Auction vs. Posted-Price: Market Mechanism, Lender Behaviors, and Transaction Outcomes in Online Crowdfunding

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Abstract

We study the effect of different market mechanisms, specifically auctions and posted-prices, on participant behaviors and transaction outcomes in an online personal loan market. We develop a game theoretic model to generate empirically testable predictions, then exploit a regime change on a peer-to-peer lending site, Prosper.com, to test them. We find that under posted-prices, loans are funded with higher probability, but only at higher initial and contract interest rates, and are more likely to default. While market-based auctions may be slow in discovering the correct price, "expert"-based posted-price selling may yield unintended, negative welfare consequences.

Keywords: Multiunit-auctions, Posted-prices, Crowdfunding, Peer-to-peer (P2P) lending, Observational learning.

JEL Classification: D44, L11, L86, G20

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1 Introduction

Auctions have long been a dominant market mechanism in electronic commerce. A prominent example is eBay.com, one of the earliest and most successful examples of e-commerce, where auctions are extensively used to match buyers and sellers through a competitive process. Auctions are also widely used in online business-to-business (B2B) procurements and many other contexts (Lucking-Reiley (2000), Bajari and Hortaçsu (2004), The Economist (2000)). Researchers have conducted extensive research on auctions even before the Internet age; but it is with the Internet that online auctions are now able to reach millions of potential customers, generating significant interest and success. Naturally, when Internet-based crowdfunding [1] markets emerged in the past decade, auctions were often adopted as the typical funding mechanism to match borrowers and lenders. In fact, one of the earliest such platforms, Prosper.com, was called "the eBay for personal loans" since it used an auction mechanism to aggregate bids from the investors.

Recently however, an interesting trend has emerged in online markets: auctions seem to have lost some of their appeal. A notable example can be found on – interestingly – eBay.com. Using proprietary data from eBay.com, Einav et al. (2013) show that eBay sellers increasingly favor posted-price sales over open auctions. Two other studies (Hammond (2010), Hammond (2013)) observe a similar trend. These studies focus on antecedents to the choice between auctions and posted-prices, since on eBay.com, this choice is endogenous to the seller. To date, we still know little about how different market mechanisms affect the behavior of market participants and transaction outcomes, since the trend documented in these studies is the endogenous choice of sellers. We study this question in the context of online crowdfunding, exploiting a regime change mandated by a market platform.

[1] Online crowdfunding broadly refers to the aggregation of funds from individual lenders, investors or donors to support a person or organization via the internet. Compared to traditional financial markets, online crowdfunding allows the supply and demand of funds to match directly online in a many-to-one fashion. In addition to debt-based crowdfunding (also known as peer-to-peer lending) that we study, there are also reward-based (such as Kickstarter.com), donation-based (such as Kiva.org), and equity-based crowdfunding sites.

Specifically, our research focuses on online debt-based crowdfunding, also known as "peer-to-peer" (henceforth "P2P") lending. This is an online market for funding unsecured personal loans. One of the largest such marketplaces is Prosper.com. On December 20, 2010, Prosper.com unexpectedly abandoned its well-known auction model (where each investor bids both a dollar amount and an interest rate) and switched the entire website to a posted-price mechanism (Renton (2010)) (where the interest rate is pre-set and investors only bid a dollar amount).[2] Compared to the eBay studies where the change is gradual and endogenous, this regime change on Prosper.com was immediate, exogenous and unanticipated by market participants; it therefore provides an ideal opportunity to investigate how different market mechanisms impact participant behaviors and market efficiency.

Understanding how online market mechanisms affect participant behaviors and transaction outcomes is an important and in fact fundamental question for electronic commerce. This is especially true for the nascent but burgeoning industry of online crowdfunding (Agrawal, Catalini and Goldfarb (2013), Lawton and Marom (2010)), of which Prosper.com is but one example. Only if we come to a comprehensive understanding of the intended and unintended consequences of market mechanisms in this emerging area of research, can we design a more efficient and effective marketplace to match demand and supply of funds, and ensure its long-term viability. As the US prepares for further growth in this industry, especially the upcoming equity-based crowdfunding legalized by the 2012 "Jumpstart Our Business Startups" (JOBS) Act,[3] this research question has important policy implications.

[2]Prosper.com's corporate blog about the regime change can be found at http://blog.prosper.com/2010/12/30/exciting-new-enhancements-at-prosper/.

[3]Specifically, the JOBS Act amends Section 4 of the Securities Act to exempt security issuers from some requirements when they offer and sell up to $1 million in securities, provided that individual investments do not exceed certain thresholds and other conditions are satisfied. One of these conditions is that issuers can use a crowdfunding intermediary. More information can be found on the U.S. Securities and Exchange Commission (SEC) webpage for the Act: http://www.sec.gov/spotlight/jobs-act.shtml.

To address this research question, we first propose a model comparing the multiunit uniform price auction with the posted-price mechanism in the context of P2P lending. To our knowledge, this is the first theoretical comparison of these two market mechanisms,[4] especially in online crowdfunding. Our model predicts that Prosper.com, as the pricing agent in the posted-price regime, will assign higher interest rates for loans, compared to what the borrowers would have chosen as their reserve interest rates in auctions. Meanwhile, listings will be funded with higher probability under the posted-price sales. By extension, the contract interest rates for loans funded in the posted-price stage will be higher as well, since in the auctions the final interest rates cannot be higher than the reserve interest rates.

We empirically test these predictions using data from Prosper.com around the time of the regime change, exploiting the policy change on the website. We focus on listings initiated during a short time period before and after the regime change, specifically from August 20, 2010 to April 19, 2011. We compare the pricing (the initial interest rate of a listing), funding probabilities (the listings' probability of full funding), as well as the contract interest rates of the funded loans. Consistent with our theoretical predictions, we find that the initial interest rates under the posted-price mechanism are indeed higher than those in the auctions, and the listings after the regime change are much more likely to be funded than before. We also find that the contract interest rates in the posted-price stage are on average higher. In other words, while the regime change indeed led to a higher funding probability, it came at a cost of higher interest rates.

More important, and as a result of the higher contract rate, we find evidence that loans funded under the posted-price regime are more likely to default than those funded from the auctions. This is consistent with the literature that the interest rate is an important predictor of default (e.g. Stiglitz and Weiss (1981) and Bester (1985)). This finding points to an unintended consequence apart from Prosper.com's advertised purpose of abandoning their auction model.

On the other hand, we also investigate the effect of the mechanism change on lenders' behav-

[4] Einav et al. (2013) propose a model comparing a single object second price auction with the posted-price mechanism, while we focus on the comparison of the multiunit uniform price auction with the posted-price mechanism.

iors, including herding and bidding strategies. We find that lenders tend to submit larger bids, and submit those bids sooner, under the posted-price regime than in the auctions. This further supports and explains the finding that loans are funded faster for borrowers, and helps with "quicker deployment of funds" as intended by Prosper.com.

