer (vs. firm producer)	-296.009*** (71.033)	-472.880*** (141.98)	-769.148** (255.848)	-486.927*** (103.864)
Consumer x dev. effort	-0.027*** (0.005)	-0.017+ (0.009)	-0.027* (0.012)	-0.038*** (0.007)
Consumer x user ratings	1.740* (0.858)	4.132* (1.719)	9.010* (4.357)	3.780** (1.247)
Consumer x com. intens.	0.200 (0.227)	-0.112 (0.422)	0.987 (0.610)	0.602+ (0.328)
Release Year (categ.)	y	y	y	y
Commercializ. effort 1: # of languages	2.442 (1.801)	13.725*** (3.688)	12.981* (5.686)	10.929*** (2.727)
Commercializ. effort 2: # of screenshots	13.453*** (1.324)	20.785*** (2.518)	17.552*** (3.167)	21.002*** (1.909)
Experience: Previously released games	8.322*** (1.957)		8.439 (5.865)	0.164 (3.557)
Median playtime	0.268*** (0.017)	0.165*** (0.036)	0.613*** (0.047)	0.266*** (0.024)
Genre: Action Adventure	-7.745 (23.593)	-9.495 (42.381)	-142.374* (65.037)	-13.522 (33.827)
Genre: Adventure	-32.495 (23.402)	-65.045 (44.255)	-97.620 (68.863)	-41.998 (34.490)
Genre: Casual game	-207.672*** (28.828)	-187.071** (57.542)	-336.496*** (85.126)	-221.531*** (42.150)
Genre: Role play. game	41.633 (35.028)	90.586 (67.643)	-88.042 (105.120)	-45.229 (51.713)
Genre: Simulation	241.527*** (30.121)	284.908*** (58.036)	292.764*** (76.689)	224.165*** (43.923)
Genre: Sports and racing	186.290** (57.471)	206.775* (102.918)	-188.068 (145.674)	165.095* (83.167)
Genre: Strategy	110.693*** (31.653)	94.934 (63.687)	235.314* (93.123)	75.470 (46.328)
Random effect: Developer				Var.: 120007 SD: 346.4 Groups: 2606
Observations	4,239	2,359	1,118	4,239
R^2	0.387	0.250	0.600	
Adjusted R^2	0.383	0.240	0.589	
Log Likelihood				-33661.140
Akaike inf. criterion				67390.290
Bayesian inf. criterion				67606.260
Residual standard error	501.605 (df = 4207)	709.770 (df = 2327)	719.745 (df = 1087)	
F statistic	85.803*** (df = 31; 4207)	25.041*** (df = 31; 2327)	54.335*** (df = 30; 1087)	

Notes: ***$p<0.001$; **$p<0.01$; *$p < 0.05$; +$p < 0.10$; Unstandardized coefficients are shown. The mixed model is fitted by REML. The p-values are calculated with Satterthwaite's method (Luke, 2017).*

5.3.2 Qualitative research findings

Since the quantitative study did not directly capture motivational and behavioral variables of the consumer game developers, the possibility that the pricing differences revealed by the quantitative analysis were caused by other factors than those proposed in the hypotheses cannot be entirely excluded. The following results from the qualitative interview study seek to validate the quantitative results by reviewing the motivational accounts of the innovating consumers' pricing decisions.

Functional role and innovation-related motivations

All 29 respondents indicated that they were avid computer gamers and had been playing computer games for many years when they decided to develop an own game. They started game development as a hobby and devoted their personal discretionary time to it (see Table 8 for examples). Thus, all interviewees can be categorized as users.

Their innovation activities were stimulated by a mixture of self-rewards. Most innovating consumers (24 of 29 respondents) deliberately sought to develop a game that they themselves found valuable. They looked forward to playing the game themselves and enjoyed the development process. Many readily stated seeing the game's development as a perfect way to use their creativity and to self-express (25 of 29 developers). The third most mentioned reason for innovating was learning by doing (15 of 29 respondents). Developing a game was an opportunity to extend experiences and improve skillsets. The results match the empirical evidence of several studies documenting the motivations of own use, enjoyment, and learning as key drivers of innovation activities of users (Hertel et al., 2003; Roszkowska-Menkes, 2017).

Less than one-third of the participants (9 of 29) stated that some commercial interest was already present when starting the development. Of these, just one exceptional participant, hoping for revenues to enable him to quickly quit his job, rated economic return as the main driver for innovating. The other brought it up as complementary expectation that was not the key reason to start developing an own game. Table 9 lists counts of motivation statements.

Table 8: *Exemplary consumer innovator quotes on innovation motivation*

Functional role and innovation-related motivations
Consumers deciding to sell their innovations to others start their innovation work as users. The decision to innovate is primarily triggered by the expectation of nonpecuniary self-rewards (e.g. own use, enjoyment, learning). In this, they resemble free innovators.

"When we [brothers] started it was a hobby and we both had full time jobs that paid […] living so this was on nights and weekends only" – Aw

"I wanted to play it [the game], but I couldn't, because it didn't exist yet." – Ed

"We [married couple] have kids, and we were playing with them with real wooden pieces, having lots of fun. The problem is, pieces and space are limited. That is why the project came to life." – Dd

"I did a game I like myself. […] to learn something new (C# and Unity)." – Ps

"If I had a recipe for a million-dollar game that I don't feel excited about, I wouldn't do it." – Mc

"Making games has become my hobby. This is extremely exciting and fun. Besides, it is a suitable way for me to express myself creatively." – Yk

Table 9: *Innovation-related motivations reported in semi-structured interviews*

Type of motivation	**Respondents (n=29)**
Create something they want to play themselves	24
Process enjoyment	25
Achieve or improve (game) development skills	15
Commercial interest	9

Most respondents who referred to their commercial interest reported that the idea to sell emerged late in the development process (14 of 22). Very often, they realized the potential of their innovation only after receiving signals of interest from their family, friends, and/or other gamers. In sum, almost all the respondents made clear that economic incentives were not the vital cause to initially justify their innovation efforts and only became more important later. Examples are presented in Table 10. This aligns well with the results of Shah and Tripsas (2007) for user entrepreneurs and those of Halbinger (2018) for makerspace innovators.

Table 10: *Exemplary consumer innovator quotes on the commercialization decision*

Decision to sell the game
The expectation of economic returns is not a key motivator. The idea to sell the innovation for a price often arises in later stages of the innovation process. Consumers are often stimulated by others to exploit a commercialization opportunity.

"Selling was never a focus. [… The] main reason not to give it away for free - because we [classmates] didn't want to give the impression that it's worthless." – Vk

"I especially enjoy developing games. That the game on Steam made some money is an extra bonus." – Oa

"If I had a recipe for a million-dollar game that I don't feel excited about, I wouldn't do it." – Mc

"I honestly felt a little guilty [charging a price] because this is what I'd be doing for fun anyway. – Ed

"Versions of that game were published on a small indie website for free. One day I set a very small and not mandatory price on it to see what would happen." – Mc

"People started telling us […] it is so good; we should charge for it. We were like 'oh I don't know…' and just put it on sale for a dollar. Later we're like: 'wait a minute, can we pay our bills with this?'" – Aw

"I wanted to give [Game] away for free. […] but my friends insisted I charge something for it. […] It's scary to think of treating making things with love as a business." – Sh

"Originally, I was just making it for myself, but then I decided to share the story with others. […] Even though the game is priced […] when anyone emails me about the game, I send them a free copy." – Dv

Interestingly, some interviewees reported that even after releasing the game for a price revenue generation was not the sole objective. Five sampled consumer innovators offered the same game at no charge on another platform or were willing to share their game for free when gamers contacted them. Another interviewee invited others to contribute changes to his game and shared revenues with contributors. Similarly, four developers reported that they deliberately decided against implementing features frequently requested by customers because they did not match their personal vision of what their game should be. Apparently, they were willing to sacrifice potential revenue for personal aspirations.

Cost, quality, and competitive intensity as price determinants

Consistent with the quantitative results, *cost considerations* were of only moderate importance: 11 of 29 developers reported thinking about development costs when openly asked how they set their prices. The marginal role of costs in consumer innovators' pricing was further reflected in the interpretation of what respondents considered as development costs. About one-third of all respondents stated that they had born no costs.

Personal time was rarely considered as a cost factor, and many respondents even forgot the mandatory US$100 Steam publishing fee. Except for one game developer, none of the participants kept proper track of the hours invested into their games. When asked to quantify their total development effort, they based their answer on spontaneous and rough estimations (e.g., "past holidays", "all available time"). The one innovating consumer who recorded his working hours still hardly used this to determine the price floor for his game. Although time tracking made him aware of the unfavorable effort-return ratio, charging a relatively high price to increase his margin was still not an option.

Across the entire interviewee sample, the articulation of cost-related considerations was most frequent among those who also reported having had some commercial interest early in the innovation process. Apparently, development effort matters more if there is at least some vague hope to eventually make a living from game development down the road. Example quotes are presented in Table 11.

Table 11: *Exemplary consumer innovator quotes on cost considerations in pricing*

Cost considerations in the pricing decision
Monetary expenses of consumer innovators are kept on a low level. Time invested in product development is rarely tracked. Most consumers do not consider their working time as development costs.
"The money was spent, I watched it, but it wasn't high enough to have a negative effect on my life. It's about as much as I give for a beer." – Oa
"No costs, because you have a computer and you have a brain." – Yi
"I actually don't [track costs]. I could give you an estimate but […] I really just do it." – Ch
"If I approached this more like a business […] I'd have to consider more up-front costs I imagine." – Sh
"Making the game never felt like hard work to me. So, I didn't feel like I need to be compensated for my time." – Fw

Concerning *perceived quality* as a price determining factor, 22 of the 29 respondents emphasized aligning the price with the fun and quality playtime provided by their game. To assess the monetary equivalent of the total entertainment benefit, developers asked themselves and friends how much they would be willing to pay. They put much thought into which price would be considered fair by buyers, showing interest in achieving a positive perception among their fellow consumer peers. Unsurprisingly, 23 of the 29 respondents reported seeing potential buyers of their game as their equals rather than as transaction partners.

Three games developed by the respondents were outliers in that they showed an unfavorable price-quality ratio. They originated from the small subsample of hobbyists who reported strong initial commercialization aspirations. They all saw their game release as a training field for game development and testing to learn about the Steam marketplace. Conversely, the nine top-rated games in the sample were all developed by respondents with high and long-term personal involvement in the innovation process. These consumers emphasized how important it was for them to share a reliable and entertaining game with fellow gamers. Table 12 contains exemplary quotes on this matter.

Table 12: *Exemplary consumer innovator quotes on quality considerations in pricing*

Quality considerations in the pricing decision
Consumer innovators try to assess the benefits that players will be able to derive from playing their games. They give a lot of consideration on charging fair prices by drawing from their personal experiences and by collecting feedback from their community. They do not think about customers as buyers but as peers.
"I think it's more of a moral thing as well […] knowing that there are people who got a certain experience out of it." – Jr
"I was very social about that. It is important to listen to players." – Ak
"I just sell games when I think they are actually worth the price. […] To me it is to get the players. Getting the money is just an extra thing. Just to have more development funds." – Ch
"If it's affordable for me, then it's affordable for pretty much anybody." – Fw
"[…] not looking for the price sweetspot. More for a simply reasonable price in relation to game quality" – Vk"
"We [gaming friends] had no notion of customers. We were making a game for players just like us." – Xt
"I never think of players as clients. More like friends who try my ideas." – Hs

In line with the theoretical reasoning, *competitive-intensity-related considerations* are present in consumer innovators' price setting: in the open-ended questions, 18 of the 29 developers reported having considered similar games when setting prices. As proposed in the development of H4 and in alignment with the quantitative results, no respondent reported having tried to escape the price implications of competitive intensity by strengthening their game's perceived uniqueness. Six respondents explicitly stated that they had conducted no promotion or marketing activities to differentiate their game from those of competitors. Overall, the interview and survey responses suggest that the consumer innovators in fact strongly acknowledge the need to adapt their prices to the competitive intensity.

This observation seems inconsistent with the lack of statistical support for H4 in the quantitative study. After all, this non-finding suggests that innovating consumers did not have a higher inclination to adapt prices to competitive intensity than their firm counterparts. This apparent inconsistency is resolved by looking closely at how consumer innovators specifically evaluate the competitive intensity. Differing from the expectations, most respondents stated that they did little market scanning when assessing competitive intensity. They hardly considered the number of potential substitutes after conducting a systematic competition analysis. Rather, they scanned a limited convenience sample of games they considered similar. These references are used as competition anchor. Apparently competitive intensity is assessed by using simple heuristics.

Further, some respondents explained that scanning the marketplace for all available offers which buyers may consider as substitutes to their own game is not at all straightforward. Table 13 provides example statements. As noted earlier, computer games are not evaluated along a clear set of functional attributes that are likely to be rated in a similar way by most buyers. They are rather characterized by experience and emotional attributes whose evaluation can differ across buyers. This complicates the identification of games that are regarded by customers as competition or substitutes. Thus, the nonsignificant interaction effect may be attributed to the fact that a high readiness of consumers to adjust prices to competitive intensity is countervailed by an underestimation of the actual number of potential substitutes.

Table 13: *Exemplary consumer innovator quotes on competition consideration in pricing*

Competition considerations in the pricing decision
Consumer innovators mainly make use of their personal knowledge when estimating the level of competition. They rarely conduct a systematic and comprehensive market analysis. Prices of a small set of similar games they know about are used as anchor for pricing.
"I judge on my own merits. [… Looking at others] I guess it's good for some kind of bearing." – Jr
"I gave a look at other indie's prices, but I didn't make any other kind of marketing analysis." – Mc
"I've seen games like mine, but I didn't make any real analysis or something." – Du
"We [married couple] searched on Steam to see if there was something similar […] There was nothing similar, but we discovered after some time that Steam has a lot of buried games." – Dd

In sum, the qualitative results helped to interpret the statistical lack of support for H4, according to which consumer innovators should adapt their prices more to competitive intensity than their firm counterparts. They illustrated that most consumer innovators indeed considered similar games released on Steam when they set prices. Considering their limited resources, consumer innovators acknowledged that they could hardly expect to escape competitive price pressure with alternative marketing and stated in the interviews that they are willing to lower their prices in favor of adoption. However, when thinking about appropriate prices, many consumer innovators limited their attention to an idiosyncratic small set of comparable games they knew about. As the applied quantitative measure of competitive intensity implicitly assumed that consumers engage in a systematic and complete scan of potential substitutes, the variable failed to provide significant results in the model test.

Table 14 provides an overview of all interview partners and the initials used in the provided sample quotes. In order to relate their statements with the relevant price determinants of their products, the key attributes of their games are listed as well.

Table 14: *Interviewed consumer innovators with demographics and product information*

#	Initials	Development effort (MB)	Perceived quality (%)	Competitive intensity (# similar games)	Initial undisc. price (US cents)	Age	Country
1	Dv	400	96	23	499	33	USA
2	Du	144	91	0	299	34	Russia
3	Ts	100	100	81	899	40	Finland
4	Yk	400	60	0	399	23	Russia
5	Sh	500	100	26	299	39	USA
6	Ed	350	92	4	799	n.a.	USA
7	Xt	250	89	7	99	30	Ukraine
8	Mc	1500	90	5	399	21	Italy
9	Hs	2000	84	0	599	35	Ukraine
10	Er	460	84	238	399	38	Turkey
11	Ps	300	81	4	999	32	USA
12	Pv	100	100	27	499	37	Czech
13	Mj	200	94	36	99	34	Poland
14	Dd	300	100	0	1499	40	Spain
15	Vk	8000	81	52	599	32	Germany
16	Oa	500	66	60	1599	39	Czech
17	Vt	500	90	25	1499	22	Lithuania
18	Cl	300	79	22	99	n.a.	USA
19	Jr	9000	71	1	499	39	Singapore
20	Ch	100	90	266	99	24	USA
21	Mp	500	72	133	99	n.a.	Russia
22	Tr	8000	65	121	99	36	Finland
23	Ak	50	100	32	199	31	Canada
24	Aw	250	92	1	1499	36	USA
25	Yi	200	61	35	99	34	Russia
26	Dt	8000	98	11	2499	26	USA
27	Dn	100	92	0	1199	41	Romania
28	Fw	1000	100	62	499	32	USA
29	An	4000	95	23	1499	n.a.	Sweden
Mean:		**1638.1**	**86.7**	**44.66**	**685**	**33.1**	

Note: All the respondents were male.

5.4 Discussion and implications

Before merging the insights from both empirical studies in Chapter 7, this chapter begins discussing selected implications of the first empirical study separately. The present results extend the understanding of the early activities of non-firm entrepreneurs (Carter et al., 2003). They provided evidence that the origins of entrepreneurs as consumer innovators manifest in distinct entrepreneurial decisions, namely their pricing decisions. Product prices were shown to be an additional avenue via which commercially active consumer innovators differentiate themselves from firms on markets. In the quantitative study, the prices of consumer-generated innovations were found to be lower than those of comparable firm-developed products that required similar development effort and provided similar levels of customer perceived quality. This suggests that the market entry of innovating consumers enables buyers to satisfy their needs at a lower sacrifice, resulting in a higher customer surplus.

The findings of this sections' qualitative research showed that higher rents on the buyers' side did not come at the expense of lower benefits on consumer innovators' side. The price concessions that the consumer innovators made to their customers were compensated by the process benefits that they experienced. Being particularly concerned with setting prices that are appropriate to the value they provide, consumer innovators continue showing their exceptional consideration of customer interests despite having chosen to commercialize their offers. In sum, this study provides a first and preliminary indication that the increasing number of commercializing consumer innovators on marketplaces might be associated with a positive total welfare effect. This study provided no evidence for the assumption that commercializing consumer innovators aim to reduce the customer surplus in adopting consumer innovation. They much rather tend to put the earned money to good use in order to create even better and more beneficial innovations for their adopters.

Overall, this research suggests that when seeking to explain decisions relating to entrepreneurial opportunity exploitation and value capturing, it is fruitful to extend the attention beyond motivations for monetary gain (Fauchart and Gruber, 2011). For instance, this study may stimulate more research into how non-firm entrepreneurs handle potential trade-offs between economic and non-economic considerations when they act on entrepreneurial opportunities (Shepherd et al., 2015).

Further, the results are of practical importance for firms, who face an increasing number of consumer innovators that are entering markets with self-developed products. As witnessed in open-source software development before, consumers who progressively use commercial channels to diffuse their innovations foreshadow a massive transformation of markets by turning leisure activities into commercially viable work (Fitzgerald, 2006). This first investigation of the marketing behaviors of such leisurely

commercially active consumer innovators has proven that consumer innovators, to some extent, do not play by the same rules as firms. The results suggest that commercially active consumer innovators are willing and able to undercut firm prices by deliberately investing their discretionary time for personal self-rewards and community-related benefits instead of monetary returns.

This may pose an even stronger threat to the financial success of firms than the existence of free innovation. After all, commercializing consumer innovators upload their products to the same platforms and present them in a similar way as firms do. An increasing number of consumer innovators that attach low price tags to workable products can put pressure on firms to lower their prices. Boudreau (2018) found at least weak evidence for a downward pressure on prices by showing that professional developers charge slightly lower prices for top apps after many amateurs had entered the market.

However, the results strongly suggest that engaging in price competition will indeed be Kamikaze, as Holden and Nagle (1998) called it. Price reductions are likely to be mirrored by consumer innovators, who do not have to consider a cost-based price floor. Product differentiation (e.g., organizing competitions and events for their games) and/or collaborating with innovating consumers (e.g., taking the role of publishers of consumer games) seem to be the more promising routes. Overall, this first set of results calls for a careful consideration of appropriate reactions by firms.

5.5 Limitations and future research

As outlined in Chapter 4.3, the specific empirical context of computer games likely has an influence on the managerial decision-making of suppliers in the industry. For instance, the cost structures of digital products are very different to those of physically manufactured goods (Huang and Sundararajan, 2010; Jones and Mendelson, 2011). Fixed costs mainly comprise development costs and are therefore sunk. Variable production and diffusion costs are close to zero. These conditions apply to firms and consumer innovators likewise, but may particularly enhance consumer innovators' inclination and ability to charge lower prices and to relax the link between development costs and prices. Future work should explore whether the presented evidence is generalizable beyond the area of digital products.

The theoretical explanations of the observations are based on innovation-related motivations. While the qualitative study provided clear support for the key role of self-rewards in consumers' pricing decisions, the precise motivations of consumers and firms were neither quantified nor purposefully varied. Based on the work conducted so far, not all alternative explanations for the pricing outcomes documented in this study can be ruled out. Further research could employ large-scale surveys of commercially active

consumer innovators to collect more evidence on how innovation-related motivations manifest in marketing and sales decisions. An alternative approach to prove the causality of motivations for pricing decisions is the intentional alteration or manipulation of self-reward sources in experimental studies.

Also, developing a more fine-grained classification of consumer innovators bears considerable potential for intriguing insights. For instance, by investigating the interviewees' commercial aspirations in the qualitative study closely, indications for the existence of two different groups were visible: a large group of part-time hobbyist opportunistic sellers, who do not plan to turn their hobby into a professional business. And a smaller group of aspiring entrepreneurs, who accidentally find themselves on their way to the creation of a company. Researchers may want to develop a more precise picture of commercialization activities of each sub-group. The identification of stark differences in managerial decisions of hobbyist sellers and nascent entrepreneurs could enrich the understanding of early stages of the entrepreneurship process.

Concluding, the findings presented in this chapter stimulate research on the quantification of the effects of prices on consumer innovations adoption. Differing price levels for similar quality may for example lead price-quality inferences astray – a possibly detrimental impact of low prices on consumer innovations' diffusion. More general limitations and further research avenues are discussed in Chapter 7, where all contents of this dissertation are integrated. This will also allow additional insights on customers' perceptions of the set prices, for example, whether consumer innovators' pricing-decisions are beneficial for adoption or whether they should change their approach to pricing. Therefore, in the following empirical study, closer attention is paid to the demand side of commercialized consumer innovation. This aims at an understanding of how customers react and form purchasing decisions when facing the prices consumer innovators have set as described in this study.

6 Study II: Price Perception of Consumer Innovation

The previous empirical study widened the knowledge on how consumer innovators set prices. In order to understand how consumer innovation commercialization affects markets, it is also relevant to understand how customers react to these prices. The price has unquestionable importance in customers' product evaluation and subsequent purchasing decisions (Ingenbleek et al., 2010; Hinterhuber, 2015). It is thus a key factor in product adoption. With more and more online marketplaces being characterized by a mix of firm and consumer sellers with differing pricing practices, the question arises whether also customers' price evaluation varies systematically between these vendor groups. With regards to innovation adoption, it is particularly relevant to understand whether the prices consumer innovators set align well with customers' price expectations and perceptions. Coherently, this study investigates whether and in which way customers perceive product prices differently depending on which innovator type (consumer innovator vs. firm) charges them.

6.1 Introduction

The viability of consumers as source of innovation was repeatedly explained (von Hippel, 2005; Harhoff and Lakhani, 2016; Gambardella et al., 2017; Gault, 2018). Early scholarly research focused on contributing evidence regarding the development and generation of consumer innovations (von Hippel, 2005, 2017; Bogers et al., 2010; Roszkowska-Menkes, 2017). Less research was conducted on the commercialization of consumer innovations (Agarwal and Shah, 2014; de Jong et al., 2015). Stimulated by work on user entrepreneurship (Shah and Tripsas, 2007, 2012), more recent studies began investigating how entrepreneurial consumer innovators behave in pursuing market exploitation (Fauchart and Gruber, 2011; Agarwal and Shah, 2014; Oo et al., 2018). The growing research interest mimics the increasing visibility of commercialization activities by consumer innovators. In the pre-internet era, commercially motivated consumers had to engage in technology licensing, or they had to start an own business to exploit their innovations as user entrepreneurs (Baldwin et al., 2006, p. 20; Shah and Tripsas, 2007). Online marketplaces for digital and physical goods largely removed such barriers toward commercialization (Kuznetsov and Paulos, 2010; Wolf and McQuitty, 2011). Well-known platforms such as Steam, Etsy or Amazon Handmade now host large crowds of consumer innovators who offer their products for sale alongside professional firms (Haefliger et al., 2010; Church and Oakley, 2018; Lin et al., 2019). This poses the question how these offers are perceived.

The central element introduced by commercialization is the price. Price evaluation is a cognitive process by which buyers try to infer a price justification based the information they have about an offer (Broniarczyk and Alba, 1994; Rao, 2005). Lacking exhaustive

product information, buyers are inclined to use external cues to infer information about a product and to judge whether the product price is appropriate. Exemplary cues that were shown to influence price evaluations are, e.g., brand names (Rao and Monroe, 1989; Erdem et al., 2008), store types (Thaler, 1985; Bolton et al., 2003), or the country of origin (Diamantopoulos and Zeugner-Roth, 2010; Koschate-Fischer et al., 2012). In this research, the type of developer is proposed as another cue that buyers may use to infer information from and use in the evaluation of prices. Empirical studies on the evaluation of non-commercial products repeatedly confirmed the relevance of a stated innovation source (Fuchs et al., 2013; Dahl et al., 2015). For example, Schreier et al. (2012) found that presenting a product with the label "user-design" (versus firm-design) positively affects product attractiveness.

This study extends the line of research on stated innovation source effects by focusing on price evaluations. The predictions of possible influences of the consumer innovator cue and prices base on behavioral pricing research, particularly reference price theory (Rajendran and Tellis, 1994; Mazumdar et al., 2005). As introduced in Chapter 2.3.3, reference prices are formed in buyers' minds as benchmarks to judge new price stimuli against. The importance of reference prices for price judgements and product choice is well accepted (Winer, 1986; Kalyanaram and Winer, 1995; Baucells and Hwang, 2017). Studies in behavioral pricing primarily investigated the formation of reference prices and explored the effects of gaps between reference and focal prices on price judgements and buying decisions (Urbany et al., 1988; Gavious and Lowengart, 2012; Kopalle et al., 2012).

It is posited that the stated developer type (consumer vs. firm) affects both, buyers' formation of reference prices and how buyers react to deviations from the reference. The developed propositions build on the fundamental assumption that information on an innovation's origin elicits specific beliefs about the developer group (Broniarczyk and Alba, 1994; Campbell, 2007; Kim et al., 2014). The beliefs concerning consumer innovation refer to the motivations and commercialization objectives that they pursue. It is proposed that labeling a product as consumer innovation elicits convictions that customers hold regarding consumer innovators' motivations and market-related objectives. Buyers are then expected to combine such beliefs with other available cues to judge whether a given purchase price is appropriate and fair (Tellis and Gaeth, 1990; Grewal and Compeau, 2007). If they come to a positive conclusion, they should be more inclined to adopt the product.

Regarding the reference price formation, this study's key prediction is that buyers form lower reference price ranges for products developed by consumer innovators than for similar products from firms. Furthermore, it is hypothesized that prices deviating from this reference have a less accentuated (negative) effect on price judgements of user-generated products than on price evaluations of firm-developed offers (Monroe, 1971;

Han et al., 2001; Ofir, 2004). Consequently, the buyers' reaction on gaps between the focal and the reference price is expected to affect purchasing decisions less strongly if consumer innovators offer a product.

To test these assumptions, a mixed methods approach is employed (Creswell, 2009; Castro et al., 2010). The main study is a large-scale quantitative analysis of computer games published on the video game marketplace "Steam", using a new sample of 2340 matched pairs of computer games, half of them labelled as being consumer innovated, the other not. The goal is to identify whether customers form systematically different reference prices for consumer and firm products and to test how price deviations from the reference price relate to adoption. Because field observations can only observe, but not capture the buyers' mental inferences that prompt price reactions, the market data study is complemented with factorial surveys. These complementary studies add qualitative and quantitative insights by investigating buyers' inferences on a consumer innovator label in more detail.

Together, this study's empirical insights validate the proposed difference in the reference price formation: The reference price range is lower for products developed by consumer innovators than firm-generated products. Furthermore, the results provide solid support for different reactions to prices above and below the reference prices: Price gaps have less negative effect on consumer innovation sales than on firm sales. The analyses also corroborate the proposed theoretical account, according to which these observed differences relate to inferences that buyers make regarding fairness inducing factors. Primarily, that consumer innovators do not try to take advantage of customers to maximize their profits.

This study adds insights to consumer innovation commercialization research (von Hippel, 2005, 2017; Raasch and von Hippel, 2013b; Stock et al., 2015). The understanding of how potential buyers evaluate consumer innovations is broadened by introducing the price as an important product variable (Schreier et al., 2012; Fuchs et al., 2013). The study further contributes to the research on behavioral pricing (Woodside, 2015; Bolton, 2018). It proves the presence of in inverse U-shaped relationship of price and demand in information rich marketplaces, where customers have credible product reviews available. The findings also show that it is appropriate to consider the source of innovation as an additional external cue that affects reference price formation and the assessment of market price attractiveness.

6.2 Behavioral side of prices

In prescriptive economic models of customer behavior, customers are considered as well-informed and rational decision makers, striving to maximize the "value for money" (Hogarth and Reder, 1987; Thaler, 2000; Case et al., 2012). A growing body of research

tackled this by demonstrating empirical deviations of customer behavior from theoretical predictions. First dismissed as anomalies, these results stimulated the establishment of behavioral pricing as a complementary research field that was introduced in Chapter 2.3.

Not only the processing, also the availability of information disagrees with economic theories of transparent markets (Broniarczyk and Alba, 1994; Lindsey-Mullikin and Grewal, 2006; Petrescu, 2011). Today, it is widely accepted that customers often have no choice but to make a purchase decision based on incomplete information. This prevents them from making surplus-maximizing decisions. Customers have particular difficulties with estimating a product's expectable benefit. Such estimations require information on all relevant aspects of focal goods, including intrinsic and experience attributes, which are difficult to evaluate pre-purchase (Zeithaml, 1988; Kim and Krishnan, 2015). Value assessments are further complicated when customers are not fully aware of their preferences. This renders an evaluation of the extent to which a good can help to accomplish favorable ends difficult (Huffman and Kahn, 1998). Not being able to assess the value of market offers implies that it is impossible to estimate the obtainable customer surplus before a purchase.

Customers react to this limitation in two ways: First, they use reference prices. Research dedicated considerable effort to investigate how these reference prices are established, which was covered in Chapter 2.3.3 (Nasiry and Popescu, 2011; Krishnan et al., 2013; Baucells and Hwang, 2017). Consecutive work inquired the assumption of uniform reference price formation by investigating how situational variables (e.g., time pressure, type of store), the type of product being purchased (e.g., purchase frequency, involvement), and customer characteristics (e.g., price sensitivity, brand loyalty, self-construal) influence these cognitive processes (Rajendran and Tellis, 1994; Mazumdar et al., 2005; Kopalle et al., 2012). This chapter builds up on these investigations by proposing a products' source of development as another factor influencing the formation of reference prices and the evaluation of actual product prices against it.

Second, incomplete information on a goods' value seems to prompt customers to infer value by interpreting available cues (Grewal and Compeau, 2007). For example, customers use brands or characteristics of the vendors as indicators for the value that they may obtain (Diamantopoulos and Zeugner-Roth, 2010). Another intensively investigated marketplace cue is the price itself (Tellis and Gaeth, 1990). As introduced in Chapter 2.3.2, customers interpret prices not only as the monetary sacrifice to obtain a good, but also as an indicator of a good's potential benefit (Rao and Monroe, 1989; Erdem et al., 2008; Völckner, 2008). Like the research on reference prices, also literature on price-quality inferences identified several variables that influence how readily and strongly buyers use price as a quality cue (e.g., product category, availability of other cues, familiarity of buyers with product category; Völckner and Hofmann, 2007). This

study posits that whether a product originates from a consumer innovator or a firm may be an additional moderator of this relationship.

Another customer concern in price evaluation is price fairness. Buyers do not exclusively account for their own absolute surplus when responding to prices, they also consider how the surplus is distributed across buyer and vendor (Bolton and Lemon, 1999). The perception of price unfairness is particularly strong for price increases or prices above the reference price range (Mazumdar et al., 2005). According to the principle of "dual entitlement" buyers perceive (increased) prices as unfair if they infer that vendors realize profits to the disadvantage of customers. Conversely, buyers perceive fairness if they assume that a high price is justified by costs. A more detailed introduction to price fairness was provided in Chapter 2.3.4.

This inference on the vendors' profits is enriched by assumptions about the intentions for charging a certain price (Kahneman et al., 1986a; Campbell, 1999). Customers perceive some attributed motives as negative and greedy (e.g., using top brand reputation to enforce high prices), which directly raises feelings of price unfairness (Kahneman et al., 1986b; Bolton et al., 2003). Whether a product has been developed by consumer innovators or firms can be expected to influence the motives that buyers infer. In this chapter, it is proposed that the source of innovation may limit inferences of some motives and stimulate the attribution of others.

6.3 Hypotheses development

This part of the work fuses behavioral pricing research with consumer innovation research. A behavioral pricing lens is adopted to propose how perceptions and responses to prices may differ between firm-generated products and products originating from consumer innovators. The three predominant frameworks adopted in this study are the concepts of reference prices, price-quality-inferences and price fairness.

6.3.1 Relationship between prices and demand

Behavioral pricing research commonly assumes a demand function that favors prices reasonably close to customers' reference prices. The aggregated demand function begins with an upward-sloping segment until reaching a reference price range. For prices exceeding price expectancy the curve shifts to a downward-sloping segment. In total, the price is expected to have an inverted U-shaped relationship with demand. This was introduced in Chapter 2.3.

Behavioral theory explains the upward-sloping area of the demand curve with prices' informational component. Lower (higher) prices indicate lower (higher) quality and thus lower (higher) value. When prices are low, quality conscious customers believe products

offer inferior quality and suitability to meet their requirements (Dodds et al., 1991; Ding et al., 2010). After all, customers equal low prices with low production costs and may remember unsatisfactory experiences with low-priced goods they purchased in the past (Pechmann and Ratneshwar, 1992; Kirmani and Rao, 2000). Rising prices mitigate customers' quality doubts and come with a positive demand response if prices remain within expectable ranges.

