How Does an Online Platform Impact on Human Behavior and Human Perception: Evidence from the P2P Lending Market and the E-Book Market

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HOW DOES AN ONLINE PLATFORM IMPACT ON HUMAN BEHAVIOR AND HUMAN PERCEPTION: EVIDENCE FROM THE P2P LENDING MARKET AND THE E-BOOK MARKET

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Abstract

The development of information systems and the Internet has facilitated the creation of an online platform where two or more groups are involved and interact online with each other. We explore the impact of an online platform on human behavior and human perception. There are various online markets. We focus on two markets: the online P2P market, and the e-book market.

This paper includes three essays: 'Herding behavior in online P2P lending: An empirical investigation', 'Does borrowers' information renewal change lenders' decision in P2P lending? An empirical investigation', and 'Dynamics of price elasticity over time: Evidence from the e-book industry'. Since the first essay was published in the journal and the third one was submitted to the conference, we simply present the abstracts of these essays in this paper. Also, we mainly focus on explaining the current stage and plans for completion of the second paper.

Although this paper is not yet completed, we empirically confirm some characteristics of the online markets. We expect that it would be useful to understand online business and get insights into the online markets.

Keywords: online platform, P2P lending, e-book, herding, price elasticity.

1   INTRODUCTOIN

Advances in information technology (IT) have made it possible to interact, communicate, and transact online. Online shopping, online banking, and online social networking services came into common use a few years ago. Development of information technology has also made the transition from physical to digital products possible. Although consumers still use traditional goods like CD(compact disc) and paper books, the market of digital goods such as music file and e-books has been growing rapidly. Among these relatively new markets that advances in technology have allowed, we focus on two online markets. One is the online Peer-to-Peer (P2P) lending market, and the other is the electronic book (e-book) market. These two markets are a kind of online platform where two or more groups of agents interact with each other. We explore how an online platform impacts on customer's behavior and perceptions.

This research paper is comprised of three essays. The first one is to investigate lenders' behaviour in an online P2P lending market. The second essay deals with learning mechanisms of borrowers and lenders in the market. In the last essay, we investigate changes in consumers' perception of price in the e-book market. The titles of each essay are as follows:
- Herding behavior in online P2P lending: An empirical investigation.
- Does borrowers' information renewal change lenders' decision in P2P lending? An empirical investigation.
- Dynamics of price elasticity over time: Evidence from the e-book industry.

The first essay was completed and published last year in the leading journal Electronic Commerce Research and Applications. Also, we finished the first draft of the third essay, and submitted to PACIS 2013 as a complete paper. We, however, are still working on the second essay. Therefore, in this paper which is research in progress, we decided to just report the abstracts of the first and third essay, and mainly present the research topic, main idea, the current stage, and plans for completion of the second essay.

The rest of this paper is organized as follows. Section 2 presents the abstract of the first essay, 'Herding behavior in online p2p lending: An empirical investigation'. Section 3 shows the current progress including plans for completion of the second essay, 'Does borrowers' information renewal change lenders' decision in p2p lending? An empirical investigation'. Section 4 describes the abstract of the third essay, 'Dynamics of price elasticity over time: Evidence from the e-book industry'. We conclude the paper by summarizing and mentioning future work in section 5.

2   HERDING BEHAVIOR IN ONLINE P2P LENDING: AN EMPIRICAL INVESTIGATION[1]

We study lenders' behavior in the peer-to-peer (P2P) lending market, where individuals bid on unsecured microloans requested by other individual borrowers. Online P2P exchanges are growing, but lenders in this market are not professional investors. In addition, lenders have to take big risks because loans in P2P lending are granted without collateral. While the P2P lending market shares some characteristics of the online markets with herding behavior, it also has characteristics that may discourage it. This essay empirically investigates herding behavior in the P2P lending market where seemingly conflicting conditions and features of herding are present. Using a large sample of daily data from one of the largest P2P lending platforms in Korea, we found strong evidence of herding and its diminishing marginal effect as bidding advances. We employ a multinomial logit market-share model where relevant variables verified by prior studies on P2P lending are controlled.

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[1] This essay is published in the leading journal Electronic Commerce Research and Applications.

