Second-Order Digital Inequality: The Case of E-Commerce

Completed Research Paper

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Abstract

"Second-order digital inequality" describes that certain individuals profit less from digital opportunities not only due to limited access but also due to limited abilities to use information and communication technologies (ICT). This study extends research on second-order digital inequality to the realm of e-commerce. We introduce a novel conceptualization of effective, potentially beneficial, e-commerce use that encompasses two dimensions: (1) the diversity of e-commerce platforms used by an individual; (2) the degree to which an individual uses supporting e-commerce features. Building on technology acceptance theory and social psychology, we argue that socio-economically disadvantaged individuals are less likely to use e-commerce effectively than socio-economically advantaged individuals. We empirically test our hypotheses on clickstream data that tracks the online behavior of 2819 US e-commerce users for six month. Our findings reveal that, despite equal access, the socio-economically advantaged use e-commerce more effectively regarding both dimensions. Implications for research and practice are discussed.

Keywords: Digital inequality, e-commerce, digital divide, e-commerce platforms, e-commerce functionalities, technology acceptance, social issues of ICT

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Introduction

Ever since its inception, scholars have discussed the impact of the Internet on society (DiMaggio et al. 2001). Proponents of the Internet argued it could provide people access to new ways of creating value and thus foster societal wealth and wellbeing (Hargittai 1999; Madon 2000). Some authors even suggested that new Internet-based technologies would level the playing field between societal strata and reduce social inequality (Anderson et al. 1995). In contrast, others contended that rather than reducing economic disparities within and across societies, the Internet could in fact lead to "increasing inequalities, improving the prospects of those who are already in privileged positions while denying opportunities for advancement to the underprivileged" (Hargittai 2003).

Within the debate on the social ramifications of the Internet, the phenomenon of "digital inequality" has received substantial attention (Dewan and Riggins 2005; Hargittai and Hinnant 2008; Hsieh et al. 2008; Kvasny and Keil 2006). Digital inequality refers to the difference between individuals regarding their access to, and ability to use, information and communication technologies (ICT) (DiMaggio et al. 2004). Early studies observed so called "first-order" digital inequality by showing that the socio-economically disadvantaged typically have less access to ICT than their advantaged peers (DiMaggio et al. 2001; Katz and Rice 2002). More recently, scholars have turned their attention to "second-order" digital inequality by noting that individuals also differ with regard to the way they *use* ICT depending on their socio-economic status (DiMaggio and Hargittai 2001). Scholars have explored digital inequality, focusing on central and potentially beneficial Internet uses such as information search (van Deursen 2012), e-government participation (Belanger and Carter 2009) and capital-enhancing websites (Zillien and Hargittai 2009). They cautioned that, due to digital inequality, less privileged individuals may be less able to profit from the opportunities the Internet has to offer (Mossberger et al. 2003).

Recently, e-commerce has emerged as an additional area of opportunity creation within the digital inequality discussion. With worldwide online sales exceeding $1 trillion (eMarketer 2013), e-commerce captures a substantial share of the global business. More importantly, a wide range of e-commerce platform formats and features have evolved that help individuals to optimize the economic outcome of their purchases. For instance, e-coupons, price comparisons, or auctions are means by which individuals can shop cheaper than in the brick-and-mortar world. In other words, users who are able to shop more effectively by leveraging e-commerce functionalities potentially generate a substantial economic surplus (Dewan and Riggins 2005). Thus, e-commerce might be particularly beneficial for the socio-economically disadvantaged.

Despite the potential benefits of e-commerce for online shoppers, almost no scholarly attention has so far been devoted to digital inequality in the context of e-commerce. Prior research (Akhter 2003; Howard et al. 2001; Zillien and Hargittai 2009) suggests that, contrary to homo economicus expectations, those with the least economic resources are less likely to fully leverage the breadth of opportunities available to realize savings when shopping online. These findings imply that economic inequality in the "offline" world might be further perpetuated in the "online" universe. However, extant digital inequality research has mainly focused on selective aspects of e-commerce and there has been little consideration of the general role of e-commerce as a potential amplifier or compensator of inequality. So far there is only little empirical evidence on the existence of digital inequality within e-commerce and only a limited theoretical conceptualization of what actually constitutes inequality with regard to e-commerce use. In this vein, scholars called out for research that better conceptualizes and studies digital inequality in the context of e-commerce (Dewan and Riggins 2005).

We seek to address this research gap by exploring how individuals vary in how they use e-commerce as a function of their socio-economic status and, in turn, whether e-commerce amplifies or attenuates digital inequality. We focus specifically on the influence of an individual's socio-economic status on two aspects of e-commerce use that promise economic gains, namely (1) the extent to which an individual is able to leverage the *diversity of e-commerce platforms* available within the product purchasing step (e.g., general retailers, daily deals, flash sales); and (2) the degree to which an individual employs *supporting features* such as e-coupons and price comparisons within the information search step to further benefit from e-commerce. We draw on technology acceptance theory and social psychology to hypothesize that socio-economically disadvantaged online shoppers tend to shop less diversely and will be less likely to make use

of supporting e-commerce features. We test these hypotheses on a unique set of clickstream data which tracks the online behavior of 2,819 US participants for 6 months in 2012.

Our study most importantly contributes to digital inequality research by highlighting that second-order digital inequality is a prevalent societal issue and persists within the context of e-commerce. We further add to the broader context of information systems research by introducing an innovative conceptualization and operationalization of e-commerce system use that may be extended to other technologies. Moreover, using clickstream data as empirical basis of our research represents a novel approach to investigate technology acceptance based on actual rather than intended behavior. Finally, our research has important implications for public policy and managerial practice. Understanding how socio-economic status impacts e-commerce use may influence policy making with regard to digital skills, ICT education and consumer protection and might help businesses to effectively target different societal groups.

Theory and Hypotheses

Digital Inequality: The Perpetuation of Socio-economic Status Online

"Digital inequality" denotes the difference between individuals in terms of their access to, and the ability to use, ICT which in turn restrains them from realizing opportunities offered through those technologies (DiMaggio et al. 2004). While digital inequality has been observed with regard to various demographic dimensions such as gender, race, and age (Chaudhuri et al. 2005; Rice and Katz 2003), the phenomenon has been particularly highlighted in the context of socio-economic differences between individuals as reflected in their income and education (Jung et al. 2001). Mossberger et al. (2003), for instance, found that individuals with lower income and education are restricted in their job prospects due to their relative lack of access and skills to use ICT in a working environment.

Digital inequality constitutes a complex and multi-faceted societal challenge on the global level as well as within national societies (OECD 2013; UN 2013). Researchers have argued that digital inequality is a perpetuation of underlying social disparities in the "real" world (Kvasny and Keil 2006; Norris 2001; Warschauer 2003). It has been cautioned that, comparable to the so-called "Matthew effect" (Merton 1973), peoples' initial advantages in technology access may translate into increasing relative returns over time, thereby further widening the gap between the more and the less privileged parts of society.