This study posits this relationship to be particularly likely for hedonic products. Quality and value are not easily observable for this product type. Hedonic goods are low in search qualities or extrinsic attributes and high in experience attributes or intrinsic qualities (Babin et al., 1994; Alba and Williams, 2013). The latter type of product parameters is, by definition, more difficult to evaluate before purchase (Milgrom and Roberts, 1986; Alba and Williams, 2013). Buyers are likely to perceive a higher risk of incorrect evaluations and thus show a stronger inclination to use the price as a surrogate for product quality (Shapiro, 1973; Tellis and Gaeth, 1990). In a similar vein, a demand curve with an upward-slope for relatively low prices is more likely to exist for product categories characterized by higher product complexity and variation between alternatives (Kardes et al., 2004a; Cronley et al., 2005). In product categories involving a greater attribute set and more heterogenous product alternatives, prior purchase and usage experience is less informative for the next buying decision. In consequence, even customers with a purchase track record tend to associate price and quality in this case (Zeithaml, 1988; Tellis and Gaeth, 1990).

When discussing the contingencies for the price-perceived quality link, one could argue that using prices to infer quality and value should have become less relevant after most products are now rated and reviewed on the internet. However, customers process multiple quality cues simultaneously when trying to infer unobservable product quality (Erdem et al., 2008; Akdeniz et al., 2013). The availability of quality ratings does not imply that customers ignore other cues, such as the price. Results of studies that explore the interplay of multiple product cues suggest that the price remains an important indicator of quality. Customers still associate higher (lower) prices with higher (lower) quality even if they have access to customer ratings or third-party evaluations from credible sources (Rao and Monroe, 1989; Akdeniz et al., 2013).

In addition, while ratings undoubtedly reduce quality uncertainty, buyers may remain unsure about the benefits that products will generate for them personally. This is again particularly true for hedonic products. Next to search attributes (e.g., technical parameters such as performance or features), subjective attributes (e.g., aspects related with use experience, appearance and emotional effects), that are of high importance for hedonic goods, are of relevance in ratings (de Langhe et al., 2016). The evaluation of the latter attributes is not necessarily uniform. Their perception can widely differ in a customer population (Sun, 2011). Whether customers interpret prices as a quality cue

also depends on the motivation and time to process product information (Suri and Monroe, 2003). This leaves room for other information cues next to product ratings. All in all, the upward slope of the demand function is proposed to remain observable for hedonic products despite the availability of extensive online ratings.

The downward-sloping demand curve area requires less discussion, as it is in alignment with fundamental microeconomic literature (Marshall, 1988; Case et al., 2012). It postulates that customers try to maximize their customer surplus by allocating their limited budget across purchases. All other things being equal, higher prices imply a lower customer surplus. This is particularly true if customers are convinced that in a product category even the highest quality product cannot provide more than a certain maximum benefit (Ding et al., 2010). For example, price conscious customers value travel as mean of reaching a destination. They reach the maximum perceived benefit by receiving passable transportation. For them, the marginal utility of, e.g., upgrades is steeply decreasing. In their philosophy, all travelers, whether economy or business class, reach their destination at the same time and this is what traveling is about.

Behavioral pricing adds two additional explanations for the downward-sloping demand curve for notably higher prices (Popescu and Wu, 2007; Nasiry and Popescu, 2011). First, if a product price exceeds the reference price range, customers start to reason about the gap. Empirical evidence strongly suggests that the discrepancy is usually perceived as a loss, irrespective of the benefit a product contributes. Buyers associate the gap with a low transaction utility, causing lower purchase probability. In alignment with prospect theory, buyers react even more negatively to these losses than they react positively to perceived gains, i.e., prices below the reference price range (Tversky and Kahneman, 1992; Nasiry and Popescu, 2011).

Second, perceived price unfairness provides another substantial psychological explanation for the negative response to higher prices. As explained before, buyers speculate about the reasons for high prices and price increases and regularly conclude that they are not justified by increased costs but rather profit interests (Campbell, 1999). For notably high prices, potential buyers are more likely to perceive an unfair distribution of surplus among the vendor and the buyer and may infer exploitative motivations on the vendors' side. For a depiction, see Figure 6. Summing up this proposition results in the first hypothesis:

H1: The price of hedonic products in information rich markets has an inverted U-shaped relationship with demand.
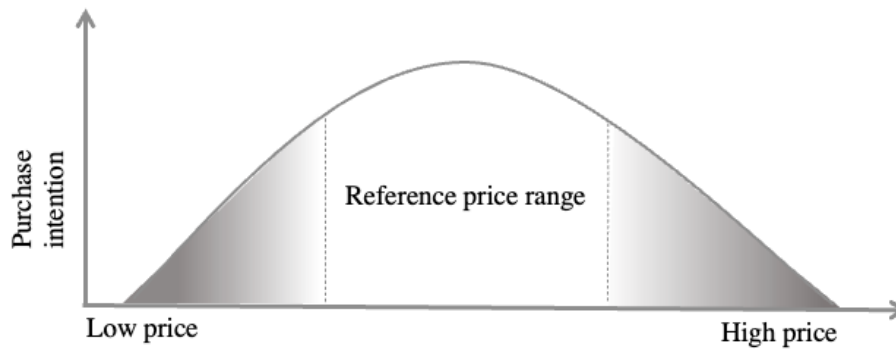
Figure 6: *Inverted U-shaped price-demand curve (Source: Own depiction)*

6.3.2 Innovation source as moderator: Price reference level

Theory commonly conceptualizes reference prices as an internal price expectation that customers develop based on prior purchasing experiences and the current buying context (Mazumdar et al., 2005; see Xia et al. 2004 and Bolton and Lemon, 1999 for other conceptualizations). Expectation-based reference prices result from the price memory that is shaped by all product quality and price information that customers have been exposed prior to the purchase (Baucells et al., 2011). This memory includes first-hand experiences of own purchases and captures the secondary information that buyers have collected (sub-) consciously about choices in the product category (Cunha and Shulman, 2011).

Among others, the formation of reference prices is moderated by the product category, customer characteristics and factors of the purchase context (Mazumdar et al., 2005; Moon et al., 2006; Koschate-Fischer and Wüllner, 2017). Here, it is posited that buyers build different reference prices for firm-generated products than for products of consumer innovator origin. Precisely, this study expects consumer innovation reference prices to be lower than those of firms, suggesting a shift of the price-demand curve turning point towards lower prices. This is depicted in Figure 7.
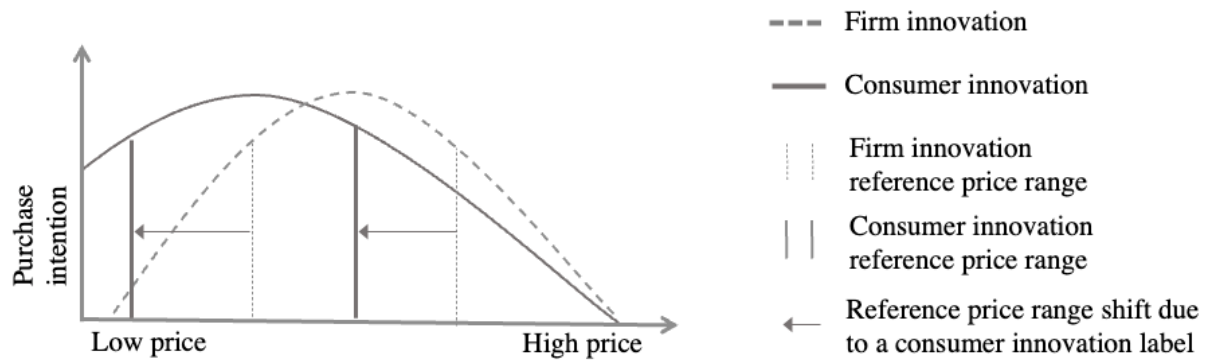
Figure 7: *Price-demand curve shift for consumer innovation (Source: Own depiction)*

A precondition for this formation of different reference prices is that buyers have information on the type of vendor. They need to be able to categorize products they encounter as either firm or consumer generated. Retailers and platforms increasingly support this by promoting information about consumers as the originators of new products (Jeppesen and Molin, 2003; Lettl, 2007; Fuchs et al., 2013; Dahl et al., 2015). Prominently, several marketplaces that actively seek for consumer innovation use the "consumer-designed" label as a core value proposition of their platform. For example, the 3D print design marketplace "Thingiverse" advertises: "Check out all the incredible objects people have created and get inspired to make your own!"[2]. "Amazon Handmade" invites customer to purchase "[…] products handcrafted by Makers and Artisans"[3]. As described in Chapter 4.3, in the computer game industry consumer innovators became particularly popular amongst customers as "indie developers".

Here, reference prices formed about consumer innovator products are proposed to be lower than reference prices for firm products. Buyers may develop lower internal reference prices for consumer innovation, because they experienced that they are often offered at lower prices than firms' products. That users and consumers tend to undercut the price points of firms was indicated in theory and empirically confirmed in Chapter 5 (Baldwin et al., 2006; Bogers et al., 2010; von Hippel, 2017). Even more, consumer innovators frequently opt to freely reveal their innovation, even though their quality and value justify asking prices higher than zero (de Jong et al., 2015; von Hippel, 2017). Consequently, buyers should form a relatively lower price expectation based on their memorized information.

---

[2] https://www.thingiverse.com/about
[3] https://www.amazon.com/handmade

Therefore, it is proposed that:

H2: Consumer innovation reference prices are lower than reference prices for similar firm-generated products.

6.3.3 Innovation source as moderator: Responses to low and high prices

A purchase price within the reference price range matches the price expectations of buyers, draws little attention and is judged as normal and acceptable (Urbany et al., 1988; Kalyanaram and Little, 1994; Linzmajer et al., 2011). In contrast, leaving the distribution of normal and acceptable prices evokes more intensive cognitive processing. Following the proposition in H1, the outcomes of a price evoked cognitive process are mostly associated with a negative purchasing response. This chapter proposes that these reactions are less accentuated for consumer innovations than for firm products. Such a moderation should hold true for the upward-sloping low-price area and the downward-sloping high-price area of the price-demand curve, leading to a flattened price-demand curve as depicted in Figure 8.
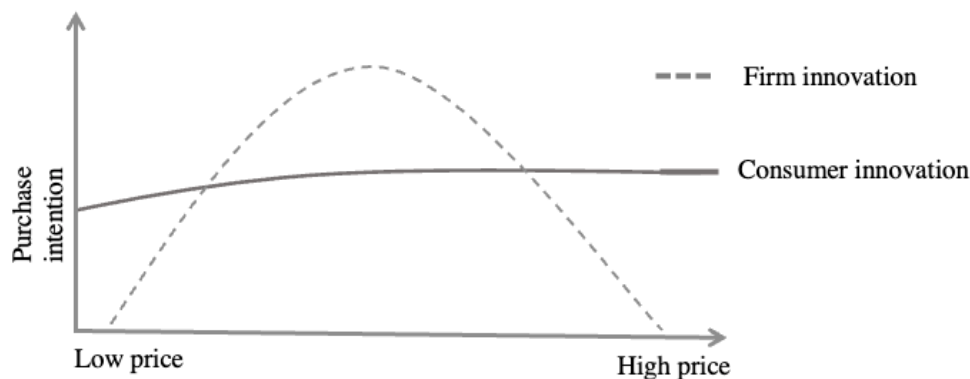
Figure 8: *Flattened price-demand curve for consumer innovation (Source: Own depiction)*

Regarding the upward-sloping area at relatively low prices, it was explained that undercutting the acceptable price range activates doubts, particularly about quality (Rao and Monroe, 1989; Völckner and Hofmann, 2007; Koschate-Fischer and Wüllner, 2017). These negative effects of price-quality inferences can be expected to be less severe for consumer innovations than for firm-developed products for various reasons. The reference price for consumer innovation is lower than price expectation for firm

products and even reaches free diffusion. This makes it likely that even comparatively low-priced consumer innovations differ little from a price range considered as normal. Regarding Weber's law, comparatively small stimuli should not trigger reactions (Grewal and Marmorstein, 1994). In addition to the lesser absolute discrepancy, differences in low price areas weigh psychologically less severe. Adding further strength to the argument, prospect theory suggests that the same deviation will be perceived as less intense when it is favorable for the rater, i.e., lower for the buyer, as compared to when they are unfavorable (Tversky and Kahneman, 1981, 1992).

Also, even if customers ponder on the low price of a consumer-developed product, there are fewer reasons to conclude poor quality. Knowing that a product has been developed by consumers may activate a set of stored beliefs that serve as alternate explanations for the low price. Most importantly, customers with a minimum attention for the amateur and hobbyist innovation phenomenon are likely to see consumer innovators as individuals who are primarily motivated by self-rewards rather than by financial return (Stahlbrost and Kareborn, 2011; Halbinger, 2018). Buyers may understand that consumer innovators charge lower prices because they can benefit for their innovations without having to capture the highest monetary profit possible (Shah and Tripsas, 2007; Gambardella et al., 2017). Similarly, buyers may acknowledge that consumer innovators are interested in a broad diffusion of their innovations and understand that charging low prices is instrumental for achieving this goal (von Hippel, 2017). In other words, unlike for firms, low prices do not necessarily coincide with the inference of low development effort and poor product quality. Customers may rather trace them back to the low profit orientation of consumer innovators.

Buyers may also activate beliefs regarding consumers' innovation-related costs. Most consumer innovators do not command large development budgets and are not in possession of abundant resources (von Hippel, 2005; Hienerth et al., 2014b; Lüthje and Stockstrom, 2016). It seems self-evident that they need to stay in low-cost corridors by employing efficiency and creativity in the innovation process. In the same vein, buyers may understand that consumers do not need cash inflows to compensate their innovation effort in order to ensure financial solvency. Their development costs are primarily opportunity costs of time and do not entail payouts. If buyers share this understanding of consumer innovation costs, they may not automatically interpret a low product price as an indicator of low development effort.

Turning to the upward-sloping side of the demand curve, this study proposes that also the response to prices above the reference price range is less negative for consumer-generated than for firm-generated products. When buyers face prices exceeding their internal price anchor, they evaluate that price's vindication (Bolton et al., 2003). The concepts of dual entitlement, distributive justice, and equity theory suggest that high prices tend to be perceived as fair if buyers think high costs cause a price (Kahneman et

al., 1986a; Bolton et al., 2003; Jung et al., 2020). In contrast, if buyers assume that sellers volitionally take advantage of buyers to increase their profits, perceptions of unfairness are likely. Buyers usually do not have valid information on costs and profit ranges. In such ambiguous situations, they have been shown to rely on their general knowledge or beliefs about the seller and the seller's practices to arrive at judgments of price fairness (Xia et al., 2004). Research on firm vendors suggests that their customers have a strong inclination to perceive high selling prices as unfair. Many customers have poor cost appreciation and share a general skepticism regarding firm prices. They seem to believe that firms drive their pricing mainly with profit interests (Campbell, 1999; Bolton et al., 2003). Faced with high or rising firm prices, customers are suspicious about vendor gouging, particularly if they do not entail a relationship with the seller (Halpern, 1994; Xia et al., 2004).

The negative perceptions of prices above the reference price are likely less severe for products originating from consumer innovators. When confronted with excessive consumer innovation prices, beliefs regarding consumer innovators can be recalled as an explanation. The buyers may share the understanding that intrinsic and social motivations are the primary drivers of consumer innovation (Raasch and von Hippel, 2013a; Hienerth et al., 2014b). They should associate this with the belief that consumer innovators do not prioritize profit maximization when they set prices. As a result, high prices are more likely to be attributed to extraordinary innovation efforts of the consumers, which elicits more favorable perceptions of fairness, less negative affections, and finally, less severe negative buying responses.

Further, it seems reasonable to believe that consumer innovators have a better reputation than firms and that this positively affects the evaluation and reaction to relatively high prices (Campbell, 1999). Some buyers may even connect emotionally and identify with consumer innovators (Burger-Helmchen and Cohendet, 2011). After all, consumer innovators are also users and buyers. People encountering consumer-generated products may feel that the originators belong to the same broader social category and activate identity-driven attributions. Dahl et al. (2015) found that consumers prefer products developed in user-driven rather than normal designer-driven firms and could demonstrate that this preference is explainable by the activation of a user identity. Concluding, it is posited that identity-related attributions also affect the evaluation of product prices and, by this, the purchase behavior of buyers.

H3: The stated source of innovation moderates the inverted U-shaped relationship between product prices and demand in such a way that the curve will be flatter for consumer innovator products than for firm-generated products.

6.4 Method

Like in the first study of this dissertation, a sequential mixed methods approach is employed to investigate customers price responses to consumer-generated and firm-based innovations (Creswell, 2009; Castro et al., 2010). First, the relationship between product prices and demand is examined with market data (Tellis, 1988; Bijmolt et al., 2005). This quantitative analysis allows testing the theoretical predictions based on real market observations. Second, to isolate and validate the explanations underpinning the hypotheses, two scenario-based online experiments were conducted. In factorial surveys, respondents evaluated presentations of products varying in their prices and regarding the stated developing party (consumer innovator versus professional). Furthermore, respondents' free associations regarding commercialized consumer innovations were collected and analyzed.

6.4.1 Quantitative dataset

Being one of the industries where consumer innovation gained exceptional popularity among customers, the video game industry was again chosen as the empirical field (Prügl and Schreier, 2006; Burger-Helmchen, 2008; Haefliger et al., 2010; Parmentier and Gandia, 2013; Koch and Bierbamer, 2016; Lee et al., 2020). "Indie" games are well represented and popular in video game online marketplaces (Crogan, 2018; Dreunen, 2020). The database presented in Study 1, containing all 11,986 games sold for a price and not offering in-game purchases on Steam, was again tapped as data source.

Before a change in privacy policy, Steam listed all the games that the users had played on the public customer profiles. This allowed the estimation of game adoption, which is necessary for this study. The player count was extracted from the third-party database SteamSpy for each of the sampled games. 847 games that were at least once discounted to be free of charge were removed from the sample. Zero price effects can create an irrational surge in demand and distort the adoption counts (Shampanier et al., 2007; Niemand et al., 2019). In order to avoid the use of "indie" as a term for simple novelty or deviance, 285 games that were solely categorized as "indie", without any other category assigned, were excluded. Descriptive statistics are presented in Table 15 and a correlation matrix is provided in Table 16.

Table 15: *Descriptive statistics*

	Mean	SD	Min	Max
Adopters	113705.96	749645.26	745	37790201
Price (mean)	853.75	622.97	69.95	5219.00
Game size (MB)	2975.28	4589.7	10.00	100000.00
Game rating	73.77	19.89	3.00	100.00
Playtime	3.79	9.96	0.02	436.73
Similar games	76.70	197.34	0.00	3222.00
Nth game	2.84	4.15	1.00	39.00
Languages	3.63	3.89	1.00	27.00
Screenshots	10.48	6.03	2.00	72.00
Discount mean %	5218	18.16	10.00	90.15
Days disc (%)	0.12	0.07	0.00	0.96
Cent per MB	2.12	5.09	0.00	99.90

Table 16: *Correlation matrix*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Adopters											
(2) Price (mean)	0.07*										
(3) Game size (MB)	0.15*	0.44*									
(4) Game rating	0.08*	0.16*	-0.01								
(5) Playtime	0.13*	0.11*	0.03*	0.05*							
(6) Similar games	-0.05*	-0.15*	-0.07*	-0.06*	0.01						
(7) Nth game	0.10*	0.08*	0.01	0.07*	0.05*	0.04*					
(8) Languages	0.19*	0.15*	0.17*	0.08*	0.04*	-0.08*	0.04*				
(9) Screenshots	0.07*	0.20*	0.19*	-0.02	0.02	-0.11*	-0.01	0.04*			
(10) Discount mean %	0.08*	-0.29*	-0.08*	-0.20*	-0.06*	-0.07*	0.07*	0.07*	0.02		
(11) Days disc (%)	0.01	-0.01	0.05*	-0.04*	0.01	-0.02	0.07*	0.10*	0.07*	0.20*	
(12) Cent per MB	-0.03*	-0.06*	-0.22*	0.06*	0.02	0.02	0.05*	-0.07*	-0.06*	-0.03	-0.03*

*Notes: * significant at $p < .05$*

The 10,854 games that remained after filtering were then segregated into the two groups of games sold as "indie" games and "regular" games offered by computer game firms: 7,334 belonged to the group of indie games and 3,520 fell into the other category. As the games were not randomly assigned to the two different groups (indie games versus regular firm games) an imbalanced distribution of observable variables that may lead to biased estimates cannot be excluded.

To make sure that the groups of indie and firm games are comparable, a nearest neighbor propensity score matching was applied to build a matched-pair sample (Rubin, 1979). The key attributes of the games that customers are likely to use in their product evaluations were chosen as matching factors: the average user ratings, the size of the game, the game genre, how frequently it was on sale and, most importantly, its mean asking price. In the resulting sample of 4,680 games, each game in the first group has a paired game in the second group: the sample consists of 2,340 indie branded and 2,340 non-indie-branded games. Table 17 shows that the games of both groups are now similar in prices, perceived quality, size, discount frequency.

Table 17: *Comparison of game characteristics grouped by developer type*

	Regular firm (n = 2340)		**Consumer innovation** (n = 2340)		**t-test**		
	Mean	*SD*	*Mean*	*SD*	*t*	*df*	*p*
Adopters	163240	1030276	64171.20	240412.24	4.53	2593	<0.001
Price (mean)	857.71	631.66	849.79	614.27	0.43	4674	0.664
Game size (MB)	3059.11	4276.43	2891.45	4881.21	1.25	4599	0.211
Game rating	73.72	19.73	73.82	20.06	-0.17	4677	0.861
Days discounted (%)	0.12	0.07	0.11	0.06	1.40	4663	0.162
Playtime (h)	4.30	12.99	3.28	5.40	3.49	3124	<0.001
Similar games	59.56	165.28	93.84	223.59	-5.96	4308	<0.001
Nth game	3.84	5.30	1.85	2.10	16.91	3057	<0.001
Languages	3.80	3.37	3.47	4.34	2.89	4408	0.004
Screenshots	10.31	6.01	10.66	6.05	-1.99	4678	0.047
Mean discount%	56.63	17.31	47.74	17.91	17.26	4673	<0.001
Cent per MB	1.88	4.55	2.36	5.56	-3.25	4501	0.001

6.4.2 Measurement of variables in the quantitative analysis

Dependent variable: Game demand

The measure of video game demand is based on the customer profiles on Steam that by default listed all Steam games a player had ever played. A third-party platform (SteamSpy) calculated how often each game had been adopted in total by aggregating all players of each game. Because the European data protection law required player profiles to be private by default from April 2018 on, this dataset is one of the last containing this reliable demand estimate,

Independent variable: Game prices and consumer innovation label

As the dependent variable is measured by cumulative game adoption, the average price charged over the lifetime of the games was used as corresponding measure for the independent variable. The price is integrated as quadratic polynomial, allowing to test for the presence of an inverse U-shape effect on demand (Haans et al., 2016).

A dummy variable is employed to flag the games that haven been labeled as "indie games" (consumer innovator games) and those that are regularly marketed as games sold by firms. The type of originator and vendor is predicted to moderate the relationship between prices and demand. The regular, unlabeled group of games serves as reference level.

Control variables

A series of relevant control variables is employed to account for other influences on the demand for a game. First, all game level variables that were used to build the matched pairs of games (user rating, game size, game genre and days on discount) were included. The median time players spent in the game as well as the price per MB was added. To account for activities of the game vendors that may influence the perceived attractiveness of a game the number of available languages and the number of screenshots provided in the game description were included as proxies for the vendors' marketing effort and professionalism. In a similar vein, the number of games that the vendors had released prior to the focal game was added as an indicator of their experience and reputation in the market. Finally, to account for the market context of each game, a variable capturing the level of direct product competition was integrated. By comparing the tags of the focal game with the tags of all other games previously released on the platform, the number of similar games that may be perceived as substitutes for the focal game was identified and controlled for.

6.5 Results

Since the dependent variable is count data, a Poisson quasi maximum likelihood model is fitted. The quasi estimation was chosen because it allows for overdispersion in the data. Regarding conditional specifications, the Poisson quasi maximum likelihood analysis provides consistency under weaker assumptions than comparable count data specifications, such as regular Poisson or negative binomial regression (Cameron and Trivedi, 1998; Ver Hoef and Boveng, 2007; Ebersberger and Kuckertz, 2021).

The relatively low correlations between the independent model variables displayed in Table 16 and the small nonstructural variance inflation factor ($GVIF^{1/(2df)} < 1.5$) suggest that collinearity is no concern. For two observations, the Cook's distance reaches values larger than one. Since a visual control did not provide indications for measurement errors, the potential outliers were kept in the main analysis that is displayed in Table 18. Alongside the robustness checks, Table 19 documents that the results remain stable when removing the potential outliers. The total model's pseudo R2 indicates a good model fit (Kullback-Leibler's pseudo R2 65.82; Colin Cameron and Windmeijer, 1997). It is important to note that such pseudo R2 values are commonly much higher and not directly comparable with regular R2 values of non-generalized models. To avoid inappropriate interpretations, they must be reported with care (Colin Cameron and Windmeijer, 1997). Hence, they are not displayed in the tables.

The results indicate strong support for Hypothesis 1, which proposes an inverted U-shape relationship between the product price and demand. Adding the price squared to the model contributes significant explanatory power (difference between model 2 and 3; F = 9.13, p < .01) and the squared coefficient is negative in all models. In the full model 4, the main effect of price is positive and significant (b = 28.60; p < 0.001) and the second order polynomial of the price is negative and significant (b = -12.99; p < 0.001), describing the proposed inverse U-shaped demand response to prices.

Also the moderating effect of the innovation source on reference prices is supported (Hypothesis 2). Adding the source of innovation as main and moderating effect substantially improves the model fit (difference between model 3 and 4; F = 7.07, p < .001). In the full model 4, a significant negative interaction term between the source of innovation and product price (b = -18.73, p < .001) indicates that the turning point of the U-shaped demand curve for indie games is shifted to lower price levels (Haans et al., 2016). Customers' reference price is lower when evaluating indie games than when assessing games created by professionals.

The significance of the positive interaction term between the source of innovation and the price squared provides support for Hypothesis 3. In line with the expectations, the existence of the indie label flattens the U-shaped relationship between price and demand

(b = 18.23, p < .001). Conversely, firm-generated games have a steeper relationship between price and demand. Notably, the results suggest that indie games do not only experience less detrimental effects of prices above the reference price range but may even experience a slightly positive relationship. In total, the parabolic demand curve for computer games is confirmed. The curves position and shape are significantly moderated by labelling a product as indie game.

A series of robustness checks were conducted to assess the findings' stability. They are reported in Table 19. First, the two potential outlier observations were removed. The results remained consistent. In order to test the stability of H1, a cubic polynomial of the price was added into the equation to allow more flexibility in the curve. The cube of the price is not statistically significant (b = -3.01; p = .35), and the model fit was not notably improved by its inclusion (F=1.03, p = .31). This indicates that the inverted U-shaped relationship fits the data better than other specifications.

Next, alternative measurements of the price variable were employed. When using the maximum price that had been charged over the lifetime of a game (instead of the average observed price) effects remained stable. The same applies when using a time-weighted price average as dependent variable. Here, each observed price-level over the lifetime of the game was multiplied with the days that the given price was charged, and this divided by the total number of days that the game had been on the market.

As traditional robustness check, the data is further analyzed using a negative binomial model (Ver Hoef and Boveng, 2007). The results remain consistent. They are also unchanged when only those video games were integrated that are priced up to two standard deviations higher or lower than the maximum of the demand curve for firm games (i.e., the reference price for firm games), ruling out potential effects that extreme price levels may have on the demand. Finally, the analysis was repeated using the entire unmatched sample of games. The results are the same as in the matched pair sample.

Table 18: *Results of log-linked quasi-Poisson count data regression*

	Dependent variable: Number of adopters			
	(1)	**(2)**	**(3)**	**(4)**
(Intercept)	7.22 (0.42)***	7.38 (0.43)***	7.41 (0.44)***	7.47 (0.41)***
Price (mean in US Cents)		18.46 (2.71)***	21.73 (3.09)***	28.60 (3.57)***
Price (mean) ^ 2			-6.94 (2.65)**	-12.99 (3.35)***
Price (mean) x CI				-18.73 (5.22)***
Price (mean) ^ 2 x CI				18.23 (5.28)***
Consumer innovator (CI)				0.31 (0.10)**
Game size (MB)	0.00 (0.00)***	0.00 (0.00)***	0.00 (0.00)***	0.00 (0.00)***
Game rating	0.04 (0.00)***	0.04 (0.00)***	0.04 (0.00)***	0.03 (0.00)***
Languages	0.11 (0.01)***	0.12 (0.01)***	0.11 (0.01)***	0.11 (0.01)***
Screenshots	0.02 (0.00)***	0.01 (0.00)***	0.01 (0.00)**	0.01 (0.00)**
Playtime (h)	0.01 (0.00)***	0.01 (0.00)***	0.01 (0.00)***	0.01 (0.00)***
Action adventure	0.28 (0.08)***	0.30 (0.08)***	0.32 (0.09)***	0.30 (0.08)***
Adventure	0.14 (0.34)	0.19 (0.35)	0.20 (0.35)	0.16 (0.33)
Puzzle casual	-1.03 (0.17)***	-0.84 (0.18)***	-0.78 (0.18)***	-0.80 (0.17)***
Release year	y	y	y	y
Nth game	0.04 (0.01)***	0.03 (0.01)***	0.03 (0.01)***	0.03 (0.01)***
Mean discount rate	0.01 (0.00)***	0.01 (0.00)***	0.01 (0.00)***	0.01 (0.00)***
Days discounted (%)	0.81 (0.47)	0.72 (0.50)	0.70 (0.51)	0.75 (0.48)
Cent per MB	-0.03 (0.02)*	-0.03 (0.02)*	-0.03 (0.02)*	-0.04 (0.02)*
Similar games	-0.00 (0.00)*	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)
Deviance decrease		27784140	5458983	12690434
F model fit increase		46.48	9.13	7.07
p model fit increase		<.001	<.01	<.001
Num. obs.	4680	4680	4680	4680

*Notes: ***p < 0.001; **p < 0.01; *p < 0.05*
Release years are integrated as categorical control variables, indicated by 'y'(es) in the table, but not individually reported for reasons of comprehensibility.

Table 19: *Robustness checks of regression models of price on adopter count*

Variation	No outliers	Cubic price	Different price measure	Different price measure	Model change to neg. bin.	Prices within +/- 2 SD of reference	All observations unmatched
Model	Log-linked quasi-Poisson for overdispersed count data				Negative binomial		
Price measure	Mean price	Mean price	Highest price	Weighted price	Mean price	Mean price	Mean price
(Intercept)	7.62 (0.40)***	7.42 (0.43)***	7.57 (0.41)***	7.70 (0.41)***	9.71 (0.11)***	9.44 (0.12)***	10.03 (0.12)***
sigma (Intercept)					12.50 (0.03)***	12.58 (0.03)***	12.53 (0.02)***
Game size (MB)	0.00 (0.00)***	0.00 (0.00)***	0.00 (0.00)***	0.00 (0.00)***	0.00 (0.00)***	0.00 (0.00)***	0.00 (0.00)***
Game rating	0.03 (0.00)***	0.04 (0.00)***	0.04 (0.00)***	0.03 (0.00)***	0.01 (0.00)***	0.01 (0.00)***	0.01 (0.00)***
Languages	0.11 (0.01)***	0.11 (0.01)***	0.11 (0.01)***	0.11 (0.01)***	0.04 (0.00)***	0.05 (0.00)***	0.03 (0.00)***
Screenshots	0.01 (0.00)*	0.01 (0.00)**	0.01 (0.00)***	0.01 (0.00)**	0.01 (0.00)***	0.01 (0.00)***	0.01 (0.00)***
Playtime (h)	0.02 (0.00)***	0.01 (0.00)***	0.02 (0.00)***	0.01 (0.00)***	0.00 (0.00)***	0.00 (0.00)***	0.00 (0.00)***
Consumer innovator (CI)	0.34 (0.10)***	0.34 (0.10)***	0.31 (0.10)**	0.39 (0.10)***	0.11 (0.03)***	0.07 (0.03)*	0.12 (0.02)***
Nth game	0.03 (0.01)***	0.03 (0.01)***	0.04 (0.01)***	0.03 (0.01)***	0.01 (0.00)**	0.01 (0.00)**	0.00 (0.00)**
Mean discount rate	0.01 (0.00)***	0.01 (0.00)***	0.01 (0.00)**	0.01 (0.00)**	0.01 (0.00)***	0.01 (0.00)***	0.01 (0.00)***
Days discounted (%)	0.59 (0.47)	0.66 (0.51)	0.71 (0.48)	1.12 (0.49)*	0.59 (0.17)***	0.39 (0.20)*	0.66 (0.10)***
Cent per MB	-0.03 (0.01)†	-0.03 (0.01)*	-0.04 (0.02)*	-0.04 (0.01)*	-0.01 (0.00)*	-0.01 (0.00)*	-0.00 (0.00)*
Similar games	-0.00 (0.00)*	-0.00 (0.00)	-0.00 (0.00)†	-0.00 (0.00)†	-0.00 (0.00)*	-0.00 (0.00)***	-0.00 (0.00)***
Price (mean)	23.11 (3.60)***	20.53 (3.27)***			8.92 (1.41)***	9.92 (1.36)***	16.99 (1.48)***
Price (mean) ^ 2	-11.28 (3.22)***	-6.40 (2.84)*			-4.06 (1.21)***	-6.33 (1.31)***	-6.57 (1.18)***
Price (mean) ^ 3		-3.01 (3.19)					
Price (mean) x CI	-16.01 (5.10)**				-6.60 (1.87)***	-3.99 (1.85)*	-7.92 (2.18)***
Price (mean) ^ 2 x CI	11.38 (5.48)*				9.67 (1.73)***	7.20 (1.86)***	22.14 (2.11)***
Price (max)			24.78 (3.02)***				
Price (max) ^ 2			-11.63 (1.99)***				
Price (max) x CI			-13.53 (4.82)**				
Price (max) ^ 2 x CI			16.99 (3.26)***				
Price (weighted)				32.53 (3.35)***			
Price (weighted) ^2				-12.26 (2.91)***			
Price (weighted) x CI				-22.70 (5.10)***			
Price (weighted) ^2 x CI				19.27 (4.89)***			
Deviance	7594480944.10	804129544.91	788825077.47	774228099.19			
Nagelkerke R²					0.20	0.25	0.21
Generalized AIC					109507.04	88008.78	225347.32
Num. obs.	4,678	4,680	4,680	4,680	4,680	3,757	9,575

Notes: ***p < 0.001; **p < 0.01; *p < 0.05*

6.6 Complementary empirical evidence

The market data used in the quantitative study did not allow to explore the specific perceptions and beliefs that cause buyers different price responses to products offered by consumer innovators. It thus must be acknowledged that the theoretical accounts can benefit from further validation. To provide convergent additional evidence for the theoretical explanations and corroborate the empirical results from the market data analysis, two vignette-based experiments were conducted. Participants were recruited from the online panel "Prolific.co", which is commonly evaluated as one of the panel service providers of higher quality (Peer et al., 2017). The participants were prescreened to be particularly avid computer gamers (> 5 hours gaming per week), be of US nationality with first language English and have a proven track record of at least 10 prior study submissions with a rejection rate under 5%. Participants that submitted a response to one of the studies were excluded from participation in further studies.