Our work contributes to a long-term debate over the optimal sales mechanism. For instance, Bulow and Klemperer (1996) compare auctions against negotiations, whereas Wang (1993) and Kultti (1999) provide theoretical comparison between single object auctions and posted-price sales. More recent comparisons of these market mechanisms, particularly between posted-prices and auctions, can be found in such diverse fields as treasury auctions (Ausubel and Cramton (2002), Hortaçsu and McAdams (2010)) and initial public offering (IPO) (Biais, Bossaerts and Rochet (2002), Zhang (2009)). Furthermore, our paper also contributes to the growing literature on crowdfunding in general, and the research on P2P lending in particular. Recent investigations include Zhang and Liu (2012), Rigbi (2013) and Lin, Prabhala and Viswanathan (2013). Our results on lenders' herding behavior contributes to the observational learning literature, as developed theoretically in Banerjee (1992) and Bikhchandani, Hirshleifer and Welch (1992), and empirically in Simonsohn and Ariely (2008) and Zhang and Liu (2012).

2 Research Context

Since the inception of Zopa.com in 2005 in the United Kingdom, online peer-to-peer lending has witnessed rapid growth around the globe. In the United States, Prosper.com and LendingClub.com are the two largest platforms. Prosper.com officially opened to the public on February 13, 2006. As of January 14, 2013, there were 1.61 million registered members (either as a borrower, a lender, or both) on Prosper.com. More than $68,022$ unsecured personal loans, valued over USD 446 million in total, have been funded.

A brief outline of the funding procedure on Prosper.com is as follows.[5] A potential borrower

[5]Our descriptions emphasize website features that are most relevant to our study, but may not cover all institutional

starts with a loan application to the website by registering on Prosper.com and verifying his identity. After that, the borrower may post an eBay-style listing, describing the purpose of the loan, the requested amount, and the term of the loan (typically 3 years). The initial interest rate can be specified in two ways. Before December 20, 2010 the borrower needs to specify the maximum rate he or she is willing to accept. After the regime change to posted-price (pre-set interest rate), Prosper.com *presets* an interest rate for the borrower based on the borrower's credit profile and his borrowing history on Prosper.com.

Before the regime change on December 20, 2010, once the listing is posted with a specified duration, a multiunit uniform price auction will be conducted until the listing is either fully funded, or expired. Any verified Prosper.com lender can bid in the auctions. In their bids, the lenders specify the amount of funds that they would like to invest, and the minimum interest rate that they are willing to lend at. A single lender's bidding amount does not need to cover the borrower's requested amount, and multiple lenders are allowed to fund the loan. All lenders can observe previous lenders' identities and their bidding amount. During the bidding process, the ongoing loan interest rate is the lowest rate among all lenders that are outbid (excluded from funding the loan), or the starting interest rate that the borrower set at the beginning if no lender has been outbid. Once a lender is outbid, his bidding interest rate will be made public. At the end of the auction process, if the loan receives full funding, the contract interest rate will be the ongoing interest rate at that time, which can be either the lowest losing interest rate or the reserve interest rate. In a sense, the borrower sets the initial interest rate and the auction helps "discover" the contract interest rate.

On December 20, 2010, Prosper.com unexpectedly eliminated this auction model.[6] Since then, the interest rate is preset by Prosper.com, based on the website's evaluation of the borrowers' creditworthiness and whether they have previous Prosper loans or not. The borrowers can no

details. Interested readers can refer to other studies of Prosper.com such as Zhang and Liu (2012), Lin, Prabhala and Viswanathan (2013), and Freedman and Jin (2011) for further details.

[6] Renton (2010) provides evidence that this change was largely unexpected.

longer use the auction format. Lenders now only specify a dollar amount for their bids, implicitly accepting the preset interest rate. Multiple lenders are also allowed to fund the loan. Listings will not be converted into loans unless the full amount requested by the borrower are funded, as no partial funding is allowed during our study period; and the contract interest rate is the rate preset at the beginning. Table 1 summarizes the key difference between these two regimes.

As mentioned in their corporate blog when announcing the regime change, Prosper.com argued that the new posted-price regime would allow "*...a quicker deployment of funds*," and borrowers would "*likely get their loan listing funded sooner as well*". "Quicker deployment" refers to the fact that while lenders need to fund their Prosper.com account before they can invest, their Prosper.com account bears no interest. Their funds can only generate returns when invested in a loan that is successfully funded and originated. To understand if this is indeed the case, and if there are other consequences of this change, we develop a stylized model to motivate our empirical analysis.

3 A Model of Sales Mechanisms

In this section, we develop a model to compare the multiunit uniform price auctions with the posted-price mechanism, in the context of Prosper.com. This model is based on the share auction model proposed by Wilson (1979), and further developed in Back and Zender (1993) and Wang and Zender (2002). We develop the following model to highlight the key difference between auction and posted-price mechanisms.

We consider a borrower posting a loan request on the platform. In an auction, the lowest losing bid (or the reserve interest rate) sets the contract rate for all winning lenders. In the posted-price setting, Prosper.com presets the interest rate for a particular loan, and the borrower either accepts or rejects this offer. Once the borrower accepts and the listing is created, any lender can "purchase" the loan at the pre-set interest rate. All winning lenders will fund the personal loan based on this rate. We denote p as the contract rate of a loan funded from an auction or a posted-price selling. Finance literature (e.g. Stiglitz and Weiss (1981) and Bester (1985)) suggests that higher contract

interest rates cause, in general, higher default rates. We therefore let $\delta(p)$ be the default rate when the contract interest rate is p, and thus $\delta'(\cdot) \geq 0$.

For the borrower, there is a variable cost c for each dollar that he borrows from the site. If the loan is successfully funded, this cost will be deducted from the loan before the funds are transferred to the borrower. For example, Prosper.com charges a percentage closing fee for each loan. The borrower may also incur other costs in this process, such as their time and efforts in creating the loan request. For simplicity, we assume the borrower is requesting a loan with Q units, and the loan discount rate for the borrower is τ. We interpret it as the interest rate of his best outside option (other channels to obtain the loan). The maximum interest rate that the borrower is willing to pay on Prosper.com will then be $\tau - c$.

On the other side of the market, suppose there are N lenders in the market. We assume $N \gg Q$, i.e., there are always enough lenders to fund the loan if the price is right. We assume that each lender supplies at most one unit of the loan, and has an independent private willingness to lend (WTL). A lender's WTL is the lowest rate at which he is willing to lend. The lender will never fund the listing at any interest rate below WTL. We could also interpret this interest rate as the lender's true valuation of the loan. Let W_n denote lender n's WTL, $n = 1, 2, ..., N$. Let w_n denote its realization. We assume that W_n is distributed IID with CDF $F_W(\cdot)$, and PDF $f_W(\cdot)$. We let $W^{N:k}$ denote the k-th lowest value among N IID willingness-to-lend, and $k = 1, 2, ..., N$. Let $w^{N:k}$ denote its realization. We denote the distribution of $W^{N:k}$ by $G_k(\cdot)$ (or PDF $g_k(\cdot)$).

3.1 Auctions

We assume a sealed-bid multiunit uniform price auction with single-unit demand. In such an auction the market clearing interest rate is set by the lowest losing bid or the borrower's reserve rate. The lenders all incur a nonnegative transaction cost, λ. Sources of this cost can be the uncertainty associated with the auction process, i.e., the efforts required to judge a borrower's creditworthiness, whether the ongoing interest rate reflects that quality, the need to observe the behavior of other investors (Zhang and Liu (2012)), and the fact that the loan may not be fully

funded at the end. This cost λ therefore increases the lenders' minimum acceptable interest rate to $W_n + \lambda$. In other words, lenders will require higher interest rates than their true values, to compensate the transaction cost associated with the auction mechanism.

