Essays on Drivers and Economic Outcomes of Online Reviews

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Submitted Research Papers

1. Gutt, D., Neumann, J., Zimmermann, S., Kundisch, D., and Chen, J. 2018b. "Design of Review Systems – A Strategic Instrument to shape Online Review Behavior and Economic Outcomes," *Journal of Strategic Information Systems* (Forthcoming). https://doi.org/10.1016/j.jsis.2019.01.004

2. Gutt, D. 2018. "In the Eye of the Beholder? Empirically Decomposing Different Economic Implications of the Online Rating Variance," *Working Paper*, Paderborn University.

3. Neumann, J., Gutt, D., and Kundisch, D. 2018a. "A Homeowner's Guide to Airbnb: Theory and Empirical Evidence for Optimal Pricing Conditional on Online Ratings," *Working Paper*, Paderborn University.

4. Neumann, J., Gutt, D., and Kundisch, D. 2018b. "The Traveling Reviewer Problem – Exploring the Relationship between Offline Locations and Online Rating Behavior," *Working Paper*, Paderborn University.

5. Gutt, D., Herrmann, P., and Rahman, M. S. 2018a. "Crowd-Driven Competitive Intelligence: Understanding the Relationship Between Local Market Competition and Online Rating Distributions," *Information Systems Research* (Forthcoming).

Synopsis

1. Motivation

Despite his early doubts, Jeff Skoll did ultimately end up running eBay, which (along with other e-tailers like Amazon) has succeeded in selling on the internet only because of the enormous resources it devotes to keeping customers from getting screwed. As one eBay economist put it to us, in academic parlance, 'Our job is to reduce asymmetric information on eBay'

Fisman and Sullivan 2016, p. 51

It is a well-established finding in the economic literature that markets can fail when there is an information asymmetry between buyers and sellers (Akerlof 1970). Irrespective of whether a business transaction takes place on a classical used car market or on an e-commerce platform, when buyers cannot assess the quality of a product, in theory, the transaction will not happen. However, in real world environments, such as used car markets, buyers can physically inspect a car or do a test drive. On e-commerce platforms, however, this kind of product inspection is usually not possible prior to purchase. This means that buyers cannot ascertain the condition of the desired product or whether the seller will actually ship it. As a result, e-commerce platforms such as eBay have to find other solutions to reduce the information asymmetry between buyers and sellers. One remarkably effective way that has become common practice these days is to implement an online review system. In the case of eBay, by installing and continuously improving its online review system, information system designers and economists cooperate to "*reduce asymmetric information"* (Fisman and Sullivan 2016, p. 51).

On eBay, online reviews[1] mainly serve to mitigate the risk of cheating sellers who renege on their promises by not sending the products. Most e-commerce platforms have embraced online review systems which have become an integral part of online purchasing (e.g. Amazon, Yelp, Airbnb, or TripAdvisor). These e-commerce platforms use online reviews to enable prospective consumers to inspect attributes of, for example, a digital camera, a restaurant, a private apartment, or a hotel room that could otherwise only have been inspected upon consumption. Review systems are available for a variety of different industries and can be implemented either on a single retailer's website (e.g. Amazon), on a marketplace of third-party sellers (e.g. Amazon Marketplace), or as a pure review system without purchasing options (e.g. Yelp).

Online review systems have become a crucial pillar of success for e-commerce platforms. Surveys report that 90% of all online purchase decisions are influenced by online reviews (ReviewPro 2013) and that the majority of online shoppers read at least four reviews before making a purchase (Kee 2008). In its annual letter to shareholders, Amazon even highlights the number of online reviews

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[1] In this dissertation, I use the term "online reviews" when referring to online reviews in general, irrespective of whether they are textual or numerical in nature, and "online rating" when referring to numerical ratings or specific numerical metrics, such as the online rating variance.

(approximately 7 million) they collected in the year 2009 (SEC 2009). But dominant market players like Amazon and Yelp are not the only ones thriving on review systems. There is hardly any small- or medium sized online retailer nowadays that has not embraced it. The very fact that these firms are making use of syndicated reviews offered by third-party providers as a means of competing against the likes of Amazon (USA Today 2017) further emphasizes the importance of online reviews and review systems.

Consequently, scholars have turned their attention to online review systems and have tested, for instance, whether online reviews have an impact on sales. The basic assumption is that online reviews should reduce the information asymmetry between buyers and sellers and hence protect markets from failing. In theory, no sales at all should take place in a market with information asymmetry and opportunistic sellers (Akerlof 1970). Therefore, any reduction in information asymmetry should lead to an increase in sales in that market. Researchers' empirical findings have mostly supported this proposition. Specifically, they found that different metrics such as the valence of online ratings (measured by the mean of all single online ratings) or the sheer volume of online reviews have, by and large, a positive effect on a business' sales figures (Babic Rosario et al. 2016), irrespective of whether the business operates online (Chevalier and Mayzlin 2006) or offline (Anderson and Magruder 2012).

Over the past 20 years, the body of literature on online reviews has grown at an impressive rate (as documented in detail in Gutt et al. (2018b)). Scholars from the fields of marketing, economics, management, and information systems have collated an array of different studies on the outcomes of online reviews – for example on the positive effects of the rating valence and the review volume on book sales (Chevalier and Mayzlin 2006). Scholars have also investigated the factors that drive the generation of online reviews – for example the social influence bias of previous ratings on future ratings (Muchnik et al. 2013) or temporal path dependencies in ratings (Li and Hitt 2008). However, despite the level of scholarly attention paid to online reviews, four major gaps can be found in the literature:

First to note is that, at the time of writing, the state of the literature on online review system design has not yet been systematically reviewed. Despite the existence of meta-analyses that are analyzing metrics, such as the valence and the volume of online ratings (e.g., Babic Rosario et al. 2016, You et al. 2015), and general literature reviews (e.g., King et al. 2014, Cheung and Thadani 2012) on the individual reviewer-level, the literature on online review system design still lacks synthesis. Given that a large number of studies have evaluated online review system design features such as rating dimensions (Chen et al. 2018) or management responses (Proserpio and Zervas 2017), a literature review of design features is in order to consolidate the state of the research.

Second, the literature has found inconsistent results on the relationship between the variance of online ratings and economic outcomes. Even though some theoretical and experimental accounts do exist that reconcile the variety of results, empirical evidence from the field is still rudimentary.

Third, empirical evidence on the environmental implications for online review systems is still scant. For example, most of the studies have been conducted in B2C contexts and it is questionable whether results obtained in these contexts also hold in other contexts, e.g., in the sharing economy. For the sharing economy, little is known on the economic outcomes of online reviews. Yet, on sharing economy platforms such as Airbnb and Uber, online reviews arguably represent an even more important source of information for potential customers. Compared to a standard hotel booking, for example, Airbnb provides less codified information in the form of international star rating standards or hotel chain brands that might be used as a substitute for online reviews.

Fourth, only very few studies consider the implications of the offline world, such as local market competition, or the geographical dynamics of a reviewer, as drivers of online reviews. To adapt the design of review systems to heterogeneous offline conditions, review system designers need to be informed about the interplay between the offline environment and online rating behavior. Moreover, thanks to their granularity, scale, and real-time availability, online reviews present ideal opportunities for industrial economists to study classical differentiation models in offline world environments.

Consequently, the overarching aim of the studies comprised in this dissertation is to contribute knowledge to address these four gaps.

My dissertation presents five research papers. In the first study, we assess the current state of the literature on online review system design in a systematic literature review (Gutt et al. 2018b). The literature collection of this study is then used to demarcate the literature gaps addressed by the empirical papers included in this dissertation. For these studies, I collected data from different sources, namely Amazon, Airbnb, and Yelp. In the second study, I investigate the impact of the online rating variance on prices and sales of digital cameras on Amazon (Gutt 2018). In the third, we analyze direct outcome effects of online ratings and additional platform-generated quality information in the sharing economy (Neumann et al. 2018a). In the fourth, we investigate the relationship between a reviewer's traveling activity and her online rating behavior (Neumann et al. 2018b). Finally, the fifth paper analyzes the effect of local market competition on the heterogeneity of available mean ratings in the restaurant market (Gutt et al. 2018a).

The synopsis of this dissertation is structured as follows: Section 2 illustrates the theoretical background. Section 3 reviews the current state of the literature and presents the research gaps. Section 4 provides an overview of the five papers of this dissertation, including summary tables with detailed information regarding the contribution of co-authors and the scientific dissemination undertaken in the form of presentations and publications. Finally, section 5 summarizes the implications for research and practice as well as the limitations of the studies and offers directions for future research. Section A1 in the appendix depicts visual examples of key features of online review systems studied in the five papers.