6.6.1 Experiment 1

The first experiment sought to provide further support for the proposition that buyers develop different price expectations for products created by consumers versus firms. This test would provide convergent evidence for H2 if it showed that, in fact, buyers expect consumer-generated games being offered for lower prices than similar products sold by firm vendors.

In this between-subject experiment 64 participants were exposed to a video game product description. The presented game was inspired by an existing open-source game named "0 A.D". It was chosen due to its optimal mix of innovativeness and sophistication. This made the game appear to be equally likely to originate from indie developers or computer game firms. Because of the game's clear nature, it did not require neither extensive expertise nor heavy involvement to understand the products' value proposition and key attributes.

A short text description with the key attributes of the game was complemented by a collage of in-game screenshots. The collage is displayed in Appendix A7. A call to action was integrated to simulate a purchasing situation as closely as possible ("*Recommended (origin) game – Buy now for US$ (price level)*"). Only the stated originator of the game was varied in the textual game description and a banner on the screenshots. The game was labeled either as "indie" or without source information, representing the regular firm source. Keeping the description constant across both conditions ensured that any differences in the responses between the conditions are attributable to the associations with the indie game developer.

The participants (n = 64; M_{age} = 30.11; 37.5% female) were randomly assigned to one of the two conditions (indie game versus firm game). The groups of respondents did not differ in age, education, or video game involvement. When participants in both conditions entered the survey, they were announced the presentation of a soon to be released game. Then, the participants saw the game presentation. Finally, they were asked to estimate the price for which the game would be probably offered: *"Which selling price do you expect for this game?"*.

The results show that, compared with the participants in the firm-generated game conditions, the respondents seeing the indie game vignette expected the selling price to be on average US$6.00 lower ($M_{indie}$ = 19.06; SD_{indie} = 11.32; M_{firm} = 25.06, SD_{firm} = 16.10; unequal variances t(55.62) = -1.73, one-tailed p < .05). The maximum expected price for the indie game was US$50.90 (95% confidence interval lower bound = US$15.20, upper bound = US$23.14) vs. US$60.00 (95% confidence interval lower bound = US$19.24, upper bound = US$30.87) for the game commercialized by a firm.

This finding provides support for a moderating effect of the source of innovation on the demand curve. Hypothesis 2 posited that the prices of products developed by consumer innovators versus firms are evaluated differently because buyers develop distinct internal reference prices for each origin. The result of this experiment confirms this proposition again.

6.6.2 Experiment 2

The second scenario-based experiment addresses the issue of different buying reactions to prices deviating from the reference prices (Hypothesis 3). Since the reference prices for consumer innovations have been found to be significantly lower than for firm-generated products in the main quantitative study and the previous experiment, positive and negative deviations of the consumer innovations' prices from reference prices are not equally likely or strong. The base probability that consumer innovators charge prices that fall significantly below price expectations is necessarily smaller. Even prices that fall below the range of normal and acceptable prices can only have a very small psychological effect as the absolute deviation is little and they are beneficial for the buyer. Consequently, this experiment focuses on the right side of the demand curve and addresses the response of buyers to relatively high prices. It investigates how prices above the reference price range affect potential buyers' evaluations and interpretations. This tests the theoretical explanation as to why customers react less negatively to high prices of consumer-generated products and more severely to notably high prices of firm-developed products. Specifically, the role of perceived price fairness is tested.

Participants recruited from Prolific.co (N = 165; M_{age} = 27.92 years; 31.8% female) took part in this 2x2 between-subject experiment. Again, the description of the computer game "0 A. D." was presented. Six participants were excluded because they did not pass the required attention checks and two participants were removed because they knew the game. In the vignettes, the price (acceptable price versus high price) and the developer of the game (indie developer versus professional) was manipulated.

Participants were randomly assigned to one of the four conditions, thus no significant differences in age (F(1, 155) = 0.195, p = .66), education (χ2(5, N = 157) = 1.42, p = .92) or gender (χ2(1, N = 157) = 0.765, p = .48) were present. The participants indicated playing video games for an average of 18 hours per week, without differences between the groups (F(1, 155) = 0.079, p = .78). 83.4% of the respondents would give the game a try after seeing it. Again, no differences were found between groups (χ2(1, N = 157) = 1.25, p = .37). Finally, 91.7% of the respondents, equal across groups (χ2(1, N = 157) = 1.65, p = .32), stated that they purchase indie games next to regular games.

The game description and the labeling of the two developer groups was the same as in Experiment 1. The two price levels were determined in a pilot survey with 35 participants from Prolific.co. US$4.99 was determined as a price at which most respondents did not perceive the game as too low priced to doubt its quality. This was defined as "acceptable" price point, i.e., a customer favorable normal price at the lower end of the reference price range, satisfying the expectations of many buyers. US$29.99 was determined as the last price before most respondents do not even consider purchasing the given game. This is coined the "high" price.

At the beginning of the survey, the interest in gamers was explained and the participants were asked to indicate how many hours they played games per week. Next, the respondents were asked to take up to 2 ½ minutes to "*Please write an essay about purchasing games developed by (developer type). What are your associations and thoughts when seeing such (developer type) games in the marketplace?*" (Suri and Monroe, 2003). Writing the essay induces minimum thinking about the developer group that participants were assigned to. Compared to an artificial and prescriptive definition, respondents apply their own understanding of indie or firm-generated games. This increases external validity. The essays also grant insights into the respondents' convictions on indie and firm games. This helps to understand whether their beliefs and evaluations are in line with those posited in the theoretical development.

Next, participants were presented the game description. After being exposed to one of the four conditions, respondents were asked to provide answers regarding four constructs. These variables were operationalized using existing measures available in the literature. First, the respondents were asked to indicate their purchase intention (Dodds et al., 1991). A significant interaction effect between the source of innovation

and the price is predicted. Following the reasoning in Hypotheses 3, the difference between purchase intentions of consumer and firm games should become more pronounced for higher prices – to the disadvantage of games sold by firms. Second, participants are asked to estimate how much effort and care the given developer had invested into the creation of the game by using the creative product semantic scale from O'Quin and Besemer (1989). As proposed before, the response differences to high prices may be primarily due to varying perceptions of price fairness. The perception of fairness is more likely to be evoked if the reason for the high price is primarily attributed to high product development effort and cost. Thus, it is expected that this attribution is more prevalent for products originating from consumers.

To address alternative accounts leading to differences in purchase intentions, participants had to indicate the sacrifice that paying the asking price would mean to them (Suri and Monroe, 2003). At last, to exclude that the purchase intentions may be affected primarily by price-quality inferences, participants were asked to rate the perceived quality of the products based on Weber and Shaw's video game quality perceptions (2009).

A multiple analysis of variance (MANOVA) was applied. Between-subject effects are reported in Table 20. Equality of covariances is given (Box's M = 27.88, F = 1.49, p = .082). The results of Pillai's trace, Wilk's Lambda, Hotelling's Trace and Roy's Largest Root are consistent, as displayed in Table 21. All this indicates stability of the results. In the text, only Wilk's Lambda is reported. Descriptive statistics and post-hoc pairwise comparisons are reported in Table 22. The comparisons are calculated as one-sided in accordance with the theoretical account and were corrected with Bonferroni's method for multiple comparisons.

Table 20: *Tests of between-subject effects*

	Dependent variable	Sum of squares	df	Mean square	F	Sig.	Partial Eta squared
Corrected model	Craft diligence	28.778	3	9.593	3.710	.013	.068
	Exp. quality	1.865	3	0.622	0.288	.834	.006
	Purch. intention	53.479	3	17.826	4.448	.005	.080
	Perc. sacrifice	401.789	3	133.930	53.844	.000	.514
Intercept	Craft diligence	3629.332	1	3629.332	1403.622	.000	.902
	Exp. quality	4071.115	1	4071.115	1887.260	.000	.925
	Purch. intention	1483.432	1	1483.432	370.123	.000	.708
	Perc. sacrifice	2847.519	1	2847.519	1144.792	.000	.882
Source of innovation (Consumer innovator - CI or firm)	Craft diligence	3.297	1	3.297	1.275	.261	.008
	Exp. quality	0.167	1	0.167	0.077	.781	.001
	Purch. intention	4.730	1	4.730	1.180	.279	.008
	Perc. sacrifice	1.132	1	1.132	0.455	.501	.003
Price level	Craft diligence	8.765	1	8.765	3.390	.068	.022
	Exp. quality	0.516	1	0.516	0.239	.625	.002
	Purch. intention	32.977	1	32.977	8.228	.005	.051
	Perc. sacrifice	397.490	1	397.490	159.804	.000	.511
CI x Price level	Craft diligence	19.767	1	19.767	7.645	.006	.048
	Exp. quality	0.922	1	0.922	0.428	.514	.003
	Purch. intention	20.831	1	20.831	5.198	.024	.033
	Perc. sacrifice	9.048	1	9.048	3.638	.058	.023
Error	Craft diligence	395.611	153	2.586			
	Exp. quality	330.045	153	2.157			
	Purch. intention	613.216	153	4.008			
	Perc. sacrifice	380.567	153	2.487			

Multivariate tests of main effects confirm differences in product and price perceptions between price levels ($F(4, 150) = 40.758$, $p < .001$, partial $\eta^2 = .521$, Wilk's $\Lambda = .479$). As expectable, higher prices were associated with lower purchase intentions and the perception of a higher sacrifice when compared to acceptable prices (Purchase intentions: $F(1, 153) = 8.23$, $p < .01$, partial $\eta^2 = .051$; sacrifice perception $F(1, 153) = 159.80$, $p < .001$, partial $\eta^2 = .51$). Interestingly, the main effect of the price on perceived

development effort and perceived quality was not significant (perceived effort: $F(1, 153) = 3.39$, $p = .068$, partial $\eta^2 = .022$; perceived quality: $F(1, 153) = 0.239$, $p = .625$, partial $\eta^2 = .002$). Turning to the source of innovation, there is no discernable difference present in product and price perceptions between the indie and firm-generated labels ($F(4, 150) = 1.027$, $p = .395$, partial $\eta^2 = .027$, Wilk's $\Lambda = .97$).

Table 21: *Multivariate tests*

Effect		Value	F	df	Error df	Sig.	Partial Eta sq.
Intercept	Pillai's Trace	0.956	819.347	4	150	.000	.956
	Wilks' Lambda	0.044	819.347	4	150	.000	.956
	Hotelling's Trace	21.849	819.347	4	150	.000	.956
	Roy's Larg. Root	21.849	819.347	4	150	.000	.956
Source of innovation (Consumer vs. Regular)	Pillai's Trace	0.027	1.027	4	150	.395	.027
	Wilks' Lambda	0.973	1.027	4	150	.395	.027
	Hotelling's Trace	0.027	1.027	4	150	.395	.027
	Roy's Larg. Root	0.027	1.027	4	150	.395	.027
Price level (low vs. high)	Pillai's Trace	0.521	40.758	4	150	.000	.521
	Wilks' Lambda	0.479	40.758	4	150	.000	.521
	Hotelling's Trace	1.087	40.758	4	150	.000	.521
	Roy's Larg. Root	1.087	40.758	4	150	.000	.521
Interaction: Source of innovation x Price level	Pillai's Trace	0.085	3.472	4	150	.010	.085
	Wilks' Lambda	0.915	3.472	4	150	.010	.085
	Hotelling's Trace	0.093	3.472	4	150	.010	.085
	Roy's Larg. Root	0.093	3.472	4	150	.010	.085

Design: Intercept + Source of innovation (Consumer vs. Regular)+ Price level (low vs. high) + Interaction: Source of innovation x Price level

Most importantly, significant interaction effects of price level and the two developer labels are present ($F(4, 150) = 3.472$, $p = .01$, partial $\eta^2 = .085$, Wilk's $\Lambda = .92$). Particularly, the interaction of price and innovation source on purchase intentions is significant ($F(1, 153) = 5.20$, $p = .02$, partial $\eta^2 = .033$). The difference in purchase intentions of products originating from the two groups gets accentuated for high prices in favor of consumer innovations (mean difference $= 1.09$, $p = .012$). The interaction effect is also significant for the expected craftsmanship rigor ($F(1, 153) = 7.65$, $p < .01$,

partial $\eta^2 = .048$). Supporting the theoretical explanations, customers expect high-priced indie games to have received significantly more development effort than high-priced firm games (mean difference at high price = 1.01, $p < .01$). The interaction effect of prices and developer label on perceived sacrifice as well as the interaction term of prices and developer label on perceived quality is not significant (perceived sacrifice: ($F(1, 153) = 3.64$, $p = .058$, partial $\eta^2 = .023$; perceived quality: $F(1, 153) = 0.428$, $p = .514$, partial $\eta^2 = .003$). It is unlikely that the observed differences stem from distinct perceptions of price sacrifice and product quality.

**Table 22:** *Descriptive statistics and pairwise comparisons*

Dependent variable	Price level	Mean CI	CI SE	Mean reg.	Reg. SE	Mean difference	SE	p one-tail.	90% Conf. interval for difference	
									Lower	*Upper*
Craft diligence	$04.99	4.882	.230	5.306	.268	-.424	.353	.12	-1.008	.160
	$29.99	5.121	.261	4.112	.276	1.009	.380	<.01	.381	1.637
Expected quality	$04.99	4.974	.210	5.194	.245	-.221	.322	.25	-.754	.313
	$29.99	5.244	.238	5.155	.252	.089	.347	.40	-.485	.663
Purch. intention	$04.99	3.374	.286	3.759	.334	-.385	.439	.19	-1.112	.342
	$29.99	3.184	.325	2.098	.343	1.086	.473	.01	.304	1.868
Perc. sacrifice	$04.99	2.850	.225	2.537	.263	.313	.346	.18	-.260	.886
	$29.99	5.579	.256	6.235	.270	-.656	.372	.04	-1.272	-.040

*Notes: CI = Consumer innovation; Reg. = Regular firm innovation; SE = Standard error*

To conclude, in price areas above the range of accepted prices, products labeled as consumer innovation enjoy higher purchase intentions than the same products presented as firm offers. This is primarily triggered by perceptions of higher development effort for consumer innovators, which is the core cause of perceived price fairness. Graphical displays of the estimated marginal effects are presented in Figures 9, 10, 11 and 12.
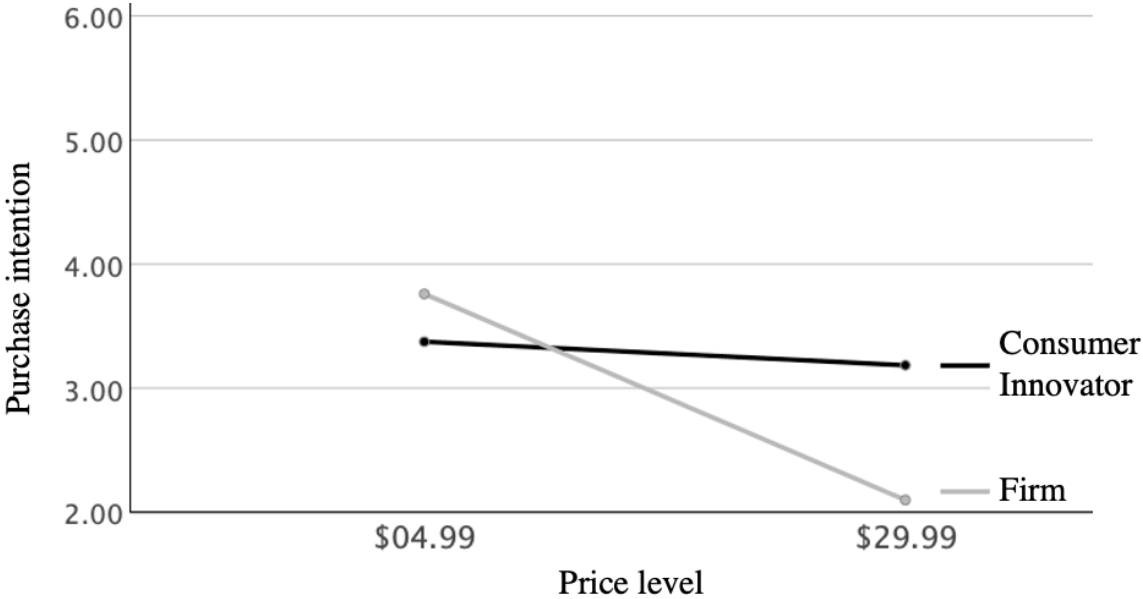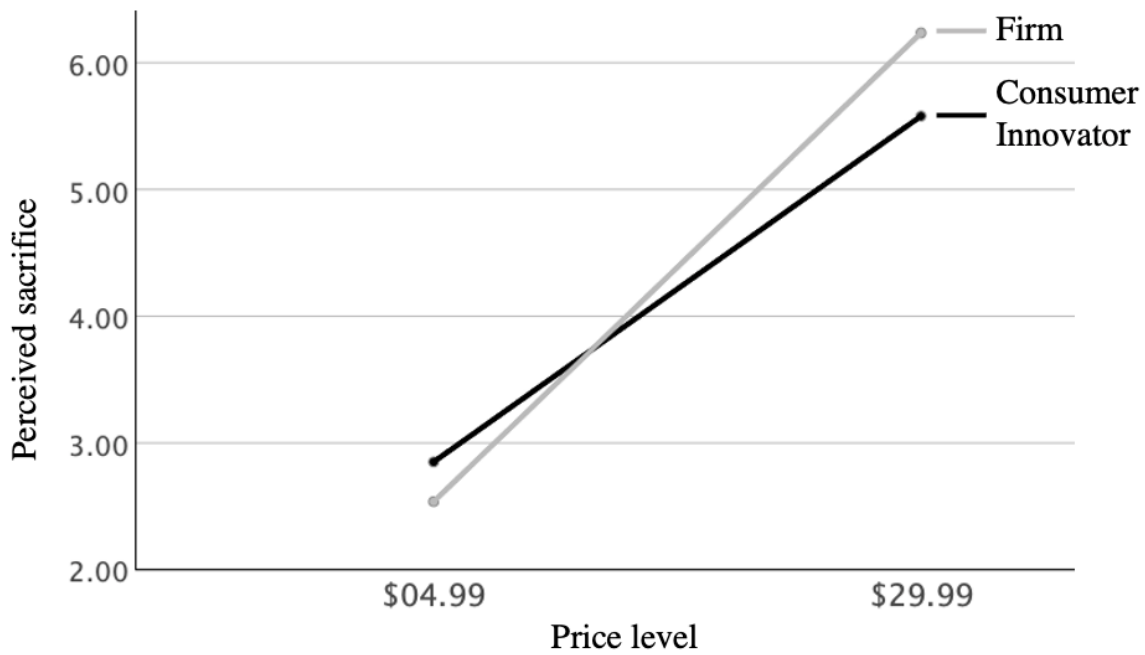
Figure 9: *Moderation of the purchase intention by a consumer innovator label (Source: Own depiction, generated from output of IBM SPSS v26)*
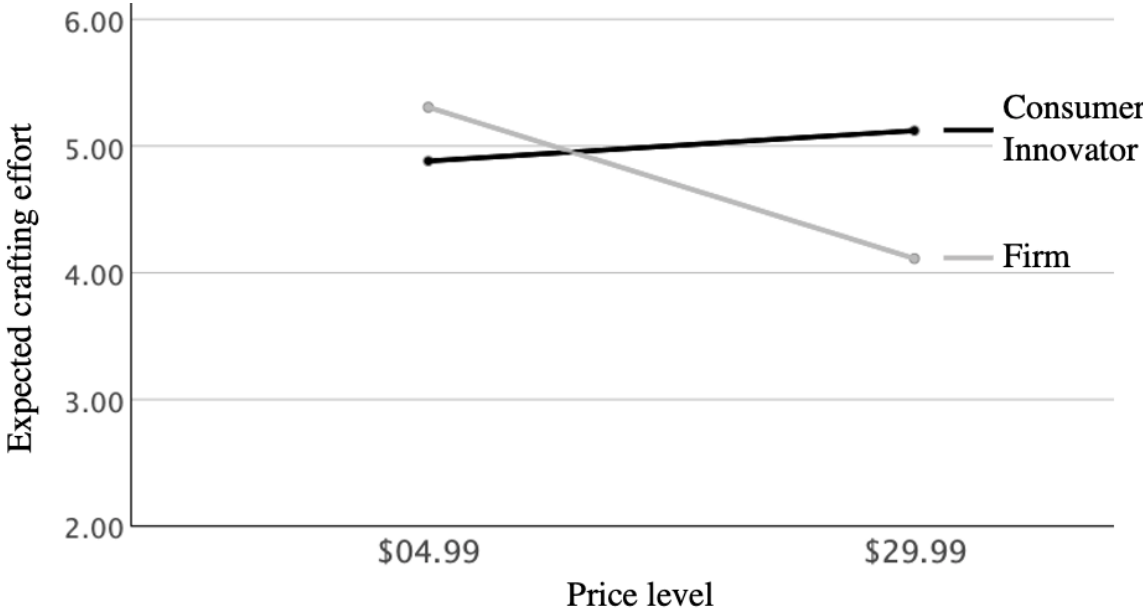
Figure 10: *Moderation of the expected crafting effort by a consumer innovator label (Source: Own depiction, generated from output of IBM SPSS v26)*
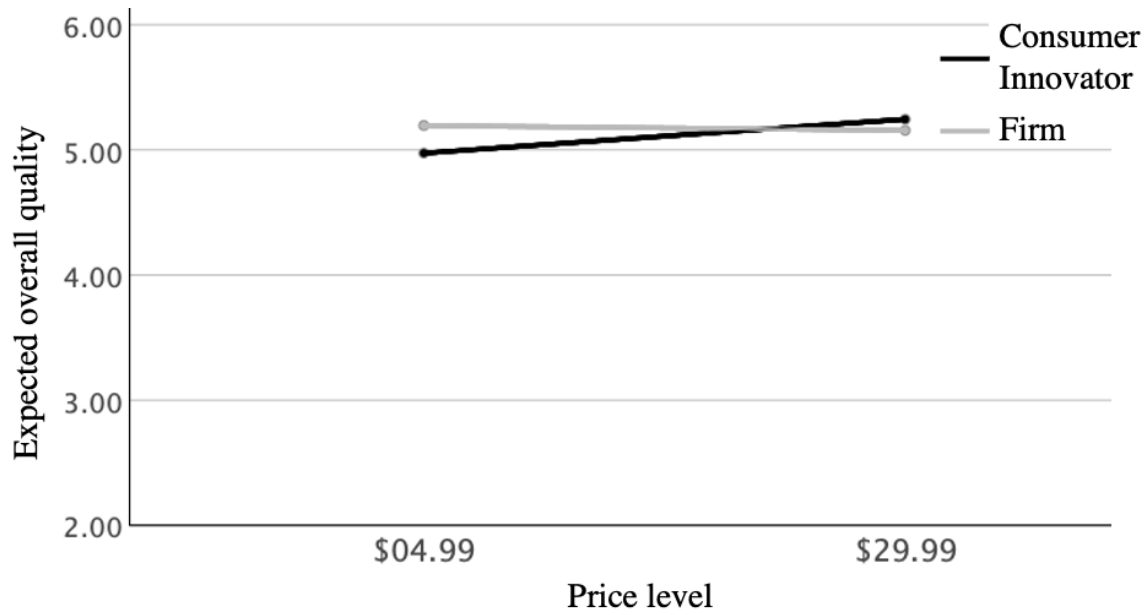
Figure 11: *Moderation of the expected overall quality by a consumer innovator label (Source: Own depiction, generated from output of IBM SPSS v26)*

Figure 12: *Moderation of the perceived sacrifice by a consumer innovator label (Source: Own depiction, generated from output of IBM SPSS v26)*

This result is supported through the essays that the participants wrote before seeing the vignette. Attention is focused on the answers of those participants assigned to the indie developer conditions (n = 89). They spent an average of 2 minutes and 20 seconds on the writing task. Their text answers were analyzed and extracted text fragments assigned to the key conceptual accounts from the theoretical explanations. Namely, it was differentiated between knowledge of consumer innovation concepts, price expectancy, quality expectancy and fairness aspects regarding consumer innovator prices. 86 of the 89 respondents associated the "indie" label with aspects known from consumer innovation theory. This confirms that knowledge of consumer innovation can be assumed, and consumer innovation theory included in analyzing customers' decision-making processes. Concerning the price expectancy, 46 respondents mentioned that they attest indie developers to set lower prices or have inferior profit interests. Examples can be read up in Table 23. As hypothesized in H2 and H3, the lower prices are perceived as a mean to make games more accessible, not as sign of bad quality.

Table 23: *Exemplary customer quotes on consumer innovation price expectations*

Price expectations – are there price differences expected between consumer innovations and professional innovations?

"While it might not be fair, there is an expectation that indie games should be cheap."

"Oftentimes, indie games are not as aggressively priced as games released by more mainstream developers"

"Creators of indie games are less focused on money and more on creating high quality games people enjoy."

"The creators are obviously very passionate about their work, and that usually shows through their games. They are trying to bring joy to their audience. […] The lower price points make them more accessible."

"[…] nearly always have goals beyond 'make as much money as humanly possible'"

"[…] focused more on the fun factor rather than making money off of it."

"Indie games are created by people who want to release a game for the main purpose of allowing players to enjoy. Making the most profit and money isn't their primary goal."

"They are more interested in making a fun/artistic game than meeting a bottom line like some big companies."

"Money isn't their primary focus. They tend to want to create a game hoping that other people will enjoy it."

"Not just a game made for making money and moving on to the next one like a lot of AAA products end up being"

"AAA developers are restricted by their profit motivation"

Regarding the quality expectation, 49 respondents specifically attest consumer innovations to provide similar, if not better quality than regular products. They are particularly impressed by the uniqueness of their products. Just eight respondents reported an overall negative image of consumer developed indie games. Exemplary quotes are displayed in Table 24.

Table 24: *Exemplary customer quotes on consumer innovation quality expectations*

Quality expectations – can consumer innovations keep up with professional products?

"Sometimes, my first assumption is that the video game won't be as good since it is not from a large company with a good reputation. But I have been happily surprised in the past when I give some indie games a chance."

"Indie games are usually the ones that bring about better mechanics since they can make what they want rather than just following trends."

"I think indie games have much more attention to detail, and more visually stimulating, have over-arching plots that are more creative and enjoyable, and are ultimately superior than the same games that are pushed out repeatedly by major corporations."

"All of the AAA titles keep repeating and making the same games over and over again, always reusing a supposedly successful formula. Indie games take chances and put love and passion into their games."

"They create games of their own concepts, their own ideas, unique playstyles and often just have a lot more fun because of it. They have more control over what they want to put into the game, and they get to be themselves and manage over the project entirely."

"Most of the indie games I've played so far have been really good, and there is a lot of love behind the development of such games, something you often don't see on AAA Games"

"I favor indie games because I think they are often more enjoyable, more creative, and more boundary pushing than AAA games."

To achieve a higher perceived fairness, as described in H3, customers need to believe that prices are not a reflection of profit interest. 65 respondents stated that indie developers' main motivation is passion. They do not believe that consumer innovators' work is predominantly associated with profit interests. To appear fair, theory suggests that prices should at best be justified by costs or effort. 48 respondents expect consumer innovators to invest head over heels into their game's development. They are particularly frank about indicating that they expect them to work way past the limits that profit orientation would dictate. Together, the requirements of superior price fairness perceptions are fulfilled. Exemplary quotes are provided in Table 25.

Table 25: *Exemplary customer quotes on consumer innovation price fairness perceptions*

Fairness of prices – are consumer innovation prices justified by effort?

"The passion that is behind those types of projects is astonishing, and since they're usually developed by a small team during a very long period of time, you can really get to know and feel what the persons behind the scenes are all about."

"Many times, an indie game goes head and shoulders over the expectations of everyone involved."

"Indie developers put more thought into their content because they have not sold out yet."

"Developers have little to no pressure on them to make a certain game within an allocated amount of time to please investors"

"They are not restricted by the timelines and finances of larger labels and are able to be more creative in their development."

"Indie developed computer games are some of the best games out there. […] They are putting their all into it"

"My first thought is happiness and passion that goes into them. Even the worst of indie games probably had someone who really cared about it making it."

"Indie computer games are made with care […] and most of the time they are fairly priced"

"Buying from small indie developers is a way to support those who are on the forefront of innovation and provide the greatest diversity."

"the money's going somewhere that matters. […] giving them money means helping the developers more directly. Plus, games are often just as good as any from a large company."

"Purchases for indie games makes you feel like your money is actually going to the developer for the game you are playing"

Overall, there is solid support that among involved customers in this product field the theoretical consumer innovation backgrounds are also present in customers' minds when purchasing products labelled as consumer made. Their convictions on the source of innovation alter the price effects significantly and in line with the developed theoretical account.

6.7 Discussion

In the first study of this dissertation, consumer innovators were found to behave differently in price setting. Regarding that customers are used to "normal" states and prone to heuristics and biases, it became relevant to know how buyers respond to consumer innovators altering prices. This information is a necessary first step to interpret the entire spectrum of consumer innovation pricing. For example, it would have been disastrous for diffusion if customers would interpret consumer innovators' lower prices as an indication of bad quality. Before merging the implications of both studies in Chapter 7, here the second study's results are discussed solitarily.

This study set out to understand how the stated innovation source affects customers' interpretation of prices and buying decisions. It was found that the consumer innovation label, as a so far under-researched external product cue, influences price interpretations (Miyazaki et al., 2005; Grewal and Compeau, 2007). The results rely on a large dataset from a video game marketplace and confirm an inverted U-shaped relationship between price and demand (H1). The comparison between video games originating from consumers and professional firms reveals that the stated innovation source moderates the price-demand relationship in two ways: First, the vertex of the parabolic demand curve, i.e., the reference price range center, shifts towards lower prices for consumer-generated games (H2). Second, the inverted U-shaped demand curve is flatter for indie games and steeper for games sold by firms (H3).

To validate the results of the main quantitative study, two vignette-based experiments were conducted. The results show that customers interpret the stated type of developer in line with the given theoretical explanations. Compared to firm-generated video games, buyers develop lower price expectations for games carrying the indie label. In addition, buyers show fewer negative responses to deviations from the reference price for consumer-developed games. Gaps between reference price and actual price had more negative effects on the demand of games commercialized by firms. The price differences of consumer innovators are likelier expected to be justified, e.g., by increased costs. This increases the fairness perception of price deviations.

6.7.1 Theoretical implications

This study contributes to consumer innovation research by shedding light on the implications that follow if consumer innovators decide to sell their innovations. According to the concept of free innovation, consumer innovators do not require compensated transactions for being rewarded for their investments and are therefore often offering their products for free (von Hippel, 2017). Zero-priced consumer innovations are likely to be perceived as a distinct innovation category, fundamentally differing from the category of producer innovations (Boudreau and Jeppesen, 2015).

One could argue that when consumers charge prices for their innovations, these differences fuzz out. By entering product markets and mimicking firms, consumer innovations may lose their distinct position on the perceptual map of customers.

Being perceived equally to firm innovation would imply that potential buyers respond to consumer innovations in the same way as they react to firm vendors' products. Given that consumer innovations often lack the assets required for superior commercialization (e.g., execution excellence, marketing budgets), loosing distinctiveness could translate into market disadvantages relative to firms. This study shows that this is not necessarily the case – at least not for the response to product prices. A label that states "consumer innovated" remains relevant, also in the evaluation of commercialized consumer innovations. Thus, the presented results suggest that it is fruitful to link research on consumer innovation with research on buying behavior to predict how commercial consumer innovations compete with firm products.

Research on the commercialization success of consumer innovations is rare. Even though several studies have explored the phenomenon of user entrepreneurship, most have focused on the behaviors that these early-stage entrepreneurs follow in commercialization and their social identities (Haefliger et al., 2010; Fauchart and Gruber, 2011; Shah and Tripsas, 2012; Agarwal and Shah, 2014). This includes this dissertations' first study. The few studies that explored how consumer innovation is perceived by customers strongly indicate the importance of customers' salient beliefs about consumer innovators (Schreier et al., 2012; Dahl et al., 2015).

All theoretical explanations presented in extant research posit that buyers develop favorable beliefs about customer innovators (e.g., they know more about customer needs, have more passion, are more innovative), and that these beliefs translate into a higher perceived quality of the products (Oo et al., 2018). However, provided and perceived product benefits always need to be set in relationship to the sacrifice required to obtain it. This chapter thus extended the present research by introducing prices and the price perception as a key variable in the relationship between innovation evaluation and demand.