In the private value paradigm, auction theory (Krishna (2009)) predicts that the weakly dominant strategy for a lender is to submit his true value $W_n + \lambda$.[7] Thus, the winners will be the Q lenders with the lowest true WTL, and each of them wins one unit of the loan. Knowing the lenders' bidding strategy, the borrower will choose a reserve interest rate, r, to maximize his expected payoff. In the context of Prosper.com before the regime change, this reserve interest rate corresponds to the initial interest rate set at the very beginning of the auction process.[8]

To develop the borrower's payoff function, we notice that this is a personal loan market with borrowing and repayment obligations in a future date. Specifically, if the loan is funded, the borrower receives Q units from the winning lenders immediately. He is committed to pay back the principal and interest within a certain time period. Without loss of generality, we assume that this is a one-period loan. The total repayment amount will be $Q \cdot (1 + p_A(r) + c)$, where $p_A(r)$ is the market clearing interest rate if the loan is funded. The subscript indicates that the listing is funded from an auction, and this interest rate is a function of the borrower's reserve interest rate. If the borrower is risk neutral, then his payoff in terms of present value will be $\pi_A = Q - Q \cdot (1 + p_A(r) + c)/(1 + \tau)$. We simplify the equation and get the borrower's payoff as a

[7] Compared to the models in the auction literature, our context presents two complications. First, lenders' bids are bounded above by the borrower's reserve interest rate. Second, lenders will take into account the loan's potential likelihood of default, which is closely related to the contract interest rate. However, it is straightforward to show that these two factors do not affect the lenders' equilibrium bidding strategy, and the lenders' weakly dominant strategy is still to bid their true valuation.

[8] Recall that we assume the borrower has a discount rate of τ. We can interpret it as the interest rate of the borrower's best outside option, *i.e.*, the lowest rate he is offered from other financial institutions. Based on this interpretation, the borrower's reserve interest rate must satisfy $r < \tau$. Our results later verify this observation.

function of r:

$$\pi_A = \frac{Q \cdot (\tau - p_A(r) - c)}{1+\tau}.$$

It is clear that the market clearing interest rate will vary across listings. Specifically, the market clearing rates will be equal to

$$\begin{cases} w^{N:Q+1} + \lambda, & \text{if } w^{N:Q+1} + \lambda \leq r; \\ r, & \text{if } w^{N:Q} + \lambda \leq r < w^{N:Q+1} + \lambda. \end{cases}$$

Note that the probability of being funded is $\Pr\left(W^{N:Q+1} + \lambda \leq r\right)$ and $\Pr\left(W^{N:Q} + \lambda \leq r < W^{N:Q+1} + \lambda\right)$ correspondingly. Then the expected market clearing rate $p_A(r)$ conditional on the reserve interest rate r will be $E[W^{N:Q+1} + \lambda | W^{N:Q+1} + \lambda \leq r]$ and r, respectively. Therefore, we can write the borrower's expected payoff as

$$\begin{aligned} E\pi_A = &\frac{Q \cdot \left[\tau - E[W^{N:Q+1} + \lambda | W^{N:Q+1} + \lambda \leq r] - c\right]}{1+\tau} \cdot \Pr\left(W^{N:Q+1} + \lambda \leq r\right) \\ &+ \frac{Q \cdot (\tau - r - c)}{1+\tau} \cdot \Pr\left(W^{N:Q} + \lambda \geq r > W^{N:Q+1} + \lambda\right). \end{aligned}$$

The borrower maximizes his expected payoff by choosing the initial reserve interest rate. The proof in Appendix A shows that the optimal reserve interest rate r^* is defined by the following implicit function,

$$r^* = \tau - c - \frac{G_Q(r^* - \lambda) - G_{Q+1}(r^* - \lambda)}{g_Q(r^* - \lambda)}. \tag{3.1}$$

The numerator of the ratio is exactly the probability that the market clearing interest rate is the reserve interest rate. Thus we can interpret this ratio as the normalized premium deducted to screen out the possibility that the $Q+1$st lowest bid is less than the reserve interest rate. We can further simplify Equation (3.1) to get

$$r^* = \tau - c - \frac{F_W(r^* - \lambda)}{Q \cdot f_W(r^* - \lambda)}. \tag{3.2}$$

Recall that $F_W(\cdot)$ and $f_W(\cdot)$ are the distribution functions of W_n. The result implies that the optimal reserve price is independent of the number of lenders. If W_n has a log-concave distribution, r^* is increasing with the quantity Q.

3.2 Posted-Prices

Under the posted-price regime, Prosper.com presets an interest rate, p, to maximize its expected profit. The borrower either accepts or rejects this offer. Upon accepting the offer, the borrower will post the listing, and the interest rate will be fixed at the pre-set level.

Before we model Prosper.com's decision process, we consider the borrower's choice first. If the borrower could choose the fixed interest rate level, his expected payoff can be written as

$$E\pi_B = \frac{Q \cdot (\tau - p - c)}{1+\tau} \cdot \Pr\left(W^{N:Q} \leq p - \delta(p)(1+p)\right),$$

where $\delta(\cdot)$ is the default rate function.The B subscript indicates that it is (for now) the borrower's choice. To see the inequality in the equation, notice that a lender will find the loan profitable if and only if $1 + w_n \leq (1+p)(1-\delta(p))$, which can be simplified to $w_n \leq p - \delta(p)(1+p)$. Let $\gamma(p) = p - \delta(p)(1+p)$, which is the loan's expected rate of return.

The borrower maximizes his revenue by choosing p. The following equation implicitly characterizes this optimal price level,

$$p_B^* = \tau - c - \frac{G_Q(\gamma(p_B^*))}{g_Q(\gamma(p_B^*)) \cdot \gamma'(p_B^*)}. \tag{3.3}$$

It can be shown that the relationship between p_B^* and the reserve interest rate r^* in the auctions depends on the expected rate of return function, $\gamma(\cdot)$, as well as the distribution of lenders' valuations. This is an extension to the basic model in Einav et al. (2013). Under the usual commodity economy interpretation, therefore, the seller assigns higher "price"—analogous to lower interest rate in the current context—in the posted-price setting, given the common value setup.

We now return to Prosper.com's decision. The platform presets the interest rate p for a par-

ticular loan. The borrower's strategy is to pick a threshold or cut-off rate $\tilde{p}$. If p is lower than this cut-off, the borrower will accept the offer. If it is higher, he will reject it and leave the market. In other words, the borrower accepts p if $p \leq \tilde{p}$, and rejects otherwise. Note that again the probability of being fully funded is $\Pr\left(W^{N:Q} \leq \gamma(p)\right)$. Similar to our analysis of the auctions, the borrower's expected payoff for accepting Propser.com's pre-set interest rate can be shown to be $\frac{Q\cdot(\tau-p-c)}{1+\tau} \cdot \Pr\left(W^{N:Q} \leq \gamma(p)\right)$, while rejecting the offer generates zero payoff. At the threshold the borrower is indifferent between accepting and rejecting. That is, $\frac{Q\cdot(\tau-p-c)}{1+\tau} \cdot \Pr\left(W^{N:Q} \leq \gamma(p)\right) = 0$. Then it is easy to show that the cutoff price is $\tilde{p} = \tau - c$.