2. Theoretical Background

In his seminal paper, Akerlof (1970) describes how a market for used cars unravels due to information asymmetry between buyers and sellers. On this market, sellers know the quality of their used cars but the buyers cannot perfectly judge it prior to purchase. There are two types of sellers on this market: high and low quality sellers. The high quality sellers sell at a reservation price that is higher than that of the low quality sellers. As buyers cannot distinguish between high and low quality sellers, however, both seller types offer their cars for the same price, the high quality price. The least buyers can do is estimate a rough probability of buying a lemon – a low quality car – and a high quality car. The buyer thus forms her willingness to pay as a weighted average of buying, respectively, a high or a low quality car. The weighted average willingness to pay is clearly below the prices of the cars offered on the market since all sellers, irrespective of the quality, offer their cars at the high quality price. Therefore, high quality sellers leave the market, buyers make no purchases, and the market fails.

In order to reduce this information asymmetry, sellers can resort to signaling and buyers can resort to screening (e.g., Riley 2001, Easly and Kleinberg 2010). Signaling is initiated by the better informed market party (here, the seller), to inform the worse informed party (the buyer) about the quality of the product. Strong signals are characterized by the fact that the cost of obtaining it is negatively correlated with the quality of the seller's product – i.e., for sellers of high quality products it is relatively easy to obtain, but for low quality sellers it is not (Easly and Kleinberg 2010). Money-back-guarantees, legal third-party certifications, or professionally-curated consumer reports can be considered strong signals, as they are very costly to obtain for low quality sellers. Screening, on the other hand, is conducted by the worse informed market party (the buyers), and describes the efforts they invest in finding high quality products (Riley 2001).[2]

However, most products and services are not only differentiated by quality, i.e., along the vertical dimension, but also by the taste-match with the buyer's taste, i.e., along a horizontal dimension. While many buyers would agree that they appreciate a well-manufactured high quality camera, some buyers might prefer cameras with simple options that make them easier to use, whereas others prefer highly adjustable settings and complex options to choose from.

Finally, products and services differ in the degree of buyer-seller information asymmetry prior to purchase, depending on their attributes. Nelson (1970) and Darby and Karni (1973) define three product attributes as follows: (1) Search attributes can be easily inspected by the buyer prior to purchase, such as the size and the color of the product; (2) Experience attributes can be inspected only after purchase,

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[2] It should be noted here that, naturally, sellers are also in some respects worse informed vis-à-vis their buyers. For instance, they do not know the buyer's willingness to pay and usually they obtain only little information about instances in which one of their products malfunctions after the sale has been completed.

such as the ease of use of a software, the atmosphere of an Airbnb apartment, or the taste of a pizza; (3) Credence attributes cannot be inspected even after purchase or only upon incurring substantial costs, such as the treatment effectiveness of a doctor.
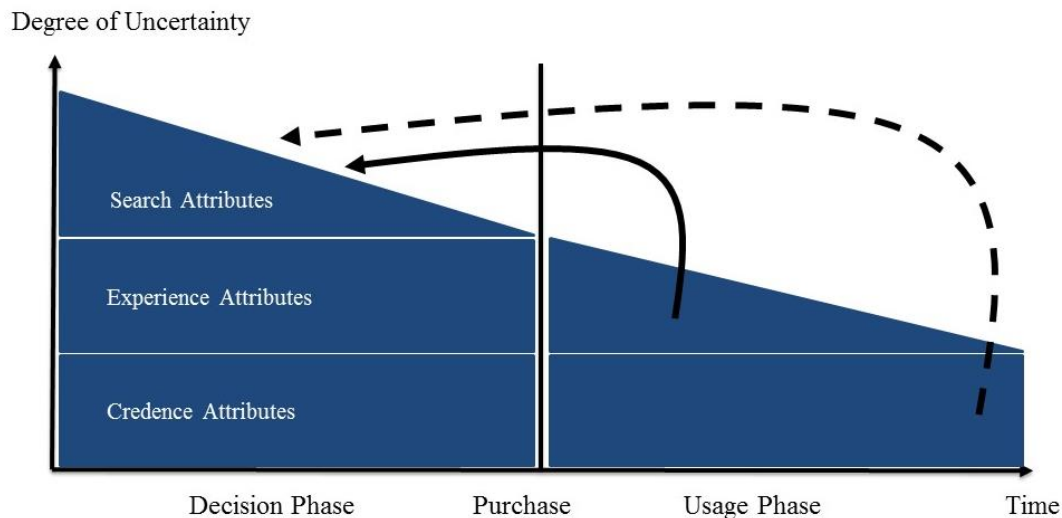

Figure 1: Search, Experience and Credence Attributes (adapted from Kaas (1991))

In essence, the main purpose of online reviews is to reduce the information asymmetry between buyers and sellers through peer-generated reviews of past customers (Dellarocas 2003). In this way, high and low quality sellers in Akerlof's example can be distinguished by high and low ratings. Sellers can signal their high quality with high ratings, buyers can learn about horizontal product features prior to purchase, and experience and perhaps even credence attributes are transformed into search attributes, as depicted in Figure 1. Furthermore, sellers can also learn about their customers' willingness to pay and the customer experience of their product, and adapt their pricing scheme and product design accordingly. In summary, online reviews represent a powerful tool for sellers to enhance their profit, and for buyers to find the product that best matches their needs.

Although the theory behind online reviews is most strongly connected to studies on information asymmetry, studying online reviews is, in many instances, highly context-dependent. For this reason, empirical online review studies often draw on additional theories to delineate testable hypotheses, for example, Causal Attribution Theory (Chen and Lurie 2013), or expectation-confirmation theory (Chen et al. 2018). Consequently, regarding the big picture of online review system design, if researchers were to develop a design theory of online review systems – which is currently missing from the literature— many different streams of literature would need to be leveraged for its development.

3. Status Quo of Research on Online Reviews

3.1 Conceptual Model

In order to classify the studies of online reviews, I rely on an adapted version of the conceptual model by Gutt et al. (2018b). This conceptual model consists of four constructs, namely, drivers, online reviews, outcomes, and the design of review systems. Online reviews directly affect outcomes and they themselves are affected by drivers.[3] Both of these relationships can be moderated by the design of the review system. The economic effects, i.e., outcomes, of online reviews can be measured on the consumer, the firm, or the market level. These outcomes typically represent economic effects directly resulting from the metrics of online reviews (i.e., *direct outcome effect* (a) in Figure 2). For example, an increasing valence of online ratings may increase a product's sales and thus represents a direct outcome effect on the firm level. Drivers[4] refer to any effects that influence individual online reviews or any online review metric (i.e., *direct driver effect* (b)) and they can be review-related or reviewer-related. For instance, the social influence bias is a review-related driver which suggests that previous online reviews observable by a reviewer directly influence their own review (Muchnik et al. 2013).
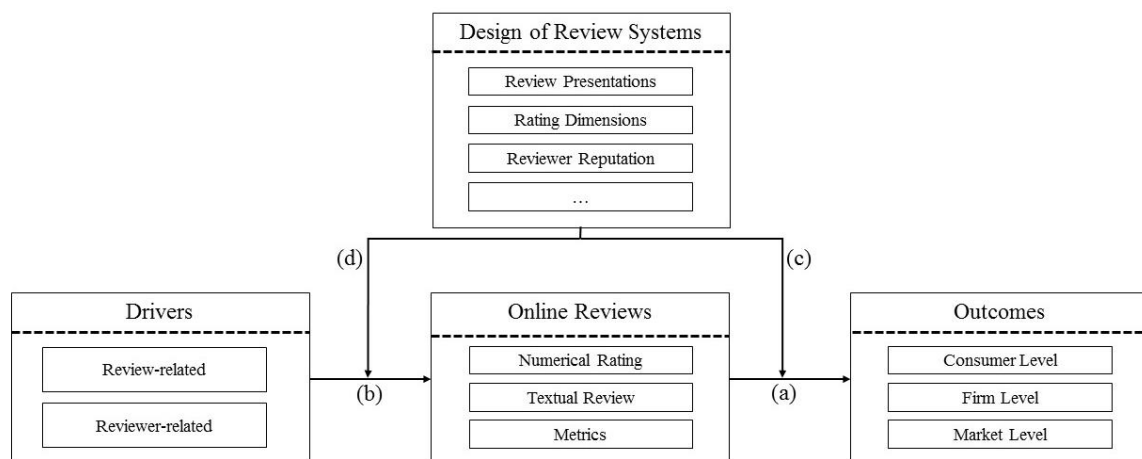

Figure 2: Conceptual Model of Existing Online Review Research (adapted from Gutt et al. 2018b))

A more recent perspective captures research on the design of review systems as an instrument to moderate the direct outcome effect (i.e., *moderating output effect* (c)) or the direct driver effect (i.e.,

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[3] While I imply a causal relationship between the constructs in the conceptual model, I acknowledge that not all studies investigate causal relationships or, indeed, correlational relationships. This notwithstanding, I use this model to classify causal as well as correlational studies (and, of course, theoretical studies).