This also contributes to behavioral pricing research. While the evaluation of prices is a well-researched topic, how buyers interpret prices and how customers arrive at the conclusions whether a price is justified or unfair is not fully understood (Xia and Monroe, 2017; Jung et al., 2020). For example, studies exploring the formation of reference prices have focused on investigating how prices paid on past purchases or external price information influence the perceptions of what is a normal or acceptable price (Briesch et al., 1997; Baucells et al., 2011). Other external factors that buyers may process when forming price expectations have rarely been explored (Baucells and Hwang, 2017). By showing that reference prices and price evaluations are different for

consumer innovations than for firm-generated products, this study encourages the investigation of more factors that may be considered in price evaluations. Today, customers have access to vast product-related information, particularly via the internet (Floyd et al., 2014; de Langhe et al., 2016). With the availability of such information, also the number of potential external cues that may moderate price evaluations and should receive research attention has increased.

6.7.2 Practical implications

This study provides several straightforward pricing-related recommendations for consumer innovators. On the one hand, the findings suggest that consumer innovators do not need to worry about negative quality inferences elicited by low prices. Consumer innovators can decide to commercialize their product and still do not need to adapt to the (higher) price level of similar products offered by firm vendors. In conjunction with the results from the first study, this is an important insight that will be discussed further in Chapter 7.

On the other hand, if consumer innovators aim at being compensated for their innovation-related costs, they can charge prices above the reference price range without suffering demand cuts as severe as firms. This implies that consumer innovators can take the risk of relatively high development effort and production costs, because they can expect that customers will accept the possibly resulting high prices as justified.

The results also highlight a potential threat to firms selling their products on the same platforms and marketplaces as consumer innovators. Buyers may feel that they can get the same benefits from products developed by consumer innovators as from professional firm products, albeit at a lower price. Incumbents thus need to be aware of competition from consumer innovators and open their competition radar to lower priced products labelled as consumer innovation.

Finally, this study's results imply that product marketplaces which are open to consumer innovations are well-advised to communicate the functional background of their vendors effectively. Managers of marketplaces should further provide information on consumer innovators' backgrounds to activate favorable convictions about consumer innovators in the buyers' minds or keep them alive.

6.8 Limitations and further research

There are several limitations in this study that might stimulate future research. It is, for example, unclear whether the findings can be generalized to other markets. In previous studies, the way how customers perceive and respond to prices was found to be stable across industries (Agarwal and Teas, 2002; Völckner, 2008). Nevertheless, this study

investigates video games only. Buyers are certainly aware of the innovation-related attributes that come with digital products. Their reactions to video games may thus not transfer well to more technically complex and cost intensive industries. These aspects were introduced with the empirical field in Chapter 4.3 and will be discussed in Chapter 7 again. Future research might seek to explore the moderating role of the stated source of innovation in other fields, such as physical goods or services.

Despite the positive image of consumer innovators in the computer game industry, this study's results did not replicate findings that report a throughout positive effect of a consumer innovation label on quality perception (e.g., Schreier et al., 2012). Rather, there were no differences in quality perception between the sources of innovation visible. Again, this may be attributed to the industry. Still, it calls for further understanding of the moderating effects of the consumer innovation label in conjunction with other factors, such as the price. The reaction towards a commercialized consumer innovation may, for example, also be related to previous experiences with consumer innovation, know-how in the product field or product involvement. At last, buyer characteristics were not directly measured in this chapters' studies. Neither was there a differentiation between customer groups. Just like consumer innovators, also buyers are diverse, e.g., regarding their product expertise, involvement, and tendency of being loyal to brands. This could affect how the presented relationships are evaluated. Further research suggestions follow in the next chapter.

7 Integration and Conclusion

The establishment of online marketplaces in a wide range of product categories has created ample opportunities for consumers to distribute and commercialize their self-developed innovations (Baldwin et al., 2006; Wolf and McQuitty, 2011; Brem et al., 2019; Crogan, 2018). Increasing numbers of consumer innovators decide to use this opportunity and to become sellers of their innovations (Whitson et al., 2018). This dissertation responds to calls for more research on this distinct group of commercializing consumer innovators (Shah and Tripsas, 2007, 2012; Agarwal and Shah, 2014; Shepherd et al., 2015; Oo et al., 2018).
The presented findings are particularly relevant for

(a) consumer innovators, as they aid in shaping and validating marketing strategies,

(b) business administrators, who gain insights on what to expect from and how to respond to commercializing consumer innovators as competitors, and

(c) economists, by providing information that adds to understanding the market impacts of the commercialization of consumer innovations.

The essential element of commercialization is the price. It is the central instrument to generate commercial profit from a good. The way prices are set does not only have an immediate effect on products' adoption rates and profit margins, but it also influences customers' perception of a product (Ingenbleek, 2007; Ingenbleek et al., 2013; Liozu and Hinterhuber, 2013). This dissertation focused on consumer innovation price setting and price perception because of these extensive effects and prices' crucial function in commercialization. Two empirical studies were conducted. Both employed a sequential mixed methods approach to examine the issues from various angles. As empirical field, a large computer game marketplace was chosen.

The first study examined the price setting behavior of consumer innovators in a large-scale analysis of 4,242 products, matched into pairs of consumer and firm products. In-depth interviews with 29 commercializing consumer developers followed. The results show that consumer innovators set lower prices for similar products than firms. They also relate their prices more to the benefits they provide to the customer and less to their incurred development costs than firms. Concerning the competition, consumer innovators are willing to undercut competitors' prices in order to aid the diffusion of their products. However, their competitive analyses are erratic. As a result, they miss out on potential competitors and show no systematically stronger reaction to competitive intensity than firms.

In the second study, the adoption of priced consumer innovation was analyzed. The price level as a predictor of sales was compared between the innovations of firms and

consumers. The sample of the market observation investigation consisted of 4,680 products. Half of the sample products were marketed as consumer made. These consumer innovations were matched with regular products that are equal in key product attributes. The results show that customers expect lower prices for similar products if they are labelled as consumer innovated. Customers are also more accepting of prices that exceed or fall short of their price expectations when a consumer innovator makes the offer rather than a firm. Two follow-up experiments with 229 participants are used to validate the findings as well as the proposed theoretical account that explains the observed differences. After discussing the outcome of each study separately in its respective empirical chapters, this chapter integrates all findings, states the composite contributions of this dissertation and identifies opportunities for further research.

7.1 Theoretical contributions and implications

All presented results provide consistent support that the same motivational structure that prompts the creation of consumer innovations also affects their commercialization. This was proven regarding the supply and the demand side by using the example of prices. The motivations that originally triggered innovation activities influence marketing decisions of consumer innovators. Furthermore, customers are aware of why consumers innovate and that the goals they aspire with product development and diffusion differ from those of firms. This impacts how customers perceive their offers.

The findings result in three major contributions to theory, which are covered in this chapter. The first contribution is that theory needs to consider consumer innovators that commercialize their innovations as a separate group of economic agents. Since commercializing consumer innovators make systematically different decisions than firms and customers perceive them differently, their functional role requires special attention when they are integrated into extant economic theory. Conversely, this dissertation shows the fallacy of transferring findings on commercially motivated sellers onto consumer innovators simply because they decided to charge a price for their innovations. An adjustment for their background must be applied.

The second contribution concerns the impact of consumer innovation commercialization on economic welfare. The results prove that also commercializing consumer innovators forward experienced process benefits to adopters by setting lower, more value-based prices. The welfare generating aspect of consumer innovation thus remains intact, despite prices being charged. Moreover, the present findings indicate that the welfare aspect may even be enhanced by prices.

The third contribution covered in this chapter revisits the extensions made to the body of consumer innovation research. The presented work contributes to a better understanding of the character of commercializing consumer innovators. Next to

generating footholds for further research, the results give novel explanations for the extraordinary market success of commercial endeavors of consumer innovators.

7.1.1 Commercializing consumer innovators are special economic agents

An influx of consumer innovations was repeatedly reported to transform markets (Benkler, 2006; de Jong et al., 2015; Oo et al., 2018). The presented results confirm that present microeconomic and marketing theory is insufficient to explain dynamics on consumer innovation enriched markets. Consumer innovators' market activity remains characterized by their functional role as consumer innovators and does not resemble that of firms. Consequently, their decision-making deviates significantly from that of firms and their impact on markets is different. This dissertation provided prove for that based on an investigation of pricing decisions. It was, for example, found that consumer innovators violate a fundamental principle of running a firm by setting prices that undercut the long-term cost floor for extended durations. This is possible because profits are not a primary interest in their functional role as consumer innovators. The results give reason to believe that also other marketing decisions might be affected by this. Further extension of the present knowledge to account for consumer innovators' special role in markets thus appears reasonable.

This dissertation also demonstrated that present theory on non-commercial consumer innovation activity provides viable information to form expectations on how exactly consumer innovator behavior might deviate from that of firms. Both empirical studies confirmed that predictions on how consumer innovators and their customers act on markets can be deduced from extant consumer innovation literature. Uniting the streams of firm-related theory with research on consumer innovation thus has proven its potential to be the source of further cogent hypotheses and to provide promising new insights.

Regarding the impact of consumer innovators as special agents on markets, some scholars have examined the effect that crowds of innovating consumers have on markets (Shah and Tripsas, 2012; Boudreau and Jeppesen, 2015; Gambardella et al., 2017). They found that a growing proportion of non-firm innovators positively impacts welfare, product quality, and customer satisfaction. The positive effects are mainly explained by a higher number and a higher variety of product alternatives for customers (Boudreau and Jeppesen, 2015; Gambardella et al., 2017; Boudreau, 2018).

This dissertation went beyond observing changes in marketplaces and set out to empirically test the reasons behind such effects. It also extended the focus of consumer innovation research to instances of priced consumer innovation. Despite appearing like firm innovation at first sight, commercializing consumer innovators were, for example,

found to forward their process rewards to customers in the form of price cuts. This deviates fundamentally from regular microeconomic theory, in which producer compensations are solely covered by sales generated revenues (Case et al., 2012). These empirical results can be integrated into more conceptual theories on market dynamics. For example, agent-based modeling research integrates behavioral rules deducted from market observations and experiments rather than sticking to prescriptive economic theory (Arthur, 1991; Bonabeau, 2002).

Recently, machine learning in agent-based models was used to identify environmental settings, such as tax models or incentivization systems, that optimize auction outcomes or social outcomes for economies (Dütting et al., 2020; Zheng et al., 2020). The presented findings on consumer innovation pricing allow adding consumer innovators as economic agents into such simulations. These agents should regard their process and use rewards in innovation pricing decisions more than firms do. Also the customer preference for consumer innovation and their lenience towards unexpectedly low or high prices can serve as a valuable addition. This may, for example, help to estimate socially optimal levels of consumer innovation activity and commercialization on markets. Supposing the simulated impact is positive for the society under certain boundary conditions, these models can provide indications of policies and parameters that can be used to foster commercial consumer innovation activity.

7.1.2 Welfare considerations of consumer innovation pricing

The second field of implications concerns the social and welfare impact of consumer innovation commercialization. A large fraction of consumer innovation was found to be shared entirely for free (von Hippel, 2017). When developed and distributed without any monetary transaction, society draws an immediate welfare benefit from consumer innovation (Gault and von Hippel, 2009; Gambardella et al., 2017). With more consumer innovators charging a price, this welfare potential seems endangered. If they set prices with which they primarily aim to generate profits, and thereby resemble firm behavior, the positive effect of consumer innovation on welfare would be obliterated.

The presented findings on consumer innovation pricing show that this is not the case. Consumer innovators regard the experienced process reward and social aspects in their pricing decisions. Rather than experiencing process rewards and then asking to be remunerated on top of that, consumer innovators forward their process rewards to all customers in the form of price reductions. Hence, also priced consumer innovation allows for a substantial customer surplus. The concept of consumer innovation as welfare generating activity thus remains valid, even for consumer innovations that end up being sold.

However, there is more to the generation of welfare from consumer innovation than integrating process rewards into asking prices or ask for no price at all. To realize welfare effects, customers must adopt the consumer innovations (de Jong et al., 2015, 2018). Compared to a free giveaway, the presence of prices makes it harder for customers to realize that a benefit can potentially be made from adopting a consumer innovation. Should customers fail to recognize this due to the charged price, consumer innovation diffusion is harmed. Consequently, pricing consumer innovation would have detrimental effects, as society would not benefit from consumer innovation anymore.

The present research found that this is not the case. Customers remain aware that consumer innovators are well meaning with them and do adopt priced consumer innovation. The results document that they do not only deem it appropriate to reimburse consumer innovators monetarily, but also prove that they prefer paying consumer innovators over paying firms. They reap the surplus that consumer innovators grant them, despite being asked to pay a price.

7.1.3 Extension of consumer innovation research

Turning towards the third group of implications, the presented research results add to the understanding of the commercializing consumer innovator as a separate group of entrepreneurs. Entrepreneurial research has long acknowledged that entrepreneurs are a very heterogenous group. They were found to not only differ in external factors, like available monetary and human resources, but also in intrinsic factors, such as their aspirations, risk propensity, opportunity costs, abilities, experiences, emotional stability and more. Many of these differences affect their entrepreneurial journey (Zander, 2007; Townsend and Hart, 2008; Parker, 2009; Townsend et al., 2010).

So far, consumer innovators that decided to charge a price left the scope of consumer innovation research and were categorized as regular aspiring entrepreneurs (Shah and Tripsas, 2012). However, consumer innovators come with a unique set of personal characteristics, giving them a unique entrepreneurial character set. Nevertheless, consumer innovation and entrepreneurial character research streams were rarely joined (Fauchart and Gruber, 2011; Stock et al., 2014; Shepherd et al., 2015; Oo et al., 2018). This work has illuminated consumer innovators' degree of profit interests, ties to their customers and consideration of process rewards in their entrepreneurial decision-making. Next to examining characteristics of commercializing consumer innovators, this dissertation also investigated adopters' considerations of consumer innovators as a separate group of entrepreneurs. The preference of customers to buy from consumer innovators rather than from firms suggests that a consumer innovator image might be as valuable as a strong brand image (Rao and Monroe, 1989; Allenby and Rossi, 1991). This reaffirms recent empirical work on consumer innovations reporting that customers are appreciating the customer centric work of consumer innovators (Dahl et al., 2015;

Fuchs et al., 2015; Pollok et al., 2021). As seen in this dissertation, not even prices seem to dampen this positive halo of consumer innovation.

Given their profound nature and their long-lasting effects, consumer innovators' traits may lead to different behavior in other entrepreneurial fields as well. Some promising examples might be entrepreneurial confidence, team building, option creation and pivoting, capital acquisition and exit-decisions (Scherpereel, 2008; Parker, 2009; Wennberg et al., 2010; Hogarth and Karelaia, 2011). Regarding the subjects of future research, this work may inspire researchers of entrepreneurial identities to extend their research from the domain of how entrepreneurial identity traits affect entrepreneurs' decision-making to how they affect third party behavior, such as customer perceptions and investor decisions.

Furthermore, the presented findings provide a new explanation for the extraordinary market success of consumer entrepreneurs (Shah and Tripsas, 2012; Shah et al., 2012). Shah et al. (2012) report that while consumer innovators launch only 10.7% of all startups in the United States, among the surviving firms after 5 years the share of consumer innovator founded companies is 46.6%. This success was largely accounted to consumer innovators making good business use of their superior customer insights in innovation generation (von Hippel, 2005; Agarwal and Shah, 2014; Oo et al., 2018).

This dissertation added further information that can explain the longevity of consumer innovators' commercial endeavors. Consumer innovators' outstanding customer insights enhance their pricing decisions. They implement value-based pricing instinctively, which is unanimously deemed to be the ideal pricing strategy by theory (Ingenbleek, 2007; Nagle et al., 2014). This puts consumer entrepreneurs' pricing ahead of firm producers, who more frequently use inferior cost- or competition-based pricing strategies (Hinterhuber, 2008; Liozu et al., 2012). Not only do consumer innovators frequently employ value-based pricing, they also execute it well. Being close to their customers enables them to determine appropriate customer value estimates with little market research.

Another cause for their long survival on markets found in this dissertation is that customers are more tolerant towards consumer innovators' prices that do not exactly meet their expectations. Customers empathize with them, treat them as equals, and impose fewer negative inferences on consumer innovators. This lenience with consumer innovators may well extend to other areas of customer judgement. Future research should further drill into such aspects in order to uncover other reasons that cause consumer entrepreneurs' extraordinary market success. Possible research avenues are the tolerance towards product faults, unfinished products or a different level of product support.

A remaining open question is whether the presented findings are immediately associated with the exact same group of user entrepreneurs that Shah and colleagues (2012) depicted. While Shah et al. (2012) sampled firms founded by consumer innovators, the consumer innovators in this dissertation's samples mostly did not aspire a future as business owners. In parts, they were particularly filtered to not have founded a business, but rather be an innovator in their spare time. Being innovators next to a day job, they closest resemble "hybrid entrepreneurs" (Folta et al., 2010). In a survey of 262 Swedish hybrid entrepreneurs, 47% had their motivation rooted in "passion" and "enjoyment of the combination of business and work", while only 16% named "to earn money" as their primary motivation (Thorgren et al., 2014). Like this work, also entrepreneurial research suggests treating such hybrid entrepreneurs differently than nascent entrepreneurs (Wennberg et al., 2008; Folta et al., 2010). So far, this is not done regularly, which is called a "shortcoming since the hybrid form is very common in practice, and research on entrepreneurship in general may not apply to it" (Thorgren et al., 2014). This is in line with the implications of Chapter 7.1.1. Given the documented similarities, merging these research streams seems to hold further promising insights to theory and practice.

7.2 Practical contributions and implications

The first study's practical implications mainly included suggestions for incumbent firm providers that need to react or prepare for an influx of commercialized consumer innovation. The second study contained insights on how consumer innovators can set adoption increasing prices. Furthermore, marketplace operators were informed that they benefit from promoting consumer innovation work explicitly as such by labelling it adequately. Together, the presented studies paint a favorable picture for commercializing consumer innovators. Their way of making pricing decisions aligns with recommendations from marketing theory. Customers are lenient with consumer innovators when it comes to pricing, and likely will be with other managerial decisions as well. From this dissertation's findings, consumer innovators are thus well advised to charge prices. Consumer innovation commercialization creates a symbiotic relationship between innovators and customers, rather than merely shifting the surplus from customers to innovators. This chapter first outlines how this symbiosis can practically enhance the welfare generation of consumer innovation and second, how incumbents may benefit from the ways of consumer innovators and how to compete with them

.

7.2.1 Increase welfare generation by commercializing consumer innovation

Commercialization of consumer innovation has the potential to augment its welfare impact. Equipping consumer innovators with inferior profit interests with capital enables them to purchase better equipment or materials and spend more time with their passion. As a result, they can create even more and better innovations, which in turn allows granting an even higher surplus to adopters. Just as non-profit organizations increase their impact by reinvesting their earnings into their cause, also consumer innovators should reach their personal and social goals quicker with the availability of funds (Herman and Renz, 1999; Anheier, 2014).

To unfold their total welfare potential, consumer innovations must spread widely through their potential customer base. A consumer innovation's potential to generate welfare thus remains bound the consumer innovator's propensity to diffuse the innovation (Gambardella et al., 2017). The present results show that charging a price may come with considerable positive impacts on diffusion. Clearly, charging a price allows consumer innovators to reimburse themselves for some of the diffusion work, which should expedite diffusion. Admittedly though, consumer innovators have other interests than profit generation and monetary reimbursement. Thus, getting money in turn for an activity they do not enjoy might not impel them much (Füller et al., 2013; de Jong and Lindsen, 2021).

However, most other market participants do not share consumer innovators' attitude to profits. Setting a price should thus activate market mechanisms that assist an innovation's diffusion (Rogers, 1983). Third party diffusion agents, such as marketplaces or distributors, will become interested in earning a share of consumer entrepreneurs' revenues (Schramm et al., 2010; Garcia and Jager, 2011). To increase their earnings, these agents will likely put effort into accelerating consumer innovation diffusion. For example, marketplaces are interested in increasing sales to receive more commissions, which incentivizes promoting commercialized consumer innovations over free ones. The same applies to distributors and publishers, who sign on consumer innovators and charge commissions for diffusing their work.

As more indirectly involved diffusion agents, price comparison platforms will list consumer innovations once a price is set in order to earn their share with referral programs. Adding a price also gives the option to offer discounts, which is a strong driver of customer adoption and unavailable for free innovation (Moore and Olshavsky, 1989; Madan and Suri, 2001). Also specialist magazines should be inclined to discuss commercialized consumer innovations as more adequate alternatives to firm products rather than as free oddity that exists next to commercial products. After all, setting a price has much more functions than just deciding the revenue per sale and attracting

third party diffusion agents. It signals professionalism and reliability, a long-time commitment to a product and proposes that, in case of commercial success, the innovation will potentially become the innovator's main priority.

Even if setting a one-time purchase price is not aligning well with a consumer innovator's interest, alternative pricing models may convey a similarly positive message. Some pricing strategies that seem to fit consumer innovators' functional role well are donations, patronages, pay what you want models or becoming a part of subscriptions or bundle sales (Cossu, 2019; Zhao et al., 2020; Regner, 2021).

Furthermore, proving that the market introduction of consumer innovation does not erase its welfare potential and, on the contrary, may even improve it adds an essential ethical note. Promoters of consumer innovation commercialization can rest assured that they do not act against societal interests in turning formerly free innovation to commercial products and services, if the process rewards remain forwarded to customers. Also, researching the mechanics behind the interplay of process rewards and profit interests does not mean neglecting consumer innovations' welfare-inducing side. This dissertation has shown that commercial approaches to consumer innovation creation and diffusion complement the less pecuniary ones without obliterating their benefits.

7.2.2 Learning from and competing with consumer innovators

The overall very positive implications of being a consumer innovator, or at least being labeled as one, might inspire firms to imitate the ways of commercializing consumer innovators. Integrating consumers into the innovation process is widely acknowledged as an excellent idea (Bogers et al., 2010; Baldwin and von Hippel, 2011). Marketing theory promotes value-based pricing and suggests integrating customers into the pricing process (Ingenbleek, 2007; Bolton, 2018). A novel concept might be to adopt lead user concepts in pricing approaches that rely on customer integration (Kratzer and Lettl, 2009; Brem et al., 2018). After all, this work showed that consumer innovators, who are more engaged with products than regular customers, are particularly likely and seemingly successful in applying value-based pricing. They may be the more informative participants in firms' pricing research as well.

A conceivable conclusion of firm practitioners from this work might as well be to disguise as consumer innovators in promotional campaigns in order to appropriate the reported advantages. There are other fields where firms promise themselves positive effects from such cloaking. Commonly known approaches are green- or craft-washing (Lyon and Montgomery, 2015; Rivaroli et al., 2020). These tactics are however not without flaws. Empirical work found that the camouflage can backfire once customers unveil it (Chen and Chang, 2013; Wu et al., 2020). This might likely happen here as

well, because the consumer innovator image is scaffolded by the support of the customer community and consumer innovators' superior personal integration with customers. A firm can replicate the labels and actions of consumer innovators, but likely not the outstanding connection that consumer innovators have with their peers.

Given that it does not seem advantageous to assume a consumer innovator image for firms, in the long run it seems promising to rather water down customers' positive consumer innovation convictions with comparative marketing that defames them. Vice versa, consumer innovators are well advised not to abuse their superior standing amongst customers and thereby harm their reputation. Instead, they should insistently augment their image to avoid losing the benefits that this dissertation documented. Possible actions to achieve this are providing more insights into the production process, remaining engaged in the customer community and, of course, to continue setting prices that closely resemble the benefit that customers retrieve from their products.

7.3 Further research

The first elementary continuation of this work concerns validating the findings in other empirical fields. The present research was conducted in an environment that is particularly nurturing for consumer innovators. Because of their intangible nature and the readily available tools for innovation, computer games are extraordinarily accessible for consumer innovators. Furthermore, almost the entire computer game customer base is pooled in online marketplaces with low entry barriers for consumer innovators. Besides, customers of computer games have a very positive perception of consumer innovation. Overall, the used empirical field facilitates consumer innovation diffusion and commercialization particularly well (Abrate and Menozzi, 2020; Del Bosco et al., 2020; Ruffino, 2021).

To assess in which other industries the presented results are applicable, the applied research can be repeated in other fields. However, a more systematic approach is to systematize the characteristics of consumer innovation nurturing environments. Based on the similarity of consumer innovation facilitating attributes, a preliminary judgement of how well the results transfer into different fields would be enabled. Furthermore, the systematic assessment of attributes that expedite consumer innovation creation and commercialization could serve as a blueprint on how to replicate equally supportive environments elsewhere.

A three-step process of further research could create such an instrument: First stands a detailed conceptualization of aspects that create nurturing environments for consumer innovation, their commercialization and diffusion in an assessment tool. Second, various market environments need to be categorized along the defined criteria. This gives an indication of how well the presented results transfer to these industries. It can also serve

as a gap analysis for improving the conditions for consumer innovation in these fields. In a third step, the effects of different market environments on (non-) commercial consumer innovation generation and diffusion can be observed systematically. This allows to identify particularly beneficial environmental aspects and moderators. Based on this, institutions that are interested in promoting consumer innovation could take targeted measures to facilitate consumer innovation and its diffusion.

While possible implications for market dynamics and welfare were outlined in the previous chapters, it needs to be acknowledged that the present analyses do not allow exact estimations of the welfare effects associated with an increasing population of commercializing consumer innovators. Neither did the data allow tracking the actual price dynamics that the market entry of consumer innovators stimulated. Without such information, expectations on the long-lasting customer surplus effect of commercialized consumer innovation remain vague. For example, it cannot be excluded that adaptation processes are taking place that attenuate the encountered effects in the long run. Longitudinal observations of consumer innovation market entry and subsequent market developments would add substantial knowledge to such questions. In addition, this dissertation focused specifically on consumer innovators and their customers. Future research could explore more indirect effects of consumer innovation pricing, for example, on competitors, marketplaces, and general price levels.

Another aspect worth exploring is the effect of consumer innovation commercialization on communities in which, so far, open licenses, free revealing, and mutual support prevailed (Bergquist and Ljungberg, 2001; West and Gallagher, 2006; West and Lakhani, 2008). The resulting discords of contrasting free versus commercial diffusion keep various communities in suspense (e.g., in community work, Moen and Fields, 2002; computer game modifications, Joseph, 2018; and online knowledge sharing, Zhang et al., 2019). Also the consumer and open innovation research community is parting on their opinions to which degree commercial aspects should be combined with pure free consumer innovation (West and Piller, 2014; Block et al., 2016; Brem et al., 2019; von Hippel, 2017). With valid estimations of the multiple welfare effects of commercialization at hand, researchers could explore whether and in which conditions the welfare-enhancing effects of commercialization mitigate or outweigh negative consequences associated with increasing commercial consumer innovation activity.

Concerning the comparison of price levels and the roles of pricing determinants between consumer innovators and firms, the present studies do not embrace the full heterogeneity within these groups. Just as there are many entrepreneurial identities, consumer innovators are diverse, for example, regarding their dominating values, goals, expertise, and (social) capital (Stock et al., 2014; Pongtanalert and Ogawa, 2015). The many names used in the literature for non-firm innovators confirm this heterogeneity (e.g., amateurs, consumers, hobbyists, tinkerers, DIYers, hackers, users). A similar diversity

applies to customers. They differ, among others, in their product involvement, available income and social interests. Furthermore, the specific purchase situation can differ in terms of factors that were shown to affect decision-making, such as available time, agency problems or store setting (Bornemann and Homburg, 2011). Further research may want to cross consumer entrepreneurs' traits with various customer types and assess the effects of each identity on decision-making within and between all groups. A similar research setup is applicable for changes in purchase situations and environments.

Regarding the type of pricing, this dissertation only investigated onetime payments as the most frequently employed payment scheme. Considering the wide spectrum of payment modalities in pricing theory, this is a strong confinement. Future works should indulge in assessing the consumer innovation cue's interaction with more innovative pricing practices such as captive pricing, zero price effects, performance pricing, freemium and prescription models, product bundling or flat fee pricing (Hinterhuber and Liozu, 2014).

This dissertation also does not account for various behavioral pricing aspects that promise interesting moderations with consumer innovation cues. Deep discounting, for example, was found to harm product perception because of customers' adverse inferences on quality. Since price-quality inferences are less severe for consumer innovation, such practices might not retain these negative repercussions (Moore and Olshavsky, 1989; Chapman, 1993). With similar reasoning, everyday-low-price strategies and high-quality low-price claims were found to have detrimental effects on product perception and adoption of firm products (Lal and Rao, 1997; Shirai, 2015). The presented findings indicate that a consumer innovation label may moderate these negative low-price effects. Consequently, such strategies might be just right for boosting consumer innovators' sales.

At last, consumer innovation research could benefit from integrating more marketing-related variables of interest beyond the price. Interactions with a consumer innovation cue might occur in communication activities (e.g., advertising messages, product descriptions, customer relationship management) or sales approaches (e.g., sales channel choice, product presentation, guarantee promises). Research in this direction should be of great benefit for both, free and commercial consumer innovation diffusion. Overall, based on pricing research, this dissertation made substantial progress in understanding the commercial side of consumer innovation and should have inspired further research in consumer innovation marketing.

References

Abernathy, W. J., & Utterback, J. M. (1978). Patterns of industrial innovation. *Technology Review*, *80*(7), 40–47.

Abrate, G., & Menozzi, A. (2021). User innovation and network effects: The case of video games. *Industrial and Corporate Change*, *29*(6), 1399–1414. https://doi.org/10.1093/icc/dtaa030

Abratt, R., & Pitt, L. F. (1985). Pricing practices in two industries. *Industrial Marketing Management*, *14*(4), 301–306. https://doi.org/10.1016/0019-8501(85)90023-9

Abu-Assab, S., & Baier, D. (2009). Designing products using quality function deployment and conjoint analysis: a comparison in a market for elderly people. In A. Fink, B. Lausen, W. Seidel, & A. Ultsch (Eds.), *Advances in Data Analysis, Data Handling and Business Intelligence* (pp. 515–526). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-01044-6_47

Acar, O. A. (2019). Motivations and solution appropriateness in crowdsourcing challenges for innovation. *Research Policy*, *48*(8). https://doi.org/10.1016/j.respol.2018.11.010

Agarwal, R., & Shah, S. K. (2014). Knowledge sources of entrepreneurship: Firm formation by academic, user and employee innovators. *Research Policy*, *43*(7), 1109–1133. https://doi.org/10.1016/j.respol.2014.04.012

Agarwal, S., & Teas, R. (2002). Cross-national applicability of a perceived quality model. *Journal of Product & Brand Management*, *11*, 213–236. https://doi.org/10.1108/10610420210435425

Agrawal, A., Catalini, C., Goldfarb, A., & Luo, H. (2018). Slack time and innovation. *Organization Science*, *29*(6), 1056–1073. https://doi.org/10.1287/orsc.2018.1215

Akdeniz, B., Calantone, R. J., & Voorhees, C. M. (2013). Effectiveness of marketing cues on consumer perceptions of quality: The moderating roles of brand reputation and third-party information. *Psychology & Marketing*, *30*(1), 76–89. https://doi.org/10.1002/mar.20590

Akdeniz, M. B., & Talay, M. B. (2013). Cultural variations in the use of marketing signals: A multilevel analysis of the motion picture industry. *Journal of the Academy of Marketing Science*, *41*(5), 601–624. https://doi.org/10.1007/s11747-013-0338-5

Alba, J., Lynch, J., Weitz, B., Janiszewski, C., Lutz, R., Sawyer, A., & Wood, S. (1997). Interactive home shopping: Consumer, retailer, and manufacturer incentives to participate in electronic marketplaces. *Journal of Marketing*, *61*(3), 38–53. https://doi.org/10.2307/1251788

Alba, J. W., & Williams, E. F. (2013). Pleasure principles: A review of research on hedonic consumption. *Journal of Consumer Psychology*, *23*(1), 2–18. https://doi.org/10.1016/j.jcps.2012.07.003

Alexander, M., & Christia, F. (2011). Context modularity of human altruism. *Science*, *334*(6061), 1392–1394. https://doi.org/10.1126/science.1202599

Allenby, G., & Rossi, P. (1991). Quality perceptions and asymmetric switching between brands. *Marketing Science*, *10*(3), 185–204. https://doi.org/10.1287/mksc.10.3.185

Amaral, J. V., & Guerreiro, R. (2019). Factors explaining a cost-based pricing essence. *Journal of Business & Industrial Marketing*, *34*(8), 1850–1865. https://doi.org/10.1108/JBIM-12-2018-0373

Anderson, J. C., & Narus, J. A. (1998, November 1). Business marketing: Understand what customers value. *Harvard Business Review*.
Retrieved from https://hbr.org/1998/11/business-marketing-understand-what-customers-value

Anheier, H. K. (2014). *Nonprofit Organizations: Theory, Management, Policy* (2nd ed.). London: Routledge. https://doi.org/10.4324/9781315851044

Antorini, Y. M. (2007). *Brand community innovation: An intrinsic case study of the adult fans of Lego community* (1. ed). Copenhagen: Copenhagen Business School.

Arthur, W. B. (1991). Designing economic agents that act like human agents: A behavioral approach to bounded rationality. *The American Economic Review*, *81*(2), 353–359.

Autio, E., Dahlander, L., & Frederiksen, L. (2013). Information exposure, opportunity evaluation, and entrepreneurial action: An investigation of an online user community. *Academy of Management Journal*, *56*(5), 1348–1371. https://doi.org/10.5465/amj.2010.0328

Autio, E., Kenney, M., Mustar, P., Siegel, D., & Wright, M. (2014). Entrepreneurial innovation: The importance of context. *Research Policy*, *43*(7), 1097–1108. https://doi.org/10.1016/j.respol.2014.01.015

Avant, L. L., & Helson, H. (1973). Theories of perception. In *Handbook of general psychology* (pp. 419–448). Oxford, England: Prentice Hall.