Suppose now that the platform knows the borrower's true cost c and discount rate τ, and thus $\tau - c$. Prosper.com's profit comes from the fees that it charges on funded loans. We let α denote this closing fee. This fee is fixed, in the sense that Prosper.com does not change it in the short run (consistent with what we observe for our study period). Then we can write down Prosper.com's expected profit as,

$$E\pi_P = \alpha \cdot Q \cdot \Pr\left(W^{N:Q} \leq \gamma(p)\right).$$

Prosper.com chooses an interest rate to maximize this profit given $p \leq \tau - c$ and $p \geq 0$. It can be shown that the following assumption is a sufficient condition under which Prosper.com assigns the highest possible interest rate, *i.e.*, $\tau - c$.

Assumption 1. The hazard rate for the default rate function, $\delta'(p)/(1-\delta(p))$, is bounded above by $1/(1+\tau-c)$, *i.e.*, for all $p \in [0, \tau - c]$,

$$\frac{\delta'(p)}{1-\delta(p)} \leq \frac{1}{1+\tau-c}.$$

Assumption 1 adds some functional form restrictions but are fairly reasonable and intuitive. Under the assumption, we can show that $\Pr\left(W^{N:Q} \leq \gamma(p)\right)$ is a nondecreasing function of p.[9] This

[9]To see this, note that Assumption 1 is a sufficient condition for the expected rate of return function, $\gamma(\cdot)$, to be nondecreasing on $[0, \tau - c]$.

implies that Prosper.com will choose an interest rate as high as possible to maximize its expected profit. To summarize, in a posted-price setting Prosper.com presets an interest rate,

$$p^* = \tau - c. \tag{3.4}$$

3.3 Comparisons and Predictions

An immediate observation is that $p^* > r^*$. In other words, Prosper.com will preset an interest rate higher than what the borrower would have chosen in auctions. Also note that the probability of being funded in the auctions, $\Pr\left(W^{N:Q} + \lambda \leq r^*\right)$, is strictly less than that under posted-prices, $\Pr\left(W^{N:Q} \leq \gamma(p^*)\right)$.[10] Conditional on the loan being funded, since the initial interest rate in the posted-price regime is higher than that in the auctions, and the contract rate is identical to the initial rate in posted-prices, the contract rate is also strictly higher than the contract rate in auctions. In turn, the loan default rate, which the finance literature has shown to be increasing in contract interest rates, should also be higher in the posted-price regime. We therefore summarize the following predictions from the model:

1. Prediction 1: The initial interest rates assigned by Prosper.com under the posted-price mechanism are higher than the initial interest rates chosen by borrowers in the auctions.
2. Prediction 2: Conditional on the loans being funded, the contract interest rates under the posted-price mechanism are higher than those under the auction regime.
3. Prediction 3: The funding probability under the posted-price mechanism is higher than in the auctions.
4. Prediction 4: For funded loans, the probability of being defaulted under the posted-price mechanism is higher than in the auctions.

[10] A necessary condition is $\delta(\tau - c) \leq (\tau - c)/(1 + \tau - c)$, which suggests that unless the default rate is too high, the funding probability under the posted-price regime is strictly higher.

These predictions can be intuitively deducted as well. Under both regimes, the borrower moves before lenders, as the borrower needs to commit to an initial (asking) interest rate before potential lenders decide whether or not to invest; and the website's profit comes from originated loans. In addition, there are two key features for the posted-price mechanism: first, the pricing power lies with Prosper.com; and second, by serving as the pricing agent, Prosper.com reduces the uncertainty associated with ongoing interest rates under auctions.

Under auctions, the borrower is faced with a tradeoff between the initial (asking) interest rate and probability of funding. The borrower will favor a lower starting interest rate because he cannot revise that rate once the auction starts, and if the rate is unnecessarily high, that rate will be effective for the life of the loan (c.f. "winner's curse"). In fact, if the lower rate does not attract sufficient funding, it is virtually costless to post another request with a higher asking rate. Under posted-prices, Prosper.com implicitly ensures that the interest rate reflects borrower quality. In other words, at the same starting interest rate, lenders will be more likely to place bids under posted-prices than auctions. Prosper.com is therefore able to extract surplus from the borrower because the borrower has to move first, and by setting the interest rate higher, potential lenders are more likely to participate and fund loans – after which the website is able to charge fees. This is the intuition behind prediction 1, and the other predictions follow.

In addition to these predictions, for the higher initial interest rate to induce higher funding probabilities, we should be able to observe that lenders are more willing to bid under posted-prices. Hence, an auxiliary prediction from our model is that lenders should be willing to place bids earlier in auctions, and place larger bids. And because the price information (interest rate) from Prosper.com website should carry more weight than the asking rate of borrowers, lenders should be able to rely less on the behaviors of others to judge borrower quality. Hence, the rational herding behavior documented in Zhang and Liu (2012) should be reduced, if not eliminated, under posted-prices. However, our focus remains the four predictions above.

We next turn to transactions data from Prosper.com to empirically test these theoretical predictions. In the next section, we introduce our datasets and discuss the construction of our samples.

4 Data and Sample

We obtained data from Prosper.com on January 14, 2013.[11] These data cover all transactions since the website's inception in February 2006, including both funded and failed listings. For each listing, we obtain an extensive set of variables including the requested loan amount, initial interest rate, loan term, timestamps (the starting time and ending time), results of the listings, and the repayment status of funded loans as of our data collection date. The borrower's credit information includes his Prosper rating (a letter grade), credit score range, debt to income ratio, as well as extended credit information such as the number of current and historical credit lines, delinquency history, and bank card utilization. We also obtain detailed information for each bid, including the identity of the bidder (lender), bid amount, timestamp, and outcome (winning or losing). And finally, for successfully funded loans, we have the loan origination date, contract interest rate, repayment status, and so on.

Prosper.com eliminated auctions on December 20, 2010. We therefore construct our main sample as all listings posted between August 20, 2010 and April 19, 2011.[12] We also drop listings suspected of identity theft and repurchased by Prosper.com. These listings are easily identified since the starting dates are well before the time range in our sample, and their credit grading system is the same as the old one.

Table 2 and 3 in Appendix D summarize the main sample used in our empirical analysis. There were $13,017$ listings posted during the period. $8,470$ of them began before December 20, 2010, and $4,547$ listings were initiated in the posted-price stage. Out of these listings, $4,446$ were funded and became loans. Among these loans, $1,925$ were funded using auctions, and $2,521$ were initiated

[11] Prosper.com maintains and updates the data sets on a daily basis. The data sets used in this research contain all listing-level and bid-level information.

[12] Prior to August 2010, Prosper.com allowed borrowers to use "automatic funding" for their auctions, where the borrower set a reserve interest rate and the auction would end as soon as 100% funding was reached. That funding option was discontinued by the website, and during the time that we study, no such auctions existed.

under posted-prices. Thus, roughly 22.7% of listings in the auction stage were successfully funded, whereas that ratio is about 55.4% under posted-prices. The table also shows that on average, the contract interest rates the borrowers pay in the loans are lower in posted-price stage on average. Following our predictions derived in Section 3, we seek to identify how funding probabilities, initial (asking) interest rates, and contract interest rates change as a result of the regime change from auctions to posted-prices, holding everything else constant.

5 Empirical Models and Results

We now empirically test the predictions from our model earlier in the paper, and also explore the influence of this regime change on lenders' bidding strategy and behaviors. We also compare the outcome of loans funded under these two market mechanisms, respectively.