[4] We recognize that earlier literature often refers to biases which cause differences between various online reviews. Because the term "bias" implies a divergence from an objectively correct statement and such correctness is difficult to establish, we propose the term "driver" instead.

moderating driver effect (d)).[5] These moderating effects capture all the options available to a firm to manipulate its review system. Such manipulations may include the implementation of different forms of review presentations, rating dimensions, or reviewer reputation, to name just a few.

3.2 Identification of Research Gaps

Before evaluating the body of existing literature I consulted literature review studies (Cheung and Thadani 2012, King et al. 2014) and meta-analyses of online reviews (Matos and Rossi 2008, Floyd et al. 2014, You et al. 2015, Babic Rosario et al. 2016, Hong et al. 2017).[6]

First to note is that none of the review studies and meta-analyses focus on the design features of online review systems. Yet, a growing body of literature has demonstrated that online review system design plays a crucial role in moderating economic outcome effects (e.g., Forman et al. 2008, Bolton et al. 2013, Li 2017) and drivers (e.g., Proserpio and Zervas 2017, Chen et al. 2018, Shen et al. 2015) of online reviews. In order to provide review system designers with a consolidated overview of the moderating impact of review system design on drivers and economic outcomes, a literature review on this topic was needed. From a scholarly perspective, an initial synthesis of the fragmented literature on review system design features provides an essential foundation for developing a design theory of online review systems.

Moreover, a comprehensive meta-analysis investigates the relationship between sales and the volume, valence, and variance of online ratings (Babic Rosario et al. 2016). While this study's findings suggest that there is a stronger relationship between sales and the volume of online reviews, rather than the valence of ratings, the meta-analysis presents mixed results for the online rating variance. In some of models in this study, certain operationalizations exhibit a significant positive correlation, whereas in others the correlation is negative (Babic Rosario et al. 2016). These mixed results have not been scrutinized or explained by the authors and the study concludes that variability in ratings may jeopardize sales. No other meta-analyses or literature reviews have as yet investigated the economic outcomes of the online rating variance.

One review study synthesizes the research of online reviews on an individual-level, focusing on latent individual constructs (Cheung and Thadani 2012). This study considers the context of an online review only as a very broad boundary condition. The authors argue that more market-level studies are needed

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[5] I acknowledge that review system design choices can also be modelled as direct effects on outcomes (e.g., Forman et al. 2008) or on online reviews (e.g., Chen et al. 2018). For instance, one may argue that review system design can directly influence the valence of ratings when rating scales are designed on a scale from 1 to 5 as opposed to on a binary scale. However, I argue that review system design can only manipulate the basic motivation of whether and how a consumer writes a review and the basic motivation of whether and how a potential consumer reads reviews. Thus, I consider review system design as having a moderating effect that, in turn, influences direct effects.

[6] I acknowledge that there are also literature review studies on online reviews published in conference proceedings (e.g., Trenz and Berger 2013), but in line with the literature search strategy in Gutt et al. (2018b), they are not considered here.

to understand the role played by the context of online reviews. This argument is in line with two other meta-analyses which also underline the need to consider the context of online reviews more explicitly (Matos and Rossi 2008, Babic Rosario et al. 2016). One meta-analysis actually incorporates context – here, competition within an industry – as a moderator of the relationship between online review volume/ rating valence and sales (You et al. 2015). They find that higher competition is associated with a less strong relationship between online rating metrics and sales (You et al. 2015). Yet, this study does not analyze the influence competition has on the generation of online reviews in the first place.

Analyzing these studies has provided a first insight of the gaps in the body of literature on online reviews. First, there is no literature review on online review system design (Gap 1). Second, there is still a gap with respect to economic outcomes of the online rating variance (Gap 2). Third, existing studies highlight insufficient scholarly understanding of the role that the context plays in the generation of online reviews and their outcomes. I present first advances to address this lack of knowledge in two ways. First I will analyze economic outcomes of online reviews in the sharing economy (Gap 3) and, second, I will analyze the offline environment as a driver of Online Reviews (Gap 4).

Table 1: Existing Literature Review Studies and Meta-Analyses

	Study	Online Rating Variance	Context of Online Reviews
Review Studies	Cheung and Thadani (2012)	Not considered	Not considered/ Call for Analysis of Environment
Meta-Analyses	Matos and Rossi (2008)	Not analyzed	Not analyzed/ Call for Analysis of Environment
	You et al. (2015)	Not analyzed	Industry Competition as a Moderator of Outcomes
	Babic Rosario et al. (2016)	Analyzed with mixed results	Not analyzed
	↓	↓	↓ ↓
	Gap 1: *No Systematic Review of Literature on Online Review System Design*	Gap 2: *Economic Outcomes of the Online Rating Variance*	Gap 3: *Economic Outcomes of Online Reviews in the Sharing Economy* — Gap 4: *Offline Environment as a Driver of Online Reviews*

After the investigation of the literature review studies and meta-analyses, I evaluated the current body of literature on online reviews to demarcate research Gap 2, 3, and 4, addressed in this dissertation. To this end, I manually coded all the 312 papers resulting from the literature search conducted in Gutt et al. (2018b) with respect to papers that investigate: (1) Economic outcomes of the online rating variance; (2) Economic outcomes of online reviews in the sharing economy; (3) The offline environment as a

driver of online reviews. A detailed documentation of the literature search strategy can be found in (Gutt et al. 2018b).

Among the 312 papers, thirteen have empirically analyzed the relationship between the online rating variance and economic outcomes – primarily sales, purchase intention, and prices – with contradictory results. There is considerable disagreement among these papers about the following questions: (1) is there any relationship between the online rating variance and economic outcomes, and if so, (2) what is the sign of this relationship? Regarding the first question, three of the thirteen papers fail to find a direct relationship between the online rating variance and economic outcomes (Kostyra et al. 2016, Moon et al. 2010, Chintagunta et al. 2010). Concerning the second question, five papers find a negative (Hu et al. 2017, Wu et al. 2013, Minnema et al. 2016, Langan et al. 2017, Raguseo et al. 2017), two a positive (Bao and Chang 2014, Clemons et al. 2006), and three a mixed (positive and negative) relationship between the online rating variance and outcome variables (Wang et al. 2015, Sun 2012, He and Bond 2015). Table 2 provides an overview of the sign of the relationship between the variance of online ratings and economic outcomes found by these thirteen studies.

Table 2: Signs of the Relationship between Online Rating Variance and Economic Outcomes

Sign of Relationship	Kostyra et al. (2016)	Chintagunta et al. (2010)	Moon et al. (2010)	Langan et al. (2017)	Wu et al. (2013)	Minnema et al. (2016)	Raguseo et al. (2017)	Hu et al. (2017)	Bao and Chang (2014)	Clemons et al. (2006)	Sun (2012)	He and Bond (2015)	Wang et al. (2015)
Positive									✓	✓			
Neutral	✓	✓	✓										
Negative				✓	✓	✓	✓	✓					
Mixed											✓	✓	✓

Furthermore, I did not find a single paper that has analyzed outcome effects of online reviews in the sharing economy[7] environment.[8] This is all the more surprising given the rapid growth of sharing economy platforms like Airbnb and Uber. These platforms arguably rely on online review systems to an even greater extent than sellers of consumer goods, for instance, because there are virtually no alternative means of inspecting a sharing economy good or service prior to purchase other than by the information provided by the online review system.

Finally, the large majority of papers I identified have neglected the local offline environment as a potential driver of online reviews. Only seven papers explicitly consider the role played by the local offline environment as a driver of online reviews. Of these seven papers, three have investigated the association between a reviewer's cultural background and the volume, valence, and helpfulness of her reviews (Hong et al. 2016, Fang et al. 2013, Koh et al. 2010), two have investigated local market competition as a driver of fake reviews given and received by hotels (Mayzlin et al. 2014) and restaurants (Luca and Zervas 2016), one investigates the association between geographical reviewer similarity on the perceived helpfulness of a reviews (Forman et al. 2008), and another studies the implications of geographical and temporal distance on the valence of individual online ratings (Huang et al. 2016).

The scant empirical evidence on this relationship is especially problematic considering the burgeoning stream of literature highlighting the interplay between online behavior and the local offline world. For instance, scholars have investigated how offline marketing communications via TV affect online searches (Joo et al. 2014), how the number of brick and mortar stores in a local market affect consumers' online purchases (Brynjolfsson et al. 2009), or how casual dating arranged via online services influences the local spread of sexually transmitted diseases (Chan and Ghose 2014, Greenwood and Agarwal 2016). In light of these papers, it is reasonable to assume that local offline conditions should also have a systematic bearing on the online rating behavior of reviewers. The quantification and evaluation of this relationship is crucial for the interpretation of reviews by potential customers, businesses, and review platforms alike.

Table 3 provides a summary of the studies pertaining to the gaps I have identified in the literature.