Scholars have devoted increasing attention to digital inequality and its underlying mechanisms. Earlier research focused on the first-level "digital divide" (DiMaggio and Hargittai 2001) which denotes differences in people's access to ICT and its sociological implications such as exclusion from online education (Katz and Rice 2002). More recent studies noted that access to Internet is losing importance, with broadband penetration in developed countries almost at saturation levels (e.g., 80% in 2012 in the U.S.; OECD 2013). Correspondingly, recent research seeks to shed light on the so-called "second-level" digital inequality (Hargittai 2002: p.1): rather than studying *whether* individuals use the Internet or not, the debate now focuses on exploring differences in *how* people use the Internet to create opportunities for themselves. Mossberger et al. (2003) suggested three different manifestations of digital inequality: first, a skills divide related to the individual ability to handle computers and the Internet and to get access to information; second, an economic opportunity divide resulting from people's inability to participate in Internet-based education, training, and employment opportunities; and third, a democratic divide due to the inability to engage in e-government. In this vein, digital inequality scholars have explored aspects such as general Internet skills (e,g., Hargittai 2010) and the adoption of e-government (e.g., Helbig et al. 2009). For instance, van Deursen and van Dijk (2010) studied Internet skills in the Dutch population and observed that lower education predicted lower Internet skills. In our study, we focus on one aspect related to ICT, which has also been proposed to be affected by, and to affect, digital inequality (Dewan and Riggins 2005): the use of e-commerce.

E-commerce and the Potential Economic Benefits of Platform Use Diversity and Supporting E-commerce Features

E-commerce in the business-to-consumer context has been defined as the trade of products and services online (Olson and Olson 2000). The U.S. Department of Commerce (2014) estimates that, in 2013, U.S.

citizens spent US$ 263 billion for products and services online and that online sales will reach US$ 370 billion by 2017 (Forrester Research Inc 2013). In 2014 alone, e-commerce sales are expected to increase by an additional 14% as opposed to sales in 2013 (Centre for Retail Research 2014).

Given the growing importance of e-commerce, scholars in information science have studied various aspects of people's use of e-commerce. For instance, behavioral research in e-commerce illuminates which factors motivate individuals to engage in online shopping in general (Gefen and Straub 2000; Gefen et al. 2003; Pavlou and Fygenson 2006). Other researchers have investigated specific e-commerce functions such as auctions and e-coupons (Bosnjak et al. 2006; Jung and Lee 2010).

In the context of our study it is important to define what actually constitutes effective —i.e., potentially beneficial from an economic point of view—e-commerce use. Buyer decision making models break down the purchasing process into a number of steps (Engel et al. 1973), of which information search and the product purchasing decision are considered to be the most important within the online context (Gefen and Straub 2000). When considering the product purchasing step, the continuous evolution of the e-commerce landscape over the last decade needs to be taken into account. Today, consumers can chose among a diverse variety of formats and vendors from which to buy a product. For instance, the rapid proliferation of innovative formats such as auctions, daily deal or flash sale sites provide consumers with an increasing range of alternatives to traditional online retailers such as Amazon.com and the opportunity to save money by finding the best deal. Likewise, in the information search step consumers can choose between different e-commerce features to optimize prices (in addition to getting general product information), predominantly through price comparisons and e-coupons. Consequently, a conceptualization of effective e-commerce use should account for the heterogeneous information search and product purchase options available that offer individuals the potential to achieve economic benefits and thus go beyond the traditional use concept of a simple transaction made online.

In this study, we focus on two specific aspects of e-commerce use, both of which are particularly likely to create economic benefits for users in either the information search or the product purchasing phase(1) the extent to which an individual is able to leverage the diversity of e-commerce platforms available within the product purchasing step (e.g., general retailers, daily deals, flash sales); and (2) the degree to which an individual employs supporting features such as e-coupons and price comparisons within the information search step to further benefit from e-commerce. We define *"e-commerce platform use diversity"* as the variety of e-commerce platforms an individual uses when shopping online. This definition entails two particular aspects. First, it accounts for the general degree to which an individual makes use of different e-commerce websites and platforms when shopping online. Online shoppers can access a wide a range of e-commerce platforms, for example general retailers such as Amazon.com, specialized retailers such as Zappos.com, and brand shops such as Nike.com. Research within offline retail has shown that a larger number and variety of store visits per week leads to an economic advantage (Carlson and Gieseke 1983): those individuals shopping for groceries who make more trips to different stores achieve lower prices on average because of price dispersion between stores. Similar patterns of price dispersion can be observed online (Ba et al. 2012). Correspondingly, online shoppers who selectively switch between e-commerce websites and leverage the breadth of platforms available are more likely to achieve economic gains.

A second particular aspect entailed in the definition of platform use diversity is the users' participation in 'alternative' e-commerce formats such as auctions (e.g. Ebay.com), flash sales (e.g. Gilt.com), and daily deal sites (e.g. Groupon.com). Prior research shows that especially alternative e-commerce formats offer significant cost savings for users. For instance, Bapna et al. (2008) estimate that the consumer surplus from auctions on Ebay.com exceeded US$ 7 billion in 2003. Similarly, daily deal and flash sale websites offer heavily discounted deals for a limited time (Boon 2013; Martinez and Kim 2012), improving users' odds to achieve lower prices than in other sales channels.

We define *"supporting e-commerce features use"* as an individual's use of price comparisons and e-coupons in connection with an online transaction. Price comparison websites such as Shopping.com or Bizrate.com increase consumer power by creating price transparency and by offering additional product information. Research has shown that the potential savings resulting from the use of price comparison websites can be significant (Rezabakhsh et al. 2006). For instance, Baye et al. (2004) examined four million prices for 1000 consumer electronics products and found that, despite increased transparency, price dispersion ranged from an average of 3.5 percent up to 23 percent. Moreover, consumers can achieve additional savings by leveraging websites that offer free promotional e-coupons such as

Retailmenot.com or Coupons.com. E-coupons are digital codes which entail a price reduction for a given product or website (Jung and Lee 2010). Thus, using e-coupons enables users to capture a higher economic gain per transaction on a given platform.

Digital Inequality in E-commerce Use

Extant studies have repeatedly called for research on digital inequality in the context of different ICT use applications (DiMaggio et al. 2001, 2004; Hargittai and Hinnant 2008; Zillien and Hargittai 2009) and e-commerce in particular (Akhter 2003; Hoffman et al. 2006). Specifically, Dewan and Riggins (2005) introduced the notion of an "e-commerce divide," which they defined as "certain people's inability to make use of more advanced e-commerce online functionalities and services" (2005: p. 318). They argue that even in the case of equal Internet access, socio-economically disadvantaged individuals might be less able to seize the multiple opportunities to achieve economic gains that are offered by e-commerce.

The notion of an "e-commerce divide" carries a number of intriguing theoretical implications. First, such a divide contradicts assumptions about rational behavior, opportunity cost and the decreasing marginal value of money. Under such assumptions, one would expect the motivation to save cost through e-commerce to be strongest for those individuals with the least financial resources and that those who earn the least would incur less opportunity cost when investing time online. Ultimately, this would prevent the emergence of an e-commerce divide. Second, the existence of an e-commerce divide seems counterintuitive since e-commerce theoretically carries the potential to reduce—rather than reinforce—disparities regarding consumption possibilities in the offline world (Anderson et al. 1995). While, in the brick-and-mortar universe, product availability, access, and pricing are highly dependent on the consumer's place of residence and typically favor those consumers who live in well developed areas, in the online world the product offering and prices are principally identical for everybody. In addition, the costs to search for products and prices on the Internet are lower compared to the offline world, for instance due to automated price comparisons. In the offline world, information search is costly, which might prevent those from lower income classes to extensively search for the best product at the best price. Altogether, the notion of an "e-commerce divide" contradicts *homo economicus* assumptions about consumer behavior and the theoretical "equalizing power" of e-commerce. Thus, it seems particularly interesting to explore whether and why e-commerce eventually attenuates or fortifies digital inequality.