Since funding probability and contract interest rate on loans is an immediate result of lender's behaviors, our analyses will not be complete without a finer look into the lender's behaviors, such as the amount of bids, timing of their bids, and if the regime change resulted in any changes in their herding behavior (Zhang and Liu (2012)).

Our analysis will also not be complete without a look at the long-term *outcome* of the funded loans. Will these loans be ultimately repaid by the borrowers, and how is that likelihood affected by the regime change? If our hypothesis regarding contract rates is supported, then a natural extension is that the loans funded after the change should also be more likely to default. We test this conjecture using loan performance data.

5.1 Empirical strategy

5.1.1 Models on *initial* interest rates

Our analytical model predicts that Prosper.com, in the posted-price stage, will assign higher interest rates compared to what the borrower would have chosen as the reserve interest rates in the auction stage *ceteris paribus*. A natural extension of that prediction is that the *contract* interest rates (for

funded loans) should also be higher under posted-prices, since in auctions (with lower reserve interest rates) the final contract rate cannot be higher than the reserve rate.

We first compare the initial interest rates under the two mechanisms. Let r_i denote the initial interest rate of listing i, for all listings in the sample. Our first specification is a simple linear model:

$$r_i = \beta_0 + \beta_1 \cdot 1\{\text{Posted-Price}\}_i + \beta_2' X_i^{\text{Loan}} + \beta_3' X_i^{\text{Listing}} + \beta_4' X_i^{\text{Credit}} + \varepsilon_i. \tag{5.1}$$

Notice that after the regime change, Prosper.com assigns the interest rates for borrowers according to its own categorical system, i.e. different rates for borrowers in different credit categories.[13] We therefore add interest rate category fixed effects to the above model. Specifically, let r_{ic} denote the interest rate of listing i in category c. We have

$$r_{ic} = \nu_c + \beta_1 \cdot 1\{\text{Posted-Price}\}_{ic} + \beta_2' X_{ic}^{\text{Loan}} + \beta_3' X_{ic}^{\text{Listing}} + \beta_4' X_{ic}^{\text{Credit}} + \varepsilon_{ic}, \tag{5.2}$$

where ν_c are the category fixed effects, and ε_{ic} is the idiosyncratic error term. The $\mathbf{X}$'s are characteristics about the borrower and the associated listing. Our main independent variable of interest is the indicator variable that equals 1 when the listing is created under the regime of pre-set interest rates, and 0 otherwise. Thus, the regime change effect will be captured by $\hat{\beta}_1$, coefficient of this indicator variable.

5.1.2 Models on *contract* interest rates

We next compare the *contract interest rates* empirically. We could use similar specifications as in Equation 5.2. However, this potentially introduces a selection bias. Specifically, contract interest rate is observed only when the personal loan is successfully funded, so estimating a model similar to Equation (5.2) will lead to biased estimates. We therefore turn to matching methods to identify

[13] A screenshot of these categories is available at http://web.archive.org/web/20110926231350/http://www.prosper.com/loans/rates-and-fees/.

how the regime change affects the contract interest rates of funded loans.

Specifically, we interpret the posted-price mechanism as "treatment" and the auction mechanism as "control", and estimate the treatment effect associated with the sales mechanism switch. The exogenous change in sales mechanisms ensures the identification of the treatment effect. We use nearest-neighbor propensity score matching. First, we estimate the following probability of being in the posted-price stage (the treatment) given a set of covariates, using a logit regression,

$$\rho(\mathbf{x}_i) = \Pr(D_i = 1 | \mathbf{X} = \mathbf{x}_i), \tag{5.3}$$

where D_i is a dummy variable equal to 1 if the listing is posted after the regime change, and $\mathbf{X}$ includes all the covariates as in Equation 5.1 or 5.2. Then we estimate the average treatment effects (ATE) with bias adjusted and robust standard errors. In other words, we find the nearest "neighbors" in the auction stage (untreated) for each listing under the posted-price mechanism (treated), and vice versa. We then estimate the sample ATE with replacement. We follow Abadie and Imbens (2006) to calculate the standard errors of the matching estimates. All estimations are performed in R (see Sekhon (2011)).

5.1.3 Models on funding and default probabilities

To explore the effect of regime change on the funding probability, we estimate a version of fixed effects logit model. We also incorporate the interest rate category fixed effects as discussed in Section 5.1.1. We let s_{ic} denote a dummy variable that equals 1 if the listing i in category c is successfully funded, and 0 otherwise. Then we estimate the following logit model:

$$\Pr(s_{ic} = 1) = \Lambda\left(\nu_c + \beta_1 \cdot 1\{\text{Posted-Price}\}_{ic} + \beta_2' X_{ic}^{\text{Loan}} + \beta_3' X_{ic}^{\text{Listing}} + \beta_4' X_{ic}^{\text{Credit}}\right), \tag{5.4}$$

where $\Lambda(\cdot) = \exp(\cdot)/(1-\exp(\cdot))$ is the logit function. The marginal effect associated with the logit estimate of β_1 reflects the regime change effect on loan's funding probability.

We use a similar model for the default likelihood of loans, except that the outcome variable, d_{ic}, is an indicator that equals 1 if the funded loan i in category c is defaulted during its repayment

process. Specifically, we estimate the following logit model with category fixed effects:

$$\Pr(d_{ic}=1)=\Lambda\left(\nu_c+\beta_1\cdot 1\{\text{Posted-Price}\}_{ic}+\beta_2' X_{ic}^{\text{Loan}}+\beta_3' X_{ic}^{\text{Listing}}+\beta_4' X_{ic}^{\text{Credit}}\right). \tag{5.5}$$

5.2 Results and Discussions

5.2.1 Funding Probability and Interest Rates

We report the estimation results for the model (5.2) in the fifth column in Table 5 in the Appendix E. Table 5 reports the estimates for the comparison of *initial* interest rates. Table 6 displays the results for the comparison of *contract* interest rates using nearest-neighbor propensity score matching. The estimates for Model (5.4) are reported in column 5 in Table 7. We report the average partial effects for this logit model. We also calculate the marginal effects at means, and the results are consistent.

The estimate for the regime change dummy in the fifth column of Table 5 shows that in posted-price sales, the initial interest rate is around 1%, or 100 basis points, higher than what the borrower would have set in auctions. This is a nontrivial difference for interest rates (c.f. Edward M. Saunders (1993)). Notice that if we did not incorporate the interest rate category fixed effects, the results would have been reversed. For the funding probability, Table 7 shows that compared to using auctions, the funding probability using the price posting strategy is on average more than 20% higher. Figure 1 also displays this apparent trend in funding probability. Notice that there is a kink at the regime change date, and this turns out to be significant even if we control for multiple covariates.[14]

Table 6 presents the estimation results from the propensity score matching. The estimates in column 4, 5, and 6 show that after the regime change, the *contract* interest rates for funded loans are around 1% higher than the loans funded in the auction stage. The results are robust to the choice of

[14]One may argue that the kink could be driven by seasonality effect since the regime change was made right before the holiday. We check that possibility by examining the daily ratio of funded loans one year prior to our study period, and do not find such an effect of seasonality.

different matching estimators. Similar results hold when we estimate the average treatment effect on the treated (ATT). These results lend support to our theoretical predictions that the *contract* interest rates should be higher in the posted-price stage. They show that while the loans are more likely to be funded under posted-prices, it came with a cost in the form of higher interest rates.