Avlonitis, G. J., & Indounas, K. A. (2005). Pricing objectives and pricing methods in the services sector. *Journal of Services Marketing*, *19*(1), 47–57. https://doi.org/10.1108/08876040510579398

Babin, B. J., Darden, W. R., & Griffin, M. (1994). Work and/or fun: Measuring hedonic and utilitarian shopping value. *Journal of Consumer Research*, *20*(4), 644–656. https://doi.org/10.1086/209376

Bagchi, R., & Davis, D. F. (2012). $29 for 70 items or 70 items for $29? How presentation order affects package perceptions. *Journal of Consumer Research*, *39*(1), 62–73. https://doi.org/10.1086/661893

Bakos, J. Y. (1997). Reducing buyer search costs: implications for electronic marketplaces. *Management Science*, *43*(12), 1676–1692. https://doi.org/10.1287/mnsc.43.12.1676

Baldwin, C., Hienerth, C., & von Hippel, E. (2006). How user innovations become commercial products: A theoretical investigation and case study. *Research Policy*, *35*(9), 1291–1313. https://doi.org/10.1016/j.respol.2006.04.012

Baldwin, C., & von Hippel, E. (2011). Modeling a paradigm shift: from producer innovation to user and open collaborative innovation. *Organization Science*, *22*(6), 1399–1417. https://doi.org/10.1287/orsc.1100.0618

Barone, M. J., Manning, K. C., & Miniard, P. W. (2004). Consumer response to retailers' use of partially comparative pricing. *Journal of Marketing*, *68*(3), 37–47. https://doi.org/10.1509/jmkg.68.3.37.34769

Baucells, M., & Hwang, W. (2017). A model of mental accounting and reference price adaptation. *Management Science*, *63*(12), 4201–4218. https://doi.org/10.1287/mnsc.2016.2569

Baucells, M., Weber, M., & Welfens, F. (2011). Reference-point formation and updating. *Management Science*, *57*(3), 506–519. https://doi.org/10.1287/mnsc.1100.1286

Bearman, J. (2009, November 13). Can D.I.Y. supplant the first-person shooter? *The New York Times*.
Retrieved from https://www.nytimes.com/2009/11/15/magazine/15videogames-t.html

Bell, D. R., & Lattin, J. M. (2000). Looking for loss aversion in scanner panel data: the confounding effect of price response heterogeneity. *Marketing Science*, *19*(2), 185–200. https://doi.org/10.1287/mksc.19.2.185.11802

Beltagui, A., Rosli, A., & Candi, M. (2020). Exaptation in a digital innovation ecosystem: The disruptive impacts of 3D printing. *Research Policy*, *49*(1). https://doi.org/10.1016/j.respol.2019.103833

Benkler, Y. (2006). *The wealth of networks: How social production transforms markets and freedom*. New Haven, Connecticut: Yale University Press.

Bergquist, M., & Ljungberg, J. (2001). The power of gifts: Organizing social relationships in open source communities. *Information Systems Journal*, *11*(4), 305–320. https://doi.org/10.1046/j.1365-2575.2001.00111.x

Bernevega, A., & Gekker, A. (2021). The industry of landlords: Exploring the assetization of the triple-a game. *Games and Culture*, tba. https://doi.org/10.1177/15554120211014151

Bertolini, L. (2018). H*ands-on game development without coding: Create 2D and 3D games with visual scripting in Unity*. Birmingham: Packt Publishing Ltd.

Bijmolt, T. H. A., Van Heerde, H. J., & Pieters, R. G. M. (2005). New empirical generalizations on the determinants of price elasticity. *Journal of Marketing Research*, *42*(2), 141–156. https://doi.org/10.1509/jmkr.42.2.141.62296

Bilgram, V., Brem, A., & Voigt, K.-I. (2008). User-centric innovations in new product development—systematic identification of lead users harnessing interactive and collaborative online-tools. *International Journal of Innovation Management*, *12*(03), 419–458. https://doi.org/10.1142/S1363919608002096

Billieux, J., Flayelle, M., Rumpf, H.-J., & Stein, D. J. (2019). High involvement versus pathological involvement in video games: A crucial distinction for ensuring the validity and utility of gaming disorder. *Current Addiction Reports*, *6*(3), 323–330. https://doi.org/10.1007/s40429-019-00259-x

Biswas, A., & Blair, E. A. (1991). Contextual effects of reference prices in retail advertisements. *Journal of Marketing*, *55*(3), 1–12. https://doi.org/10.2307/1252143

Bitran, G. R., & Mondschein, S. V. (1997). Periodic pricing of seasonal products in retailing. *Management Science*, *43*(1), 64–79. https://doi.org/10.1287/mnsc.43.1.64

Bitta, A. J. D., & Monroe, K. B. (1974). The influence of adaptation levels on subjective price perceptions. *Advances in Consumer Research*, *01*, 359–369.

Bitzer, J., Schrettl, W., & Schröder, P. J. H. (2007). Intrinsic motivation in open source software development. *Journal of Comparative Economics*, *35*(1), 160–169. https://doi.org/10.1016/j.jce.2006.10.001

Block, J. H., Henkel, J., Schweisfurth, T. G., & Stiegler, A. (2016). Commercializing user innovations by vertical diversification: The user–manufacturer innovator. *Research Policy*, *45*(1), 244–259. https://doi.org/10.1016/j.respol.2015.09.007

Bloemer, J., & Ruyter, K. de. (1998). On the relationship between store image, store satisfaction and store loyalty. *European Journal of Marketing*, *32*(5/6), 499–513. https://doi.org/10.1108/03090569810216118

Boehm, B. W., & Papaccio, P. N. (1988). Understanding and controlling software costs. *IEEE Transactions on Software Engineering*, *14*(10), 1462–1477. https://doi.org/10.1109/32.6191

Bogers, M., Afuah, A., & Bastian, B. (2010). Users as innovators: A review, critique, and future research directions. *Journal of Management*, *36*(4), 857–875. https://doi.org/10.1177/0149206309353944

Bogers, M., & West, J. (2010). *Contrasting innovation creation and commercialization within open, user and cumulative innovation* (SSRN Scholarly Paper No. 1751025). Rochester, NY: Social Science Research Network. Retrieved from Social Science Research Network website: https://papers.ssrn.com/abstract=1751025

Bogers, M., & West, J. (2012). Managing distributed innovation: Strategic utilization of open and user innovation. *Creativity and Innovation Management*, *21*(1), 61–75. https://doi.org/10.1111/j.1467-8691.2011.00622.x

Böhm, M. (2012, June 10). Indie Game: Film über Spieleentwickler. *Der Spiegel*. Retrieved from https://www.spiegel.de/netzwelt/games/indie-game-film-ueber-spieleentwickler-a-837013.html

Bolton, L. E. (2018). Behavioral pricing in JCR (Winter 2017/2018)—Virtual JCR research curation. *Journal of Consumer Research*. Retrieved from https://academic.oup.com/jcr/pages/behavioral_pricing_in_jcr

Bolton, L., Warlop, L., & Alba, J. (2003). Consumer perceptions of price (un)fairness. *Journal of Consumer Research*, *29*, 474–491. https://doi.org/10.1086/346244

Bolton, R., & Drew, J. (1991). A multistage model of customers' assessments of service quality and value. *Journal of Consumer Research*, *17*, 375–384. https://doi.org/10.1086/208564

Bolton, R. N., & Lemon, K. N. (1999). A dynamic model of customers' usage of services: usage as an antecedent and consequence of satisfaction. *Journal of Marketing Research*, *36*(2), 171–186. https://doi.org/10.2307/3152091

Bonabeau, E. (2002). Agent-based modeling: Methods and techniques for simulating human systems. *Proceedings of the National Academy of Sciences*, *99*, 7280–7287. https://doi.org/10.1073/pnas.082080899

Boudreau, K. (2018). A*mateurs crowds & professional entrepreneurs as platform complementors* (No. w24512). Cambridge, MA: National Bureau of Economic Research. https://doi.org/10.3386/w24512

Boudreau, K. J., & Jeppesen, L. B. (2015). Unpaid crowd complementors: The platform network effect mirage. *Strategic Management Journal*, *36*(12), 1761–1777. https://doi.org/10.1002/smj.2324

Bowman, C., & Ambrosini, V. (2000). Value creation versus value capture: towards a coherent definition of value in strategy. *British Journal of Management*, *11*(1), 1–15. https://doi.org/10.1111/1467-8551.00147

Boyle, E. A., Hainey, T., Connolly, T. M., Gray, G., Earp, J., Ott, M., Pereira, J. (2016). An update to the systematic literature review of empirical evidence of the impacts and outcomes of computer games and serious games. *Computers & Education*, *94*, 178–192. https://doi.org/10.1016/j.compedu.2015.11.003

Bradonjic, P., Franke, N., & Lüthje, C. (2019). Decision-makers' underestimation of user innovation. *Research Policy*, *48*(6), 1354–1361. https://doi.org/10.1016/j.respol.2019.01.020

Brazauskas, R., & Logan, B. R. (2016). Observational studies: Matching or regression? *Biology of Blood and Marrow Transplantation*, *22*(3), 557–563. https://doi.org/10.1016/j.bbmt.2015.12.005

Brem, A., Bilgram, V., & Gutstein, A. (2018). Involving lead users in innovation: a structured summary of research on the lead user method. *International Journal of Innovation and Technology Management*, *15*(03). https://doi.org/10.1142/S0219877018500220

Brem, A., Bilgram, V., & Marchuk, A. (2019). How crowdfunding platforms change the nature of user innovation – from problem solving to entrepreneurship. *Technological Forecasting and Social Change*, *144*, 348–360. https://doi.org/10.1016/j.techfore.2017.11.020

Bridges, E., Yim, C. K. (Bennett), & Briesch, R. A. (1995). A high-tech product market share model with customer expectations. *Marketing Science*, *14*(1), 61–81. https://doi.org/10.1287/mksc.14.1.61

Briesch, R. A., Krishnamurthi, L., Mazumdar, T., & Raj, S. P. (1997). A comparative analysis of reference price models. *Journal of Consumer Research*, *24*(2), 202–214. https://doi.org/10.1086/209505

Broniarczyk, S. M., & Alba, J. W. (1994). The role of consumers' intuitions in inference making. *Journal of Consumer Research*, *21*(3), 393–407. https://doi.org/10.1086/209406

Brooks, C. J. (2003). *Survival in cold waters: Staying alive*. Canada: Transport Canada Marine. Retrieved from https://tc.canada.ca/sites/default/files/migrated/tp13822e.pdf

Brucks, M., Zeithaml, V. A., & Naylor, G. (2000). Price and brand name as indicators of quality dimensions for consumer durables. *Journal of the Academy of Marketing Science*, *28*(3), 359–374. https://doi.org/10.1177/0092070300283005

Burger-Helmchen, T. (2008). Are users the next entrepreneurs? A case study on the video game industry. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1146531

Burger-Helmchen, T., & Cohendet, P. (2011). User communities and social software in the video game industry. *Long Range Planning*, *44*(5), 317–343. https://doi.org/10.1016/j.lrp.2011.09.003

Burkert, M., Ivens, B. S., Henneberg, S., & Schradi, P. (2017). Organizing for value appropriation: Configurations and performance outcomes of price management. *Industrial Marketing Management*, *61*, 194–209. https://doi.org/10.1016/j.indmarman.2016.06.007

Burroughs, J. E., & Rindfleisch, A. (2002). Materialism and well-being: A conflicting values perspective. *Journal of Consumer Research*, *29*(3), 348–370. https://doi.org/10.1086/344429

Busso, M., & Galiani, S. (2014). T*he causal effect of competition on prices and quality: Evidence from a field experiment* (No. w20054). National Bureau of Economic Research. Retrieved from National Bureau of Economic Research website: https://www.nber.org/papers/w20054

Cachon, G. P., & Swinney, R. (2008). Purchasing, pricing, and quick response in the presence of strategic consumers. *Management Science*, *55*(3), 497–511. https://doi.org/10.1287/mnsc.1080.0948

Callele, D., Neufeld, E., & Schneider, K. (2005). Requirements engineering and the creative process in the video game industry. *13th IEEE International Conference on Requirements Engineering (RE'05)*, 240–250. https://doi.org/10.1109/RE.2005.58

Cameron, A. C., & Trivedi, P. K. (1998). *Regression analysis of count data*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511814365

Campbell, M. C. (1999). Perceptions of price unfairness: antecedents and consequences. *Journal of Marketing Research*, *36*(2), 187–199. https://doi.org/10.2307/3152092

Campbell, M. C. (2007). "Says who?!" How the source of price information and affect influence perceived price (un)fairness. *Journal of Marketing Research*, *44*(2), 261–271. https://doi.org/10.1509/jmkr.44.2.261

Carter, N. M., Gartner, W. B., Shaver, K. G., & Gatewood, E. J. (2003). The career reasons of nascent entrepreneurs. *Journal of Business Venturing*, *18*(1), 13–39. https://doi.org/10.1016/S0883-9026(02)00078-2

Case, K. E., Fair, R. C., & Oster, S. M. (2012). *Principles of economics* (10th ed). Boston: Prentice Hall.

Castro, F. G., Kellison, J. G., Boyd, S. J., & Kopak, A. (2010). A methodology for conducting integrative mixed methods research and data analyses. *Journal of Mixed Methods Research*, *4*(4), 342–360. https://doi.org/10.1177/1558689810382916

CGTrader. (n.d.). About Us. Retrieved May 26, 2021, from CGTrader.com website: https://www.cgtrader.com/about-us

Chalk, A. (2014, August 19). Analyst says digital sales made up 92 percent of PC game market in 2013. Retrieved May 11, 2021, from PC Gamer website: https://www.pcgamer.com/analyst-says-digital-sales-made-up-92-percent-of-pc-game-market-in-2013/

Chapman, J. (1993). The effect of discounts on the price-perceived quality paradigm. *Journal of Marketing Theory and Practice*, *1*(2), 1–11.

Chen, C. Y. (2009). Who I am and how I think: The impact of self-construal on the roles of internal and external reference prices in price evaluations. *Journal of Consumer Psychology*, *19*(3), 416–426. https://doi.org/10.1016/j.jcps.2009.05.012

Chen, Y., Harper, F. M., Konstan, J., & Li, S. X. (2010). Social comparisons and contributions to online communities: A field experiment on movielens. *American Economic Review*, *100*(4), 1358–1398. https://doi.org/10.1257/aer.100.4.1358

Chen, Y.-S., & Chang, C.-H. (2013). Greenwash and green trust: The mediation effects of green consumer confusion and green perceived risk. *Journal of Business Ethics*, *114*(3), 489–500. https://doi.org/10.1007/s10551-012-1360-0

Cheng, L. L., & Monroe, K. B. (2013). An appraisal of behavioral price research (part 1): Price as a physical stimulus. *Academy of Marketing Science Review*, *3*(3), 103–129. https://doi.org/10.1007/s13162-013-0041-1

Christopher, M., & Gattorna, J. (2005). Supply chain cost management and value-based pricing. *Industrial Marketing Management*, *34*(2), 115–121. https://doi.org/10.1016/j.indmarman.2004.07.016

Church, E. M., & Oakley, R. L. (2018). Etsy and the long-tail: How microenterprises use hyper-differentiation in online handicraft marketplaces. *Electronic Commerce Research*, *18*(4), 883–898. https://doi.org/10.1007/s10660-018-9300-4

Cialdini, R. B., Eisenberg, N., Green, B. L., Rhoads, K., & Bator, R. (1998). Undermining the undermining effect of reward on sustained interest. *Journal of Applied Social Psychology*, *28*(3), 249–263. https://doi.org/10.1111/j.1559-1816.1998.tb01705.x

Claussen, J., & Halbinger, M. A. (2021). The role of pre-innovation platform activity for diffusion success: Evidence from consumer innovations on a 3D printing platform. *Research Policy*, *50*(8). https://doi.org/10.1016/j.respol.2020.103943

Coase, R. H. (1937). The nature of the firm. *Economica*, *4*(16), 386–405.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, *35*(1), 128–152. https://doi.org/10.2307/2393553

Cohendet, P., & Simon, L. (2007). Playing across the playground: Paradoxes of knowledge creation in the videogame firm. *Journal of Organizational Behavior*, *28*(5), 587–605. https://doi.org/10.1002/job.460

Colin Cameron, A., & Windmeijer, F. A. G. (1997). An R-squared measure of goodness of fit for some common nonlinear regression models. *Journal of Econometrics*, *77*(2), 329–342. https://doi.org/10.1016/S0304-4076(96)01818-0

Conlisk, J. (1996). Why bounded rationality? *Journal of Economic Literature*, *34*(2), 669–700.

Cornwell, J. F. M., Franks, B., & Higgins, E. T. (2017). How the "truth" self relates to altruism: When your problem is mine. *Social Cognition*, *35*(2), 204–226. https://doi.org/10.1521/soco.2017.35.2.204

Cossu, S. M. (2019). What's next? In S. M. Cossu (Ed.), *Game Development with GameMaker Studio 2: Make Your Own Games with GameMaker Language* (pp. 511–519). Berkeley, CA: Apress. https://doi.org/10.1007/978-1-4842-5010-5_14

Cox, J. L. (2001). Can differential prices be fair? *Journal of Product & Brand Management*, *10*(5), 264–275. https://doi.org/10.1108/10610420110401829

Creswell, J., Clark, V., Gutmann, M., & Hanson, W. (2003). Advance mixed methods research designs. In *Handbook of mixed methods in social and behavioral research* (pp. 209–240). Los Angeles: SAGE Publications, Inc.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed). Los Angeles: SAGE Publications, Inc.

Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (Third Edition). Los Angeles: SAGE Publications, Inc.

Crogan, P. (2018). Indie dreams: Video games, creative economy, and the hyperindustrial epoch. *Games and Culture*, *13*(7), 671–689. https://doi.org/10.1177/1555412018756708

Cronley, M. L., Posavac, S. S., Meyer, T., Kardes, F. R., & Kellaris, J. J. (2005). A selective hypothesis testing perspective on price-quality inference and inference-based choice. *Journal of Consumer Psychology*, *15*(2), 159–169. https://doi.org/10.1207/s15327663jcp1502_8

Csikszentmihalyi, M. (1975). *Beyond boredom and anxiety* (1st ed). San Francisco: Jossey-Bass Publishers.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper & Row.

Cunha, M., & Shulman, J. D. (2011). Assimilation and contrast in price evaluations. *Journal of Consumer Research*, *37*(5), 822–835. https://doi.org/10.1086/656060

Curry, D. J., & Riesz, P. C. (1988). Prices and price/quality relationships: A longitudinal analysis. *Journal of Marketing*, *52*(1), 36–51. https://doi.org/10.2307/1251684

Dahl, D. W., Fuchs, C., & Schreier, M. (2015). Why and when consumers prefer products of user-driven firms: A social identification account. *Management Science*, *61*(8), 1978–1988. https://doi.org/10.1287/mnsc.2014.1999

Dahlin, K., Taylor, M., & Fichman, M. (2004). Today's edisons or weekend hobbyists: Technical merit and success of inventions by independent inventors. *Research Policy*, *33*(8), 1167–1183. https://doi.org/10.1016/j.respol.2004.06.003

Darke, P. R., & Dahl, D. W. (2003). Fairness and discounts: The subjective value of a bargain. *Journal of Consumer Psychology*, *13*(3), 328–338. https://doi.org/10.1207/S15327663JCP1303_13

Das, G., Mukherjee, A., & Smith, R. J. (2018). The perfect fit: The moderating role of selling cues on hedonic and utilitarian product types. *Journal of Retailing*, *94*(2), 203–216. https://doi.org/10.1016/j.jretai.2017.12.002

Davis, L. N., Davis, J. D., & Hoisl, K. (2012). Leisure time invention. *Organization Science*, *24*(5), 1439–1458. https://doi.org/10.1287/orsc.1120.0791

Dawar, N., & Parker, P. (1994). Marketing universals: Consumers' use of brand name, price, physical appearance, and retailer reputation as signals of product quality. *Journal of Marketing*, *58*(2), 81–95. https://doi.org/10.2307/1252271

Day, G., & Montgomery, D. (1999). Charting new directions for marketing. *Journal of Marketing*, *63*, 3–13. https://doi.org/10.2307/1252096

de Jong, J. P. J. (2013). *User innovation by Canadian consumers: Analysis of a sample of 2,021 respondents*. Unpublished paper commissioned by Industry Canada. Quoted in "Free Innovation" by Eric von Hippel (2017).

de Jong, J. P. J. (2016a). The empirical scope of user innovation. In *Revolutionizing innovation: Users, communities, and open innovation*. Cambridge, Massachusetts ; London, England: MIT Press.

de Jong, J. P. J. (2016b). *The importance of measuring household sector innovation* [OECD Blue Sky Forum III report]. Retrieved from https://www.oecd.org/sti/004%20-%20BlueSky%20paper%20measurement%20-%20final%20version%20with%20appendix.pdf

de Jong, J. P. J., Ben-Menahem, S. M., Franke, N., Füller, J., & von Krogh, G. (2021). Treading new ground in household sector innovation research: Scope, emergence, business implications, and diffusion. *Research Policy*, *50*(8). https://doi.org/10.1016/j.respol.2021.104270

de Jong, J. P. J., & Flowers, S. (2018). Free in, free out? Outbound transfer of user innovations in small UK firms. *Industrial Marketing Management*, *73*, 21–30. https://doi.org/10.1016/j.indmarman.2018.01.008

de Jong, J. P. J., Gillert, N. L., & Stock, R. M. (2018). First adoption of consumer innovations: Exploring market failure and alleviating factors. *Research Policy*, *47*(2), 487–497. https://doi.org/10.1016/j.respol.2018.01.004

de Jong, J. P. J., & Lindsen, I. (2021). Enhancing diffusion of consumer innovations on knowledge sharing platforms. *Asian Journal of Technology Innovation*, 1–19. https://doi.org/10.1080/19761597.2021.1886859

de Jong, J. P. J., von Hippel, E., Gault, F., Kuusisto, J., & Raasch, C. (2015). Market failure in the diffusion of consumer-developed innovations: Patterns in Finland. *Research Policy*, *44*(10), 1856–1865. https://doi.org/10.1016/j.respol.2015.06.015

de Langhe, B., Fernbach, P. M., & Lichtenstein, D. R. (2016). Navigating by the stars: Investigating the actual and perceived validity of online user ratings. *Journal of Consumer Research*, *42*(6), 817–833. https://doi.org/10.1093/jcr/ucv047

Dean, J. (1976, November). Pricing policies for new products. *Harvard Business Review*. Retrieved from https://hbr.org/1976/11/pricing-policies-for-new-products

Dean, P. (2014, April 6). The story of DOTA. Retrieved May 11, 2021, from Eurogamer website: https://www.eurogamer.net/articles/2011-08-16-the-story-of-dota-article

Deci, E. L., & Ryan, R. M. (2000). The "What" and "Why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01

Del Bosco, B., Chierici, R., & Mazzucchelli, A. (2020). User entrepreneurship in the video game industry: The role of communities. *Journal of Small Business and Enterprise Development*, *27*(4), 681–701. https://doi.org/10.1108/JSBED-07-2019-0252

Delmar, F., & Davidsson, P. (2000). Where do they come from? Prevalence and characteristics of nascent entrepreneurs. *Entrepreneurship & Regional Development*, *12*(1), 1–23. https://doi.org/10.1080/089856200283063

DeMonaco, H. J., Oliveira, P., Torrance, A. W., von Hippel, C., & von Hippel, E. A. (2018). *Free medical innovation by patients – no producers required* (SSRN Scholarly Paper No. ID 3241760). Rochester, NY: Social Science Research Network. Retrieved

from Social Science Research Network website:
https://papers.ssrn.com/abstract=3241760

DeMonaco, H. J., Oliveira, P., Torrance, A. W., von Hippel, C., & von Hippel, E. A. (2019, February 21). When patients become innovators. *MIT Sloan Management Review*. Retrieved from https://sloanreview.mit.edu/article/when-patients-become-innovators/

Dholakia, U. M. (2018, July 12). When cost-plus pricing is a good idea. *Harvard Business Review*. Retrieved from https://hbr.org/2018/07/when-cost-plus-pricing-is-a-good-idea

Di Gangi, P. M., & Wasko, M. (2009). Steal my idea! Organizational adoption of user innovations from a user innovation community: A case study of Dell IdeaStorm. *Decision Support Systems*, *48*(1), 303–312. https://doi.org/10.1016/j.dss.2009.04.004

Diamantopoulos, A. (1995). Pricing. In *Marketing Theory and Practice* (pp. 182–197). London: Macmillan Education UK. https://doi.org/10.1007/978-1-349-24260-3_11

Diamantopoulos, A., & Zeugner-Roth, K. P. (2010). "Country of origin" as brand element. In *Wiley international encyclopedia of marketing*. https://doi.org/10.1002/9781444316568.wiem06004

Ding, M., Ross Jr., W. T., & Rao, V. R. (2010). Price as an indicator of quality: Implications for utility and demand functions. *Journal of Retailing*, *86*(1), 69–84. https://doi.org/10.1016/j.jretai.2010.01.002

Diver, M. (2016). *Indie games: The complete introduction to indie gaming*. London: Michael O'Mara Books.

Dodds, W. B., Monroe, K. B., & Grewal, D. (1991). Effects of price, brand, and store information on buyers' product evaluations. *Journal of Marketing Research*, *28*(3), 307–319. https://doi.org/10.2307/3172866

Dreunen, J. van. (2020). *One up: creativity, competition, and the global business of video games*. New York City: Columbia Business School Publishing.

Dufwenberg, M., & Gneezy, U. (2000). Price competition and market concentration: An experimental study. *International Journal of Industrial Organization*, *18*(1), 7–22. https://doi.org/10.1016/S0167-7187(99)00031-4

Dütting, P., Feng, Z., Narasimhan, H., Parkes, D. C., & Ravindranath, S. S. (2020). Optimal auctions through deep learning. *ArXiv:1706.03459 [Cs]*. Retrieved from http://arxiv.org/abs/1706.03459

Ebersberger, B., & Kuckertz, A. (2021). Hop to it! The impact of organization type on innovation response time to the COVID-19 crisis. *Journal of Business Research*, *124*, 126–135. https://doi.org/10.1016/j.jbusres.2020.11.051

Edwards, C. (2013, November 4). Valve lines up console partners in challenge to Microsoft, Sony. *Bloomberg News*. Retrieved from https://www.bloomberg.com/news/articles/2013-11-04/valve-lines-up-console-partners-in-challenge-to-microsoft-sony

Eisenmann, T. R., Pao, M., & Barley, L. (2014). Dropbox: "It just works." *Harvard Business School Case*, (9-811–065).

El-Ansary, A. I. (2006). Marketing strategy: Taxonomy and frameworks. *European Business Review*, *18*(4), 266–293. https://doi.org/10.1108/09555340610677499

Ellison, G., & Ellison, S. F. (2009). Search, obfuscation, and price elasticities on the internet. *Econometrica*, *77*(2), 427–452. https://doi.org/10.3982/ECTA5708

Entertainment Software Association. (2019). Essential facts about the video game industry 2019. Retrieved May 11, 2021, from https://www.theesa.com/wp-content/uploads/2019/05/ESA_Essential_facts_2019_final.pdf

Epstein, S. (1994). Integration of the cognitive and the psychodynamic unconscious. *The American Psychologist*, *49*, 709–724. https://doi.org/10.1037//0003-066X.49.8.709

Erdem, T., Keane, M. P., & Sun, B. (2008). A dynamic model of brand choice: When price and advertising signal product quality. *Marketing Science*, *27*(6), 1111–1125. https://doi.org/10.1287/mksc.1080.0362

ESA Eurostat. (2010). *European system of national and regional accounts—Paragraph 2.118*. Retrieved from https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Household_sector

Evans, J. S. B. T. (2002). Logic and human reasoning: An assessment of the deduction paradigm. *Psychological Bulletin*, *128*(6), 978–996. https://doi.org/10.1037/0033-2909.128.6.978

Evans, J. St. B. T. (2003). In two minds: Dual-process accounts of reasoning. *Trends in Cognitive Sciences*, *7*(10), 454–459. https://doi.org/10.1016/j.tics.2003.08.012

Fauchart, E., & Gruber, M. (2011). Darwinians, communitarians, and missionaries: The role of founder identity in entrepreneurship. *Academy of Management Journal*, *54*(5), 935–957. https://doi.org/10.5465/amj.2009.0211

Fehr, E., & Fischbacher, U. (2003). The nature of human altruism. *Nature*, *425*(6960), 785–791. https://doi.org/10.1038/nature02043

Ferguson, J. L., Ellen, P. S., & Bearden, W. O. (2014). Procedural and distributive fairness: Determinants of overall price fairness. *Journal of Business Ethics*, *121*(2), 217–231. https://doi.org/10.1007/s10551-013-1694-2

Finkel, N. J. (2001). *Not fair!: The typology of commonsense unfairness*. Washington, DC, US: American Psychological Association. https://doi.org/10.1037/10431-000

Fisher, M., Gallino, S., & Li, J. (2017). Competition-based dynamic pricing in online retailing: A methodology validated with field experiments. *Management Science*, *64*(6), 2496–2514. https://doi.org/10.1287/mnsc.2017.2753

Fitzgerald, B. (2006). The transformation of open source software. *MIS Quarterly*, *30*(3), 587–598. https://doi.org/10.2307/25148740

Floyd, K., Freling, R., Alhoqail, S., Cho, H. Y., & Freling, T. (2014). How online product reviews affect retail sales: A meta-analysis. *Journal of Retailing*, *90*(2), 217–232. https://doi.org/10.1016/j.jretai.2014.04.004

Folta, T. B., Delmar, F., & Wennberg, K. (2010). *Hybrid Entrepreneurship* (SSRN Scholarly Paper No. ID 1477325). Rochester, NY: Social Science Research Network. Retrieved from Social Science Research Network website: https://papers.ssrn.com/abstract=1477325

Forbis, J. L., & Mehta, N. T. (1981). Value-based strategies for industrial products. *Business Horizons*, *24*(3), 32–42. https://doi.org/10.1016/0007-6813(81)90125-7

Franke, N., Keinz, P., & Steger, C. J. (2009a). Testing the value of customization: When do customers really prefer products tailored to their preferences? *Journal of Marketing*, *73*(5), 103–121. https://doi.org/10.1509/jmkg.73.5.103

Franke, N., & Piller, F. (2004). Value creation by toolkits for user innovation and design: the case of the watch market. *Journal of Product Innovation Management*, *21*(6), 401–415. https://doi.org/10.1111/j.0737-6782.2004.00094.x

Franke, N., Schirg, F., & Reinsberger, K. (2016). The frequency of end-user innovation: A re-estimation of extant findings. *Research Policy*, *45*(8), 1684–1689. https://doi.org/10.1016/j.respol.2016.04.012

Franke, N., & Schreier, M. (2010). Why customers value self-designed products: The importance of process effort and enjoyment*. *Journal of Product Innovation Management*, *27*(7), 1020–1031. https://doi.org/10.1111/j.1540-5885.2010.00768.x

Franke, N., Schreier, M., & Kaiser, U. (2009b). The "I designed it myself" effect in mass customization. *Management Science*, *56*(1), 125–140. https://doi.org/10.1287/mnsc.1090.1077

Franke, N., & Shah, S. (2003). How communities support innovative activities: An exploration of assistance and sharing among end-users. *Research Policy*, *32*(1), 157–178. https://doi.org/10.1016/S0048-7333(02)00006-9

Franke, N., & von Hippel, E. (2003). Satisfying heterogeneous user needs via innovation toolkits: The case of Apache security software. *Research Policy*, *32*(7), 1199–1215. https://doi.org/10.1016/S0048-7333(03)00049-0

Franke, N., von Hippel, E., & Schreier, M. (2006). Finding commercially attractive user innovations: A test of lead-user theory. *Journal of Product Innovation Management*, *23*(4), 301–315. https://doi.org/10.1111/j.1540-5885.2006.00203.x

Freeman, G., McNeese, N., Bardzell, J., & Bardzell, S. (2020). "Pro-Amateur"-driven technological innovation: Participation and challenges in indie game development. *Proceedings of the ACM on Human-Computer Interaction*, *4*, 1–22. https://doi.org/10.1145/3375184

Frey, B. S., & Pommerehne, W. W. (1993). On the fairness of pricing—An empirical survey among the general population. *Journal of Economic Behavior & Organization*, *20*(3), 295–307. https://doi.org/10.1016/0167-2681(93)90027-M

Fuchs, C., Prandelli, E., Schreier, M., & Dahl, D. W. (2013). All that is users might not be gold: How labeling products as user designed backfires in the context of luxury fashion brands. *Journal of Marketing*, *77*(5), 75–91. https://doi.org/10.1509/jm.11.0330

Fuchs, C., Schreier, M., & van Osselaer, S. M. J. (2015). The handmade effect: What's love got to do with it? *Journal of Marketing*, *79*(2), 98–110. https://doi.org/10.1509/jm.14.0018

Fueglistaller, U., Müller, C. A., Müller, S., & Volery, T. (2016). *Entrepreneurship: Modelle - Umsetzung - Perspektiven: mit Fallbeispielen aus Deutschland, Österreich und der Schweiz* (4. Auflage). Wiesbaden: Springer.

Füller, J. (2006). Why consumers engage in virtual new product developments initiated by producers. *Advances in Consumer Research*, *33*, 639–646.