To build hypotheses on the relation between an individual's socio-economic status and his or her tendency to use a diverse set of e-commerce platforms and supporting e-commerce features, we draw on Davis' (1989) technology acceptance model (TAM). TAM is a widely accepted model in information systems research (Benbasat and Barki 2007; Taylor and Todd 1995; Venkatesh and Davis 2000; Venkatesh et al. 2003) and has been extended to robustly predict various facets of consumers' use behavior in the context of e-commerce (Gefen and Straub 2000; Koufaris 2002; Pavlou 2003) such as online auctions (Stern et al. 2008) and e-coupons (Kang et al. 2006). TAM originally predicts an individual's intention to use new technologies as a function of two factors (Davis 1989): perceived ease of use, which describes the subjective degree of effort required to use a technology; and perceived usefulness, which refers to the individual's perception of the utilitarian gains that can be derived from using a technology. In our study, we will use the equivalent term of utilitarian motivation in lieu of perceived usefulness to denote an individual's motivational disposition (see Hsieh et al., 2008).

In line with prior e-commerce research (e.g., Ahn et al. 2007; Pavlou 2003), we apply an extended, context-specific TAM. In their quest to continuously refine the TAM and adapt it to the context of e-commerce, scholars have dedicated particular attention to perceived risk as an additional precursor of an individual's e-commerce use (Gefen et al. 2008). The individual's perception of risk is quintessential when studying e-commerce use because the consumer and the Internet store are physically separated and therefore online transactions have an inherently impersonal nature (Bhatnagar and Ghose 2004; Kim and Benbasat 2003; Pavlou 2003). Glover and Benbasat (2010) describe the perceived risk of online shopping as an aggregate of an individual's subjective assessment of three dimension of risk: first, the risk of information misuse, e.g. abuse of personal or financial data; second, the risk related to product benefits, e.g., the risk that a product will not arrive; and third, the risk of functionality inefficiency, e.g. that returning a product will be too difficult.

Further, scholars introduced the construct of hedonic motivation as a complementing element to increase the predictive power of TAM in the context of e-commerce (Ahn et al. 2007; Ha and Stoel 2009). In this

context, hedonic motivation is the degree to which an individual can derive enjoyment from online shopping (Childers et al. 2001). In contrast to utilitarian motivation, which describes the outcome driven extrinsic motivational factors for using a technology, hedonic motivation refers to the intrinsic motivation reinforced only by "the process of performing the activity per se" (Davis et al. 1992: p.112). Researchers investigating online consumer behavior have shown that hedonic aspects of online shopping are different from those in the brick-and-mortar universe, but equally important. For instance, sensory stimulation offered through a website, the playfulness of a website, and the ability to share e-commerce experiences with others improve the odds that consumers perceive online shopping as more enjoyable and show more intention to shop online (e.g., Ahn et al. 2007; Childers et al. 2001; Lin et al. 2005; Moon and Kim 2001).

The central idea of our study is that, because of their socio-economic status, individuals tend to differ in their use of e-commerce. The socio-economically disadvantaged will differ from their advantaged peers in terms of their perceived ease use, i.e. the degree to which they are affected by e-commerce complexity. Moreover, less privileged individuals are likely to differ from the more privileged in their motivational dispositions, i.e., regarding the relative importance of hedonic and utilitarian stimuli. Lastly, they are likely to be distinct regarding the degree to which they perceive e-commerce as risky. We argue that these dispositions, in turn, lead to status-induced differences in how individuals behave regarding their e-commerce platform use diversity and their use of supporting e-commerce features. . The general logic of our theorizing is illustrated in Table 1 by using TAM constructs to link socio-economic status and e-commerce use. We display our research model in Figure 1 and describe it in the following passages.

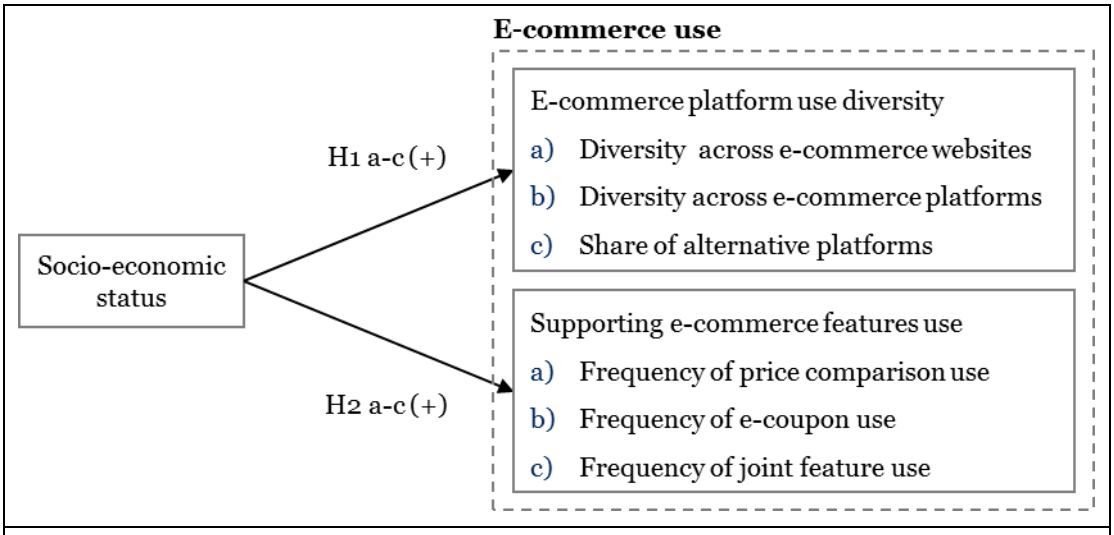

Figure 1. Research Model – Digital Inequality in E-Commerce Use

Digital Inequality Regarding E-commerce Platform Use Diversity

Three rationales lead us to argue that socio-economic status is linked to platform use diversity. First, the increased complexity of using multiple e-commerce platforms is likely to affect the perceived ease of use of the socio-economically advantaged individuals to a lesser degree than the perceived ease of use of the socio-economically disadvantaged. Technology complexity has long been identified as a major barrier to ICT use, including e-commerce (Rice and Katz 2003). However, social psychology suggests that the socio-economical differences cause people to vary in how they perceive complexity: privileged individuals typically have better access to skills and techniques that allow them to cope more easily and flexibly with challenges (Fan and Eaton 2001), which is one reason why they are less affected by stress creating factors (Hoffman 2003), including environmental complexity. Relatedly, scholars studying individual digital skills found a divide between socio-economic classes regarding the skills required to accomplish certain