3   DOES BORROWERS' INFORMATION RENEWAL CHANGE LENDERS' DECISION IN P2P LENDING? AN EMPIRICAL INVESTIGATION

3.1   Introduction

Online Peer-to-Peer lending (P2P lending) is a financial service where borrowers and lenders directly transact without intermediaries. This new trend of financial transaction has rapidly grown after Zopa (http://www.zopa.com), the first P2P lending site, was launched in 2005 in the UK. Prosper (http://www.prosper.com) is the largest P2P lending platform operating in the US. It has over a million members and it has funded a sum of over $300 million in personal loans as of February 2012. According to Slavin (2007), P2P online exchange is growing in the US and the UK as an alternative platform of traditional saving and investment. Also in Europe and Asia, many P2P lending sites opened their services to the public and are now in operation. Popfunding (http://popfunding.com) is one of the largest P2P lending platforms in South Korea. Most of these sites have similar bidding mechanisms and features.

P2P lending is attractive for borrowers because they have a chance to gain loans with lower rates in some cases even without collateral. Lenders also have an incentive to participate in this market. Since transaction costs are reduced by eliminating expensive intermediaries, a higher rate of return on investment than from a bank is usually expected. However, there exists an inherent risk in P2P lending, due to the anonymous nature of the Internet and a lack of lenders' expertise. In other words, the transaction takes place in a pseudonymous online environment and most individual lenders in P2P lending are not professional investors (Klafft 2008), which causes serious information asymmetry problems. Default rates and loan frauds would also be of concern to participants in P2P lending (Wang et al. 2009). Therefore, the P2P lending sites put a lot of effort into alleviating information asymmetry. There are small differences between the sites, but most P2P lending sites ask the borrower to submit a basic personal certification in order to verify their creditworthiness. Also, the P2P lending platforms enable their members to communicate and share knowledge - social networks - so that lenders are able to utilize soft information (Iyer et al. 2009). Many researchers who study P2P lending, focus on these social networks (Freedman & Jin 2011; Herrero-Lopez 2009; Lin et al. 2009), and have shown that social networks play a role in mitigating information asymmetries.

Although these efforts work on some level, this asymmetric information problem still remains in the P2P lending market. For this reason, lenders hesitate to invest in an auction; consequently many auctions do not receive full funds. Borrowers who failed once may try again to get a loan According to Popfunding data from July 2007 to May 2010, a total of 1,883 number of auctions were opened by borrowers during this period, and among these, 1,028 auctions were not the first ones which the borrowers posted, which are henceforth called 'retried auctions'. It means that lots of borrowers request a loan again after their initial failures. Among the entire loans, 338 loan requests were successfully funded (18%). Among these fully funded loans, 220 auctions were retried ones (65%), which is a considerably high proportion. It indicates that borrowers in P2P lending tend to change some of their information after a failure before they try again to get a loan, and that these changes have an impact on the lenders' choices. In this essay, we identify what information is updated by the borrowers in retried auctions and show how this change has an impact on lenders' decision.

Despite P2P short lending history, a lot of researchers have studied this market. Most of them focus on the role of social networks and other factors that affect the likelihood of funding success in the P2P lending market. However, as far as we know no research of information update after a failure has ever been explored. This essay may help borrowers and lenders to develop a strategy that is profitable for both sides by showing dynamic information changes that are done by borrowers and the impact of such changes.

3.2 Literature Review

Although the history of online P2P lending is relatively short, there are various studies on online P2P lending. Since one of the most primary features of P2P lending is its reliance on existing social networks, many previous researchers focus on it. Social networks, especially their relational aspects, lead to better outcomes including a higher likelihood of a loan being funded, a lower risk of default, and lower interest rates (Lin et al. 2009). Lin et al. (2009) use the data from Prosper and show that social networks as a new source of soft information can partially solve a problem of adverse selection which is severe in online P2P lending. The influences of social interactions on Prosper were also evaluated (Herrero-Lopez 2009). It empirically proves that affiliation with Trusted Groups on Prosper doubles the probability of getting a loan request successfully funded. However, not all researchers agree on the positive effects of social networks in the P2P lending market. Weiss et al. (2010) find that although the screening of potential borrowers by groups can mitigate adverse selection, groups could have a negative impact on a borrower's probability of receiving the requested funds. That is because lenders who are not in the group might be discouraged from lending to a group member due to this specific group's focus on certain special interests. It is also presented that being a member of a social lending group within an online lending community is associated with significantly decreased default risk only if this membership holds the possibility of real-life personal connections (Everett 2008).