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[7] I acknowledge that there are studies on outcome effects of online reviews in C2C markets such as eBay (Cabral and Hortaçsu 2010). However, eBay is usually not considered a sharing economy platform and a statement by eBay's CEO corroborates this stance (Wenig 2016).

[8] Based on the literature review presented in Section 3, I could not identify any paper that investigates economic outcomes of online reviews in the sharing economy. I acknowledge that Teubner et al. (2017) and Wang and Nicolau (2017) investigate the correlation between online ratings on Airbnb and prices. Their studies are published in journals that did not satisfy the criteria defined in Gutt et al. (2018b). The study of Neumann et al. (2018a) comprised in this dissertation differs substantially from these two in that we propose a dynamic analytical model for optimal price and deploy econometric methods of causal inference.
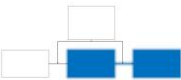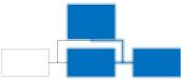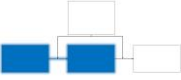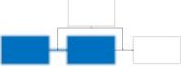
Table 3: Related Literature by Research Gap

	Sources by Gaps	*Methodology*	*Online Review Data Source*	*Product/Service*
Gap 1	Cheung and Thadani (2012)	Literature Review	—	—
	King et al. (2014)	Literature Review	—	—
	Hong et al. (2017)	Meta-Analysis	—	—
	Matos and Rossi (2008)	Meta-Analysis	—	—
	Floyd et al. (2014)	Meta-Analysis	—	—
	You et al. (2015)	Meta-Analysis	—	—
	Babic Rosario et al. (2016)	Meta-Analysis	—	—
Gap 2	Sun (2012)	Differences in Differences	Amazon, Barnes and Nobles	Books
	Kostyra et al. (2016)	Experiment	Experimental	eBook Readers
	Langan et al. (2017)	Experiment	Experimental	Laptops, Digital Cameras
	He and Bond (2015)	Experiment	Experimental	Desk Lamps, Flash Drives, Paintings, Music Albums, Ice Cream
	Wu et al. (2013)	Experiment, OLS Regressions	Experimental, Amazon and eBay	Electronics
	Minnema et al. (2016)	Fixed Effects Regressions	Anonymous online retailer	Electronics and Furniture
	Raguseo et al. (2017)	Fixed Effects Regressions	TripAdvisor and several booking websites	Hotels
	Chintagunta et al. (2010)	Instrumental Variables	Yahoo! Movies	Movies
	Bao and Chang (2014)	Instrumental Variables	Amazon	Books
	Moon et al. (2010)	OLS Regressions	Rotten Tomatoes, Yahoo! Movies	Movies
	Hu et al. (2017)	OLS Regressions	Amazon	Books, DVDs, and Videos
	Clemons et al. (2006)	OLS Regressions	Ratebeer.com	Craft Beer
	Wang et al. (2015)	Simultaneous Equation Model	Yahoo! Movies, Metacritic, Amazon, TestSeek	Movies and Cameras
Gap 3	—	—	—	—
Gap 4	Mayzlin et al. (2014)	Differences-in-Differences and Matching	Expedia, TripAdvisor	Hotels
	Hong et al. (2016)	Fixed Effects Regressions	TripAdvisor	Restaurants
	Luca and Zervas (2016)	Fixed Effects Regressions	Yelp	Restaurants
	Forman et al. (2008)	Fixed Effects Regressions	Amazon	Books
	Huang et al. (2016)	Fixed Effects Regressions	TripAdvisor	Restaurants
	Fang et al. (2013)	Fixed Effects Regressions and Matching	Amazon, Dangdang	Books
	Koh et al. (2010)	OLS Regressions	IMDB, Douban	Movies

4. Overview and Contribution

This dissertation comprises five research papers. Table 4 shows how the submitted studies relate to the conceptual model depicted in Figure 2 and the literature gaps outlined in the previous section.

Table 4: Overview of Submitted Studies by Research Gap

Gap addressed in this Dissertation	Relationship Figure 2	Source	Methodology	Data Source	Product/Service	Research Questions
Gap 1: *No Systematic Review of Literature on Online Review System Design*		Gutt et al. (2018b)	Scoping Literature Review	—	—	*What is the state-of-the-art in review system design? What are the remaining research gaps in review system design? What are promising ways to close the research gaps?*
Gap 2: *Economic Outcomes of the Online Rating Variance*		Gutt (2018)	Fixed Effects Matching	Amazon, www.camelcamelcamel.com	Digital Cameras	*Does the source of the variance influence the impact of the variance of online ratings on prices and sales?*
Gap 3: *Economic Outcomes of Online Reviews in the Sharing Economy*		Neumann et al. (2018a)	Analytical Model, Fixed Effects and Differences-in-Differences	Airbnb	Whole Apartments, Private Rooms, Shared Rooms	*How do you set profit-maximizing prices on platforms that account for interactions between prices and online ratings under rating inflation and additional quality signals?*
Gap 4: *Offline Environment as a Driver of Online Reviews*		Neumann et al. (2018b)	Fixed Effects and Clustering	Yelp, www.city-data.com	Restaurants	*Do people give systematically different online ratings to businesses patronized while traveling compared to businesses patronized in their home area?*
		Gutt et al. (2018a)	Fixed Effects and Instrumental Variables	Yelp, www.city-data.com, FDIC, US Census Business Pattern Data	Restaurants	*What is the impact of local market competition on the heterogeneity of available mean online ratings?*

In the following, I dedicate one sub-section to each of the studies included in this dissertation. I provide a brief summary of the paper with details on the scientific contributions made by the respective author, and information on the dissemination of research findings in the form of presentations and publications.

4.1 Gutt et al. (2018b)

In this paper, we provide a scoping literature review (Paré et al. 2015) on the research of online review systems, following a systematic literature review process (Webster and Watson 2002). To this end, we have manually scanned all issues of 38 high quality journals published between 1991 and 2017 and compiled a list of 312 papers on online reviews. We apply a conceptual model developed by ourselves (Figure 2) to classify all the papers into four categories (direct driver papers, direct outcome papers, moderated driver papers, and moderated outcome papers), before synthesizing the state-of-the-art of the research on the design of online review systems. We identify review system design features that lack evaluation, review systems for different environments, and novel devices for reviewing as research gaps to develop a research agenda which can address these gaps. Afterwards, we discuss the strategic implications of review system design from the perspective of the resource-based view. In so doing, we underline that review system design features can be understood as a means to turn online review systems into strategic assets that should be aligned with a firm's strategic goals. The strategic alignment of review systems with the firm's goals by the review system designer can be guided by our results. Moreover, we provide scholars with a detailed agenda on how to advance future research on review system design.

Table 5: Gutt et al. (2018b): Joint Work, Presentations Scientific Dissemination

Joint Work	Co-authorship with J. Neumann, S. Zimmermann, D. Kundisch and J. Chen (30% D. Gutt, 30% J. Neumann, 16% S. Zimmermann, 16% D. Kundisch, 8% J. Chen) - Concretization of the research question jointly by all authors - Positioning of the paper jointly by all authors - Literature collection jointly with J. Neumann, S. Zimmermann and D. Kundisch - Development of the conceptual model jointly with J. Neumann, S. Zimmermann and D. Kundisch - Interrater coding jointly with J. Neumann, S. Zimmermann and D. Kundisch - Statistical evaluation of interrater agreement by D. Gutt - Additional interrater coding by by M. Müller and N. Krüger (student assistants). - Write-up of paper jointly with with J. Neumann, S. Zimmermann and D. Kundisch - Write-up of the response to the reviewers and editors by J. Neumann and D. Gutt - Feedback, comments, and corrections by S. Zimmermann and D. Kundisch
Presentations	This work has not been presented so far.
Scientific Dissemination	- The work on this paper started in May 2017. - The paper was initially submitted to the **Journal of Strategic Information Systems** in June 2017. - At the time when this dissertation was submitted, the paper was under review for minor revisions with the **Journal of Strategic Information Systems**, (VHB Jourqual 3 ranking: A). The paper was accepted for publication January 31st, 2019.

4.2 Gutt (2018)

In Gutt (2018) I examine the impact of the variance of online ratings on the prices and sales of digital cameras from Amazon.com. The key feature of this study is that I employ and validate a machine learning approach allows for a calculation of the share of online rating variance attributed to product failure, on the one hand, and to consumer taste, on the other. In line with my theoretical foundation, my empirical results highlight that if the variance share is predominantly failure-related it has a negative impact on price and sales, while the impact of the taste-related share is positive. My results highlight a new perspective on the online rating variance that has hitherto been largely neglected in prior studies. Sellers can benefit from my results by adjusting their pricing strategy and improving their sales forecasts. Review platforms can facilitate the identification of product failure-related ratings to support the purchasing decision process of customers. Finally, my study is the first to lend field-empirical support to the underlying theoretical foundation.