TAM construct	Definition	Relative importance of construct depending on socio-economic status	Support for identified relative importance from existing literature	Illustration of specific TAM construct influence on e-commerce use (examples)	
				Platform use diversity	Supporting e-commerce features
Perceived ease of use (PEOU)	Subjective degree of effort required to shop online (Davis 1989)	Relatively *higher* for the *socio-economic advantaged*	Van Deursen (2012), Fan and Eaton (2001), Hoffman (2003), Rice and Katz (2003)	(+) Requires PEOU to manage e.g. multiple interface complexity	(+) Requires PEOU, e.g. evaluate price comparison search results
Utilitarian motivation	Individual perception of gains that can be derived from shopping online (Davis 1989)	Relatively *higher* for the *socio-economic advantaged*	Bonfadelli (2002), van Deursen and van Dijk (2010), Hargittai and Hinnant (2008), Norris (2001)	(+) Provides utilitarian benefit of cost savings, e.g. through using auctions or daily deals	(+) Provides utilitarian benefit of cost savings, e.g. thorough price transparency
Hedonic motivation	Degree to which an individual can derive enjoyment from online shopping (Childers et al. 2001)	Relatively *higher* for the *socio-economic disadvantaged*	Aneshensel (1992), Hsieh et al. (2008), Mathwick et al. (2001), Parker and Endler (1996)	(+) Provides hedonic benefits like e.g. novelty, thrill and feeling of escaping reality	(+) Hedonic benefits limited, e.g. to the joy of searching
Perceived Risk	Individual assessment of the risks associated with online shopping related to information misuse, product benefits and functionality inefficiency (Glover and Benbasat 2010)	Relatively *higher* for *socio-economic disadvantaged*	Schechter (2007), McLeod and Kessler (1990), Bhatnagar and Ghose (2004), Shaw (1996)	(-) Increases risk, e.g. through multiple disclosure of personal and financial data	Not applicable

Table 1. Using TAM constructs to link socio-economic status and e-commerce use

Internet tasks. For instance, van Deursen (2012) uncovered that individuals with a lower level of education were less able to access health information on the Internet. In this vein, we argue that the perceived ease of use for using a diverse set of e-commerce platforms is likely to be higher for the socio-economically advantaged given their general disposition to cope more flexibly with complexity as well as their higher level of education and Internet skills. Therefore, we anticipate that the socio-economically disadvantaged are likely to shop less diverse than the socio-economically advantaged.

Second, socio-economic status is likely to influence the motivational dispositions of individuals (Holbrook and Hirschmann 1982; Holbrook 1986), in particular their utilitarian and hedonic motivation, which in turn makes the socio-economically disadvantaged less likely to shop on a diverse range of platforms. Findings from digital literacy research suggest that obtaining utilitarian benefits is likely to be relatively more important for the socio-economically advantaged as opposed to their disadvantaged peers. For instance, Hargittai and Hinnant (2008) investigated the Internet use behavior of young adults and found that those with less education and from lower income backgrounds used the web to a lesser degree to read news or gather information on finance, health, politics or products. Further, Bonfadelli (2002) studied the Internet use behavior of more than 1400 individuals and found that those with less formal education used the Internet mostly for entertainment, while those study participants with more education used the Internet rather for informational and serviced-related purposed. Some scholars argue that the better education of the socio-economically advantaged puts them in a better position to assess and acknowledge the usefulness of ICT functionalities (Norris 2001). Other authors see the relatively lower importance of utilitarian benefits as a consequence of a lack of digital skills required to fully leverage existing utility maximizing opportunities (van Deursen and van Dijk 2010).

A high level of utilitarian motivation, in turn, positively influences an individual's inclination to shop on a diverse range of e-commerce platforms. Shopping on different platforms provides utilitarian benefits, such as a greater potential to save costs and profit from better product availability as a result of visiting a range of shopping platforms rather than just one. Similarly, the use of alternative platforms such as auctions, daily deals and flash sales offers significant cost savings (Bapna et al. 2008; Boon 2013; Martinez and Kim 2012) and thus provides utilitarian benefits. Given the relatively higher importance of utilitarian benefits for the socio-economically advantaged, they will most likely exhibit more diverse shopping patterns than socio-economically disadvantaged individuals.

Vice-versa, consumer research and social psychology suggest that obtaining hedonic benefits is likely to be relatively more important for the socio-economically disadvantaged than for their more advantaged peers. Less privileged individuals were found to be generally more exposed to stressors (Aneshensel 1992) and hence more in need of hedonically achieved stress relief, which is, for instance, provided by shopping (Arnold and Reynolds 2003). Moreover, socio-economically disadvantaged individuals exhibit a greater tendency to cope with life difficulties by escaping into different worlds (Parker and Endler 1996). This form of social escapism has already been found to be a hedonic motivational driver of online shopping behavior (Kim 2002; Monsuwé et al. 2004; Overby and Lee 2006). Internet-based entertainment provides a further opportunity especially for the socio-economic disadvantaged to "get away from it all" (Mathwick et al. 2001: p.44). As such, it is not surprising that earlier work on digital inequality finds that socio-economically disadvantaged individuals are more strongly attracted by hedonic elements of ICT use than their more advantaged peers (Hsieh et al. 2008).

Diverse online shopping patterns may also be driven by hedonic motivation. In particular, hedonic benefits such as novelty (Arnold and Reynolds 2003), a feeling of escaping reality (Mathwick et al. 2001) or thrill in the case of auctions (Turel et al. 2011) may be further augmented through diverse e-commerce use. Consequently, from a hedonic motivation point of view, the socio-economically disadvantaged may be more inclined to shop on a large range of platforms. However, we believe that hedonic motivators are less relevant in the context of our study than utilitarian motivators given that scholars found utilitarian motivation to have a much stronger impact on ICT use than hedonic motivation. Notably, this relationship has been substantiated not only in the case of workplace ICT use (Davis et al. 1992), where it might be expected, but also in the case of a leisure activity such as e-commerce (e.g., Ahn et al., 2007; Childers et al., 2001). These findings reflect that people predominantly use ICT in an instrumental way to achieve a certain outcome, corresponding to utilitarian motivation, rather than for reasons of performing the activity per se, which corresponds to hedonic motivation. So even though shopping on a large range of platforms may convey some hedonic benefits, the utilitarian benefits are expected to be the stronger

driver of diverse shopping behavior. As such, socio-economically advantaged individuals, who are more strongly motivated by utilitarian benefits, will most likely exhibit more diverse shopping patterns than their disadvantaged peers who are more strongly motivated by hedonic shopping benefits.

Third, socio-economically disadvantaged individuals are less likely to shop on a large range of platforms since their risk perception of a given e-commerce activity is likely to be relatively higher than those of their advantaged peers. Economists generally postulate that people with higher income are less risk-averse (Schechter 2007). Additionally, psychologists found that individuals from lower income classes show a more intensive emotional vulnerability with regard to financial losses (McLeod and Kessler 1990). In the specific context of e-commerce, Bhatnagar and Ghose (2004) segmented consumers based on their risk and benefit perception of online shopping and found that the perceived product risk as well as the perceived security risk were highest in the lowest income class.

A high level of perceived risk associated with online shopping, in turn, inhibits diverse shopping behavior on multiple platforms. With the transfer of transactions from the offline to the online world, the risk associated with buying a product has undeniably risen and constitutes a major influencing factor on e-commerce behavior (Pavlou 2003). The required multiple disclosure of private and financial data on different e-commerce sites associated with a diverse shopping behavior further increases the probability of personal data misuse. This might discourage risk-averse individuals from engaging in diverse e-commerce use. This behavior is likely to be reinforced as soon as an individual has built a trust-based relationship with one e-vendor through repeated transactions, making risk-averse individuals even more reluctant to switch to another e-vendor (Gefen 2002). Given the relatively higher risk perception of online shopping of the socio-economically disadvantaged, they might thus be less inclined to shop on a large range of platforms compared to the socio-economically advantaged.