Other factors affecting success in online P2P lending are also studied by many researchers. The financial strength of the borrower, of course, is an important determinant of funding success (Herzenstein et al. 2008; Iyer et al. 2009). The world's largest P2P lending platform, Prosper assigns each borrower a credit grade based on their financial documents, and this credit score varies from AA - signifying that the borrower has definitely low risk to A, B, C, D, E, and finally HR which denotes the borrower's risk as extremely high. The probability of funding success by borrowers with AA, or A is nearly 40%, in contrast to borrowers with HR whose rate is only 4% (Herzenstein et al. 2008). This credit score assigned to borrowers by Prosper is indeed related to underlying creditworthiness (Iyer et al. 2009). The demographic characteristics of the borrowers have an influence on the decision of the lenders. According to Pope and Sydnor (2008), there is evidence of racial disparity. Blacks tend to be less likely to receive funding and have conditional higher interest rates on receiving a loan compared to non-black people. Loan decision variables such as loan amounts, interest rates, and loan terms play a role as a mediator between borrower characteristics and the likelihood of funding success (Herzenstein et al. 2008). When the borrowers in P2P lending post a loan request, they write a detailed description of the purpose of the loan and a plan for repayment. Choi and Park (2011) analyze the impact of the expression that borrowers use in their writings on loan repayment with Prosper data. The expressions that emotionally appeal to lenders have a negative relation with repayment performance, and the expressions that describe the borrower's ability to regularly repay their debts are positively related with actual repayment performances.

As we mentioned in the previous section, many borrowers re-post their auctions after initial failures. There are, however, few studies which focus on the past transaction history of borrowers in P2P lending. To the best of our knowledge, there is only one research, Yum and Lee (2011), which tries to consider past transaction history as a factor for reducing the uncertainty of loans and observes the loan outcome in situations where lenders are faced with borrowers who have a funded history. The fact that past activities of the borrowers are considered, lies in the same context as our research. However, while Yum and Lee (2011) consider the past transaction history as one of borrowers' features, we focus more on the dynamic changes of information between a first-tried auction and a retried auction.

Complementing all these studies, we empirically investigate borrowers' information renewal and its impact on lenders' decision in the P2P lending market.

3.3 Development of Hypotheses

3.3.1 Research Context

Popfunding is a representative P2P lending platform in South Korea. It opened in June 2007, and as of February 28, 2011, it had 55,060 members and a total of 12,927 requested loans. Among them, 1,099 loans were successfully funded. Popfunding has a similar borrowing and lending process as other P2P lending sites like Prosper and Zopa. It applies a reverse auction mechanism as others similar sites do. The overall process of borrowing and lending in Popfunding is as follows.

To request a loan, borrowers have to join Popfunding, and anyone with the age of 20 or above can join as a member once a real name authentication. Then borrowers can post loan requests on Popfunding with details of the loan such as request amount, loan term and maximum interest rate. In this process, borrowers can submit their personal profiles which may include information such as identification certificates, credit, address, job, income and tax to the Popfunding platform operators in order to prove their creditworthiness and authenticity. Submitted certificates are not publicly opened to lenders, but lenders can ascertain whether a certification is submitted or not. If a funded borrower's payment is delayed for more than 10 days, the borrower's financial status such as credit grades, debt history and monthly income is revealed to the lender. Also, borrowers additionally post detailed descriptions of the purpose of their loans and repayment plans, and may also emotionally appeal to lenders by describing their urgent situation. If borrowers have a history in borrowing or lending it is recorded and shown with other information.

After borrowers post an auction according to the above explained procedures, it is opened to lenders. They review the information to decide whether to lend or not; if so, how much money and what interest rate they are willing to offer. Since Popfunding provides a Q&A web bulletin for each auction, lenders have a chance to gain additional information by interacting with borrowers there. All P2P lending communities including Popfunding and Prosper operate on the principle of "full financing," which means that the loan request gets funded only if it receives enough bids to cover the entire amount requested by the borrower. If an auction fails to get enough money, it is automatically cancelled by the system after the auction duration expires. The borrowers who get successfully funded receive the money, and repay it as they posted.