5.2.2 Loan Outcomes

Prosper.com focuses on faster "fund deployment" as a motivation for the regime change. In the long run, however, it is the repayment of the loans that matters most for investors as uncertainties resolve and returns are made. If lenders' choices turn out to be wrong, that could hurt their incentive to continuously participate in the market. Our Prediction 4 is that the default rate will be higher under posted-prices, and we test it next.

Since some loans originated in this period have not yet matured, we record their repayment results as of the 12th month starting from the origination date. This ensures that we are comparing loans at a similar stage of "maturity." We then estimate whether the regime change is associated with a higher or lower default rate, and present the estimation results in Table 8. Our results are robust to the choice of different repayment dates. Consistent with Prediction 4, we find that loans originated after the regime change have slightly *higher* default rates: roughly 2% higher than in auctions (column 4 in Table 8). This is an important consequence of the regime change. It suggests that even though lenders see a higher interest rate at the time of loan origination, their overall return may not be strictly higher, due to the increase in *ex post* default probabilities. We therefore conduct a welfare analysis in the next section, but before that, we briefly test the auxiliary predictions on lender behaviors that we discussed at the end of Section 3.

5.2.3 Lenders' Bidding Behaviors

We study the change in lender's bidding behaviors from two aspects. The first one uses each bid as the level of observation to compare the timing of lenders' bids as well as the amount of their bids. The second one draws on empirical studies of herding in the context of Prosper.com, and

tests whether the regime change affects lender's tendency to follow each other.

Figure 2 presents the comparison of the amount of dollars submitted in each bid. It shows that in the posted-price stage, the lenders tend to invest more in each of their bids compared to that in the auction stage. Another major reason for Prosper.com to switch to the posted-price mechanism is that the personal loans should be funded quicker. Table 4 shows that half of the funded loans from the posted-price selling receive full funding within 80 hours, compared to more than 160 hours in the auction stage. In summary, after the regime change, the lenders indeed invest more and quicker on average, so that the funding procedure is indeed more efficient.

In addition to the timing and amount of bids, another important characterization of lender behavior is herding. We hypothesized that since lenders are more likely to trust the price assigned by the platform than the initial asking rate of borrowers, lenders will have lower needs to rely on observing the behaviors of others, and therefore herding should be less likely to occur under posted-prices. To test this, we draw on prior empirical work by Zhang and Liu (2012) who also used data from Prosper.com. They find that lenders exhibit rational herding, in the sense that they gravitate toward listings with more funds received even when those listings may have seemingly "bad" credit. We replicate their empirical strategy to examine the effect of the regime change on this rational herding behavior. Specifically, we estimate the model proposed by Zhang and Liu separately using the listings in the auction stage, and in the posted-price stage. Table 9 reports the estimation results. The estimate shows an interesting *reversal* in lenders' herding behavior. In auctions, a listing with USD 100 more funding at the start of a day will receive on average USD 2.7 more funds during the day; while this number under posted-prices is negative (-USD 17.2). A full investigation of the herding reversal will be beyond the scope of this paper; however, this result does lend support to our predictions.

5.3 Social Welfare

As a quick summary, our results so far show that funding probability, interest rates, as well as default probability are all higher under posted-prices. From a policy point of view, a critical question

is how this change affects overall social welfare. That is, how does the increase in lender surplus (if any) compare to the decrease in borrower surplus, and can we say with certainty that this market is better or worse off using the new, posted-price mechanism? Although the posted-price mechanism is associated with higher funding probability, the higher contract interest rates may lead to moral hazards (Stiglitz and Weiss (1981)) that increase ex post default rates. The total social surplus depends not only on how often the loans are being funded, but also on how often the funded loans are paid back. The welfare comparison is therefore ambiguous. We present a formal development of this observation in Appendix B, and we can see that, in fact, under certain conditions, auctions may outperform posted-prices in terms of social welfare. In a sense, this result is to be expected. The business model of Prosper.com (and other major players in the debt-based online crowdfunding arena) dictates that they need to ensure higher probability of funding, since a significant source of their revenue is from the closing fees at the time of loan origination, not repayment.

6 Conclusions

The choice of market mechanisms is one of the most fundamental questions in any marketplace. For a nascent industry such as online peer-to-peer lending, or more broadly online crowdfunding, this choice is critical. For market designers, platform owners and policy makers, there are delicate short-term and long-term consequences that should be carefully weighed. Although auctions appear to have gradually been replaced by posted-price mechanisms (at least in the US), there has been little systematic empirical research on the consequences of such a regime change. Our goal is to make the first step in fulfilling this gap in the literature.

We exploit an exogenous regime change on an online peer-to-peer lending marketplace, Prosper.com, to answer this question. We develop a game theoretic model to compare the multiunit uniform price auctions and posted-price sales, and test its predictions using detailed transaction data from the market around the time of the regime change. Our empirical results lend support to our theoretical predictions in terms of initial and contract interest rates, as well as funding and

default probabilities.

We find evidence of short-term improvements for both borrowers and lenders. For lenders, our results show that lenders benefit from a quicker "deployment" of funds because loans are funded faster under posted-prices. There appeared to be a virtuous cycle: after the regime change, lenders tend to invest more in each bid, and invest sooner. This, in turn, contributes to faster funding of loan requests and deployment of lenders' funds. Borrowers also seem to benefit from the change, since their requests are funded sooner. Both of these short-term benefits in terms of funding probabilities were noted by Prosper.com when they made the regime change, and rightly so.

On the other hand, however, as our theoretical model predicts and our empirical analysis shows, Prosper.com assigns higher initial interest rates under posted-prices than borrowers would have in auctions; in fact, about 100 basis points higher. That is, while lenders enjoy a higher nominal return on loans, it comes at a cost to borrowers. More important, this change has long-term implications for the repayment of loans. As the finance literature has long documented (Stiglitz and Weiss (1981)), the interest rate is one of the most critical factors in predicting *ex post* loan default. Our analysis of loans originated around the time of the regime change is consistent with this prediction and we find that loans are indeed more likely to default under posted-prices. These findings, along with our analysis in Appendix B, suggest that the switch to posted-prices does not necessarily increase overall social welfare.

Our paper is one of the first to systematically document these intended and unintended consequences of the regime change in online P2P lending. While the traditional "crowd"-based auction mechanism may be slower to fund loans, its long-term welfare effects may not necessarily be worse than posted-prices set by experts. Since P2P lending platforms such as Prosper.com deduct service fees at the time of the loan origination rather than repayment, it *is* in their best interest to ensure a higher funding probability in the short-term. However, market designers and policy makers should carefully consider the long-term consequences on borrowers' capabilities and willingness to repay. Hence, our study not only has implications for P2P lending, but for other types of crowdfunding as well: When the marketplace derives revenue from short-term success, such as the origination of

a loan or the funding of a business venture, open auctions that rely on "wisdom of the crowd" may allocate resources in a more socially desirable fashion. More broadly, our study contributes to the growing literature on electronic market design and online auctions, and also a better understanding of how market participant behaviors change under different market mechanisms.