Based on the differential behavior regarding perceived ease of use, hedonic and utilitarian motivation, and perceived risk, we formally propose:

> *H1a-c: The higher an individual's socio-economic status the more diverse will be the individual's transaction behavior when shopping online: (a) in terms of e-commerce websites used, (b) e-commerce platforms used, and (c) share of alternative platforms used.*

Digital Inequality Regarding Supporting E-commerce Features Use

In line with the argumentation above, perceived ease of use and differences in motivational dispositions will lead to differential use of supporting e-commerce features of the socio-economically advantaged and disadvantaged. Perceived risk is assumed to not influence the use of supporting e-commerce features since price comparison and e-coupon websites do not usually require the disclosure of personal data and the use of these features does not constitute a transaction.

Building on findings that perceived ease of use of accepting a technology is relatively lower for the socio-economically disadvantaged, it seems likely that they will experience greater difficulty in using supporting e-commerce features. The use of supporting e-commerce features adds complexity to online shopping. While it is relatively easy for an individual to access price comparison websites, a certain level of information evaluation skills is required to sort out search results and to select a vendor imposing a potential complexity barrier (van Deursen and van Dijk 2010). In line with traditional coupon research (Levedahl 1988) we assume that the complexity of searching for e-coupons on a broad variety of websites and testing e-coupon validity constitutes an additional barrier. Building on the argumentation above we argue that due to missing skills and a lower ability to handle complexity, using supporting e-commerce features will be more difficult for the socio-economically disadvantaged.

Given that the socio-economically disadvantaged are also likely to be relatively less motivated by utilitarian benefits, which are important drivers of supporting e-commerce features use, they are likely to use price comparisons and e-coupons less frequently when shopping online. The use of price comparison websites and e-coupons mainly grants utilitarian benefits while hedonic elements are rare. Price comparisons generate utilitarian value through increased price transparency and the potential to save cost (Bock et al. 2007). The use of e-coupons is generally viewed as a means to generate additional savings at the point of sale and thus also mainly exhibits utilitarian shopping benefits (Jung and Lee 2010). For both price comparisons and e-coupons, factors related to hedonic motivation are limited. As theorized above, the socio-economically disadvantaged are relatively less motivated by utilitarian shopping benefits. Thus,

we posit the socio-economically disadvantaged to be less motivated to use supporting e-commerce features. Building on the reasoning above, we formally propose:

> *H2a-b: The higher an individual's socio-economic status the higher will be the frequency of (a) price comparison use and (b) e-coupon use when shopping online.*

An individual who not only uses either price comparisons or e-coupons but both features conjointly is likely to achieve even higher gains but at the same time will be faced with higher task complexity. Thus:

> *H2c: The higher an individual's socio-economic status the higher will be the frequency of joint price comparison and e-coupon use when shopping online.*

Methodology

Data Sample

We test our hypotheses on a unique set of clickstream data courtesy of comScore. Clickstream data represents a record of an individual's online activities. It tracks the user's navigation path online, collecting information, for example, on the websites the user visits, the actions carried out on each site as well as e-commerce transaction details such as domain name, product and price. In contrast to site-centric data, which only assimilates information for a given website, syndicated clickstream data is "user-centric" (Padmanabhan et al. 2001), as it chronicles the online activities of users across multiple websites.

Clickstream data is a particularly powerful empirical basis for studying facets of Internet use. It is frequently applied in the field of online marketing in order to evaluate browsing behavior, effectiveness of online advertising and online shopping patterns (Bucklin and Sismeiro 2009). With regard to the latter, the focus has largely been on predicting purchase conversion, understanding factors driving successful transactions and investigating auction pricing mechanisms (Moe 2006; Park and Bradlow 2005).

Using clickstream data as an empirical basis has several key advantages. First, it avoids typical weaknesses of cross sectional data such as self-report bias and common rater effects (Podsakoff et al. 2003) by tracking actual behavior. Second, a clickstream dataset typically covers a period of several months. The longitudinal nature of the data means that the risk of a sustained behavioral bias by the user is minimal. Third, user-centric clickstream data in particular encompasses a very large and detailed set of information that would be difficult to aggregate using survey-based measures. For the purpose of our study, which attempts to understand e-commerce use in a more in-depth and nuanced manner, clickstream data provides the level of detail needed to accurately capture use.

Our dataset comprises 19958 Internet users from 10000 households in the US whose Internet activities were tracked for a period of 6 months from May to October 2012. Participants are part of an opt-in comScore consumer sample which is compiled using industry standard methodologies such as random digit dial (RDD) recruitment and through membership incentives. In order to normalize self-selection bias in the opt-in sample, comScore employs a technique called "iterative proportional fitting". In this process they use an enumeration survey and calibration panel sample with participants only recruited via (Cook and Pettit, 2009). Obtained measures are used to calculate a weighting scheme for the opt-in panel in order to ensure population representativeness and normalize the main sources of self-selection bias such as proportionally attracting more heavy users (comScore 2014).

In order to ensure sample validity, a number of restrictions were applied. Transactional data observations were limited to four product categories: apparel & accessories, consumer electronics, home supplies & living, and health & beauty. Other purchases, such as music downloads, digital subscriptions and food orders, were excluded. The rationale behind this selection was to define a homogeneous comparison basis that only includes products which can be purchased online on several different platforms and for which price comparisons and e-coupons are available. In addition, only participants with complete demographic data, a minimum age of 18 years and at least one e-commerce transaction in the observation period were included. The resulting sub-sample encompasses 2819 users and 14260 transactions.

The data set includes user-level browsing and transaction-related data points from the top 200 mainstream e-commerce websites in the US and the largest alternative e-commerce, e-coupon and price comparison websites. As we are concerned with e-commerce platforms rather than with individual

websites, we classified the URLs in one of the following disjoint categories: general retailers, specialized retailers, brand shops, auctions, daily deals, flash sales, price comparison and e-coupons. The classification was undertaken by two independent raters who received the same platform descriptions and selection criteria. The reports by the two raters coincided fully in their classification of the URLs.

The sample exhibits an approximate 50/50 gender split across all income groups and an age distribution of 24%-28% for ages 18-24, 25-34; 14-19% for ages 35-44, 45-54; <10% for ages 55-64, 64+. The age distribution is consistent with findings on the age distribution of the actual online shopping population in the US (Forrester Research Inc 2013). Over 80% of the participants use the Internet for personal purposes for at least 5 hours a week (Table 2). Notably, the average number of transactions for each income class is fairly equal across groups and users from the lowest income class spend a proportionally higher percentage of their income online compared to participants from higher income classes. As such a general familiarity with e-commerce can be expected for all income groups.