Table 6: Gutt (2018): Joint Work, Presentations Scientific Dissemination

Joint Work	Single authored paper ▪ Student assistance by R. Wulfes (data preparation), J. Abraham, and N. Krüger.
Presentations[9]	▪ 02/2018: Gutt, D. 2018. Sorting Out the Lemons – Identifying Product Failures in Online Reviews and their Relationship with Sales, in: **Proceedings of the Multikonferenz Wirtschaftsinformatik 2018 (MKWI)**, Research-in-Progress, Lüneburg, Germany. ▪ 06/2018: Gutt, D. 2018. In the Eye of the Beholder? – Empirically Decomposing Different Economic Implications of the Online Rating Variance, in: **Proceedings of the Twenty Fifth European Conference on Information Systems (ECIS)**, Portsmouth, UK. ▪ 11/2018: PhD Workshop Paderborn University.
Scientific Dissemination	▪ The work on this paper started in August 2017. ▪ Different versions of this paper are published in the proceedings of the **European Conference on Information Systems (ECIS)**, 2018 (VHB Jourqual 3 ranking: B), and the proceedings of the **Multikonferenz Wirtschaftsinformatik (MKWI)** 2018 (VHB Jourqual 3 ranking: D).

4.3 Neumann et al. (2018a)

In this study we propose a two-period model for optimal price setting that takes into account potentially inflated ratings, which are a widespread issue for many sharing economy platforms. Our theoretical findings suggest that sellers in the medium-quality segment have an incentive to lower their first-period prices in order to monetize on increased second-period ratings, and that the possibility of monetizing on second-period ratings depends on the buyers' assessments of the rating system's reliability. Additionally, we find that total profits and prices increase with online ratings and additional quality signals. Empirically, conducting difference-in-difference regressions on a comprehensive panel data set from Airbnb, we are able to validate that price increases are associated with lower ratings, and find empirical support for the prediction that additional quality signals and additional reviews increase prices in the short run. Our results can support sellers in their price setting strategy. Moreover, our work underscores the beneficial impact of the signal precision of online review systems. Thus, review system designers should strive to increase the precision of online reviews, i.e., take measures to mitigate online rating inflation. Finally, our results highlight that, at least to some extent, sellers in the sharing economy turn increases in the volume of ratings and additional quality signals into price premiums.

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[9] If no name is indicated behind the presentation entry, I am the presenting author. Joint presentations with co-authors and presentations by co-authors without me are indicated in brackets.

Table 7: Neumann et al. (2018a): Joint Work, Presentations Scientific Dissemination, Awards

	Co-authorship with J. Neumann and D. Kundisch (45% J. Neumann, 45% D. Gutt, 10% D. Kundisch)
Joint Work	▪ Literature review by J. Neumann and D. Gutt
	▪ Concretization of the research question jointly by all authors
	▪ Positioning of the paper jointly by all authors
	▪ Hypotheses development jointly by J. Neumann and D. Gutt
	▪ Data collection from Airbnb by J. Neumann and M. Langendorf (Student Assistant)
	▪ Analytical model development by J. Neumann
	▪ Empirical analysis by J. Neumann and D. Gutt
	▪ Write-up of paper by J. Neumann and D. Gutt
	▪ Write-up of the response to the reviewers and revision for the ECIS and the ICIS versions of the paper by D. Gutt
	▪ Feedback, comments, and corrections by D. Kundisch
Awards	▪ Best Poster Presentation at the **Fakultätsforschungsworkshop** in Bad Arolsen, Paderborn University, 2015.
Presentations	▪ 06/2015: Gutt, D., Herrmann, P. 2015. Sharing Means Caring? Hosts' Price Reactions to Rating Visibility, in: **Proceedings of the Twenty Third European Conference on Information Systems (ECIS)**, Research-in-Progress, Münster, Germany.
	▪ 11/2015: Gutt, D., Herrmann, P. 2015. Sharing Means Caring? Hosts' Price Reactions to Rating Visibility, contribution at: **Fakultätsforschungsworkshop** in Bad Arolsen, Paderborn University.
	▪ 12/2016: Gutt, D., Kundisch, D. 2016. Money Talks (Even) in the Sharing Economy: Empirical Evidence for Price Effects in Online Ratings as Quality Signals, in: **Proceedings of the Thirty Seventh International Conference on Information Systems (ICIS)**, Research-in-Progress, Dublin, Ireland.
	▪ 06/2017: Neumann, J., Gutt, D. 2017. A Homeowner's Guide to Airbnb: Theory and Empirical Evidence for Optimal Pricing Conditional on Online Ratings, in: **Proceedings of the Twenty-Fourth European Conference on Information Systems** (**ECIS**), Guimarães, Portugal. (presented by J. Neumann).
	▪ 11/2017: Neumann, J., Gutt, D., Kundisch, D. 2017. A Homeowner's Guide to Airbnb: Theory and Empirical Evidence for Optimal Pricing Conditional on Online Ratings, contribution at: **INFORMS Conference on Information Systems and Technology (CIST)**, Houston, USA.
Scientific Dissemination	▪ The work on this paper started in July 2015.
	▪ Different versions of this paper are published in the proceedings of the **European Conference on Information Systems (ECIS)**, 2015 and 2017 (VHB Jourqual 3 ranking: B) and the proceedings of the **International Conference on Information Systems (ICIS)** 2016 (VHB Jourqual 3 ranking: A).

4.4 Neumann et al. (2018b)

In this study we examine the relationship between ratings made outside of a customer's home area, i.e., when traveling, and the magnitude of online ratings. In line with the rosy view theory, we find that customers who rate while traveling give, on average, higher ratings than locals. This relationship is moderated by the posting time of a review relative to consumption, as travelers also post more positive ratings during or shortly after consumption compared to locals. Our identification strategy leverages panel data to control for unobservable reviewer heterogeneity and a clustering approach to mitigate reviewer-restaurant selection biases. We also investigate several additional factors such as travel distance, identification strategy of a reviewer's home city, and the size of the home city relative to the size of the travel destination city. Our results have direct implications for platforms, sellers, and customers. First, for businesses it seems beneficial to obtain ratings from travelers who rate with temporal distance to consumption as one way of increasing their average rating. Second, when potential customers are comparing the mean ratings of two businesses to decide between, the information of whether a reviewer was a traveler or a local should be taken into consideration. Therefore, rating platforms could consider whether to facilitate the identification of a review as having been written by a traveler or by a local during or after consumption.

Table 8: Neumann et al. (2018b): Joint Work, Presentations Scientific Dissemination

Joint Work	Co-authorship with J. Neumann and D. Kundisch (45% J. Neumann, 45% D. Gutt, 10% D. Kundisch)
	▪ Literature review by J. Neumann and D. Gutt
	▪ Concretization of the research question jointly by all authors
	▪ Positioning of the paper jointly by all authors
	▪ Hypotheses development jointly by J. Neumann and D. Gutt
	▪ Data collection from Yelp.com by J. Neumann
	▪ Empirical analysis by J. Neumann and D. Gutt
	▪ Write-up of paper by J. Neumann and D. Gutt
	▪ Write-up of the response to the reviewers and revision of the paper by J. Neumann and D. Gutt
	▪ Feedback, comments, and corrections by D. Kundisch
Presentations	▪ 06/2017: Neumann, J., Gutt, D., Kundisch, D. 2017. The Traveling Reviewer Problem – Exploring the Relationship Between Offline Locations and Online Rating Behavior, contribution at: **Fakultätsforschungsworkshop** in Lippstadt, Paderborn University. (presented by J. Neumann and D. Gutt).
	▪ 11/2017: Neumann, J., Gutt, D., Kundisch, D. 2017. The Traveling Reviewer Problem – Exploring the Relationship Between Offline Locations and Online Rating Behavior, contribution at: **Topics in Economics and Management (TEAM)**, Paderborn University.
	▪ 11/2017: Neumann, J., Gutt, D., Kundisch, D. 2017. The Traveling Reviewer Problem – Exploring the Relationship Between Offline Locations and Online Rating Behavior, contribution at: **INFORMS Annual Meeting**, Houston, USA. (presented by J. Neumann).
	▪ 12/2017: Neumann, J., Gutt, D., Kundisch, D. 2017. The Traveling Reviewer Problem – Exploring the Relationship between Offline Locations and Online Rating Behavior, in: **Proceedings of the Thirty Eighth International Conference on Information Systems (ICIS)**, Seoul, South Korea. (presented by J. Neumann).
	▪ 02/2018: Neumann, J., Gutt, D., Kundisch, D. 2018. The Traveling Reviewer Problem - Exploring the Relationship Between Offline Locations and Online Rating Behavior, contribution at: **Workshop IS Design and Economic Behavior (ISDEB)**, Lüneburg, Germany (presented by D. Kundisch and D. Gutt).
	▪ 06/ 2018: Neumann, J., Gutt, D., Kundisch, D. 2018. The Traveling Reviewer Problem - Exploring the Relationship Between Offline Locations and Online Rating Behavior, contribution at: **Symposium on Statistical Challenges in Electronic Commerce Research (SCECR)**, Rotterdam, Netherlands.
Scientific Dissemination	▪ The work on this paper started in December 2016.
	▪ An earlier version of this paper is published in the proceedings of the **International Conference on Information Systems (ICIS)** 2017 (VHB Jourqual 3 ranking: A).