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A Derivation of Equation (3.2)

Recall that under the auction mechanism, the borrower's expected profit is

$$E\pi_A = \frac{Q\cdot\left[\tau - E[W^{N:Q+1}+\lambda \,|\, W^{N:Q+1}+\lambda \le r] - c\right]}{1+\tau}\cdot \Pr\left(W^{N:Q+1}+\lambda \le r\right) + \frac{Q\cdot(\tau - r - c)}{1+\tau}\cdot \Pr\left(W^{N:Q}+\lambda \ge r > W^{N:Q+1}+\lambda\right).$$

Or,

$$E\pi_A = \frac{Q\cdot(\tau-\lambda-c)}{1+\tau}\cdot\Pr(W^{N:Q+1}\le r-\lambda) - \frac{Q\cdot E[W^{N:Q+1}|W^{N:Q+1}\le r-\lambda]}{1+\tau}\cdot\Pr(W^{N:Q+1}\le r-\lambda) + \frac{Q\cdot(\tau-r-c)}{1+\tau}\cdot\left[\Pr(W^{N:Q}\le r-\lambda) - \Pr(W^{N:Q+1}\le r-\lambda)\right]. \tag{A.1}$$

To see that Equation (A.1) holds, note that[15]

$$\begin{aligned}\Pr(W^{N:Q}+\lambda \le r < W^{N:Q+1}+\lambda) &= \Pr(W^{N:Q}\le r-\lambda > W^{N:Q+1}) \\ &= \binom{N}{Q}\cdot F_W(r-\lambda)^Q\cdot(1-F_W(r-\lambda))^{N-Q},\end{aligned}$$

and

$$\begin{aligned}\Pr(W^{N:Q}\le r-\lambda) - \Pr(W^{N:Q+1}\le r-\lambda) &= G_Q(r-\lambda) - G_{Q+1}(r-\lambda) \\ &= \binom{N}{Q}\cdot F_W(r-\lambda)^Q\cdot(1-F_W(r-\lambda))^{N-Q}.\end{aligned}$$

We can rewrite Equation (A.1) as

$$E\pi_A \propto (\tau-\lambda-c)\cdot\Pr(W^{N:Q+1}\le r-\lambda) - E[W^{N:Q+1}|W^{N:Q+1}\le r-\lambda]\cdot\Pr(W^{N:Q+1}\le r-\lambda) + \cdot(\tau-r-c)\cdot\left[\Pr(W^{N:Q}\le r-\lambda) - \Pr(W^{N:Q+1}\le r-\lambda)\right], \tag{A.2}$$

where we omit the constant parts. The conditional expectation in Equation (A.2) can be written as $E[W^{N:Q+1}|W^{N:Q+1}\le r-\lambda] = \frac{\int_{-\infty}^{r-\lambda} w g_{Q+1}(w)dw}{G_{Q+1}(r-\lambda)}$. And since $\Pr(W^{N:Q}\le r-\lambda) = G_Q(r-\lambda)$ and

[15] See the section of order statistics in Casella and Berger (2001).

$\Pr(W^{N:Q+1} \leq r-\lambda) = G_{Q+1}(r-\lambda)$, (A.2) can be further simplified to

$$\begin{aligned} E\pi_A \propto (\tau-\lambda-c)\cdot G_{Q+1}(r-\lambda) - \int_{-\infty}^{r-\lambda} w g_{Q+1}(w)dw \\ + \cdot(\tau-r-c)\cdot[G_Q(r-\lambda)-G_{Q+1}(r-\lambda)] \end{aligned} \tag{A.3}$$

The first order necessary condition to the maximization of $E\pi_A$ is then

$$\frac{dE\pi_A}{dr} = G_{Q+1}(r-\lambda) - G_Q(r-\lambda) + (\tau-r-c)g_Q(r-\lambda) = 0$$

Then the optimal reserve price satisfies

$$r^* = \tau - c - \frac{G_Q(r^*-\lambda)-G_{Q+1}(r^*-\lambda)}{g_Q(r^*-\lambda)}. \tag{A.4}$$

The second part in the RHS of (A.4) can be extended as

$$\frac{\binom{N}{Q}\cdot F_W(r^*-\lambda)^Q\cdot(1-F_W(r^*-\lambda))^{N-Q}}{\frac{N!}{(N-Q)!(Q-1)!}\cdot f_W(r^*-\lambda)\cdot F_W(r^*-\lambda)^{Q-1}\cdot(1-F_W(r^*-\lambda))^{N-Q}} = \frac{F_W(r^*-\lambda)}{Q\cdot f_W(r^*-\lambda)}.$$

So the following holds

$$r^* = \tau - c - \frac{F_W(r^*-\lambda)}{Q\cdot f_W(r^*-\lambda)}. \tag{A.5}$$

(A.5) is Equation (3.2). ■

B Welfare Comparison

In this appendix, we formally develop our discussion on the comparison of total welfare under the two market mechanisms. Mathematically, we decompose the total surplus of a particular loan into borrower surplus and lenders surplus, and compare them.

In the model described in Section 3, we assume that lenders in an auction incur positive transaction cost (λ), relative to the posted-price regime. An immediate observation is that this cost may induce efficiency loss, as the cost raises the lenders' minimum acceptable interest rates, which in turn lowers the funding probability. In other words, holding everything else equal (such as the borrower profile and lender population), the transaction cost associated with the auction mechanism reduces the total social surplus, as it raises the lenders' willingness to lend (supply function). Another key note is that in the posted-price environment, the borrower surplus is squeezed to zero: our model shows that under posted-prices, Prosper.com assigns $p^* = \tilde{p}$, the maximum interest rate at which a borrower is willing to post the listing. Consequently, the lenders surplus is maximized under posted-prices.

Let us first look at the total surplus for a listing under the auction mechanism. We consider a successfully funded loan with a default rate, δ. Let p denote the contract interest rate again, and then the default rate $\delta = \delta(p)$. We know that the borrower's highest acceptable interest rate is $\tilde{p} = \tau - c$ from our earlier results. We also know that with probability $\Pr\left(W^{N:Q+1} + \lambda \leq r^*\right)$ the contract interest rate is $p = W^{N:Q+1} + \lambda$ (where the lowest losing bid sets the contract rate), and with probability $\Pr\left(W^{N:Q} + \lambda \leq r^* < W^{N:Q+1} + \lambda\right)$ the contract rate is $p = r^*$.