Due to the information asymmetry problem, the success probability by borrowers to receive full funding tends to be quite low. Thus, borrowers who once failed often tend to repost a loan request in Popfunding. When they try again to get a loan, borrowers need to make some differences in their auction. Otherwise, they would fail again. In this essay, we examine what specific information is modified in such retried auctions, and how these changes affect the decision making progress of the lenders.

3.3.2 Research Hypotheses

P2P lending sites generally nudge borrowers to optionally fill up some information in order to receive successful investments from lenders. Considering the fact that P2P lending is based on financial transactions between individuals, P2P lending sites usually recommend borrowers to provide certain types of certification which may substantiate their financial credibility to the lenders. In the case of Popfunding.com, borrowers can selectively submit seven types of certifications such as credit scores and income statements to show their financial credibility. Additionally, historical records of financial transactions of the borrower in P2P lending sites can be also used as backup data to represent one's financial credibility.

Generally, previous researches showed that borrowers with higher financial credibility have a higher probability of getting investments from lenders. However, our research focus lies on retrials of the borrowers after they failed in their initial P2P lending auctions. We assume that a borrower who initially fails will not re-post the loan request unless he/she backs up his/her information that may

increase his/her financial credibility. According to this argument, our research suggests the following hypothesis:

H1-1: When borrowers repost an initially failed P2P lending auction, they try to significantly improve their financial credibility to acquire investments.

One of the unique features in P2P lending mechanism is that there exists not only financial activities, but also social network activities between members (lenders and borrowers). In traditional financial institutions (such as banking systems), the main agent of loan decisions is the institution itself. However, in P2P lending, loan decisions come from a group of individuals in a P2P lending network. In addition to financial activities, these members (bong lenders and borrowers) are sharing information and forming social relationships with each other. Under this context, not only financial credibility but also a certain reputation in the social network is critically important for acquiring investments from lenders. The importance of a social network context in P2P lending has been highlighted before, but our analysis focuses on the borrowers' efforts to increase their reputations after they failed in their first auctions.

There are several ways to increase reputations in P2P lending networks. Similar to other internet communities, members can post on bulletin boards in P2P lending sites. Our research defines a borrower's reputation in a social network as social credibility and suggests a similar hypothesis with the one associated with financial credibility:

H1-2: When borrowers repost an initially failed P2P lending auction, they try to significantly improve their social credibility to acquire investments.

Now we build hypotheses about the lender's perspective: whether a borrower's increased financial and social credibility has an effect on the decision making of the lender. The two hypotheses above focus on the borrowers' efforts to increase their credibility after they failed to receive investments. However, it is another issue whether these increases in the borrower's status have actually any effect on lenders' loan decisions. According to the previous research, these two types of information, financial and social credibility, give positive impact on the loan decision. However, previous studies did not consider the context where borrowers retry initially failed loan auctions. Therefore our research suggests the following two hypotheses in perspective of the lender-side decision making. These two hypotheses identify which type of credibility affects the lenders decision making progress when borrowers retry their initially failed auctions:

H2-1: When borrowers repost an initially failed P2P lending auction, the increase in these borrowers' financial credibility has a positive impact on lenders' loan decisions.

H2-2: When borrowers repost an initially failed P2P lending auction, the increase in these borrowers' social credibility has a positive impact on lenders' loan decisions.

3.4 Proposed Methodology

We did not choose the model for testing our hypotheses, but we conducted two empirical tests to confirm that the presence of borrowers' information renewal and its impact on lenders' decision making. According to the previous section, H1-1 and H1-2 are related to increases in borrowers' financial and social credibility respectively. On the other hand, H2-1 and H2-2 examine the change in lenders' decision making. For the borrowers' perspective, we used discriminant analysis to classify P2P loan auctions by the number of retrials. For the lenders' perspective, we used logistic regression. In this test, we define the changes in borrowers' credibility (both financial and social) after they failed their initial P2P loan auctions as dependent variables. Using these dependent variables, the logistic regression examines the impact of the changes in borrowers' credibility on lenders' decisions.