4.5 Gutt et al. (2018a)

In this paper we analyze how changes in local market structure affect the properties of a market's mean rating distribution. To this end, we combine demographic, socioeconomic, and Yelp restaurant review data for 372 isolated markets in the United States. Our empirical estimates demonstrate that an increase in overall competition – measured by the total number of restaurants in a market – leads to a broader range of a market's mean rating distribution, and to a decrease in its average rating distribution. The implication is that a larger market has a proportionately greater number of lower rated restaurants, whereas higher rated restaurants have relatively fewer comparable substitutes and face less competition in such a market. These effects are particularly pronounced when the analysis is limited to specific cuisine types where vertical differentiation is more natural or when we control for city-specific unobserved heterogeneity. Our findings highlight that practitioners and scholars using online mean ratings of businesses from disparate markets should account for the local market structure to judiciously analyze the relative market power of a business. In this way we extend the conceptual model presented in Figure 2 by adding market-level drivers as a new category of drivers.

Table 9: Gutt et al. (2018a): Joint Work, Presentations Scientific Dissemination, Awards

	Co-authorship with P. Herrmann and M. Rahman (70% D. Gutt, 10% P. Herrmann, 20% M. Rahman)
Joint Work	▪ I joined the author team in July 2015
	▪ Literature review by P. Herrmann and D. Gutt
	▪ Concretization of the research question jointly by all authors
	▪ Positioning of the paper jointly by all authors
	▪ Hypotheses development by D. Gutt
	▪ Data collection by P. Herrmann, Michael Whittaker (student assistant), and D. Gutt
	▪ Empirical analysis by P. Herrmann and D. Gutt
	▪ Write-up of paper by P. Herrmann and D. Gutt
	▪ Write-up of the responses to the reviewers over the four rounds of revisions by D. Gutt
	▪ Feedback, comments and corrections by M. Rahman
Presentations	▪ Herrmann, P., Rahman, M. 2014. What is the Relationship Between Market Structure and Digitized Customer Experience?, contribution at: **INFORMS Annual Meeting**, San Francisco, USA. (presented by P. Herrmann).
	▪ 11/2014: Herrmann, P., Rahman, M. 2014. Exploring the Relationship Between Local Market Structure and Digitized Customer Experience, contribution at: **INFORMS Conference on Information Systems and Technology (CIST)**, San Francisco, USA. (presented by P. Herrmann and received best Video Award).
	▪ 12/2014: Herrmann, P., Rahman, M. 2014. The Hunt for Quality in a Market: Exploring the Relationship between Local Market Structure and Digitized Customer Experience, contribution at: **Workshop on Information Systems & Economics (WISE)**, Auckland, Neuseeland. (presented by M. Rahman).
	▪ 05/2016: Herrmann, P., Gutt, D., Rahman, M. 2016. Crowd-Driven Competitive Intelligence: Understanding the Relationship between Local Market Structure and Online Rating Distributions, contribution at: **Topics in Economics and Management (TEAM)**, Paderborn University.
	▪ 06/ 2016: Herrmann, P., Gutt, D., Rahman, M. 2016. Crowd-Driven Competitive Intelligence: Understanding the Relationship between Local Market Structure and Online Rating Distributions, contribution at: **NBER Summer Institute on the Economics of Information Technology and Digitization**, Cambridge, MA., USA. (presented by M. Rahman).
	▪ 11/2016: Herrmann, P., Gutt, D., Rahman, M. 2016. Crowd-Driven Competitive Intelligence: Understanding the Relationship between Local Market Structure and Online Rating Distributions, contribution at: **INFORMS Annual Meeting**, Nashville, USA.
Scientific Disseminatio	▪ The work on this paper started in March 2014.
	▪ The paper was initially submitted to **Information Systems Research** (VHB Jourqual 3 ranking: A+) in December 2014 and was accepted for publication in August 2018 after four rounds of revisions.

5. Conclusion

This dissertation provides novel insights on economic outcomes and drivers of online reviews. By and large, my results highlight the value of the individual- and market-level context in which online reviews are generated. In determining the outcome effects of the online rating variance, the sign of the effect depends on whether reviews have been written due to product failure or as an expression of subjective taste (Gutt 2018). Moreover, empirical evidence suggests that online reviews also have economic outcome effects in the sharing economy (Neumann et al. 2018a). Market-level environmental factors of the offline world seem to play a non-negligible role in the generation of online reviews (Neumann et al. 2018b, Gutt et al. 2018a). Finally, the avenues for future online review systems research suggest that the entwinement between online review systems and the offline world will grow even stronger – raising the need for future research – considering the ongoing rise of pervasive mobile internet devices (Gutt et al. 2018b).

5.1 Implications for Research

Theoretical Implications

To the best of my knowledge, Gutt et al. (2018b) is the first study to advocate that, from the perspective of the resource based view of the firm (Barney 1991), online review systems should be perceived as a strategic asset by the platform deploying the system. Its design should therefore be aligned with the firm's strategy and goals and the results by Gutt et al. (2018b) can be a valuable starting point for the development of a design theory of online review systems.

I am the first to provide field empirical evidence to support the theoretical findings of (Zimmermann et al. 2018) and the lab experimental findings of He and Bond (2015) on the differential effects of the online rating variance. This implies that theoretical models should be more strongly tied to the actual products the models are investigating. If models consider products that can exhibit product failure, different sources of the online rating variance should be incorporated, as in Zimmermann et al. (2018). If theoretical models do not consider this distinction, their explanatory power remains potentially limited to products that cannot malfunction.

The results of Neumann et al. (2018b) also contribute evidence for cross-context theory replication (Hong et al. 2014) of the rosy view theory (Mitchell et al. 1997). As the rosy view theory is based on hedonic consumptions, this underlines the notion that hedonic and utilitarian consumption should be differentiated in individual-level studies on online reviews.

We propose and partially validate a theoretical model that can guide the price setting behavior in the sharing economy in Neumann et al. (2018a) that scholars can extend and test. Our results imply that, in theory, sellers act according to economic considerations when listing their apartments on Airbnb.

I also highlight the potential carried by online reviews for testing classical theories of industrial organization on the relationship between competition and quality in a novel way. Prior studies on service industries (Berry and Waldfogel 2010) have been limited to examining the upper end of the quality distribution of a market due to data sparsity. Online reviews usually cover all the service establishments – e.g., restaurants – of a market in real-time. We leverage this feature of online reviews to provide the first study that investigates how local competition affects the dispersion of the available qualities in a market at both ends of the market-level distribution (Gutt et al. 2018a). The results of this study provide support for the theoretical predictions of models such as those offered by Shaked and Sutton (1983, 1987) and Berry and Waldfogel (2010). We also extend the conceptual mode presented in Figure 2 by adding market-level drivers as a new category of drivers that influence online ratings on a market level.

Empirical Implications

The results of Gutt et al. (2018b) highlight the value of design changes to online review systems for empirical research. There are still a lot of review system design features that require empirical evaluation, and review systems provide an ideal environment for empirically observing counterfactuals, for example when design features are rolled out in the US American domain but not in another – hence creating excellent conditions for natural experiments.[10] Moreover, the ongoing adoption of mobile internet devices for online reviewing can enable empirical research to study the offline environment as a driver of online reviews in more detail. I also argue that the results I present in Gutt (2018) have the potential to partially reconcile contradictory empirical findings of prior research, whilst future research is still needed for their further evaluation. This notwithstanding, when investigating effects of the online rating variance, empirical research should consider the sources of the online rating variance. For the sharing economy environment, we present first empirical evidence that a seller's dynamic price-setting is affected by online reviews (Neumann et al. 2018a). This highlights the need for future research on price-setting in the sharing economy to control for the evolution of a seller's online ratings.

Recent research across a variety of domains has used online ratings of local businesses to explain various outcomes (e.g., Wang et al. 2016, Anderson and Magruder 2012, Lu et al. 2013, Kovács et al. 2014). My results highlight two noteworthy aspects that should be considered in this research setup. First, the results of this dissertation suggest that, when dealing with online ratings of businesses in cities that attract a lot of travelers, researchers would be wise to account for the share of reviews by locals and travelers, as this factor is systematically related to reviewing behavior (Neumann et al., 2018b). Second, we have studied isolated cities that arguably represent no typical travel destination and found

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[10] Naturally, cultural differences need to be considered as well in such scenarios. These could be either controlled for via fixed effects or operationalized and analysed as one explanatory variable, as in Hong et al. (2016) for example.

that increasing competition has differential effects on the competitive environment of businesses (Gutt et al. 2018a). This might be a potential confounding factor when evaluating outcome effects of online ratings for businesses in local markets, suggesting that fine-grained control variables for a market's competitiveness are worth incorporating.