Füller, J., Hutter, K., Hautz, J., & Matzler, K. (2014). User roles and contributions in innovation-contest communities. *Journal of Management Information Systems*, *31*(1), 273–308. https://doi.org/10.2753/MIS0742-1222310111

Füller, J., Jawecki, G., & Mühlbacher, H. (2007). Innovation creation by online basketball communities. *Journal of Business Research*, *60*(1), 60–71. https://doi.org/10.1016/j.jbusres.2006.09.019

Füller, J., Schroll, R., & von Hippel, E. (2013). User generated brands and their contribution to the diffusion of user innovations. *Research Policy*, *42*(6), 1197–1209. https://doi.org/10.1016/j.respol.2013.03.006

Fursov, K., Thurner, T., & Nefedova, A. (2017). What user-innovators do that others don't: A study of daily practices. *Technological Forecasting and Social Change*, *118*, 153–160. https://doi.org/10.1016/j.techfore.2017.02.016

Gabor, Andre, & Granger, C. W. J. (1966). Price as an indicator of quality: Report on an enquiry. *Economica*, *33*(129), 43–70. https://doi.org/10.2307/2552272

Gabor, André, & Granger, C. W. J. (1979). A systematic approach to effective pricing. *Management Decision*, *17*(8), 742–760. https://doi.org/10.1108/eb001224

Gale, B. T., & Wood, R. C. (1994). *Managing customer value: Creating quality and service that customers can see*. New York ; Toronto: Free Press; Maxwell Macmillan.

Gambardella, A., Raasch, C., & von Hippel, E. (2017). The user innovation paradigm: Impacts on markets and welfare. *Management Science*, *63*(5), 1450–1468. https://doi.org/10.1287/mnsc.2015.2393

Gao, G. (Gordon), Greenwood, B. N., Agarwal, R., & McCullough, J. (2015). *Vocal minority and silent majority: How do online ratings reflect population perceptions of quality?* (SSRN Scholarly Paper No. ID 2629837). Rochester, NY: Social Science Research Network. Retrieved from Social Science Research Network website: https://papers.ssrn.com/abstract=2629837

Garcia, R., & Jager, W. (2011). From the special issue editors: Agent-based modeling of innovation diffusion*. *Journal of Product Innovation Management*, *28*(2), 148–151. https://doi.org/10.1111/j.1540-5885.2011.00788.x

Garda, M. B., & Grabarczyk, P. (2016). Is every indie game independent? Towards the concept of independent game. *Game Studies*, *16*(1). Retrieved from http://gamestudies.org/1601/articles/gardagrabarczyk

Gault, F. (2016). *Defining and measuring innovation in all sectors of the economy: Policy relevance* [OECD Blue Sky Forum III Report]. Ghent, Belgium. Retrieved from https://www.oecd.org/sti/008%20-%20BS3%202016%20GAULT%20Extending%20the%20measurement%20of%20innovation%20.pdf

Gault, F. (2018). Defining and measuring innovation in all sectors of the economy. *Research Policy*, *47*(3), 617–622. https://doi.org/10.1016/j.respol.2018.01.007

Gault, F., & von Hippel, E. A. (2009). The prevalence of user innovation and free innovation transfers: Implications for statistical indicators and innovation policy. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1337232

Gavious, A., & Lowengart, O. (2012). Price–quality relationship in the presence of asymmetric dynamic reference quality effects. *Marketing Letters*, *23*(1), 137–161. https://doi.org/10.1007/s11002-011-9143-4

Gelbrich, K. (2011). I have paid less than you! The emotional and behavioral consequences of advantaged price inequality. *Journal of Retailing*, *87*(2), 207–224. https://doi.org/10.1016/j.jretai.2011.03.003

Gerstner, E. (1985). Do higher prices signal higher quality? *Journal of Marketing Research*, *22*(2), 209–215. https://doi.org/10.1177/002224378502200210

Geylani, T., Dukes, A. J., & Srinivasan, K. (2007). Strategic manufacturer response to a dominant retailer. *Marketing Science*, *26*(2), 164–178. https://doi.org/10.1287/mksc.1060.0239

Gielissen, R., Dutilh, C. E., & Graafland, J. J. (2008). Perceptions of price fairness: An empirical research. *Business & Society*, *47*(3), 370–389. https://doi.org/10.1177/0007650308316937

Gilovich, T., Griffin, D. W., & Kahneman, D. (Eds.). (2002). *Heuristics and biases: The psychology of intuitive judgment*. Cambridge, U.K. ; New York: Cambridge University Press.

Good, J. (2007). Shop 'til we drop? Television, materialism and attitudes about the natural environment. *Mass Communication and Society*, *10*(3), 365–383. https://doi.org/10.1080/15205430701407165

Gould, J., Moore, D., McGuire, F., & Stebbins, R. (2008). Development of the serious leisure inventory and measure. *Journal of Leisure Research*, *40*(1), 47–68. https://doi.org/10.1080/00222216.2008.11950132

Green, P. E. (1984). Hybrid models for conjoint analysis: An expository review. *Journal of Marketing Research*, *21*(2), 155–169. https://doi.org/10.1177/002224378402100204

Green, P. E., Carroll, J. D., & Goldberg, S. M. (1981). A general approach to product design optimization via conjoint analysis. *Journal of Marketing*, *45*(3), 17–37. https://doi.org/10.1177/002224298104500302

Green, P. E., Krieger, A. M., & Wind, Y. (2001). Thirty years of conjoint analysis: Reflections and prospects. *Interfaces*, *31*, 56–73. https://doi.org/10.1287/inte.31.3s.56.9676

Grewal, D., & Compeau, L. D. (1992). Comparative price advertising: Informative or deceptive? *Journal of Public Policy & Marketing*, *11*(1), 52–62. https://doi.org/10.1177/074391569201100106

Grewal, D., & Compeau, L. D. (2007). Consumer responses to price and its contextual information cues. In N. K. Malhotra (Ed.), *Review of Marketing Research* (pp. 109–131). Emerald Group Publishing Limited. https://doi.org/10.1108/S1548-6435(2007)0000003008

Grewal, D., & Marmorstein, H. (1994). Market price variation, perceived price variation, and consumers' price search decisions for durable goods. *Journal of Consumer Research*, *21*(3), 453–460. https://doi.org/10.1086/209410

Grewal, D., Monroe, K. B., & Krishnan, R. (1998). The effects of price-comparison advertising on buyers' perceptions of acquisition value, transaction value, and behavioral intentions. *Journal of Marketing*, *62*(2), 46–59. https://doi.org/10.2307/1252160

Grewal, D., Roggeveen, A. L., Compeau, L. D., & Levy, M. (2012). Retail value-based pricing strategies: New times, new technologies, new consumers. *Journal of Retailing*, *88*(1), 1–6. https://doi.org/10.1016/j.jretai.2011.12.001

Griffin, D. W., Gonzalez, R., Koehler, D. J., & Gilovich, T. (2012). Judgmental heuristics: A historical overview. In *Oxford Library of Psychology*. *The Oxford handbook of thinking and reasoning* (pp. 322–345). New York: Oxford University Press.

Guhl, D., Klapper, D., Massner, K., Spann, M., Stich, L., & Yegoryan, N. (2017). Behavioral biases in marketing. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3091557

Guilding, C., Drury, C., & Tayles, M. (2005). An empirical investigation of the importance of cost-plus pricing. *Managerial Auditing Journal*, *20*(2), 125–137. https://doi.org/10.1108/02686900510574548

Guiltinan, J. P. (1976). Risk-aversive pricing policies: problems and alternatives: Can pricing under conditions of economic uncertainty be made less risky? *Journal of Marketing*, *40*(1), 10–15. https://doi.org/10.1177/002224297604000103

Gupta, A. K., Raj, S. P., & Wilemon, D. (1987). Managing the R&D-marketing interface. *Research Management*, *30*(2), 38–43. https://doi.org/10.1080/00345334.1987.11757025

Haans, R. F. J., Pieters, C., & He, Z.-L. (2016). Thinking about U: Theorizing and testing U- and inverted U-shaped relationships in strategy research. *Strategic Management Journal*, *37*(7), 1177–1195. https://doi.org/10.1002/smj.2399

Haefliger, S., Jäger, P., & von Krogh, G. (2010). Under the radar: Industry entry by user entrepreneurs. *Research Policy*, *39*(9), 1198–1213. https://doi.org/10.1016/j.respol.2010.07.001

Halbinger, M. A. (2018). The role of makerspaces in supporting consumer innovation and diffusion: An empirical analysis. *Research Policy*, *47*(10), 2028–2036. https://doi.org/10.1016/j.respol.2018.07.008

Hall, S., Walsh, M., & Yates, A. (1997). *How do UK companies set prices?* [Bank of England working paper]. Bank of England. Retrieved from Bank of England website: https://econpapers.repec.org/paper/boeboeewp/67.htm

Halpern, J. J. (1994). The effect of friendship on personal business transactions. *Journal of Conflict Resolution*, *38*(4), 647–664. https://doi.org/10.1177/0022002794038004003

Halpern, J. J. (1997). Elements of a script for friendship in transactions. *Journal of Conflict Resolution*, *41*(6), 835–868. https://doi.org/10.1177/0022002797041006006

Hamilton, T. B. (2020). *Computer game development and animation: A practical career guide*. Lanham: Rowman & Littlefield.

Han, S., Gupta, S., & Lehmann, D. R. (2001). Consumer price sensitivity and price thresholds. *Journal of Retailing*, *77*(4), 435–456. https://doi.org/10.1016/S0022-4359(01)00057-4

Hanson, W. (1992). The dynamics of cost-plus pricing. *Managerial and Decision Economics*, *13*(2), 149–161. https://doi.org/10.1002/mde.4090130207

Hardie, B. G. S., Johnson, E. J., & Fader, P. S. (1993). Modeling loss aversion and reference dependence effects on brand choice. *Marketing Science*, *12*(4), 378–394. https://doi.org/10.1287/mksc.12.4.378

Harhoff, D., Henkel, J., & von Hippel, E. (2003). Profiting from voluntary information spillovers: How users benefit by freely revealing their innovations. *Research Policy*, *32*(10), 1753–1769. https://doi.org/10.1016/S0048-7333(03)00061-1

Harhoff, D., & Lakhani, K. R. (Eds.). (2016). *Revolutionizing innovation: Users, communities, and open innovation*. Cambridge, Massachusetts ; London, England: MIT Press.

Hars, A., & Ou, S. (2002). Working for free? Motivations for participating in open-source projects. *International Journal of Electronic Commerce*, *6*(3,), 25–39.

Haruvy, E., Prasad, A., & Sethi, S. P. (2003). Harvesting altruism in open-source software development. *Journal of Optimization Theory and Applications*, *118*(2), 381–416. https://doi.org/10.1023/A:1025455523489

Hau, Y. S., & Kim, Y.-G. (2011). Why would online gamers share their innovation-conducive knowledge in the online game user community? Integrating individual motivations and social capital perspectives. *Computers in Human Behavior*, *27*(2), 956–970. https://doi.org/10.1016/j.chb.2010.11.022

Helgeson, J. G., & Beatty, S. E. (1987). Price expectation and price recall error: An empirical study. *Journal of Consumer Research*, *14*(3), 379–386. https://doi.org/10.1086/209121

Helson, H. (1964). *Adaptation-level theory: An experimental and systematic approach to behavior*. Harper and Row: New York.

Henkel, J., & Hippel, E. von. (2004). Welfare implications of user innovation. *The Journal of Technology Transfer*, *30*(1), 73–87. https://doi.org/10.1007/s10961-004-4359-6

Henrich, J., Boyd, R., Bowles, S., Camerer, C., Fehr, E., Gintis, H., & McElreath, R. (2001). In search of homo economicus: Behavioral experiments in 15 small-scale societies. *American Economic Review*, *91*(2), 73–78. https://doi.org/10.1257/aer.91.2.73

Herman, R. D., & Renz, D. O. (1999). Theses on nonprofit organizational effectiveness. *Nonprofit and Voluntary Sector Quarterly*, *28*(2), 107–126. https://doi.org/10.1177/0899764099282001

Hertel, G., Niedner, S., & Herrmann, S. (2003). Motivation of software developers in open source projects: An internet-based survey of contributors to the Linux kernel. *Research Policy*, *32*(7), 1159–1177. https://doi.org/10.1016/S0048-7333(03)00047-7

Herzog, R., & Bachman, J. (1981). Effects of questionnaire length on response quality. *Public Opinion Quarterly*, *45*(4), 549–559. https://doi.org/10.1086/268687

Hienerth, C. (2006). The commercialization of user innovations: The development of the rodeo kayak industry. *R&D Management*, *36*(3), 273–294. https://doi.org/10.1111/j.1467-9310.2006.00430.x

Hienerth, C., & Lettl, C. (2011). Exploring how peer communities enable lead user innovations to become standard equipment in the industry: Community pull effects: how lead user innovations become standard equipment. *Journal of Product Innovation Management*, *28*(1), 175–195. https://doi.org/10.1111/j.1540-5885.2011.00869.x

Hienerth, C., & Lettl, C. (2017). Perspective: Understanding the nature and measurement of the lead user construct. *Journal of Product Innovation Management*, *34*(1), 3–12. https://doi.org/10.1111/jpim.12318

Hienerth, C., Lettl, C., & Keinz, P. (2014a). Synergies among producer firms, lead users, and user communities: The case of the lego producer–user ecosystem. *Journal of Product Innovation Management*, *31*(4), 848–866. https://doi.org/10.1111/jpim.12127

Hienerth, C., von Hippel, E., & Berg Jensen, M. (2014b). User community vs. producer innovation development efficiency: A first empirical study. *Research Policy*, *43*(1), 190–201. https://doi.org/10.1016/j.respol.2013.07.010

Hinterhuber, A. (2004). Towards value-based pricing—An integrative framework for decision making. *Industrial Marketing Management*, *33*(8), 765–778. https://doi.org/10.1016/j.indmarman.2003.10.006

Hinterhuber, A. (2008). Customer value-based pricing strategies: Why companies resist. *Journal of Business Strategy*, *29*(4), 41–50. https://doi.org/10.1108/02756660810887079

Hinterhuber, A. (2015). Violations of rational choice principles in pricing decisions. *Industrial Marketing Management*, *47*, 65–74. https://doi.org/10.1016/j.indmarman.2015.02.006

Hinterhuber, A., & Liozu, S. (2014). Is innovation in pricing your next source of competitive advantage? *Business Horizons*, *57*(3), 413–423. https://doi.org/10.1016/j.bushor.2014.01.002

Hinterhuber, A., Snelgrove, T. C., & Stensson, B.-I. (2021). Value first, then price: The new paradigm of B2B buying and selling. *Journal of Revenue and Pricing Management*, *20*(4), 403–409. https://doi.org/10.1057/s41272-021-00304-3

Hitlin, S., & Piliavin, J. A. (2004). Values: Reviving a dormant concept. *Annual Review of Sociology*, *30*(1), 359–393. https://doi.org/10.1146/annurev.soc.30.012703.110640

Hogarth, R. M., & Karelaia, N. (2011). Entrepreneurial success and failure: Confidence and fallible judgment. *Organization Science*, *23*(6), 1733–1747. https://doi.org/10.1287/orsc.1110.0702

Hogarth, R. M., & Reder, M. W. (Eds.). (1987). *Rational choice: The contrast between economics and psychology*. Chicago: University of Chicago Press.

Holbrook, M. B. (Ed.). (1999). *Consumer value: A framework for analysis and research*. London ; New York: Routledge.

Holden, R. K., & Nagle, T. T. (1998). Kamikaze pricing—when penetration strategies run amok, marketers can find themselves in a divebomb of no return. *Marketing Management*, *7*(2), 30–39.

Homburg, C., Jensen, O., & Hahn, A. (2012). How to organize pricing? Vertical delegation and horizontal dispersion of pricing authority. *Journal of Marketing*, *76*(5), 49–69. https://doi.org/10.1509/jm.11.0251

Homburg, C., & Koschate, N. (2005). Behavioral Pricing-Forschung im Überblick: Teil 1: Grundlagen, Preisinformationsaufnahme und Preisinformationsbeurteilung. *Zeitschrift Für Betriebswirtschaft : ZfB*, *75*(4), 383–423.

Hox, J. J., Moerbeek, M., & van de Schoot, R. (2017). *Multilevel analysis: Techniques and applications* (3rd ed.). New York: Routledge. https://doi.org/10.4324/9781315650982

Hu, N., Pavlou, P. A., & Zhang, J. (Jennifer). (2009). *Overcoming the J-shaped distribution of product reviews* (SSRN Scholarly Paper No. ID 2369332). Rochester, NY: Social Science Research Network. Retrieved from Social Science Research Network website: https://papers.ssrn.com/abstract=2369332

Huang, F. L. (2018). Multilevel modeling and ordinary least squares regression: How comparable are they? *The Journal of Experimental Education*, *86*(2), 265–281. https://doi.org/10.1080/00220973.2016.1277339

Huang, K.-W., & Sundararajan, A. (2010). Pricing digital goods: Discontinuous costs and shared infrastructure. *Information Systems Research*, *22*(4), 721–738. https://doi.org/10.1287/isre.1100.0283

Huber, J., Wittink, D. R., Fiedler, J. A., & Miller, R. (1993). The effectiveness of alternative preference elicitation procedures in predicting choice. *Journal of Marketing Research*, *30*(1), 105–114. https://doi.org/10.1177/002224379303000109

Huffman, C., & Kahn, B. E. (1998). Variety for sale: Mass customization or mass confusion? *Journal of Retailing*, *74*(4), 491–513. https://doi.org/10.1016/S0022-4359(99)80105-5

Hukal, P., Henfridsson, O., Shaikh, M., & Parker, G. (2020). Platform signaling for generating platform content. *MIS Quarterly*, *44*(3), 1177–1205. https://doi.org/10.25300/MISQ/2020/15190

Huntemann, N., & Aslinger, B. (2016). *Gaming globally: Production, play, and place*. New York: Palgrave Macmillan. Retrieved from http://link.springer.com/10.1057/9781137006332

Ingenbleek, P. (2007). Value-informed pricing in its organizational context: Literature review, conceptual framework, and directions for future research. *Journal of Product & Brand Management*, *16*(7), 441–458. https://doi.org/10.1108/10610420710834904

Ingenbleek, P., Debruyne, M., Frambach, R. T., & Verhallen, T. M. M. (2003). Successful new product pricing practices: A contingency approach. *Marketing Letters*, *14*(4), 289–305. https://doi.org/10.1023/B:MARK.0000012473.92160.3d

Ingenbleek, P. T. M., Frambach, R. T., & Verhallen, T. M. M. (2010). The role of value-informed pricing in market-oriented product innovation management. *Journal of Product Innovation Management*, 27(7), 1032–1046. https://doi.org/10.1111/j.1540-5885.2010.00769.x

Ingenbleek, P. T. M., Frambach, R. T., & Verhallen, T. M. M. (2013). Best practices for new product pricing: Impact on market performance and price level under different conditions. *Journal of Product Innovation Management*, *30*(3), 560–573. https://doi.org/10.1111/jpim.12008

Jackson, D. J., & Hannah, S. J. (1993). Comparative analysis of image compression techniques. *1993 (25th) Southeastern Symposium on System Theory*, 513–517. https://doi.org/10.1109/SSST.1993.522833

Janiszewski, C., & Lichtenstein, D. R. (1999). A range theory account of price perception. *Journal of Consumer Research*, *25*(4), 353–368. https://doi.org/10.1086/209544

Jeppesen, L. B., & Frederiksen, L. (2006). Why do users contribute to firm-hosted user communities? The case of computer-controlled music instruments. *Organization Science*, *17*(1), 45–63. https://doi.org/10.1287/orsc.1050.0156

Jeppesen, L. B., & Molin, M. J. (2003). Consumers as co-developers: Learning and innovation outside the firm. *Technology Analysis & Strategic Management*, *15*(3), 363–383. https://doi.org/10.1080/09537320310001601531

Johansson, M., Hallberg, N., Hinterhuber, A., Zbaracki, M., & Liozu, S. (2012). Pricing strategies and pricing capabilities. *Journal of Revenue and Pricing Management*, *11*(1), 4–11. https://doi.org/10.1057/rpm.2011.42

Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. (2007). Toward a definition of mixed methods research. *Journal of Mixed Methods Research*, *1*(2), 112–133. https://doi.org/10.1177/1558689806298224

Jones, R., & Mendelson, H. (2011). Information goods vs. industrial goods: Cost structure and competition. *Management Science*, *57*(1), 164–176. https://doi.org/10.1287/mnsc.1100.1262

Jørgensen, M. (2004). A review of studies on expert estimation of software development effort. *Journal of Systems and Software*, *70*(1–2), 37–60. https://doi.org/10.1016/S0164-1212(02)00156-5

Joseph, D. J. (2018). The discourse of digital dispossession: Paid modifications and community crisis on Steam. *Games and Culture*, *13*(7), 690–707. https://doi.org/10.1177/1555412018756488

Jung, S., Cho, H. J., & Jin, B. E. (2020). Does effective cost transparency increase price fairness? An analysis of apparel brand strategies. *Journal of Brand Management*, *27*(5), 495–507. https://doi.org/10.1057/s41262-020-00191-w

Kahneman, D. (2011). *Thinking, fast and slow* (1st ed.). New York: Farrar, Straus and Giroux.

Kahneman, D., Knetsch, J. L., & Thaler, R. (1986a). Fairness as a constraint on profit seeking: Entitlements in the market. *The American Economic Review*, *76*(4), 728–741.

Kahneman, D., Knetsch, J. L., & Thaler, R. (1986b). Fairness and the assumptions of economics. *The Journal of Business*, *59*(4), 285–300.

Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1990). Experimental tests of the endowment effect and the Coase theorem. *Journal of Political Economy*, *98*(6), 1325–1348.

Kahneman, D., & Miller, D. T. (1986). Norm theory: Comparing reality to its alternatives. *Psychological Review*, *93*(2), 136–153. https://doi.org/10.1037/0033-295X.93.2.136

Kalapurakal, R., Dickson, P. R., & Urbany, J. E. (1991). Perceived price fairness and dual entitlement. *Advances in Consumer Research*, *18*, 788–793.

Kalwani, M. U., & Yim, C. K. (1992). Consumer price and promotion expectations: An experimental study. *Journal of Marketing Research*, *29*(1), 90–100. https://doi.org/10.2307/3172495

Kalyanaram, G., & Little, J. D. C. (1994). An empirical analysis of latitude of price acceptance in consumer package goods. *Journal of Consumer Research*, *21*(3), 408–418. https://doi.org/10.1086/209407

Kalyanaram, G., & Winer, R. S. (1995). Empirical generalizations from reference price research. *Marketing Science*, *14*(3), 161–169. https://doi.org/10.1287/mksc.14.3.G161

Kardes, F. R., Cronley, M. L., Kellaris, J. J., & Posavac, S. S. (2004a). The role of selective information processing in price-quality inference. *Journal of Consumer Research*, *31*(2), 368–374. https://doi.org/10.1086/422115

Kardes, F. R., Posavac, S. S., & Cronley, M. L. (2004b). Consumer inference: A review of processes, bases, and judgment contexts. *Journal of Consumer Psychology*, *14*(3), 230–256. https://doi.org/10.1207/s15327663jcp1403_6

Kasser, T., Ryan, R. M., Zax, M., & Sameroff, A. J. (1995). The relations of maternal and social environments to late adolescents' materialistic and prosocial values. *Developmental Psychology*, *31*(6), 907–914. https://doi.org/10.1037/0012-1649.31.6.907

Kathan, W., Hutter, K., Füller, J., & Hautz, J. (2015). Reciprocity vs. free-riding in innovation contest communities. *Creativity and Innovation Management*, *24*(3), 537–549. https://doi.org/10.1111/caim.12107

Kenney, M., & Zysman, J. (2016). The rise of the platform economy. *Issues in Science and Technology*, *32*, 61–69.

Keogh, B. (2015). Between triple-a, indie, casual and DIY. In K. Oakley & J. O'Connor (Eds.), *The Routledge companion to the cultural industries*. London ; New York: Routledge, Taylor & Francis Group.

Kienzler, M. (2018). Value-based pricing and cognitive biases: An overview for business markets. *Industrial Marketing Management*, *68*, 86–94. https://doi.org/10.1016/j.indmarman.2017.09.028

Kienzler, M., & Kowalkowski, C. (2017). Pricing strategy: A review of 22 years of marketing research. *Journal of Business Research*, *78*, 101–110. https://doi.org/10.1016/j.jbusres.2017.05.005

Kim, J.-Y., Kaufmann, K., & Stegemann, M. (2014). The impact of buyer–seller relationships and reference prices on the effectiveness of the pay what you want pricing mechanism. *Marketing Letters*, *25*(4), 409–423. https://doi.org/10.1007/s11002-013-9261-2

Kim, Youngbae. (2015). Consumer user innovation in Korea: An international comparison and policy implications. *Asian Journal of Technology Innovation*, *23*(1), 69–86. https://doi.org/10.1080/19761597.2015.1015672

Kim, Youngsoo, & Krishnan, R. (2015). On product-level uncertainty and online purchase behavior: An empirical analysis. *Management Science*, *61*(10), 2449–2467. https://doi.org/10.1287/mnsc.2014.2063

Kirchler, E., Fischer, F., & Hölzl, E. (2010). Price and its relation to objective and subjective product quality: Evidence from the Austrian market. *Journal of Consumer Policy*, *33*(3), 275–286. https://doi.org/10.1007/s10603-010-9138-1

Kirmani, A., & Rao, A. R. (2000). No pain, no gain: A critical review of the literature on signaling unobservable product quality. *Journal of Marketing*, *64*(2), 66–79. https://doi.org/10.1509/jmkg.64.2.66.18000

Kirriemuir, J., & McFarlane, A. (2004). *Literature review in games and learning* (Vol. 8). Bristol: Nesta Futurelab.
Retrieved from https://www.loot.co.za/product/john-kirriemuir-report-8/zcxg-70-g100

Kitcher, P. (2011). *The ethical project*. Cambridge, Massachusetts: Harvard University Press.

Koch, S., & Bierbamer, M. (2016). Opening your product: Impact of user innovations and their distribution platform on video game success. *Electronic Markets*, *26*(4), 357–368. https://doi.org/10.1007/s12525-016-0230-5

Kontus, K. (2020, August 6). How much money do Steam games make? Retrieved May 23, 2021, from Into Indie Games website: https://www.intoindiegames.com/how-much-money-do-steam-games-make/

Kopalle, P. K., Kannan, P. K., Boldt, L. B., & Arora, N. (2012). The impact of household level heterogeneity in reference price effects on optimal retailer pricing policies. *Journal of Retailing*, *88*(1), 102–114. https://doi.org/10.1016/j.jretai.2011.10.002

Kopalle, P. K., & Lindsey-Mullikin, J. (2003). The impact of external reference price on consumer price expectations. *Journal of Retailing*, *79*(4), 225–236. https://doi.org/10.1016/j.jretai.2003.09.002

Koschate-Fischer, N., Diamantopoulos, A., & Oldenkotte, K. (2012). Are consumers really willing to pay more for a favorable country image? a study of country-of-origin effects on willingness to pay. *Journal of International Marketing*, *20*(1), 19–41. https://doi.org/10.1509/jim.10.0140

Koschate-Fischer, N., & Wüllner, K. (2017). New developments in behavioral pricing research. *Journal of Business Economics*, *87*(6), 809–875. https://doi.org/10.1007/s11573-016-0839-z

Koster, R. (2005). *Moore's wall: Technology advances and online game design*. Presented at the IBM Games on Demand Conference. Retrieved from https://www.raphkoster.com/games/presentations/moores-wall-technology-advances-and-online-game-design/

Koster, R. (2018, January 17). The cost of games. Retrieved July 9, 2018, from Gamasutra—The Art & Business of Making Games website: https://www.gamasutra.com/blogs/RaphKoster/20180117/313211/The_cost_of_games.php

Kratzer, J., & Lettl, C. (2009). Distinctive roles of lead users and opinion leaders in the social networks of schoolchildren. *Journal of Consumer Research*, *36*(4), 646–659. https://doi.org/10.1086/599324

Kressmann, F., Sirgy, M. J., Herrmann, A., Huber, F., Huber, S., & Lee, D.-J. (2006). Direct and indirect effects of self-image congruence on brand loyalty. *Journal of Business Research*, *59*(9), 955–964. https://doi.org/10.1016/j.jbusres.2006.06.001

Krishnan, B. C., Dutta, S., & Jha, S. (2013). Effectiveness of exaggerated advertised reference prices: The role of decision time pressure. *Journal of Retailing*, *89*(1), 105–113. https://doi.org/10.1016/j.jretai.2012.11.001

Kuester, S., Feurer, S., Schuhmacher, M. C., & Reinartz, D. (2015). Comparing the incomparable? How consumers judge the price fairness of new products. *International Journal of Research in Marketing*, *32*(3), 272–283. https://doi.org/10.1016/j.ijresmar.2014.09.006

Kumar, V., Hurley, M., Karande, K., & Reinartz, W. J. (1998). The impact of internal and external reference prices on brand choice: The moderating role of contextual variables. *Journal of Retailing*, *74*(3), 401–426. https://doi.org/10.1016/S0022-4359(99)80102-X

Kung, M., Monroe, K. B., & Cox, J. L. (2002). Pricing on the Internet. *Journal of Product & Brand Management*, *11*(5), 274–288. https://doi.org/10.1108/10610420210442201

Kuznetsov, A., & Paulos, E. (2010). Rise of the expert amateur: DIY projects, communities, and cultures. *NordiCHI 2010: Extending Boundaries - Proceedings of the 6th Nordic Conference on Human-Computer Interaction*, 295–304. https://doi.org/10.1145/1868914.1868950

Lakhani, K. R., & von Hippel, E. (2003). How open source software works: "Free" user-to-user assistance. *Research Policy*, *32*(6), 923–943. https://doi.org/10.1016/S0048-7333(02)00095-1

Lakhani, K. R., & Wolf, R. G. (2003). *Why hackers do what they do: Understanding motivation and effort in free/open source software projects* (SSRN Scholarly Paper No. ID 443040). Rochester, NY: Social Science Research Network. https://doi.org/10.2139/ssrn.443040

Lakhani, K., Wolf, B., Bates, J., & DiBona, C. (2002). The Boston Consulting Group hacker survey. *Boston Consulting Group*. Retrieved from ftp://mirror.linux.org.au/pub/linux.conf.au/2003/papers/Hemos/Hemos.pdf

Lal, R., & Rao, R. (1997). Supermarket competition: The case of every day low pricing. *Marketing Science*, *16*(1), 60–80. https://doi.org/10.1287/mksc.16.1.60

Lalwani, A. K., & Shavitt, S. (2013). You get what you pay for? Self-construal influences price-quality judgments. *Journal of Consumer Research*, *40*(2), 255–267. https://doi.org/10.1086/670034

Lancioni, R. A. (2005). A strategic approach to industrial product pricing: The pricing plan. *Industrial Marketing Management*, *34*(2), 177–183. https://doi.org/10.1016/j.indmarman.2004.07.015

Larson, R. B. (2019). Promoting demand-based pricing. *Journal of Revenue and Pricing Management*, *18*(1), 42–51. https://doi.org/10.1057/s41272-017-0126-9

Lattin, J. M., & Bucklin, R. E. (1989). Reference effects of price and promotion on brand choice behavior. *Journal of Marketing Research*, *26*(3), 299–310. https://doi.org/10.1177/002224378902600304

Lee, D., Lin, D., Bezemer, C.-P., & Hassan, A. E. (2020). Building the perfect game – an empirical study of game modifications. *Empirical Software Engineering*, *25*(4), 2485–2518. https://doi.org/10.1007/s10664-019-09783-w

Lee, Y.-J., Hosanagar, K., & Tan, Y. (2014). *Do I follow my friends or the crowd? Information cascades in online movie ratings* (SSRN Scholarly Paper No. ID 2609533). Rochester, NY: Social Science Research Network. Retrieved from Social Science Research Network website: https://papers.ssrn.com/abstract=2609533

Leroi-Werelds, S., Streukens, S., Brady, M. K., & Swinnen, G. (2014). Assessing the value of commonly used methods for measuring customer value: A multi-setting empirical study. *Journal of the Academy of Marketing Science*, *42*(4), 430–451. https://doi.org/10.1007/s11747-013-0363-4

Lettl, C. (2007). User involvement competence for radical innovation. *Journal of Engineering and Technology Management*, *24*(1–2), 53–75. https://doi.org/10.1016/j.jengtecman.2007.01.004

Lettl, C., Herstatt, C., & Gemuenden, H.-G. (2004). *Learning from users for radical innovation* (Working Paper No. 27). EconStor. Retrieved from EconStor website: https://www.econstor.eu/handle/10419/55441

Lettl, C., Hienerth, C., & Gemuenden, H. G. (2008). Exploring how lead users develop radical innovation: Opportunity recognition and exploitation in the field of medical equipment technology. *IEEE Transactions on Engineering Management*, *55*(2), 219–233. https://doi.org/10.1109/TEM.2008.919717

Lettl, C., Rost, K., & von Wartburg, I. (2009). Why are some independent inventors 'heroes' and others 'hobbyists'? The moderating role of technological diversity and specialization. *Research Policy*, *38*(2), 243–254. https://doi.org/10.1016/j.respol.2008.12.004

Leuthesser, L., & Kohli, C. S. (1993). Product positioning: A comparison of perceptual mapping techniques. *Journal of Product & Brand Management*, *2*(4), 10–19. https://doi.org/10.1108/10610429310047660

Li, H., & Dinlersoz, E. (2012). Quality-based price discrimination: Evidence from internet retailers' shipping options. *Journal of Retailing*, *88*(2), 276–290. https://doi.org/10.1016/j.jretai.2011.12.002

Li, X., & Hitt, L. M. (2010). Price effects in online product reviews: An analytical model and empirical analysis. *MIS Quarterly*, *34*(4), 809–831. https://doi.org/10.2307/25750706

Lichtenstein, D. R., & Bearden, W. O. (1989). Contextual influences on perceptions of merchant-supplied reference prices. *Journal of Consumer Research*, *16*(1), 55–66. https://doi.org/10.1086/209193

Lichtenstein, D. R., Bloch, P. H., & Black, W. C. (1988). Correlates of price acceptability. *Journal of Consumer Research*, *15*(2), 243–252. https://doi.org/10.1086/209161

Lichtenstein, D. R., Burton, S., & Karson, E. J. (1991). The effect of semantic cues on consumer perceptions of reference price ads. *Journal of Consumer Research*, *18*(3), 380–391. https://doi.org/10.1086/209267

Lilien, G. L., Morrison, P. D., Searls, K., Sonnack, M., & von Hippel, E. (2002). Performance assessment of the lead user idea-generation process for new product development. *Management Science*, *48*(8), 1042–1059. https://doi.org/10.1287/mnsc.48.8.1042.171

Lin, D., Bezemer, C.-P., Zou, Y., & Hassan, A. E. (2019). An empirical study of game reviews on the Steam platform. *Empirical Software Engineering*, *24*(1), 170–207. https://doi.org/10.1007/s10664-018-9627-4

Lindsey-Mullikin, J., & Grewal, D. (2006). Imperfect information: The persistence of price dispersion on the web. *Journal of the Academy of Marketing Science*, *34*(2), 236–243. https://doi.org/10.1177/0092070305283366

Linzmajer, M., Hubert, M., Hubert, M., & Kenning, P. (2011). The perception of lower and higher price-thresholds: Implications from consumer neuroscience. *Advances in Consumer Research*, *39*, 792–793.