We collected the log data of Popfunding.com from May 28, 2007 to July 31, 2010. Popfunding.com is the largest P2P lending site in Korea. During this period, there were a total of 5,807 auctions posted on the site. For our analysis, we excluded auctions that failed and were never posted again. As a result, a

total of 1,883 auctions remained. From the log data of these 1,883 auctions, we extracted information about borrowers who posted auctions, and the results of other members' prediction polls about these auctions. The data includes the investment result which means whether a borrower gets full investment or not, and the state of repayment for each auction.

Due to the lack of space, we are not able to minutely describe the variables, the models, and the results. However, we could get the results which significantly support the hypotheses. In this research in progress, we only present the descriptive statistics in Table 1 because of the page limit.

	1st- poseted auctions	2nd- posted auctions	3rd- posted auctions	More than 4th
Number of auctions	855	733	222	73
Number of certifications which are submitted by the borrower	2.07	2.24	2.41	2.32
Amount a borrower has invested into other auctions	5,468	5,842	12,901	10,123
Number of investments a borrower has done to other users	0.88	1.28	2.32	1.93
Number of articles posted in the Q&A board	5.72	36.9	34.1	28.8
Interval (days)	-	23.1	31.1	28.9
Requested amount (1,000 won)	1,932	2,055	1,971	1,815
Requested duration (months)	13.7	14	14	13.3
Maximum interest rate (%)	29.2	29.2	29.5	29.6
Loan success (%)	13.8	19.1	25.2	32.9

Table 1.   Descriptive Statistics

3.5   Plans for Completion

To complete this essay, we are trying to find more appropriate models for the empirical test. The online P2P lending market, especially in Korea, is considered a kind of the lemon market. Studying the previous research about the lemon market, we would collect more data from Popfunding, to intensify the theoretical background, and empirically investigate the change of borrowers' and lenders' behavior in P2P lending. If we find the factors that influence the learning mechanism in the market, it could be used to help this lemon market operate well and be sustainable. We plan to complete this essay by this summer.

4   DYNAMICS OF PRICE ELASTICITY OVER TIME: EVIDENCE FROM THE E-BOOK INDUSTRY[2]

The e-book market has been rapidly growing in recent years due to developments in technology and the widespread use of mobile devices such as smart phones and tablet PCs. Although an e-book serves as a nearly perfect substitute for its corresponding paper book in respect of content, it has many differences in regard to cost structure and consumer's acceptance. Therefore, setting an appropriate price for an e-book is an academically interesting and practically important issue. Consumer price sensitivity and its dynamics should be investigated to develop an optimal pricing strategy.

This essay empirically explores the dynamics of price elasticity of e-book demand. We use a data set that contains information for records of e-book sales for the last two years provided by Kyobobook, the largest book retailer in Korea. The results suggest that the demand for e-books is becoming price inelastic over time. This can be partially attributed to the reference price, which has been constructed by consumers through personal experiences. We also found other factors that influence the price

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[2] This essay was submitted to PACIS 2013 as a completion paper.

elasticity and demand of e-books. From the results, we discuss the broader implications on pricing strategy.

5 SUMMARY AND FUTURE WORK

In this paper, we show 3 essays:
- Herding behavior in online P2P lending: An empirical investigation
- Does borrowers' information renewal change lenders' decision in P2P lending? An empirical investigation
- Dynamics of price elasticity over time: Evidence from the e-book industry

We explore the impact of an online platform on human behavior and human perception, and empirically find that lenders in the P2P lending market tend to herd, and customers in the e-book market have been transforming their price sensitivity. We did not explain the details in this paper due to the page limit, but the first and third essay was completed even though we have a plan to develop third essay. The first essay can be available by searching online or the journal, ECRA, and the third one is under review in PACIS 2013. Therefore, we mainly represent the current stage of the second one in this paper. For this working essay, we build research hypotheses and confirm them by simple statistical methodology. We are still trying to study the previous research related with our second essay, and develop more appropriate empirical model.

By completing and developing these essays, we expect that they will contribute to understanding online business and gain insights about online platforms.

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