5.2 Implications for Practice

The results of this dissertation also have practical implications for platform owners deploying online review systems, as well as for sellers and consumers.

For Platform Owners

By synthesizing the literature on design features of online review systems, my dissertation informs review system designers about which design features to implement for what purpose and attention is drawn to the need to systematically aligning the review systems with the platform's strategic goals (Gutt et al. 2018b). In general, my results underscore the need for review system designers to take active part in supporting the interaction of buyers and sellers through tailoring the design features of review systems. For instance, platforms should facilitate the identification of failure reviews to support customer decision making (Gutt 2018) and they could take measures to encourage candor among reviewers in the sharing economy to battle rating inflation and increase the precision of the rating information (Neumann et al. 2018a). Platforms might also facilitate a means of identifying the geographical background of a reviewer next to her rating, or platforms could aggregate a business's average rating separately for ratings by locals and travelers so consumers can make a more educated purchase decision (Neumann et al. 2018b).

For Sellers

The results of this dissertation inform sellers about the moderating effects of review system design features for the online reviews they collect and the economic outcome effects of these reviews. Based on this information, they can take an active part in leveraging this knowledge, for instance by means of review elicitation. Moreover, our results support sellers in B2C (Gutt 2018) as well as in sharing economy markets (Neumann et al. 2018a) in their price-setting strategy and their sales forecasts. In particular, we present first empirical evidence that sellers are able to translate online reviews and additional quality information they exhibit into price premiums – to however limited extent (Neumann et al. 2018a).

Sellers can also take account of the particular home market characteristics of their customers. They can actively elicit online reviews from travelers to boost the valence of their average rating or they might even conduct mobile targeting to attract either local or traveling customers (Neumann et al. 2018b). Finally, managers of chain restaurants aiming to foster a constant quality level across all of their branches should account for the systematically changing competitive environment depending on a

market's overall competitiveness (Gutt et al. 2018a). Third parties such as banks can use a business's average online rating relative to their competitors to improve their loan decisions (Gutt et al. 2018a).

For Consumers

Overall, my dissertation helps consumers to better understand and interpret online reviews. They are provided with empirical evidence that not all reviews are created equally (Gutt 2018) – i.e., that a 1- or a 2-star rating does not necessarily imply a "bad" review. Also, we make customers aware of the need to pay a small premium for well-rated Airbnb hosts (Neumann et al. 2018a). Furthermore, we point out that locals are more conservative in their ratings than travelers (Neumann et al. 2018b) and that relying on online review systems to select restaurants in highly competitive markets is more beneficial than in less competitive markets (Gutt et al. 2018a).

5.3 Limitations

Naturally, there are also limitations underlying the papers of my dissertation. One such limitation arises from the fact that my literature review (Gutt et al. 2018b) relies on a selection of journals, not having conducted query-based database searches and not having included conference proceedings. Therefore, I acknowledge that a few studies related to my research gaps may not been captured in our search in Gutt et al. (2018b). This notwithstanding, I have included a large number of relevant high quality journals from various research fields to ensure that I identify the majority of relevant high quality publications. Moreover, for each of the four empirical research papers of this dissertation, I have conducted an individual literature search considering publications beyond the scope of the search strategy of Gutt et al. (2018b).

Moreover, the empirical methods for causal inference deployed in the empirical papers of my dissertation themselves rely upon assumptions, e.g., on the common trend assumption (Neumann et al. 2018a) or on the exclusion criterion (Gutt et al. 2018a). Although all the empirical methods have been rigorously applied, as with any study relying on the analysis of observational data, each of the empirical papers relies to a certain degree on argumentation and the credibility of assumptions. To substantiate the internal validity of the studies, follow-up experiments would be recommended for example for Gutt (2018). Also, even though I focus on big market-leading e-commerce platforms to ensure external validity of my results, future research could also investigate smaller platforms to further extend the external validity.

Finally, many of the practical implications of my research papers pertain to design changes that might be beneficial to platform owners, sellers, and consumers. For example, I suggest that it is worth introducing design elements to identify failure-related reviews (Gutt 2018) or reviews from travelers (Neumann et al. 2018b) to better support consumer decision making. Yet, the onus is on future research to evaluate whether introducing such design elements is actually effective.

5.4 Future Research

In addition to the limitations outlined above, there are more avenues worth pursuing for future research. First, a detailed research agenda is provided in Gutt et al. (2018b). With respect to the studies that are part of this dissertation, future research could reevaluate the results of the online rating variance using my approach of separating the source of the online rating variance. Moreover, this technique could be applied to the service industry to identify the effects of service failure documented in online reviews (Hess Jr. et al. 2003). Furthermore, the pervasive dissemination of internet-enabled devices for mobile online reviewing presents fertile ground for online review research. As mobile devices increasingly merge the online and offline world, understanding the interplay between them is of paramount importance. Finally, a burgeoning literature has started to investigate how mobile geographical targeting (*geotargeting*) techniques can efficiently and effectively use geographical information to attract consumer attention (e.g., Molitor et al. 2018). Based on the results of my papers, future research could investigate whether platforms or sellers can more successfully deploy geotargeting by focusing for instance on travelers and at the same time increase their online ratings.

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Appendix

A.1 Illustrations of Online Reviews on the Platforms used in this Dissertation

Online reviews usually consist of at least two components, namely a numerical rating (e.g., a star rating on a scale from 1 to 5, or a binary rating) and a textual review. The numerical rating represents the reviewer's assessment of a product or service while the textual review element complements[11] the numerical rating with additional information. In addition, review systems typically provide various metrics that help evaluate or aggregate online reviews. Such metrics are for instance individual-level metrics like the perceived helpfulness of an online review and aggregate-level metrics like the volume (i.e., number of online reviews), the valence aggregated as the average numerical rating, and the variance (i.e., the numerical rating distribution). In the following, I provide some illustrative examples of the depiction of online reviews on the websites I study.

Figure A1 depicts the product page of a digital camera on Amazon. The product page displays the camera name, the aggregated valence of all ratings (here, four stars), the volume of reviews (42), and the price of the camera.

Note: URL: https://www.amazon.com/Fujifilm-600019756-FinePix-Waterproof-Digital/dp/B07BMYRHRF. Accessed 30 October 2018.
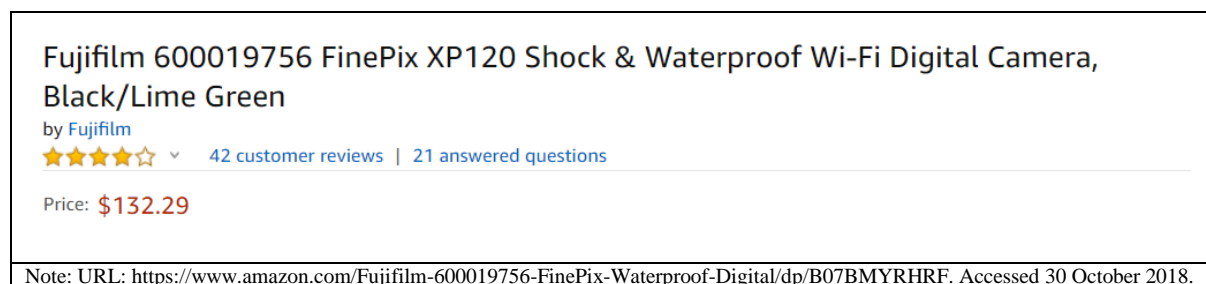
Figure A1: Aggregated Online Reviews on Amazon

As depicted in Figure A2, when hovering the cursor over the aggregate rating, the consumers can inspect the online rating distribution to get a first impression of the variance in the distribution of ratings. Here, the online ratings exhibit the often-observed J-shape, as documented in the literature (Hu et al., 2017).

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[11] There is a growing number of studies on the additional complementary information provided in review texts that can be used, for example, for the price-setting of electronics (Archak et al. 2011) or for uncovering the market structure of automobiles (Netzer et al. 2012).
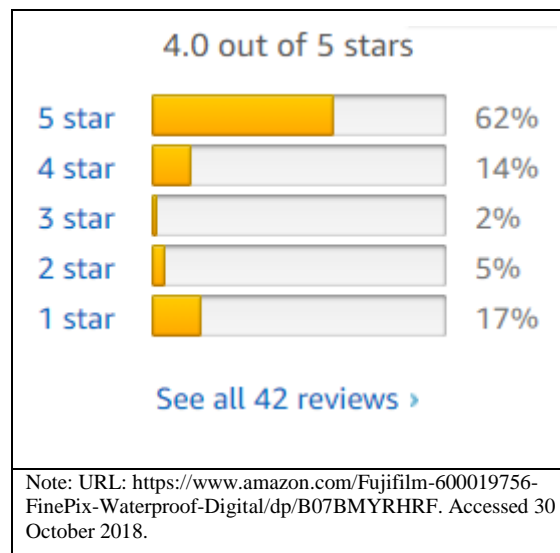
Note: URL: https://www.amazon.com/Fujifilm-600019756-FinePix-Waterproof-Digital/dp/B07BMYRHRF. Accessed 30 October 2018.