	Household income ('000 US$)				
	<25	25 - 49	50-74	75 - 99	>=100
Internet use					
<5 hours / week	15.1%	18.4%	19.5%	20.5%	20.8%
5-16 hours / week	44.9%	40.1%	43.1%	40.5%	44.3%
>16 hours / week	40.0%	41.5%	37.4%	39.0%	34.9%
Transactional data					
Ø number of transactions	4.6	4.8	5.4	5.1	5.7
Ø overall spend (US$)	163.4	167.4	201.3	202.6	230.7

Table 2. Effects of Household Income on E-Commerce Platform Use Diversity

Measurement Development

Dependent Variables: E-commerce Use

To study the aspects of e-commerce platform diversity and the use of supporting e-commerce features, we develop a total of six dependent variables (DV). We operationalize the DVs in the following manner:

DV1a-b: Across-website & across-platform diversity. We adapt an entropy measure of diversification (Jacquemin and Berry 1979) from the field of corporate diversification in order to evaluate a user's spread of transaction activity across different e-commerce platforms. The key advantage of this diversification index is that it combines the benefits of a frequency-type measure with the added insight of a classification scheme (Palepu 1985). Due to this feature, the total diversification can be further disaggregated into (DV1a) across-website and (DV1b) across-platform diversity. It is calculated as follows:

$$DT = DR + DU = \sum_{j=1}^{M} P^j \left(\sum_{i \epsilon j} P_i^j \, ln \frac{1}{P_i^j} \right) + \left(\sum_{j=1}^{M} P^j \, \ln \frac{1}{P^j} \right)$$

Where: DT = total diversification; DR = across-website diversification; DU = across-platform diversification; $j = 1,\ldots,M$ = e-commerce platforms; P^j = share of transactions on platform j; P_i^j = share of transactions on domain i within platform j

Across-website diversity captures the spread of a user's transaction activity across websites on a given e-commerce platform, for example specialized retailers. A user who, for instance, buys a pair of shoes each at online footwear retailers footlocker.com and zappos.com will score higher than a comparable user who buys both pairs at zappos.com. Across-platform diversity in turn measures the spread of a user's transaction activity across the six e-commerce platforms defined for the purpose of this study. A user who, illustratively, purchases two pairs of Nike sneakers, one on nike.com – a brand shop – and the other on Amazon.com – a general retailer –, will again have a higher diversification score than a comparable user who purchases both pairs on amazon.com. Furthermore, both measures take into account a user's total number of transactions within and across platforms, thereby controlling for pure volume-driven diversity.

DV1c: Share of transactions on alternative platforms. In order to validate the spread of transactions between mainstream (general retailer, specialized retailer, brand shop) and alternative e-commerce platforms (daily deals, flash sales, auctions), we develop a second measure of diversity by calculating the share of transactions on alternative e-commerce sites. Taking into account the data distribution, we cluster the results in 6 categories (0, 0.1%-25%, 25-49.9%, 50-74.9%, 75-99.9%, 100%) in order to enable a meaningful interpretation and differentiation between non-users, occasional users and those for whom alternative platforms are an integral part of their shopping behavior.

DV2a-c: Use of supporting e-commerce features. Searching for e-coupons and product prices can be seen as part of an information search taking place before a transaction (Pavlou and Fygenson 2006). Following previous research (Johnson et al. 2004), we define a pre-purchase period to cover the longitudinal aspect of searching and to avoid inadvertently including non-transaction-related searches at the same time. The pre-purchase period covers 3 days prior to the transaction. This appears reasonable given the need for prices and e-coupons to be transaction-related and up-to-date. Search theory (Diamond 1989) suggests that a search will only be executed if its marginal benefit is expected to exceed its marginal cost. Thus, use of supporting e-commerce features is only measured for transactions with a value of at least US$ 50 to ensure a sufficiently high incentive for all income groups to search. Applying this condition results in a sub-sample of 1195 users. Three aspects related to supporting e-commerce features are measured:

(1) *DV2a:* The number of transactions for which the participant accessed price comparison sites within a period of 3 days prior to the transaction; *(2) DV2b:* The number of transactions for which the participant accessed e-coupon sites within a period of 3 days prior to the transaction; *(3) DV2c:* The number of transactions for which the participant accessed both price comparison and e-coupon sites within a period of 3 days prior to the transaction.

Independent Variable: Socio-economic Status

Socio-economic status is generally defined based on household income and education (Jung et al. 2001; Lenhart 2002). Since income and education have been shown to be highly correlated, income is used as a proxy for socio-economic status in this study (Chiou-Wei and Inman 2008). Participants' household income is operationalized as an ordinal scale (1-5) in US$25,000 increments.

Control Variables

We control for the demographic variables age, gender and household size. Age and household size are operationalized as continuous variables, and gender as a binary variable (men=0, women=1). Furthermore, we take into account potential rural-urban disparities in online shopping behavior that may be driven by differences in access, availability of products and social norms (Lennon et al. 2007). This is included as a binary variable (urban=1, rural=0). In addition, we also control for Internet use intensity (measured on a three-point scale ranging from 1 = "<5 hours per week" to 3 = "16+ hours per week), which has been shown to be a strong predictor of online buying (Goldsmith 2002). Finally, when evaluating the use of supporting e-commerce features, we account for an individual's familiarity with e-coupon and price comparison sites by controlling for prior visits to such sites outside of the 3 days period prior to a transaction.

Selection of Statistical Methods

In order to account for differences in the composition of our six dependent variables, we use ordinary least squares (OLS), ordered logit and zero-inflated regression models to test our hypotheses. The two DVs related to the entropy measure of diversification (DV1a-b) exhibit properties of a continuous variable as well as linearity in parameters and are therefore treated with linear multiple regression. For DV1c, which is operationalized as a categorical variable, we use an ordered logit model to account for the discreteness of the DV. The model predicates that a series of breakpoints exist between the DV categories (McKelvey and Zavoina 1975), as is the case for DV1c.

DV2a-c are operationalized as count variables and require special consideration. The discrete, nonlinear and nonnegative integer properties of count data imply that the parametric assumptions of OLS regression would result in biased results. A Poisson distribution is much better suited to model count data, since it is also a discrete distribution and takes on a probability value only for integer values of 0 or

greater (Coxe et al. 2009). In Poisson regression models, it is important to account for variable lengths in observation periods. Unless otherwise specified, Poisson models assume equal observation periods. This is not the case in our data, where the number of times that a user accessed a price comparison and/or e-coupon website in connection with a transaction is highly dependent on the user's total number of transactions. We account for this aspect in the regression models for DV2a-c by applying an expansion of the Poisson model that includes an offset to control for exposure (Coxe et al. 2009). This ensures that the correct probability distribution is maintained and error structure assumptions are fulfilled.

Another common problem with count data is overdispersion, the situation in which the variance exceeds the mean (Cameron and Trivedi 2009). In this case, it is still possible to obtain consistent coefficient estimates using a Poisson regression, but the standard errors will be deflated and the t-statistics inflated (Cox 1983). In our dataset on the use of price comparison and e-coupon sites, we observe that the data is strongly skewed to the right with a large number of excess zeroes. Furthermore, comparably large differences between variances and means for DV2a-c (see Table 2) strengthen the impression of overdispersion. A likelihood ratio test using a negative binomial regression confirmed the suspicion. For all three DV2a-c, the overdispersion parameter alpha is different from zero and significant at $p<0.001$.

Given the presence of overdispersion and excess zeroes in the sample, the most appropriate model to use is the zero-inflated Poisson (ZIP) model. The ZIP model is able to handle data with excess zeroes relative to the Poisson model by supplementing a count density with a binary process (Cameron and Trivedi 2009). Vuong's likelihood ratio test (1989) for model selection confirmed the use of a zero-inflated model over a Poisson model in all instances.

Results

Table 3 displays summary statistics and pair-wise correlations for the variables in our study. No indications of multicollinearity could be found, which means that the independent variables are sufficiently unrelated and the standard errors not biased as a result.