Liozu, S. (2017). State of value-based-pricing survey: Perceptions, challenges, and impact. *Journal of Revenue and Pricing Management*, *16*(1), 18–29. https://doi.org/10.1057/s41272-016-0059-8

Liozu, S., & Hinterhuber, A. (2013). Pricing orientation, pricing capabilities, and firm performance. *Management Decision*, *51*(3), 594–614. https://doi.org/10.1108/00251741311309670

Liozu, S., Hinterhuber, A., Boland, R., & Perelli, S. (2012). The conceptualization of value-based pricing in industrial firms. *Journal of Revenue and Pricing Management*, *11*(1), 12–34. https://doi.org/10.1057/rpm.2011.34

Liozu, S., Hinterhuber, A., Perelli, S., & Boland, R. (2012). Mindful pricing: Transforming organizations through value-based pricing. *Journal of Strategic Marketing*, *20*(3), 197–209. https://doi.org/10.1080/0965254X.2011.643916

Liozu, S., Hinterhuber, A., & Somers, T. (2014). Organizational design and pricing capabilities for superior firm performance. *Management Decision*, *52*, 54–78. https://doi.org/10.1108/MD-05-2013-0279

Liu, H. (2010). Dynamics of pricing in the video game console market: Skimming or penetration? *Journal of Marketing Research*, *47*(3), 428–443. https://doi.org/10.1509/jmkr.47.3.428

Lu, Z., Bolton, L. E., Ng, S., & Chen, H. (Allan). (2020). The price of power: How firm's market power affects perceived fairness of price increases. *Journal of Retailing*, *96*(2), 220–234. https://doi.org/10.1016/j.jretai.2019.09.004

Lumley, T., Diehr, P., Emerson, S., & Chen, L. (2002). The importance of the normality assumption in large public health data sets. *Annual Review of Public Health*, *23*(1), 151–169. https://doi.org/10.1146/annurev.publhealth.23.100901.140546

Lüthje, C. (2004). Characteristics of innovating users in a consumer goods field. *Technovation*, *24*(9), 683–695. https://doi.org/10.1016/S0166-4972(02)00150-5

Lüthje, Christian. (2002). *Characteristics of innovating users in a consumer goods field: An empirical study of sport-related product consumers* (SSRN Scholarly Paper No. 298015). Rochester, NY: Social Science Research Network. https://doi.org/10.2139/ssrn.298015

Lüthje, Christian. (2004). Characteristics of innovating users in a consumer goods field. *Technovation*, *24*(9), 683–695. https://doi.org/10.1016/S0166-4972(02)00150-5

Lüthje, Christian, Herstatt, C., & von Hippel, E. (2005). User-innovators and "local" information: The case of mountain biking. *Research Policy*, *34*(6), 951–965. https://doi.org/10.1016/j.respol.2005.05.005

Lüthje, Christian, & Stockstrom, C. (2016). Cost advantages in innovation—a comparison of users and manufacturers. In *Revolutionizing innovation: Users, communities, and open innovation*. Cambridge, Massachusetts ; London, England: MIT Press.

Lyon, T. P., & Montgomery, A. W. (2015). The means and end of greenwash. *Organization & Environment*, *28*(2), 223–249. https://doi.org/10.1177/1086026615575332

Madan, V., & Suri, R. (2001). Quality perception and monetary sacrifice: A comparative analysis of discount and fixed prices. *Journal of Product & Brand Management*, *10*(3), 170–184. https://doi.org/10.1108/10610420110395395

Mandel, D. R. (2006). Economic transactions among friends: Asymmetric generosity but not agreement in buyers' and sellers' offers. *Journal of Conflict Resolution*, *50*(4), 584–606. Scopus. https://doi.org/10.1177/0022002706290432

Manning, K. C., & Sprott, D. E. (2009). Price endings, left-digit effects, and choice. *Journal of Consumer Research*, *36*(2), 328–335. https://doi.org/10.1086/597215

Markman, G. D., & Waldron, T. L. (2014). Small entrants and large incumbents: A framework of micro entry. *Academy of Management Perspectives*, *28*(2), 179–197. https://doi.org/10.5465/amp.2011.0112

Marn, M. V., & Rosiello, R. L. (1992, September 1). Managing price, gaining profit. Retrieved January 21, 2018, from Harvard Business Review website: https://hbr.org/1992/09/managing-price-gaining-profit

Marshall, A. (1988). *Principles of economics: An introductory volume*. London: Palgrave Macmillan. Retrieved from http://link.springer.com/book/10.1057/9781137375261

Mascitelli, R. (2000). From experience: Harnessing tacit knowledge to achieve breakthrough innovation. *Journal of Product Innovation Management*, *17*(3), 179–193. https://doi.org/10.1111/1540-5885.1730179

Mathews, C. C., & Wearn, N. (2016). How are modern video games marketed? *The computer games journal*, *5*(1), 23–37. https://doi.org/10.1007/s40869-016-0023-2

Maxwell, S. (2002). Rule-based price fairness and its effect on willingness to purchase. *Journal of Economic Psychology*, *23*(2), 191–212. https://doi.org/10.1016/S0167-4870(02)00063-6

Maxwell, S., & Estelami, H. (2010). The behavioral aspects of pricing. *Journal of Product & Brand Management*, *19*(7). https://doi.org/10.1108/jpbm.2010.09619gaa.001

Mayhew, G. E., & Winer, R. S. (1992). An empirical analysis of internal and external reference prices using scanner data. *Journal of Consumer Research*, *19*(1), 62–70. https://doi.org/10.1086/209286

Mazumdar, T., & Papatla, P. (2000). An investigation of reference price segments. *Journal of Marketing Research*, *37*(2), 246–258. https://doi.org/10.1509/jmkr.37.2.246.18727

Mazumdar, T., Raj, S. P., & Sinha, I. (2005). Reference price research: Review and propositions. *Journal of Marketing*, *69*(4), 84–102. https://doi.org/10.1509/jmkg.2005.69.4.84

McGee, J. S. (1980). Predatory pricing revisited. *The Journal of Law and Economics*, *23*(2), 289–330. https://doi.org/10.1086/466963

McNeish, D., & Kelley, K. (2019). Fixed effects models versus mixed effects models for clustered data: Reviewing the approaches, disentangling the differences, and making recommendations. *Psychological Methods*, *24*(1), 20–35. https://doi.org/10.1037/met0000182

Medin, D. L., Altom, M. W., & Murphy, T. D. (1984). Given versus induced category representations: Use of prototype and exemplar information in classification. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *10*(3), 333–352. https://doi.org/10.1037/0278-7393.10.3.333

Mendes-Da-Silva, W., De Brito, T. F. S., Fama, R., & Liljegren, J. T. (2008). *Effects of friendship in transactions in an emerging market: Empirical evidence from brazil* (SSRN Scholarly Paper No. ID 1084249). Rochester, NY: Social Science Research Network. Retrieved from Social Science Research Network website: https://papers.ssrn.com/abstract=1084249

Meyer, R., & Johnson, E. J. (1995). Empirical generalizations in the modeling of consumer choice. *Marketing Science*, *14*(3), 180–189. https://doi.org/10.1287/mksc.14.3.G180

Milgrom, P., & Roberts, J. (1986). Price and advertising signals of product quality. *Journal of Political Economy*, *94*(4), 796–821. https://doi.org/10.1086/261408

Mislick, G. K., & Nussbaum, D. A. (2015). Software cost estimation. In *Cost Estimation* (pp. 257–269). Hoboken, NJ, USA: John Wiley & Sons, Inc. https://doi.org/10.1002/9781118802342.ch15

Miyazaki, A. D., Grewal, D., & Goodstein, R. C. (2005). The effect of multiple extrinsic cues on quality perceptions: A matter of consistency. *Journal of Consumer Research*, *32*(1), 146–153. https://doi.org/10.1086/429606

Moe, W. W., & Schweidel, D. A. (2011). Online product opinions: Incidence, evaluation, and evolution. *Marketing Science*, *31*(3), 372–386. https://doi.org/10.1287/mksc.1110.0662

Moen, P., & Fields, V. (2002). Midcourse in the United States: Does unpaid community participation replace paid work? *Ageing International*, *27*(3), 21–48. https://doi.org/10.1007/s12126-003-1001-0

Monroe, K. B. (1971). Measuring price thresholds by psychophysics and latitudes of acceptance. *Journal of Marketing Research*, *8*(4), 460–464. https://doi.org/10.2307/3150237

Monroe, K. B. (1973). Buyers' subjective perceptions of price. *Journal of Marketing Research*, *10*(1), 70–80. https://doi.org/10.2307/3149411

Monroe, K. B. (1990). *Pricing: Making profitable decisions*. New York City: McGraw-Hill.

Monroe, K. B., & Chapman, J. D. (1987). Framing effects on buyers' subjective product evaluations. *Advances in Consumer Research*, *14*, 193–197.

Monroe, K. B., & Dodds, W. B. (1988). A research program for establishing the validity of the price-quality relationship. *Journal of the Academy of Marketing Science*, *16*(1), 151–168. https://doi.org/10.1007/BF02723333

Moon, S., Russell, G. J., & Duvvuri, S. D. (2006). Profiling the reference price consumer. *Journal of Retailing*, *82*(1), 1–11. https://doi.org/10.1016/j.jretai.2005.11.006

Moore, D. J., & Olshavsky, R. W. (1989). Brand choice and deep price discounts. *Psychology & Marketing*, *6*(3), 181–196. https://doi.org/10.1002/mar.4220060303

Moore, W. L. (1980). Levels of aggregation in conjoint analysis: An empirical comparison. *Journal of Marketing Research*, *17*(4), 516–523. https://doi.org/10.1177/002224378001700410

Morgan, D. L. (2017). *Integrating qualitative and quantitative methods: A pragmatic approach*. London: SAGE Publications, Inc. Retrieved from https://dx.doi.org/10.4135/9781544304533

Morrison, P. D., Roberts, J. H., & von Hippel, E. (2000). Determinants of user innovation and innovation sharing in a local market. *Management Science*, *46*(12), 1513–1527. https://doi.org/10.1287/mnsc.46.12.1513.12076

Muchnik, L., Aral, S., & Taylor, S. J. (2013). Social influence bias: A randomized experiment. *Science*, *341*(6146), 647–651. https://doi.org/10.1126/science.1240466

Mullainathan, S., & Thaler, R. H. (2000). *Behavioral economics* (No. w7948). National Bureau of Economic Research. https://doi.org/10.3386/w7948

Nagle, T. T., Hogan, J., & Zale, J. (2014). *The strategy and tactics of pricing: A guide to growing more profitably* (5. ed., Pearson new internat. ed). Harlow: Pearson Education.

Nagle, T. T., & Müller, G. (2018). *The strategy and tactics of pricing: A guide to growing more profitability* (Sixth edition). New York; London: Routledge.

Nair, H. (2007). Intertemporal price discrimination with forward-looking consumers: Application to the US market for console video-games. *Quantitative Marketing and Economics (QME)*, *5*(3), 239–292. https://doi.org/10.1007/s11129-007-9026-4

Narver, J. C., & Slater, S. F. (1990). The effect of a market orientation on business profitability. *Journal of Marketing*, *54*(4), 20–35. https://doi.org/10.2307/1251757

Nasiry, J., & Popescu, I. (2011). Dynamic pricing with loss-averse consumers and peak-end anchoring. *Operations Research*, *59*(6), 1361–1368. https://doi.org/10.1287/opre.1110.0952

Natter, M., & Feurstein, M. (2002). Real world performance of choice-based conjoint models. *European Journal of Operational Research*, *137*(2), 448–458. https://doi.org/10.1016/S0377-2217(01)00147-3

Newzoo. (2021). Newzoo's key numbers | games, esports, mobile. Retrieved May 23, 2021, from Newzoo website: https://newzoo.com/key-numbers/

Nieborg, D. B., & Poell, T. (2018). The platformization of cultural production: Theorizing the contingent cultural commodity. *New Media & Society*, *20*(11), 4275–4292. https://doi.org/10.1177/1461444818769694

Niedrich, R. W., Sharma, S., & Wedell, D. H. (2001). Reference price and price perceptions: A comparison of alternative models. *Journal of Consumer Research*, *28*(3), 339–354. https://doi.org/10.1086/323726

Niedrich, R. W., Weathers, D., Hill, R. C., & Bell, D. R. (2009). Specifying price judgments with range–frequency theory in models of brand choice. *Journal of Marketing Research*, *46*(5), 693–702. https://doi.org/10.1509/jmkr.46.5.693

Niemand, T., Mai, R., & Kraus, S. (2019). The zero-price effect in freemium business models: The moderating effects of free mentality and price–quality inference. *Psychology & Marketing*, *36*(8), 773–790. https://doi.org/10.1002/mar.21211

Nishikawa, H., Schreier, M., & Ogawa, S. (2013). User-generated versus designer-generated products: A performance assessment at Muji. *International Journal of Research in Marketing*, *30*(2), 160–167. https://doi.org/10.1016/j.ijresmar.2012.09.002

Nov, O. (2007). What motivates Wikipedians? *Communications of the ACM*, *50*(11), 60–64. https://doi.org/10.1145/1297797.1297798

Ocal, A. (2020, October 9). Dota 2's "The International" surpasses $40 million in prize money. *ESPN*. Retrieved from https://tv5.espn.com/esports/story/_/id/30079945/dota-2-international-surpasses-40-million-prize-money

OECD. (2005). *Oslo manual 2005: Guidelines for collecting and interpreting innovation data* (3rd ed.). Organisation for Economic Co-operation and Development ; Statistical Office of the European Communities.

OECD. (2018). *Oslo Manual 2018—Guidelines for collecting, reporting and using data on innovation, 4th Edition* (4th ed.). Organisation for Economic Co-operation and Development. Retrieved from https://read.oecd.org/10.1787/9789264304604-en?format=pdf

Ofir, C. (2004). Reexamining latitude of price acceptability and price thresholds: Predicting basic consumer reaction to price. *Journal of Consumer Research*, *30*(4), 612–621. https://doi.org/10.1086/380293

Ogawa, S., & Pongtanalert, K. (2011). *Visualizing invisible innovation continent: Evidence from global consumer innovation surveys* (SSRN Scholarly Paper No. ID 1876186). Rochester, NY: Social Science Research Network. Retrieved from Social Science Research Network website: https://papers.ssrn.com/abstract=1876186

Ohmae, K. (1982). *The mind of the strategist: The art of Japanese business*. New York: McGraw-Hill.

Oliver, R. L., & Swan, J. E. (1989). Consumer perceptions of interpersonal equity and satisfaction in transactions: A field survey approach. *Journal of Marketing*, *53*(2), 21–35. https://doi.org/10.1177/002224298905300202

O'Neill, R. M., & Lambert, D. R. (2001). The emotional side of price. *Psychology & Marketing*, *18*(3), 217–237. https://doi.org/10.1002/1520-6793(200103)18:3%3C217::AID-MAR1006%3E3.0.CO;2-M

Oo, P. P., Allison, T. H., Sahaym, A., & Juasrikul, S. (2019). User entrepreneurs' multiple identities and crowdfunding performance: Effects through product innovativeness, perceived passion, and need similarity. *Journal of Business Venturing*, *34*(5). https://doi.org/10.1016/j.jbusvent.2018.08.005

O'Quin, K., & Besemer, S. P. (1989). The development, reliability, and validity of the revised creative product semantic scale. *Creativity Research Journal*, *2*(4), 267–278. https://doi.org/10.1080/10400418909534323

Orland, K. (2017, May 18). Does Valve really own Dota? A jury will decide. Retrieved May 11, 2021, from Ars Technica website: https://arstechnica.com/gaming/2017/05/does-valve-really-own-dota-a-jury-will-decide/

Osman, M. (2004). An evaluation of dual-process theories of reasoning. *Psychonomic Bulletin & Review*, *11*(6), 988–1010. https://doi.org/10.3758/BF03196730

Parasuraman, A., Zeithaml, V. A., & Berry, L. (1988). SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. *Journal of Retailing*, *64*(1), 12–40.

Parker, S. C. (2009). Can cognitive biases explain venture team homophily? *Strategic Entrepreneurship Journal*, *3*(1), 67–83. https://doi.org/10.1002/sej.55

Parmentier, G., & Gandia, R. (2013). Managing sustainable innovation with a user community toolkit: The case of the video game Trackmania. *Creativity and Innovation Management*, *22*(2), 195–208. https://doi.org/10.1111/caim.12021

Parmentier, G., & Mangematin, V. (2014). Orchestrating innovation with user communities in the creative industries. *Technological Forecasting and Social Change*, *83*, 40–53. https://doi.org/10.1016/j.techfore.2013.03.007

Pechmann, C., & Ratneshwar, S. (1992). Consumer covariation judgments: Theory or data driven? *Journal of Consumer Research*, *19*(3), 373–386. https://doi.org/10.1086/209308

Peer, E., Brandimarte, L., Samat, S., & Acquisti, A. (2017). Beyond the Turk: Alternative platforms for crowdsourcing behavioral research. *Journal of Experimental Social Psychology*, *70*, 153–163. https://doi.org/10.1016/j.jesp.2017.01.006

Pereira, L. S., & Bernardes, M. M. S. (2018). Aspects of independent game production: An exploratory study. *Computers in Entertainment*, *16*(4), 1–16. https://doi.org/10.1145/3276322

Petrescu, M. (2011). Online price dispersion – more than imperfect information. *Journal of Product & Brand Management*, *20*(7), 541–548. https://doi.org/10.1108/10610421111181840

Polanyi, M., & Sen, A. (2009). *The tacit dimension*. Chicago ; London: University of Chicago Press.

Pollok, P., Amft, A., Diener, K., Lüttgens, D., & Piller, F. T. (2021). Knowledge diversity and team creativity: How hobbyists beat professional designers in creating novel board games. *Research Policy*, *50*(8). https://doi.org/10.1016/j.respol.2020.104174

Pongtanalert, K., & Ogawa, S. (2015). Classifying user-innovators – An approach to utilize user-innovator asset. *Journal of Engineering and Technology Management*, *37*, 32–39. https://doi.org/10.1016/j.jengtecman.2015.08.005

Popescu, I., & Wu, Y. (2007). Dynamic pricing strategies with reference effects. *Operations Research*, *55*(3), 413–429. https://doi.org/10.1287/opre.1070.0393

Postigo, H. (2007). Of mods and modders: Chasing down the value of fan-based digital game modifications. *Games and Culture*, *2*(4), 300–313. https://doi.org/10.1177/1555412007307955

Etsy. (2021). Etsy Fact Sheet. Retrieved May 26, 2021, from Etsy.com website: https://s22.q4cdn.com/941741262/files/doc_downloads/Final-Q2-Fact-Sheet_DECO-1985_Etsy-PR-Fact-Sheet_805.pdf

Priem, R. (2007). A consumer perspective on value creation. *Academy of Management Review Priem & Butler*, *32*, 219–235. https://doi.org/10.5465/AMR.2007.23464055

Prügl, R., & Schreier, M. (2006). Learning from leading-edge customers at The Sims: Opening up the innovation process using toolkits. *R and D Management*, *36*(3), 237–250. https://doi.org/10.1111/j.1467-9310.2006.00433.x

Pullman, M. E., Moore, W. L., & Wardell, D. G. (2002). A comparison of quality function deployment and conjoint analysis in new product design. *Journal of Product Innovation Management*, *19*(5), 354–364. https://doi.org/10.1111/1540-5885.1950354

Putler, D. S. (1992). Incorporating reference price effects into a theory of consumer choice. *Marketing Science*, *11*(3), 287–309. https://doi.org/10.1287/mksc.11.3.287

Raasch, C., & von Hippel, E. (2013a). Innovation process benefits: The journey as reward. *MIT Sloan Management Review*, *55*(1), 33.

Raasch, C., & von Hippel, E. (2013b). *Innovation effort as "productive consumption": The power of participation benefits to amplify innovation* (SSRN Scholarly Paper No. ID 2167948). Rochester, NY: Social Science Research Network. Retrieved from Social Science Research Network website: https://papers.ssrn.com/abstract=2167948

Rajendran, K. N., & Tellis, G. J. (1994). Contextual and temporal components of reference price. *Journal of Marketing*, *58*(1), 22–34. https://doi.org/10.1177/002224299405800102

Rao, A. R. (2005). The quality of price as a quality cue. *Journal of Marketing Research*, *42*(4), 401–405. https://doi.org/10.1509/jmkr.2005.42.4.401

Rao, A. R., Bergen, M. E., & Davis, S. (2000). How to fight price a war. *Harvard Business Review*, *78*(2), 107–116.

Rao, A. R., & Monroe, K. B. (1988). The moderating effect of prior knowledge on cue utilization in product evaluations. *Journal of Consumer Research*, *15*(2), 253–264. https://doi.org/10.1086/209162

Rao, A. R., & Monroe, K. B. (1989). The effect of price, brand name, and store name on buyers' perceptions of product quality: An integrative review. *Journal of Marketing Research*, *26*(3), 351–357. https://doi.org/10.2307/3172907

Rao, V. R. (Ed.). (2009). *Handbook of pricing research in marketing*. Cheltenham, Glos, UK ; Northampton: Edward Elgar.

Ravid, O., Glick, B., & Candler, S. (2012). „*Indie Game": The movie*. Sundance Institute. Retrieved from Sundance Institute website: https://www.sundance.org/blogs/creative-distribution-initiative/case-studies/indie-game-the-movie

Readman, J., & Grantham, A. (2006). Shopping for buyers of product development expertise: How video games developers stay ahead. *European Management Journal*, *24*(4), 256–269. https://doi.org/10.1016/j.emj.2006.05.004

Rebouças Serpa, Y., & Formico Rodrigues, M. A. (2019). Towards machine-learning assisted asset generation for games: A study on pixel art sprite sheets. *2019 18th Brazilian Symposium on Computer Games and Digital Entertainment (SBGames)*, 182–191. https://doi.org/10.1109/SBGames.2019.00032

Reed, S. K. (1972). Pattern recognition and categorization. *Cognitive Psychology*, *3*(3), 382–407. https://doi.org/10.1016/0010-0285(72)90014-X

Regner, T. (2021). Crowdfunding a monthly income: An analysis of the membership platform Patreon. *Journal of Cultural Economics*, *45*(1), 133–142. https://doi.org/10.1007/s10824-020-09381-5

Riggs, W., & von Hippel, E. (1994). Incentives to innovate and the sources of innovation: The case of scientific instruments. *Research Policy*, *23*(4), 459–469. https://doi.org/10.1016/0048-7333(94)90008-6

Rivaroli, S., Baldi, B., & Spadoni, R. (2020). Consumers' perception of food product craftsmanship: A review of evidence. *Food Quality and Preference*, *79*. https://doi.org/10.1016/j.foodqual.2019.103796

Robbins, J. (2006). Technology and the gene for minimizing effort. *2006 IEEE International Symposium on Technology and Society*, 1–9. https://doi.org/10.1109/ISTAS.2006.4375895

Robson, K., Wilson, M., & Pitt, L. (2019). Creating new products from old ones: Consumer motivations for innovating autonomously from firms. *Technovation*, *88*. https://doi.org/10.1016/j.technovation.2019.05.001

Rogers, E. M. (1983). *Diffusion of innovations* (3rd ed). New York : London: Free Press ; Collier Macmillan.

Rose, M. (2011). *250 Indie games you must play*. London: Taylor & Francis Inc.

Roszkowska-Menkes, M. (2017). User innovation: State of the art and perspectives for future research. *Journal of Entrepreneurship, Management and Innovation*, *13*(2), 127–154. https://doi.org/10.7341/20171326

Rotefoss, B., & Kolvereid, L. (2005). Aspiring, nascent and fledgling entrepreneurs: An investigation of the business start-up process. *Entrepreneurship & Regional Development*, *17*(2), 109–127. https://doi.org/10.1080/08985620500074049

Rothwell, R., Freeman, C., Horlsey, A., Jervis, V. T. P., Robertson, A. B., & Townsend, J. (1974). SAPPHO updated—Project SAPPHO phase II. *Research Policy*, *3*(3), 258–291. https://doi.org/10.1016/0048-7333(74)90010-9

Rubin, D. B. (1979). Using Multivariate Matched Sampling and Regression Adjustment to Control Bias in Observational Studies. *Journal of the American Statistical Association*, *74*(366a), 318–328. https://doi.org/10.1080/01621459.1979.10482513

Rubinstein, A., & Dalgaard, C. (1998). *Modeling bounded rationality*. Cambridge, Massachusetts ; London, England: MIT Press.

Ruffino, P. (2021). *Independent videogames: Cultures, networks, techniques and politics*. London: Routledge, Taylor & Francis. Retrieved from https://doi.org/10.4324/9780367336219

Russo, J. E., Krieser, G., & Miyashita, S. (1975). An effective display of unit price information: Can the posting of unit prices change market shares? *Journal of Marketing*, *39*(2), 11–19. https://doi.org/10.1177/002224297503900204

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

Sakellariou, E., Karantinou, K., & Goffin, K. (2017). "Telling tales": Stories, metaphors and tacit knowledge at the fuzzy front-end of NPD. *Creativity and Innovation Management*, *26*(4), 353–369. https://doi.org/10.1111/caim.12237

Samson, A., & Voyer, B. G. (2012). Two minds, three ways: Dual system and dual process models in consumer psychology. *AMS Review*, *2*(2–4), 48–71. https://doi.org/10.1007/s13162-012-0030-9

Scacchi, W. (2011). Modding as an open source approach to extending computer game systems. In S. A. Hissam, B. Russo, M. G. de Mendonça Neto, & F. Kon (Eds.), *Open source systems: Grounding research* (pp. 62–74). Berlin, Heidelberg: Springer. https://doi.org/10.1007/978-3-642-24418-6_5

Scherpereel, C. M. (2008). The option-creating institution: A real options perspective on economic organization. *Strategic Management Journal*, *29*(5), 455–470. https://doi.org/10.1002/smj.671

Schramm, M. E., Trainor, K. J., Shanker, M., & Hu, M. Y. (2010). An agent-based diffusion model with consumer and brand agents. *Decision Support Systems*, *50*(1), 234–242. https://doi.org/10.1016/j.dss.2010.08.004

Schreier, M. (2006). The value increment of mass-customized products: An empirical assessment. *Journal of Consumer Behaviour*, *5*(4), 317–327. https://doi.org/10.1002/cb.183

Schreier, M., Fuchs, C., & Dahl, D. W. (2012). The innovation effect of user design: Exploring consumers' innovation perceptions of firms selling products designed by users. *Journal of Marketing*, *76*(5), 18–32. https://doi.org/10.1509/jm.10.0462

Schroeder, D. A., Penner, L. A., Dovidio, J. F., & Piliavin, J. A. (1995). *The psychology of helping and altruism: Problems and puzzles*. New York: McGraw-Hill.

Schumpeter, J. A. (1987). *Theorie der wirtschaftlichen Entwicklung: Eine Untersuchung über Unternehmergewinn, Kapital, Kredit, Zins und den Konjunkturzyklus* (7. Aufl., unveränd. Nachdr. der 1934 ersch. 4. Aufl). Berlin: Duncker & Humblot.

Schuppar, B., & Homburg, C. (2006). *Preismanagement: Konzeption, Umsetzung und Erfolgsauswirkungen im Business-to-Business-Bereich* (1. Aufl). Wiesbaden: Dt. Univ.-Verl.

Schweisfurth, T. G., & Dharmawan, M. P. (2019). Does lead userness foster idea implementation and diffusion? A study of internal shopfloor users. *Research Policy*, *48*(1), 289–297. https://doi.org/10.1016/j.respol.2018.08.018

Sen, R. (2007). A strategic analysis of competition between open source and proprietary software. *Journal of Management Information Systems*, *24*(1), 233–257. https://doi.org/10.2753/MIS0742-1222240107

Shah, S. (2000). Sources and patterns of innovation in a consumer products field: Innovations in sporting equipment. *Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA, Working Paper WP-4105*. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.13.5045

Shah, S. K., Smith, S. W., & Reedy, E. J. (2012). *Who are user entrepreneurs? Findings on innovation, founder characteristics, and firm characteristics (The Kauffman Firm survey)* (SSRN Scholarly Paper No. ID 2018517). Rochester, NY: Social Science Research Network. https://doi.org/10.2139/ssrn.2018517

Shah, S. K., & Tripsas, M. (2007). The accidental entrepreneur: The emergent and collective process of user entrepreneurship. *Strategic Entrepreneurship Journal*, *1*(1–2), 123–140. https://doi.org/10.1002/sej.15

Shah, S. K., & Tripsas, M. (2012). *When do user innovators start firms? A theory of user entrepreneurship* (SSRN Scholarly Paper No. ID 2016384). Rochester, NY: Social Science Research Network. Retrieved from Social Science Research Network website: https://papers.ssrn.com/abstract=2016384

Shampanier, K., Mazar, N., & Ariely, D. (2007). Zero as a special price: The true value of free products. *Marketing Science*, *26*(6), 742–757. https://doi.org/10.1287/mksc.1060.0254

Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *The Academy of Management Review*, *25*(1), 217–226. https://doi.org/10.2307/259271

Shapiro, B. P. (1973). Price reliance: Existence and sources. *Journal of Marketing Research*, *10*(3), 286–294. https://doi.org/10.1177/002224377301000309

Shaw, B. (1985). The role of the interaction between the user and the manufacturer in medical equipment innovation. *R&D Management*, *15*(4), 283–292. https://doi.org/10.1111/j.1467-9310.1985.tb00039.x

Shen, L., Hsee, C. K., Wu, Q., & Tsai, C. I. (2012). Overpredicting and underprofiting in pricing decisions. *Journal of Behavioral Decision Making*, *25*(5), 512–521. https://doi.org/10.1002/bdm.746

Shepherd, D. A., Williams, T. A., & Patzelt, H. (2015). Thinking about entrepreneurial decision making: Review and research agenda. *Journal of Management*, *41*(1), 11–46. https://doi.org/10.1177/0149206314541153

Shipley, D., & Jobber, D. (2001). Integrative pricing via the pricing wheel. *Industrial Marketing Management*, *30*(3), 301–314. https://doi.org/10.1016/S0019-8501(99)00098-X

Shirai, M. (2015). Impact of "high quality, low price" appeal on consumer evaluations. *Journal of Promotion Management*, *21*(6), 776–797. https://doi.org/10.1080/10496491.2015.1088922

Shirky, C. (2010). *Cognitive surplus: How technology makes consumers into collaborators*. New York: Penguin Random House Higher Education.

Shultz, B. (2015). The work behind the scenes: The new intermediaries of the indie crafts business. *Regional Studies*, *49*(3), 451–460. https://doi.org/10.1080/00343404.2013.770597

Simon, H. A. (1972). Theories of bounded rationality. In J. Marschak, C. B. McGuire, Radner, Roy, & K. J. Arrow (Eds.), *Decision and organization. A volume in honor of Jacob Marschak*. (pp. 162–176). Amsterdam: North-Holland Pub. Co. Retrieved from http://innovbfa.viabloga.com/files/Herbert_Simon___theories_of_bounded_rationality___1972.pdf

Simon, H., & Fassnacht, M. (2016). *Preismanagement*. Wiesbaden: Springer Fachmedien. https://doi.org/10.1007/978-3-658-11871-6

Sloman, S. A. (1996). The empirical case for two systems of reasoning. *Psychological Bulletin*, *119*(1), 3–22. https://doi.org/10.1037/0033-2909.119.1.3

Sluis, L. E. C. V. der, & Poell, R. F. (2003). The impact on career development of learning opportunities and learning behavior at work. *Human Resource Development Quarterly*, *14*(2), 159–179. https://doi.org/10.1002/hrdq.1058

Smith, A. (1976). *An inquiry into the nature and causes of the wealth of nations* (Reprint of the 1904 ed. published by Methuen & Co., London.; E. Cannan, Ed.). Chicago: University of Chicago Press.

Snijders, T. A. B. (2005). Power and sample size in multilevel linear models. In B. S. Everitt & D. C. Howell (Eds.), *Encyclopedia of statistics in behavioral science*. Chichester, UK: John Wiley & Sons, Ltd. https://doi.org/10.1002/0470013192.bsa492

Sotamaa, O. (2010). When the game is not enough: Motivations and practices among computer game modding culture. *Games and Culture*, *5*(3), 239–255. https://doi.org/10.1177/1555412009359765

Spann, M., Fischer, M., & Tellis, G. J. (2014). Skimming or penetration? Strategic dynamic pricing for new products. *Marketing Science*, *34*(2), 235–249. https://doi.org/10.1287/mksc.2014.0891

Srinivasan, A., & Venkatraman, N. (2018). Entrepreneurship in digital platforms: A network-centric view. *Strategic Entrepreneurship Journal*, *12*(1), 54–71. https://doi.org/10.1002/sej.1272

Stahlbrost, A., & Kareborn, B. B. (2011). Exploring users motivation in innovation communities. *International Journal of Entrepreneurship and Innovation Management*, *14*(4), 298–314. https://doi.org/10.1504/IJEIM.2011.043051

Stanovich, K. E. (2011). *Rationality and the reflective mind*. New York: Oxford University Press.