Figure A2: Online Rating Distribution on Amazon

Figure A3 depicts a snapshot of the page of a listing posted on Airbnb. Consumers are able to see the host's name (Debra), a picture of her, the name of her listing, how many guests it can accommodate, the number of bedrooms, beds, and baths, as well as her "*superhost badge*" (overlapping her photo). Airbnb awards this badge to hosts with outstanding performance.

Note: URL: https://www.airbnb.com/rooms/4178988?locale=en&location=Nashville%2C+Tennessee%2C+USA&s=rWd1kgGz. Accessed 30 October 2018.
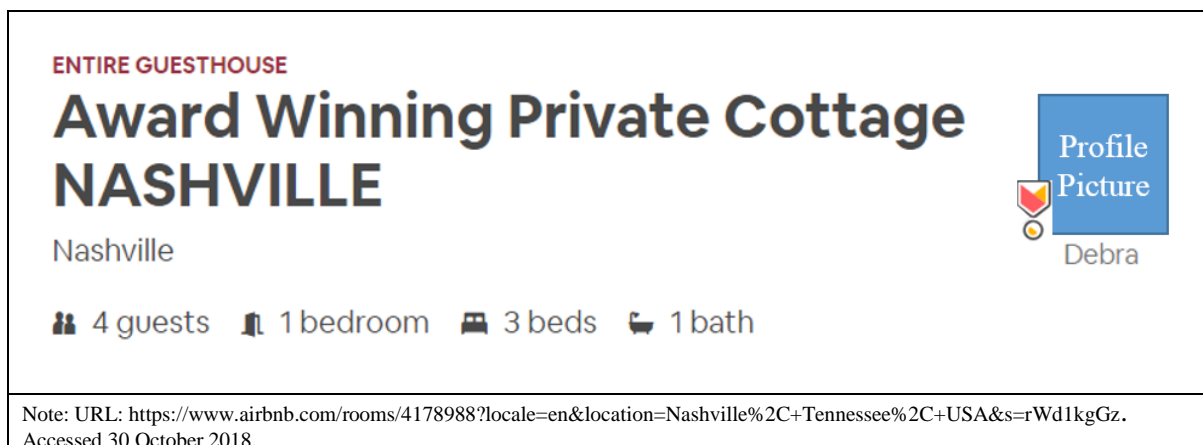
Figure A3: Listing Information on Airbnb

Moreover, Airbnb provides seven different rating dimensions (Figure A4), namely, accuracy, communication, cleanliness, location, check-in, value, and an overall rating category that is given as an independent dimension and not simply as an aggregate of the other six dimensions.

Note: URL: https://www.airbnb.com/rooms/4178988?locale=en&location=Nashville%2C+Tennessee%2C+USA&s=rWd1kgGz. Accessed 30 October 2018.
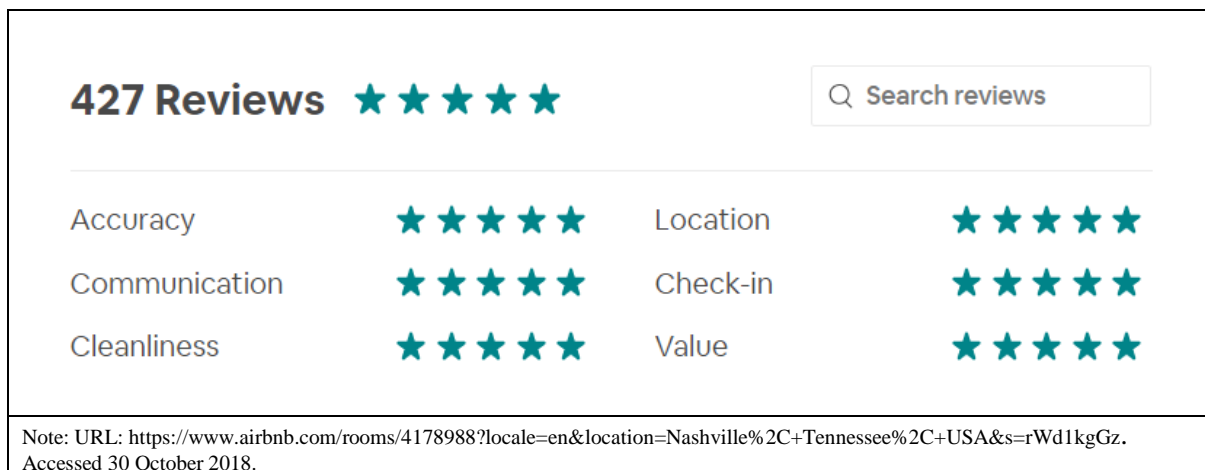
Figure A4: Online Rating Dimensions on Airbnb

Finally, Figure A5 displays the page of a restaurant listed on Yelp. Yelp prominently displays the aggregated average rating of the restaurant along with the volume of reviews, its name, the type of restaurant, the price category (from $ to $$$$), the address, and a few pictures.
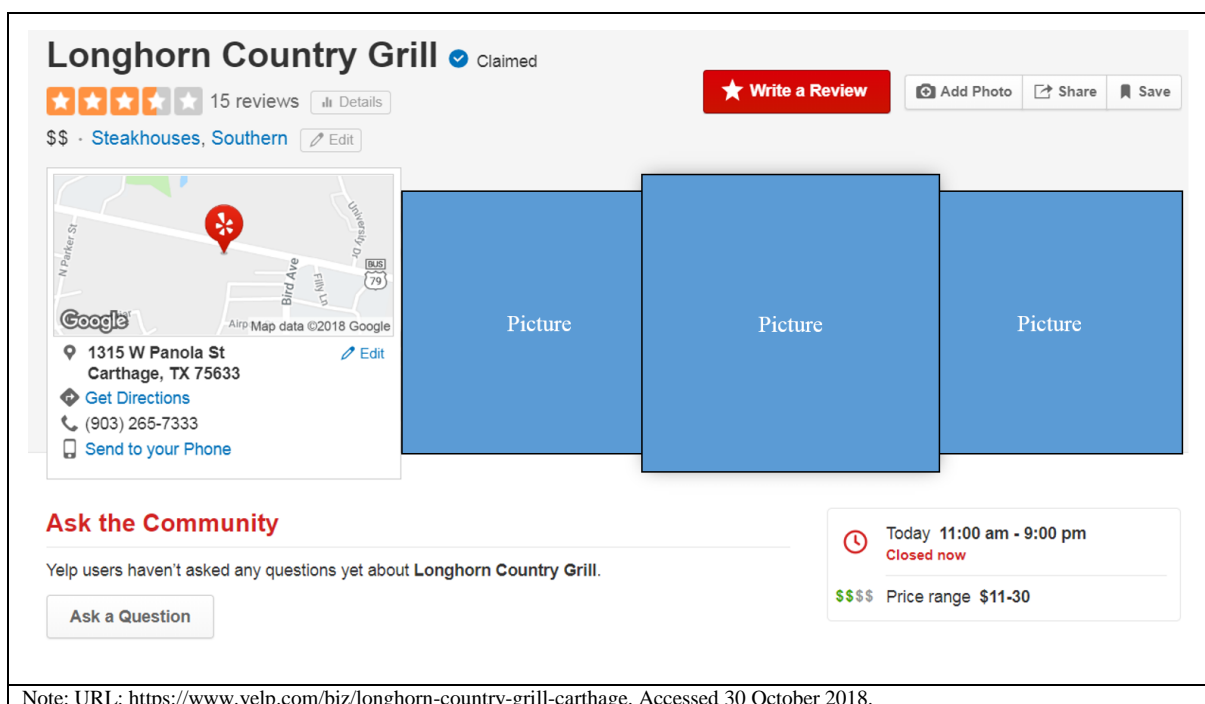

Note: URL: https://www.yelp.com/biz/longhorn-country-grill-carthage. Accessed 30 October 2018.

Figure A5: Aggregated Online Ratings on Yelp

Scrolling further down, consumers can inspect the individual ratings given by the reviewers (Figure A6). They can see the name and photo of the reviewer among the number of friends she has on Yelp,

the number of reviews she has written, the valence of her rating given for the focal restaurant, the review text, the date of the review, and whether other consumers found her review useful, funny, or cool.[12]

Note: URL: https://www.yelp.com/biz/longhorn-country-grill-carthage. Accessed 30 October 2018.

Figure A6: Online Reviews on Yelp

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[12] In fact, Amazon and Airbnb also provide similar lists of individual reviews per product and listing, but the studies on Amazon and Airbnb focus on aggregate metrics and not individual reviews, hence snapshots of individual reviews have been omitted for these websites.