Variables	Mean	S.D.	1	2	3	4	5	6
1 Age	3.69	1.51	1					
2 Gender	0.50	0.50	.08 *	1				
3 Household size	3.23	1.46	-.15 *	.06 *	1			
4 Internet use intensity	2.21	0.73	-.07 *	-.05 *	.10 *	1		
5 Urban/rural	0.72	0.45	-.09 *	-.04 *	.01	.08 *	1	
6 Household income	2.65	1.37	.11 *	-.02	.02	-.05 *	.09 *	1
7 DV1a. Across-website div.	0.09	0.22	.07 *	.08 *	-.02	.06 *	-.00	.06 *
8 DV1b. Across-platform div.	0.14	0.28	.07 *	.09 *	-.03	.03	-.02	.04 *
9 DV1c. Share alternative platforms	0.25	0.98	.01	.03	-.02	-.02	.01	.04
10 DV2a. Use of price comp.	0.32	0.88	.09 *	.03	.03	.09 *	.00	.06 *
11 DV2b. Use of e-coupons	0.23	0.86	.00	.08 *	.03	.11 *	.03	.06 *
12 DV2c. Use of both p.c. and e-c.	0.07	0.45	.01	.06 *	.05	.10 *	.01	.06

Variables	7	8	9	10	11	12
7 DV1a. Across-website div.	1					
8 DV1b. Across-platform div.	.20 *	1				
9 DV1c. Share alternative platforms	-.03	.10 *	1			
10 DV2a. Use of price comp.†	*n/a*	*n/a*	*n/a*	1		
11 DV2b. Use of e-coupons†	*n/a*	*n/a*	*n/a*	.35 *	1	
12 DV2c. Use of both p.c. and e-c.†	*n/a*	*n/a*	*n/a*	.54 *	.65 *	1

† Pair-wise correlations for DVa-c are based on the sub-sample n=1195; *p<0.05

Note: Pair-wise correlations between DV1a-c. & DV2a-c. not comparable due to different sample configurations

Table 3. Descriptive Statistics and Pairwise Correlations

Tables 4 and 5 present the analysis results. Models 1, 3, 5, 7, 9 and 11 are the control models. Model 2 shows that income has a positive and strongly significant ($p<0.001$) effect on across-website diversity. This finding supports H1a, in which we posit that users with higher income shop on a larger variety of websites within a given platform category. Model 4 indicates moderate support for H1b, in which we predict that higher income users are also more likely to shop on a larger variety of platforms. This finding is corroborated by Model 6, which shows a positive and significant ($p<0.01$) effect of income on use of alternative e-commerce platforms, supporting H1c.

Furthermore, our findings validate hypotheses H2a-c: Model 8 indicates some support for a positive relationship between income and use of price comparison sites (H2a). Models 10 and 12 corroborate the hypotheses that users with higher income will be more likely to use e-coupons (H2b) and simultaneously use both price comparison and e-coupon sites prior to a purchase (H2c).

	H1a. Across-website diversification		H1b. Across-platform diversification		H1c. Alternative platform use	
Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Age	.009 ***	.008 **	.012 **	.010 **	.020	.007
Gender	.037 ***	.039 ***	.052 ***	.053 ***	.459 **	.473 ***
Household size	-.004	-.004	-.007	-.007	-.076	-.082
Internet use intensity	.023 ***	.024 ***	.018 *	.019 **	.036	.049
Urban/rural[1]	-.000	-.004	-.012	-.014	.028	-.014
Household income		.011 ***		.008 *		.133 **
F	9.40 ***	9.86 ***	9.23 ***	8.41 ***		
Adj. R^2	.015	.019	.014	.016		
LR chi^2					12.57 *	19.16 *

Models 1-4 are calculated using linear regressions; models 5 & 6 are calculated using ordered logit regressions; N observations = 2819; p* < .05, **p < 0.01, p*** < 0.001; 1) Urban = 1, rural = 0

Table 4. Effects of Household Income on E-Commerce Platform Use Diversity

	H2a. Price comparison		H2b. E-coupons		H2c. Combined usage	
Variables	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Age	-.022	-.036	-.100	-.119	-.005	-.463 *
Gender	.013	-.008	.070	.010	-.210	-.753 *
Household size	.091	.080	.011	.017	.154	.206
Internet use intensity	-.036	-.033	.268	.246	-.131	-.192
Urban/rural[1]	.054	.063	-.197	-.286	.656	-.268
Prior site visits	18.0	17.9	17.2	17.4	18.2	17.5
Household income		.084 *		.130 **		.271 **
Total transactions	----------exposure term----------					
LR chi^2	207.4 ***	211.8 ***	219.4 ***	226.7 ***	82.83 ***	88.96 ***
AIC	1304.1	1301.7	911.7	906.4	362.2	358.1
BIC	1370.2	1372.9	977.8	977.6	428.4	429.3

All models are calculated using zero-inflated poisson regressions ; N observations = 1195; p* < .05, **p < 0.01, p*** < 0.001; 1) Urban = 1, rural = 0

Table 5. Effects of Household Income on Use of Supporting E-Commerce Features

Discussion

This study set out to explore how individuals differ in their use of e-commerce as a function of their socio-economic status and, in turn, whether e-commerce amplifies or attenuates digital inequality. Our findings particularly contribute to research on digital inequality and the societal impact of ICT. First and foremost, the results underscore that digital inequality is a prevalent societal issue, which not only has a first-order effect related to unequal ICT access but also a second-order effect resulting from inequality related to differential ICT use. Despite undisputed advances in providing ICT access (OECD 2013), ICT in general, and the Internet in particular, have so far failed to deliver on the promise of serving as equal opportunities platforms (Hargittai 2010). In fact, as an unintended social consequence, the Internet might even perpetuate socio-economic stratification. Some scholars maintained that this divide will disappear with increasing Internet access over time (Compaine 2001). Our results, however, tell a different story: even at levels of comparable Internet access, individuals who are already socio-economically advantaged are able to draw greater benefits from e-commerce use than do their disadvantaged peers. With the increasing pervasiveness of e-commerce applications in our everyday lives and a growing relevance of Internet based self-service solutions, these differences in e-commerce use could further widen the economic welfare gap between the rich and the poor. In addition, the societal impacts of differential e-commerce use patterns might be indicative for a variety of Internet use types such as e-learning or online job search where differential use among socio-economic classes might translate into unequal education and job opportunities.

Moreover, this study is, to the best of our knowledge, the first to empirically test and validate the long hypothesized relationship of an e-commerce divide. Digital inequality specifically in the context of e-commerce has so far garnered limited attention, but is of key importance given its immediate economic implications. Prior research (Dewan and Riggins 2005) has only theorized how socio-economic status negatively impacts the use of sophisticated e-commerce functionalities. Therefore, our findings represent an important step towards a more comprehensive understanding of digital inequality in the context of e-commerce.

In addition, our novel concept of use diversity could be particularly relevant to digital inequality research across different ICTs because it captures individual use patterns in multi-channel, multi-application environments. The less diverse use patterns of socio-economically disadvantaged users found in the context of e-commerce may be indicative for a variety of technological contexts, in particular those that offer a large range of use possibilities. Smartphone applications, for instance, are a case of a highly fragmented marketplace in which diverse use is likely to result in a higher payoff. Each application in itself generally only offers a limited set of functionalities; hence the ability to navigate across the marketplace and to identify, evaluate, and use a range of applications is critical to drawing a benefit.