Stanovich, K. E., & West, R. F. (2008). On the relative independence of thinking biases and cognitive ability. *Journal of Personality and Social Psychology*, *94*(4), 672–695. https://doi.org/10.1037/0022-3514.94.4.672

Stebbins, R. A. (2001). Serious leisure. *Society*, *38*(4), 53–57. https://doi.org/10.1007/s12115-001-1023-8

Stebbins, R. A. (2009). New leisure and leisure customization. *World Leisure Journal*, *51*(2), 78–84. https://doi.org/10.1080/04419057.2009.9674589

Stiglitz, J. E. (1987). The causes and consequences of the dependence of quality on price. *Journal of Economic Literature*, *25*(1), 1–48.

Stock, R. M., Oliveira, P., & von Hippel, E. (2015). Impacts of hedonic and utilitarian user motives on the innovativeness of user-developed solutions: Motives for user-developed solutions. *Journal of Product Innovation Management*, *32*(3), 389–403. https://doi.org/10.1111/jpim.12201

Stock, R. M., von Hippel, E., & Gillert, N. L. (2014). *Impacts of personality traits on consumer innovation success* (SSRN Scholarly Paper No. ID 2467152). Rochester, NY: Social Science Research Network. Retrieved from Social Science Research Network website: https://papers.ssrn.com/abstract=2467152

Stock, R. M., von Hippel, E., & Gillert, N. L. (2016). Impacts of personality traits on consumer innovation success. *Research Policy*, *45*(4), 757–769. https://doi.org/10.1016/j.respol.2015.12.002

Stylidis, K., Wickman, C., & Söderberg, R. (2020). Perceived quality of products: A framework and attributes ranking method. *Journal of Engineering Design*, *31*(1), 37–67. https://doi.org/10.1080/09544828.2019.1669769

Summerley, R. (2020). The development of sports: A comparative analysis of the early institutionalization of traditional sports and e-sports. *Games and Culture*, *15*(1), 51–72. https://doi.org/10.1177/1555412019838094

Sun, M. (2011). How does the variance of product ratings matter? *Management Science*, *58*(4), 696–707. https://doi.org/10.1287/mnsc.1110.1458

Suri, R., & Monroe, K. B. (2003). The effects of time constraints on consumers' judgments of prices and products. *Journal of Consumer Research*, *30*(1), 92–104. https://doi.org/10.1086/374696

Suri, R., Swaminathan, S., & Monroe, K. B. (2004). Price communications in online and print coupons: An empirical investigation. *Journal of Interactive Marketing*, *18*(4), 74–86. https://doi.org/10.1002/dir.20023

Tajfel, H., Billig, M. G., Bundy, R. P., & Flament, C. (1971). Social categorization and intergroup behaviour. *European Journal of Social Psychology*, *1*(2), 149–178. https://doi.org/10.1002/ejsp.2420010202

Taylor, T. L. (2018). *Watch me play: Twitch and the rise of game live streaming*. Princeton, New Jersey: Princeton University Press. https://doi.org/10.2307/j.ctvc77jqw

Teas, R. K., & Agarwal, S. (2000). The effects of extrinsic product cues on consumers' perceptions of quality, sacrifice, and value. *Journal of the Academy of Marketing Science*, *28*(2), 278–290. https://doi.org/10.1177/0092070300282008

Teece, D. J. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy*, *15*(6), 285–305. https://doi.org/10.1016/0048-7333(86)90027-2

Tellis, G. J. (1986). Beyond the many faces of price: An integration of pricing strategies. *Journal of Marketing*, *50*(4), 146–160. https://doi.org/10.2307/1251292

Tellis, G. J. (1988). The price elasticity of selective demand: A meta-analysis of econometric models of sales. *Journal of Marketing Research*, *25*(4), 331–341. https://doi.org/10.2307/3172944

Tellis, G. J., & Gaeth, G. J. (1990). Best value, price-seeking, and price aversion: The impact of information and learning on consumer choices. *Journal of Marketing*, *54*(2), 34–45. https://doi.org/10.1177/002224299005400203

Teng, C.-I. (2010). Customization, immersion satisfaction, and online gamer loyalty. *Computers in Human Behavior*, *26*(6), 1547–1554. https://doi.org/10.1016/j.chb.2010.05.029

Thaler, R. (1985). Mental accounting and consumer choice. *Marketing Science*, *4*(3), 199–214. https://doi.org/10.1287/mksc.4.3.199

Thaler, R. H. (2000). From homo economicus to homo sapiens. *Journal of Economic Perspectives*, *14*(1), 133–141. https://doi.org/10.1257/jep.14.1.133

Thaler, R. H. (2015). *Misbehaving: The making of behavioral economics*. New York: W.W. Norton & Company.

Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving decisions about health, wealth, and happiness*. New Haven, Connecticut: Yale University Press.

Thorgren, S., Nordström, C., & Wincent, J. (2014). Hybrid entrepreneurship: The importance of passion. *Baltic Journal of Management*, *9*(3), 314–329. https://doi.org/10.1108/BJM-11-2013-0175

Tidd, J., & Bessant, J. R. (2013). *Managing innovation: Integrating technological, market and organizational change* (Fifth edition). Chichester, West Sussex, United Kingdom: John Wiley & Sons.

Toftedahl, M., & Engström, H. (2019). *A taxonomy of game engines and the tools that drive the industry*. Presented at the DiGRA 2019, The 12th Digital Games Research Association Conference, Kyoto, Japan, August, 6-10, 2019. Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:his:diva-17706

Townsend, D. M., Busenitz, L. W., & Arthurs, J. D. (2010). To start or not to start: Outcome and ability expectations in the decision to start a new venture. *Journal of Business Venturing*, *25*(2), 192–202. https://doi.org/10.1016/j.jbusvent.2008.05.003

Townsend, D. M., & Hart, T. A. (2008). Perceived institutional ambiguity and the choice of organizational form in social entrepreneurial ventures. *Entrepreneurship Theory and Practice*, *32*(4), 685–700. https://doi.org/10.1111/j.1540-6520.2008.00248.x

Töytäri, P., Rajala, R., & Alejandro, T. B. (2015). Organizational and institutional barriers to value-based pricing in industrial relationships. *Industrial Marketing Management*, *47*, 53–64. https://doi.org/10.1016/j.indmarman.2015.02.005

Trenholme, D., & Smith, S. P. (2008). Computer game engines for developing first-person virtual environments. *Virtual Reality*, *12*(3), 181–187. https://doi.org/10.1007/s10055-008-0092-z

Tschang, F. T. (2007). Balancing the tensions between rationalization and creativity in the video games industry. *Organization Science*, *18*(6), 989–1005. https://doi.org/10.1287/orsc.1070.0299

Turkay, S., & Adinolf, S. (2010). Free to be me: A survey study on customization with World of Warcraft and City Of Heroes/Villains players. *Procedia - Social and Behavioral Sciences*, *2*(2), 1840–1845. https://doi.org/10.1016/j.sbspro.2010.03.995

Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, *211*(4481), 453–458. https://doi.org/10.1126/science.7455683

Tversky, Amos, & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, *185*(4157), 1124–1131. https://doi.org/10.1126/science.185.4157.1124

Tversky, Amos, & Kahneman, D. (1991). Loss aversion in riskless choice: A reference-dependent model*. *The Quarterly Journal of Economics*, *106*(4), 1039–1061. https://doi.org/10.2307/2937956

Tversky, Amos, & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, 5(4), 297–323. https://doi.org/10.1007/BF00122574

Unger, A. (2012). Modding as part of game culture. In J. Fromme & A. Unger (Eds.), *Computer games and new media cultures: A handbook of digital games studies* (pp. 509–523). Dordrecht: Springer Netherlands. https://doi.org/10.1007/978-94-007-2777-9_32

Unity Technologies. (n.d.). Learn game development w/ Unity | courses & tutorials in game design, VR, AR, & real-time 3D. Retrieved May 11, 2021, from Unity Learn website: https://learn.unity.com/tutorials

Urban, G. L., & von Hippel, E. (1988). Lead user analyses for the development of new industrial products. *Management Science*, 34(5), 569–582. https://doi.org/10.1287/mnsc.34.5.569

Urbaniak, K., Wątróbski, J., & Sałabun, W. (2020). Identification of players ranking in e-sport. *Applied Sciences*, 10(19). https://doi.org/10.3390/app10196768

Urbany, J. E., Bearden, W. O., & Weilbaker, D. C. (1988). The effect of plausible and exaggerated reference prices on consumer perceptions and price search. *Journal of Consumer Research*, 15(1), 95–110. https://doi.org/10.1086/209148

Urbany, J. E., Madden, T. J., & Dickson, P. R. (1989). All's not fair in pricing: An initial look at the dual entitlement principle. *Marketing Letters*, 1(1), 17–25. https://doi.org/10.1007/BF00436145

Uzzi, B. (1997). Social structure and competition in interfirm networks: The paradox of embeddedness. *Administrative Science Quarterly*, 42(1), 35–67. https://doi.org/10.2307/2393808

Vaidyanathan, R., & Aggarwal, P. (2003). Who is the fairest of them all? An attributional approach to price fairness perceptions. *Journal of Business Research*, 56(6), 453–463. https://doi.org/10.1016/S0148-2963(01)00231-4

Vallerand, R. J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. *Advances in Experimental Social Psychology*, 29, 271–360. https://doi.org/10.1016/S0065-2601(08)60019-2

Valve Corporation. (2021, January 13). Steam—2020 year in review. Retrieved May 23, 2021, from https://store.steampowered.com/news/group/4145017/view/2961646623386540826

van den Bos, K., Peters, S. L., Bobocel, D. R., & Ybema, J. F. (2006). On preferences and doing the right thing: Satisfaction with advantageous inequity when cognitive processing is limited. *Journal of Experimental Social Psychology*, 42(3), 273–289. https://doi.org/10.1016/j.jesp.2005.04.003

Van Heerde, H. J., Gijsbrechts, E., & Pauwels, K. (2008). Winners and losers in a major price war. *Journal of Marketing Research*, *45*(5), 499–518. https://doi.org/10.1509/jmkr.45.5.499

Varian, H. R. (1989). Chapter 10: Price discrimination. In *Handbook of Industrial Organization* (Vol. 1, pp. 597–654). Elsevier. https://doi.org/10.1016/S1573-448X(89)01013-7

Ver Hoef, J. M., & Boveng, P. L. (2007). Quasi-Poisson vs. negative binomial regression: How should we model overdispersed count data? *Ecology*, *88*(11), 2766–2772. https://doi.org/10.1890/07-0043.1

Vigneron, F., & Johnson, L. (1999). A review and a conceptual framework of prestige-seeking consumer behavior. *Academy of Marketing Science Review*, *2*, 1–15.

Völckner, F. (2008). The dual role of price: Decomposing consumers' reactions to price. *Journal of the Academy of Marketing Science*, *36*(3), 359–377. https://doi.org/10.1007/s11747-007-0076-7

Völckner, F., & Hofmann, J. (2007). The price-perceived quality relationship: A meta-analytic review and assessment of its determinants. *Marketing Letters*, *18*, 181–196. https://doi.org/10.1007/s11002-007-9013-2

Volery, T., Fueglistaller, U., Müller, C., & Müller, S. (2016). Unternehmerische Gelegenheiten und Umsetzung. In U. Fueglistaller, C. Müller, S. Müller, & T. Volery, *Entrepreneurship* (pp. 37–63). Wiesbaden: Gabler Verlag. https://doi.org/10.1007/978-3-8349-4770-3_2

von Hippel, E. (1976). The dominant role of users in the scientific instrument innovation process. *Research Policy*, *5*(3), 212–239. https://doi.org/10.1016/0048-7333(76)90028-7

von Hippel, E. (1977). The dominant role of the user in semiconductor and electronic subassembly process innovation. *IEEE Transactions on Engineering Management*, *24*(2), 60–71. https://doi.org/10.1109/TEM.1977.6447336

von Hippel, E. (1986). Lead users: A source of novel product concepts. *Management Science*, *32*(7), 791–805. https://doi.org/10.1287/mnsc.32.7.791

von Hippel, E. (1988). *The Sources of Innovation*. New York ; Oxford: Oxford University Press.

von Hippel, E. (1994). "Sticky information" and the locus of problem solving: Implications for innovation. *Management Science*, *40*(4), 429–439. https://doi.org/10.1287/mnsc.40.4.429

von Hippel, E. (1998). Economics of product development by users: The impact of "sticky" local information. *Management Science*, *44*(5), 629–644. https://doi.org/10.1287/mnsc.44.5.629

von Hippel, E. (2005). *Democratizing innovation*. Cambridge, Massachusetts: MIT Press.

von Hippel, E. (2009). Democratizing innovation: The evolving phenomenon of user innovation. *International Journal of Innovation Science*, *1*(1), 29–40. https://doi.org/10.1260/175722209787951224

von Hippel, E. (2017). *Free innovation*. Cambridge, Massachusetts: MIT Press.

von Hippel, E., de Jong, J. P. J., & Flowers, S. (2012). Comparing business and household sector innovation in consumer products: Findings from a representative study in the United Kingdom. *Management Science*, *58*(9), 1669–1681. https://doi.org/10.1287/mnsc.1110.1508

von Hippel, E., DeMonaco, H. J., & de Jong, J. P. J. (2014). *Market failure in the diffusion of clinician-developed innovations: The case of off-label drug discoveries* (SSRN Scholarly Paper No. ID 2275562). Rochester, NY: Social Science Research Network. Retrieved from Social Science Research Network website: https://papers.ssrn.com/abstract=2275562

von Hippel, E., Ogawa, S., & de Jong, J. P. J. (2011). The age of the consumer-innovator. *MIT Sloan Management Review*, *53*(1), 27.

von Hippel, E., & von Krogh, G. (2003). Open source software and the "private-collective" innovation model: Issues for organization science. *Organization Science*, *14*(2), 209–223. https://doi.org/10.1287/orsc.14.2.209.14992

von Hippel, E., & von Krogh, G. (2006). Free revealing and the private-collective model for innovation incentives. *R&D Management*, *36*(3), 295–306. https://doi.org/10.1111/j.1467-9310.2006.00435.x

von Hippel, E., & von Krogh, G. (2016). Crossroads—identifying viable "need–solution pairs": Problem solving without problem formulation. *Organization Science*, *27*(1), 207–221. https://doi.org/10.1287/orsc.2015.1023

Von Krogh, G., & von Hippel, E. (2006). The promise of research on open source software. *Management Science*, *52*(7), 975–983. https://doi.org/10.1287/mnsc.1060.0560

Wakefield, K. L., & Inman, J. J. (2003). Situational price sensitivity: The role of consumption occasion, social context and income. *Journal of Retailing*, *79*(4), 199–212. https://doi.org/10.1016/j.jretai.2003.09.004

Weber, R., & Shaw, P. (2009). Player types and quality perceptions: A social cognitive theory based model to predict video game playing. *International Journal of Gaming and Computer-Mediated Simulations*, *1*(1), 66–89. https://doi.org/10.4018/jgcms.2009010105

Weijters, B., Cabooter, E., & Baumgartner, H. (2018). When cheap isn't the same as not expensive: Generic price terms and their negations. *Journal of Consumer Psychology*, *28*(4), 543–559. https://doi.org/10.1002/jcpy.1041

Weitz, B. A. (1985). Introduction to special issue on competition in marketing. *Journal of Marketing Research*, *22*(3), 229–236. https://doi.org/10.1177/002224378502200301

Wennberg, K., Folta, T. B., & Delmar, F. (2008). *A real options model of stepwise entry into self-employment* (SSRN Scholarly Paper No. ID 1310937). Rochester, NY: Social Science Research Network. https://doi.org/10.2139/ssrn.1310937

Wennberg, K., Wiklund, J., DeTienne, D. R., & Cardon, M. S. (2010). Reconceptualizing entrepreneurial exit: Divergent exit routes and their drivers. *Journal of Business Venturing*, *25*(4), 361–375. https://doi.org/10.1016/j.jbusvent.2009.01.001

West, J., & Gallagher, S. (2006). Challenges of open innovation: The paradox of firm investment in open-source software. *R&D Management*, *36*(3), 319–331. https://doi.org/10.1111/j.1467-9310.2006.00436.x

West, J., & Lakhani, K. R. (2008). Getting clear about communities in open innovation. *Industry and Innovation*, *15*(2), 223–231. https://doi.org/10.1080/13662710802033734

West, J., & Piller, F. (2014). Firms, users, and innovation—An interactive model of coupled open innovation. In H. W. Chesbrough & W. Vanhaverbeke (Eds.), *New Frontiers in Open Innovation*. Oxford ; New York: Oxford University Press.

White, T. B., & Yuan, H. (2012). Building trust to increase purchase intentions: The signaling impact of low pricing policies. *Journal of Consumer Psychology*, *22*(3), 384–394. https://doi.org/10.1016/j.jcps.2011.09.003

Whitson, J. R., Simon, B., & Parker, F. (2021). The missing producer: Rethinking indie cultural production in terms of entrepreneurship, relational labour, and sustainability. *European Journal of Cultural Studies*, *24*(2), 606–627. https://doi.org/10.1177/1367549418810082

Wilson, J. (2005). Indie rocks! Mapping independent video game design. *Media International Australia*, *115*(1), 109–122. https://doi.org/10.1177/1329878X0511500111

Wind, J., & Mahajan, V. (1997). Issues and opportunities in new product development: An introduction to the special issue. *Journal of Marketing Research*, *34*(1), 1–12. https://doi.org/10.1177/002224379703400101

Winer, R. S. (1985). Technical note—A price vector model of demand for consumer durables: Preliminary developments. *Marketing Science*, *4*(1), 74–90. https://doi.org/10.1287/mksc.4.1.74

Winer, R. S. (1986). A reference price model of brand choice for frequently purchased products. *Journal of Consumer Research*, *13*(2), 250–256. https://doi.org/10.1086/209064

Wittink, D. R., Vriens, M., & Burhenne, W. (1994). Commercial use of conjoint analysis in Europe: Results and critical reflections. *International Journal of Research in Marketing*, *11*(1), 41–52. https://doi.org/10.1016/0167-8116(94)90033-7

Wolf, M., & McQuitty, S. (2011). Understanding the do-it-yourself consumer: DIY motivations and outcomes. *AMS Review*, *1*(3–4), 154–170. https://doi.org/10.1007/s13162-011-0021-2

Wolf, M., & McQuitty, S. (2013). Circumventing traditional markets: An empirical study of the marketplace motivations and outcomes of consumers' do-it-yourself behaviors. *Journal of Marketing Theory and Practice*, *21*(2), 195–210. https://doi.org/10.2753/MTP1069-6679210205

Wolinsky, A. (1983). Prices as signals of product quality. *The Review of Economic Studies*, *50*(4), 647–658. https://doi.org/10.2307/2297767

Woodruff, R. B. (1997). Customer value: The next source for competitive advantage. *Journal of the Academy of Marketing Science*, *25*(2), 139–153. https://doi.org/10.1007/BF02894350

Woodruff, R. B., & Gardial, S. F. (1996). *Know your customer: New approaches to understanding customer value and satisfaction*. Hoboken, New Jersey: Wiley.

Woodside, A. G. (2015). The general theory of behavioral pricing: Applying complexity theory to explicate heterogeneity and achieve high-predictive validity. *Industrial Marketing Management*, *47*, 39–52. https://doi.org/10.1016/j.indmarman.2015.02.004

Wu, P. F. (2013). In search of negativity bias: An empirical study of perceived helpfulness of online reviews. *Psychology & Marketing*, *30*(11), 971–984. https://doi.org/10.1002/mar.20660

Wu, Y., Zhang, K., & Xie, J. (2020). Bad greenwashing, good greenwashing: Corporate social responsibility and information transparency. *Management Science*, *66*(7), 3095–3112. https://doi.org/10.1287/mnsc.2019.3340

Xia, L., & Monroe, K. B. (2004). Price partitioning on the internet. *Journal of Interactive Marketing*, *18*(4), 63–73. https://doi.org/10.1002/dir.20017

Xia, L., & Monroe, K. B. (2017). It's not all about money: The role of identity in perceived fairness of targeted promotions. *Journal of Product & Brand Management*, *26*(3), 327–339. https://doi.org/10.1108/JPBM-05-2016-1196

Xia, L., Monroe, K. B., & Cox, J. L. (2004). The price is unfair! A conceptual framework of price fairness perceptions. *Journal of Marketing*, *68*(4), 1–15. https://doi.org/10.1509/jmkg.68.4.1.42733

Yeoman, I., & McMahon-Beattie, U. (2006). Luxury markets and premium pricing. *Journal of Revenue and Pricing Management*, *4*(4), 319–328. https://doi.org/10.1057/palgrave.rpm.5170155

Zander, I. (2007). Do You See What I Mean? An entrepreneurship perspective on the nature and boundaries of the firm. *Journal of Management Studies*, *44*(7), 1141–1164. https://doi.org/10.1111/j.1467-6486.2007.00732.x

Zeithaml, V. A. (1988). Consumer perceptions of price, quality, and value: A means-end model and synthesis of evidence. *Journal of Marketing*, *52*(3), 2–22. https://doi.org/10.2307/1251446

Zhang, D. J., Dai, H., Dong, L., Qi, F., Zhang, N., Liu, X., … Yang, J. (2018). How do price promotions affect customer behavior on retailing platforms? Evidence from a large randomized experiment on Alibaba. *Production and Operations Management*, *27*(12), 2343–2345. https://doi.org/10.1111/poms.12964

Zhang, J., Zhang, J., & Zhang, M. (2019). From free to paid: Customer expertise and customer satisfaction on knowledge payment platforms. *Decision Support Systems*, *127*. https://doi.org/10.1016/j.dss.2019.113140

Zhao, Y., von Delft, S., Morgan-Thomas, A., & Buck, T. (2020). The evolution of platform business models: Exploring competitive battles in the world of platforms. *Long Range Planning*, *53*(4). https://doi.org/10.1016/j.lrp.2019.101892

Zheng, S., Trott, A., Srinivasa, S., Naik, N., Gruesbeck, M., Parkes, D. C., & Socher, R. (2020). The AI economist: Improving equality and productivity with AI-driven tax policies. *ArXiv:2004.13332 [Cs, Econ, q-Fin, Stat]*. Retrieved from http://arxiv.org/abs/2004.13332

Zou, T., Ertug, G., & George, G. (2018). The capacity to innovate: A meta-analysis of absorptive capacity. *Innovation*, *20*(2), 87–121. https://doi.org/10.1080/14479338.2018.1428105
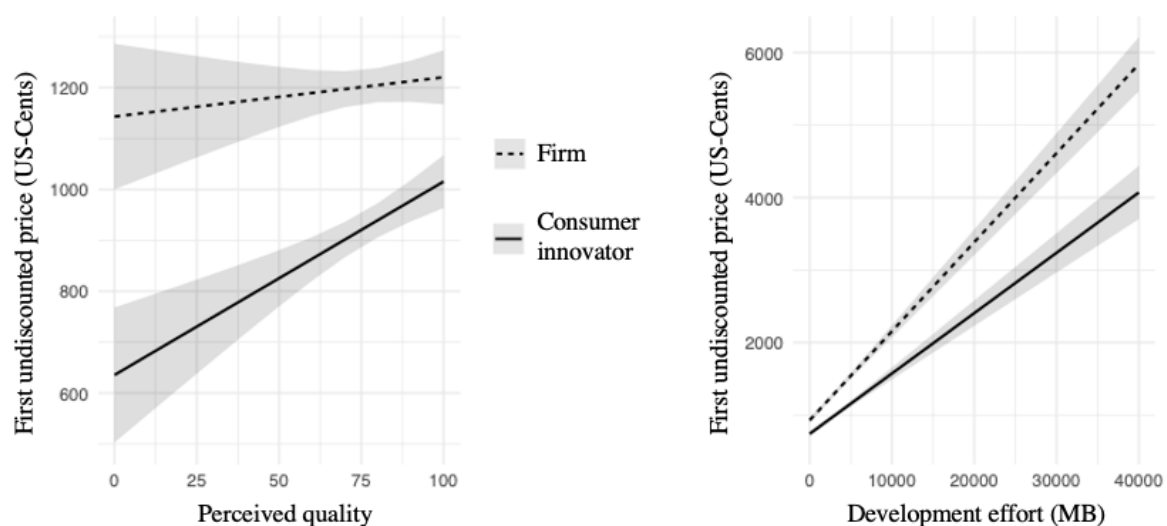
Appendix

Appendix contents

Appendix A1

Distribution of the game genres between firm and consumer developed games in Study I.

	Firm games		Consumer games	
Game genre	n	%	n	%
All	2,121		2,121	
Action	583	27.5	599	28.2
Action-Adventure	322	15.2	441	20.8
Adventure	389	18.3	399	18.8
Role Playing	142	6.7	116	5.5
Casual	202	9.5	237	11.2
Simulation	242	11.4	145	6.8
Sports and Racing	46	2.2	37	1.7
Strategy	195	9.2	147	6.9

Appendix A2

Depiction of interaction effects described in Study I (Source: Own depiction based on R output).

Appendix A3

Keywords used to identify reviews with potential price-quality relationship or quality-unrelated reviews amongst 2,000 randomly selected reviews of games in the sample.

Possibly price related reviews		Possibly reviews not related to game; reviews on fundamental tech problems			
Keyword	*Occurrences*	*Keyword*	*Occ.*	*Keyword*	*Occ.*
price	96	*fix*	66	*crash*	56
dollar	19	*install*	10	*forum*	12
value	29	*support*	67	*unplayable*	8
sale	79	*computer*	65	*broke*	14
worth	208	*bug*	92	*freez*	7
expensive	7	*PC*	64	*help*	76
pay	24	*computer*	40	*run*	67
paid	22	*machine*	16	*launch*	28
money	98	*CPU*	2	*windows*	5
Total occurrences: 582		Total occurrences: 695			
Number of reviews: 340		Number of reviews: 384			

Note: * symbolizes wildcard characters, indicating that also partial congruities were regarded.

Appendix A4

Screening of reviews for a potential price-perceived quality relationship in the perceived quality proxy of customer ratings in reviews.

Screening step	Reviews	Examples
The screening starts with the reviews that matched at least one of the price-related keywords.	340	
From the flagged reviews, those which keywords refer to something entirely different than the price paid for the game were excluded.	−105	"You will <u>pay</u> for it in blood, but it is SO satisfying when you finally make it to the next level." "Great level design, phenomenal gameplay and unbelievably stunning visuals. <u>Worth</u> your time." "No good way to find out <u>prices</u> of goods, have to click each one" "This is a game to grow with and pass on to your children like board games or moral <u>values</u>." "A <u>worthy</u> sequel to the original. Makes no damn sense, but it's not meant to"

Further, reviews that strongly indicate that a different price would not have changed the verdict of the reviewer were disregarded.	–37	"I can't recommend this still even at half <u>price</u>." "This game is <u>not worth $10;</u> this game is not <u>worth $1</u>. […] You will not enjoy it. I guarantee" "Even if you get it for free, it's not <u>worth </u>the money<u>.</u>"
Also reviews which just contained a general recommendation for purchase without referring to a specific price were not considered.	–24	"I would play this again. but there's nothing much to do yet. people would say is it <u>worth</u> it. I would say yes help the devs out by finding bugs and stuff that doesn't work." "PS: I won't refund this as I think the developers have done a good enough job as to deserve my <u>money</u>, and I hope they expand the game later in development as they have a potential gem here." "If the game provides enough entertainment and <u>value</u> that you don't feel ripped off then you should support it."
Similarly, general recommendations to buy games for a low price were excluded.	–20	"The second part of the series. Simple game but very addictive. It is easy to get all achievements. Your kids will love this game. I recommend even for a full <u>price</u>." "While I don't know if I'd call this one of the best games ever made, it's still an influential classic in its genre. Pick it up if it's on<u> sale </u>and you're interested."
Also, reviews in which the price was provided as neutral, additional information and not as a factor influencing the reviewers rating were not counted.	–10	"So, I bought this game while it was on<u> sale,</u> and I also heard that there were things done to the game to make it more of a serviceable product <u>worth </u>playing, and I will say it has rekindled my interest in the game." "I <u>paid </u>for this in December 29 2013, a founders pack, <u>$29.99 USD.</u> […] tried it on nice spec pc again today […]" "This is my first serious review. Got the game for <u>$1.50 </u>(my country is cheap yall) and played it through the normal difficulty. The game is good except the "Walrider" part."

This leaves the number of reviews that might be influenced by the price.	= 144 (7,2% of 2,000)	"A pleasant puzzler, that's <u>perfectly priced</u>, with perplexing and precise puzzles that promote people in the populous to power predominantly positive postulations. A Plus"
		"Amazing in VR. I've never played a survival game before and just got this because of the reviews. It's stunning and I'm hooked. Takes a bit of getting used to the do whatever you want type gameplay with no clear objectives, but the beauty of the world was enough. Does have crashing issues but so far, they are few and far between. This is a<u> great value at $30 let alone $10.</u> I hope you enjoy it as much as I do."
		"So, I admit I was kinda expecting this game to suck, but it didn't. <u>For the $3 i paid for this i got a heck of good deal</u> for quite the fun game."

Appendix A5

Screening of reviews for indicators that players were not able to judge the perceived quality due to malfunctioning or fundamental technical problems.

Screening step	Reviews	Examples
The screening started with a set of reviews that matched terms indicating unplayability or fundamental tech problems.	384	
Reviews in which the keyword was not used to describe a problem were not regarded.	- 204	"You need to gather the <u>support</u> of villages (usually via bribery)" "The interplay between N<u>PC</u> is groundbreaking" "Objective is to create a time <u>machine</u>." "It also helps that the game's <u>loaded</u> with memorable quotes" "Works, no <u>lag</u>"
Then, reviews in which problems with the game were described, but the reviewer was able to play the game and to evaluate the game in more detail, were excluded.	-137	"It does suffer from occurrences of choppy <u>frame rate</u>. That's not to say you can't run the game though. I've run it basically the same on my main desktop and on my laptop indicating it just needs some polish." "I hold out hope that in the future there will be further development by [*Game Developer]* to <u>fix existing bugs</u> and improve upon the foundation they've built" "After starting a new game and switching between them <u>the load order</u> wasn't the same anymore and the very moment, I deleted one of the saves I realized it was the wrong one. Technically my fault, but I think the slots to save the game should stay in one spot. "
This leaves reviews that do not contain an evaluation of the game because the buyers were not able to play it.	= 43 (2,15% of 2,000)	"I'll be happy to change my review if I can actually play the game. Edit: Tried to restart the game, <u>reboot the system, and reinstall</u> the game. Each time, same problem." "So pissed. I tried to <u>launch the game and I get stuck </u> on the Keyboard screen. No matter what I do I cannot get past that page." "<u>Can't run it on Windows 7</u> no matter what setting I try."

Appendix A6

Screening of reviews for misuse of the review system where the perceived quality was not judged but, e.g., a review was used to contact the developers for help or feature requests.

Screening step	Reviews	Examples
The screening starts with the reviews that contain a keyword referring to a problem with the game.	227	"Needs to <u>fix lag server</u> side and client side, and all these damn physics issues, jesus, but overall, pretty good" "[…] Lastly, the game is <u>SUPER glitchy.</u> Sometimes when you're attacking an enemy, it doesn't even register that you've tried to even hit the enemy. Also, I feel like the Hard difficulty was just plain ridiculous. I'm not too sure if they were trying to go for realistic, but you couldn't even sneak close to them (even if it was behind them) to get a kill because they would just hear you and immediately sound the alarm. […]" "This is one of my favorite games of all time, but this version is glitched in so many ways it is practically unplayable. The latest one I have found is that it will not allow thieves to invest points in lock picking and thus you can not open most chests in the game." "Good game. still buggy though" "a great game that ruined by huge frame drops."
The reviews that are requests to the developer and do not contain any rating of the actual game were extracted. In these cases, the review was not written to evaluate the game but rather to draw attention from the developer or from the support staff.	16 (0,8% of 2,000)	"<u>Fix</u> the undo button" "<u>Fix</u> the shotgun" "<u>Game breaking bug!</u> If you use the first doubloon on the second fountain you will not be able to use the second doubloon on the first fountain. Thus, you will not ever get 3 falling stars and will be unable to finish the game. I got three quarters thru before I realized this though I had suspicions earlier and should have started over then."

Appendix A7

Sample computer game vignette used for the first experiment of Study II. The "indie"-label was only shown to half of the participants. For the second experiment, two price levels were added. (Source of the screenshots: "0 A.D.", a computer game developed by a community of volunteers and licensed as CC BY-SA; https://play0ad.com)

Consumers are an important source of innovation. They primarily innovate out of non-monetary motivations, such as use interest, learning and social rewards. Nonetheless, increasing numbers of such consumer and user innovators recently began diffusing their creations on online marketplaces, where they price and commercialize them.

This empirical work reveals that, compared to firms, consumers' different motivations to innovate affect their pricing decisions systematically in terms of cost, customer quality and competition considerations. Furthermore, it shows that customers' price evaluations differ consistently when a product is marketed as created by consumers.

Two empirical, sequential mixed methods studies were conducted for testing a series of hypotheses derived from fusing pricing research with consumer and user innovation theory. The empirical work was executed in the field of indie video games. Its core quantitative analyses were carried out with data scraped from the Steam computer game marketplace. Interviews and experiments with commercializing consumer innovators and their customers scaffold the findings from the market data analyses.

The generated knowledge helps (a) consumer and user innovators to shape and validate their marketing strategies, (b) business administrators to respond to an influx of consumer innovators as competitors, and (c) economists in understanding the market impacts of commercial consumer innovation diffusion.

Logos Verlag Berlin