This study also has several important theoretical implications for information systems research at large. Most importantly, we develop a more holistic conceptualization of e-commerce system use for the study of technology acceptance. Drawing on Benbasat and Barki (2007), we propose that the operationalization of e-commerce use needs to go beyond the traditional notion of a single purchase and has to account for the multi-dimensional context in which transactions take place. The advantages of such an extended behavioral operationalization of use lies in a "more faithful representation of usage activities that users engage in, [and] stronger links with salient outcome variables" (Benbasat and Barki 2007: p.215). Our conceptualization of e-commerce use contributes to the understanding of online shopping in a more holistic and nuanced manner, in particular with regard to economic utility-enhancing activities.

Finally, a major methodological contribution of our study is the introduction of clickstream data as an empirical basis for technology adoption research. As Straub and Burton-Jones (2007) have noted, one of the most critical methodological issues underlying TAM is the high risk of common method variance as a result of common-rater effects and self-report bias. Typically, respondents have to indicate both their attitude towards a particular ICT, e.g. how useful they find it, and whether they use or intend to use it. Consequently, the bivariate correlations between DV and IVs risk being severely skewed. The use of clickstream data allows overcoming these methodological limitations. In addition, clickstream data tracks actual rather than intended behavior over a sustained period of time avoiding problems with time-variant intentions and potential unreliability of self-reported behavioral attitudes (Podsakoff et al. 2003). While clickstream data is not without its limitations either (Bucklin and Sismeiro 2009), technology acceptance

researchers stand to benefit from integrating clickstream data tracking actual use with self-report surveys measuring behavioral antecedents.

Above and beyond contributions to theory, our study has implications for policy makers and for business practitioners alike. Understanding how socioeconomically advantaged and disadvantaged users differ in their use of e-commerce enables policy makers to potentially devise countermeasures and businesses to develop strategies to adequately cater to different societal groups.

On a public policy level, our study highlights that digital inequality is a substantial societal issue, even in developed countries such as the US. Despite a fast increase of Internet access, Internet use behavior still differs between socio-economic groups and reinforces societal stratification. Given that the Internet can be a catalyst for economic development and – when used effectively – possesses the potential to equalize social disparities (Anderson et al. 1995), unleashing this potential should be a priority for public policy. More specifically, our findings underline the importance of developing not only access-based initiatives but also use-oriented measures. Existing governmental initiatives targeting Internet use, such as the US National Broadband Plan, have largely focused on providing access. However, our study suggests that this is not sufficient to ensure the same online opportunities to all groups in society. The traditional assumption of homogeneous ability to use ICT needs to be replaced by a more nuanced understanding, leading to more tailored policies which take socio-economic status into account. Policy interventions focusing on Internet education and digital skills could help bridge the current gap and could be added to the educational agenda in the context of broader ICT education at secondary schools, in particular in underprivileged districts. Furthermore, consumer protection agencies could be empowered to raise awareness and promote knowledge dissemination about Internet use in general and e-commerce in particular.

Online businesses and providers of e-coupon and price comparison sites could use the insights on differential e-commerce use between socio-economic groups in order to make their services more attractive to the socio-economically disadvantaged which currently might not be key customers. By effectively targeting currently alienated socio-economic groups, businesses have the potential to expand their customer base and generate additional revenue. For instance, our theorizing highlights that key hurdles – particularly for the socio-economically disadvantaged – associated with shopping on a large range of platforms are the complexity and the perceived risk of creating a unique personal account for each website. In some cases, particularly flash sale sites, users are required to sign-up before even being able to view the products on offer. An increased adoption of integrated single sign-on systems such as “Login with Amazon”, “Login with Facebook” or Google+ by online retailers could remove such frictions.

Limitations and Further Research

We acknowledge some theoretical and empirical limitations to our study, which call for further research. Further, we highlight additional promising avenues for research originating from our findings.

A common critique in technology acceptance research has been the focus on explaining a single behavior conceptualized in a narrow manner (Benbasat and Barki 2007) at one point in time. Such a one-dimensional view is not reflective of the multifaceted uses of technology and the dynamism inherent in technological change. In today’s fast-paced digitalized world, the realm of online functionalities is constantly evolving. While our proposed conceptualization of e-commerce use aims to capture online shopping more fully in its complexity and variety than current constructs, it makes no claim to being exhaustive. Thus, we urge subsequent research to refine and extend our concept of e-commerce use. In particular, e-commerce applications relating to services such as e-banking, insurance and peer-to-peer marketplaces (e.g. for accommodation/travel) are gaining increasing importance and offer an interesting avenue for further research. In addition, applying a more in depth conceptualization of system use to other information systems can provide a particular rich basis for understanding individual use patterns and their implications.

Further, the notion of use diversity developed in this study can provide an insightful lens for information systems scholars seeking to capture ICT use in multi-technology, multi-application environments such as information search and browsing patterns, areas in which complexity of online behavior is the relevant research variable. To this end, the entropy measure of diversification proposed in this study may serve future researchers as an useful measure of use diversity. The concept of use diversity may also be of

interest to digital inequality researchers, especially with regard to the broader issue of complexity management. Recent digital inequality research has sought to explain differential ability of socio-economic groups to use the Internet by studying skill-related aspects such as online navigation skills (van Deursen and van Dijk 2010). However, more fundamental, cognitive-psychological drivers such as the ability to multitask or handle information overload may in fact lie at heart of why the socio-economically disadvantaged less often fully leverage the breadth of Internet opportunities. Future research may benefit from exploring the connection between diversity in use patterns and digital inequality in more detail, from both psychological and skills perspectives.

The clickstream data used in our study has advantages in avoiding typical weaknesses of cross-sectional data such as self-report bias and common rater effects (Podsakoff et al. 2003), yet has limitations with regard to uncovering the motivations behind observed behavior. Existing research on the impact of socio-economic status on the behavioral TAM dimensions allows us to theorize why the socio-economically disadvantaged are less likely to use certain functionalities. Empirical investigations into the behavioral antecedents of digital inequality within the specific context of e-commerce would contribute to further substantiating this theoretical basis. We therefore encourage the replication of our findings using clickstream data in conjunction with surveys or structured interviews in order to enrich the understanding of the factors driving differential behavior between advantaged and disadvantaged groups.

Finally, this research only captures online shopping behavior on home PCs and in a voluntary setting. As online shopping increasingly migrates from the traditional PC to mobile devices such as tablets and smartphones, future research should investigate the generalizability of our findings across channels. Furthermore, given that the observed use patterns occurred in a voluntary setting, scholars should investigate whether differential use persists if online use is mandatory as it might be the case for some e-government dealings. Moreover, technology acceptance patterns have been found to be influenced, for example by culture (Im et al. 2011). It would be prudent to examine if our findings from the US can be replicated in other countries.

Conclusion

This study presents a new perspective on how ICT in general and e-commerce in particular relate to the societal phenomenon of digital inequality. Following researchers' call to better understand digital inequality in the context of e-commerce, we introduce a nuanced conceptualization of e-commerce use and investigate how individuals from different socio-economic backgrounds differ in their online shopping behavior. We empirically examine this behavior using clickstream data. Our findings reveal that despite equal access, significant differences in e-commerce use behavior between the socio-economically advantaged and disadvantaged exist. Even though Internet applications such as e-commerce could serve as a catalyst to reduce existing socio-economic disparities, this potential is so far not being realized. In this respect, our research constitutes an important step towards a better understanding of how ICT can impact our society for better or worse and which measures could be devised to influence this impact.

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