We calculate the lenders surplus first. For a winner, since his minimum acceptable interest rate is generally lower than the contract rate, the individual surplus will be $\left(1 + w^{N:Q+1} + \lambda\right)(1 - \delta(p)) - \left(1 + w^{N:k} + \lambda\right)$ that is $w^{N:Q+1} + \lambda - \delta(p)(1 + w^{N:Q+1} + \lambda) - \lambda - w^{N:k}$, for k among the Q winners (lowest lenders) if the lowest losing bid sets the contract rate (Scenario I); $(1 + r^*)(1 - \delta(p)) - \left(1 + w^{N:k} + \lambda\right)$ that is $r^* - \delta(p)(1 + r^*) - \lambda - w^{N:k}$ for all k if the borrower's reserve interest rate sets the contract rate (Scenario II). All the other lenders fail to fund the loan, and thus have zero surplus. Then the total lenders surplus will be the sum over of all winners' surplus. The *ex ante*

total lenders surplus (LS_A) can be shown to be equal to,

$$\begin{aligned}\mathrm{LS}_A = & E\left[\sum_{k=1}^{Q}\left[\gamma(W^{N:Q+1}+\lambda)-\lambda-W^{N:k}\right]|W^{N:Q+1}\leq r^*-\lambda\right]\times\Pr\left(W^{N:Q+1}\leq r^*-\lambda\right)\\ & +E\left[\sum_{k=1}^{Q}\left[\gamma(r^*)-\lambda-W^{N:k}\right]|W^{N:Q}\leq r^*-\lambda<W^{N:Q+1}\right]\times\Pr\left(W^{N:Q}\leq r^*-\lambda<W^{N:Q+1}\right).\end{aligned}$$

We then turn to borrower side. The borrower surplus, if the loan is successfully funded, will be $Q\times\left[(1+\tilde{p})-\left(1+w^{N:Q+1}+\lambda\right)\right]$ that is $Q\times\left(\tilde{p}-w^{N:Q+1}-\lambda\right)$ in scenario I; and $Q\times[(1+\tilde{p})-(1+r^*)]$ that is $Q\times(\tilde{p}-r^*)$ in scenario II. Then the borrower's *ex ante* surplus (BS_A) will be

$$\begin{aligned}\mathrm{BS}_A = & Q\times E\left[\tilde{p}-W^{N:Q+1}-\lambda|W^{N:Q+1}\leq r^*-\lambda\right]\times\Pr\left(W^{N:Q+1}\leq r^*-\lambda\right)\\ & +Q\times E\left[\tilde{p}-r^*|W^{N:Q}\leq r^*-\lambda<W^{N:Q+1}\right]\times\Pr\left(W^{N:Q}\leq r^*-\lambda<W^{N:Q+1}\right).\end{aligned}$$

The *ex ante* social surplus (TS_A) will be the sum of the total lenders surplus (LS_A) and the total borrower surplus (BS_A). It can be shown that the social surplus is equal to

$$\begin{aligned}\mathrm{TS}_A = & E\left[\sum_{k=1}^{Q}\left[\tilde{p}-\delta(W^{N:Q+1}+\lambda)(1+W^{N:Q+1}+\lambda)-\lambda-W^{N:k}\right]\Big|W^{N:Q+1}\leq r^*-\lambda\right]\\ & \times\Pr\left(W^{N:Q+1}\leq r^*-\lambda\right)+E\left[\sum_{k=1}^{Q}\left[\tilde{p}-\delta(r^*)(1+r^*)-\lambda-W^{N:k}\right]\Big|W^{N:Q}\leq r^*-\lambda<W^{N:Q+1}\right] \quad \text{(B.1)}\\ & \times\Pr\left(W^{N:Q}\leq r^*-\lambda<W^{N:Q+1}\right)\end{aligned}$$

Let us now conduct similar analysis for the posted-price mechanism. Previous result tells us that Prosper.com presets the interest rate that is equal to the borrower's highest acceptable rate, which is $p^*=\tilde{p}=\tau-c$. In this case the personal loan is funded if and only if $w^{N:Q}\leq\gamma(p^*)=\gamma(\tau-c)$, or the Q-th lowest lender is willing to fund the loan. So a winning lender's surplus will be equal to $(1+p^*)(1-\delta(p))-(1+w^{N:k})=\gamma(p^*)-w^{N:k}$, for all $k=1,2,...,Q$ among the lowest lenders. Then the total lenders surplus is the sum of all lenders' surplus, which is

$\sum_{k=1}^{Q}\left[\gamma(p)-w^{N:k}\right]$. The *ex ante* total lenders surplus (LS_P) is thus

$$\text{LS}_P = E\left[\sum_{k=1}^{Q}\left[\gamma(\tau-c)-W^{N:k}\right]|W^{N:Q}\leq\gamma(\tau-c)\right]\times\Pr\left(W^{N:Q}\leq\gamma(\tau-c)\right),$$

where we define $\gamma(p)=p-\delta(p)(1+p)$ in Section 3.

As mentioned earlier, the borrower surplus in the posted-price mechanism is zero since Prosper.com presets the interest rate equal to his maximum willingness to borrow. Thus in this case the social surplus (TS_P) will be equal to the total lenders surplus, which we can show is equal to

$$\text{TS}_P = E\left[\sum_{k=1}^{Q}\left[\gamma(\tau-c)-W^{N:k}\right]|W^{N:Q}\leq\gamma(\tau-c)\right]\times\Pr\left(W^{N:Q}\leq\gamma(\tau-c)\right). \tag{B.2}$$

First of all, given assumption 1, it can be shown that $\text{LS}_p \geq \text{LS}_A$. That is, the lenders surplus under the posted-price mechanism is at least as great as that in the auctions. In other words, the lenders are better off after the regime change.

More importantly, however, the regime change does not necessarily lead to higher total social welfare. It can be shown that under the following assumption, the total surplus in the posted-price selling (TS_P) is smaller than that in the auctions (TS_A).

Assumption 2. Let $p_A=\min\{r^*,w^{N:Q+1}+\lambda\}$, $\delta(\tilde{p})(1+\tilde{p})-\delta(p_A)(1+p_A)\geq\lambda$.

Note that $\delta(p)(1+p)$ measures a lender's expected loss , due to loan defaulting, at contract interest rate p. Thus, the left-hand-side of the inequality measures the difference in the expected loss under the two regimes. While the right-hand-side is the transaction cost that induces efficiency loss in the auctions. This assumption suggests that if the expected loss is reasonably high in the posted-price regime, the total social surplus will be less than that in the auctions. In this situation, the posted-price mechanism is dominated by the auctions.

C Summary of Regime Change Content

Table 1: A Comparison of Auctions vs. Price Posting - The Regime Change

	Auction Stage[a]	**Posted-Price Stage**
Initial interest rate	*Chosen by the borrower*	*Preset by Prosper.com*
Contract interest rate	*Prevailing interest rate at end of auction*	*Initial interest rate*

[a]This table summarizes the content of the regime change. Note that Prosper.com eliminated their auction model and switched to posted-prices in December 20, 2010.

D Summary Statistics of the Sample

Table 2: Summary Statistics: All Listings

	All Listings[a]		Auction Stage		Posted-Price Stage			
Variable	**Mean**	**sd**	**Mean**	**sd**	**Mean**	**sd**	**t – stat**	**p – value**
Listing Characteristics								
# of Bids	70.84	93.88	58.24	94.39	94.32	88.27	-21.70	< 0.01
1(Loan Funded)	0.34	0.47	0.23	0.42	0.55	0.50	-37.76	< 0.01
1(Electronic Transfer)	0.99	0.08	0.99	0.10	1	0	-8.99	< 0.01
1(With Description)	0.10	0.05	0.10	0.04	0.10	0.05	1.19	0.88
1(Group Member)	0.05	0.21	0.05	0.22	0.04	0.19	3.47	1
1(With Images)	0.16	0.37	0.24	0.43	0.002	0.05	51.07	1
Amount Requested	6589.45	4368.21	6105.62	3953.51	7490.71	4926.06	-16.34	< 0.01
Estimated Loss (%)	13.66	8.58	15.86	9.29	9.55	4.89	50.74	1
Initial Interest Rate (%)	24.32	9.27	25.58	9.35	21.98	8.64	22.04	1
Listing Effective Days	7.83	6.46	7.05	5.26	9.29	8.05	-16.93	< 0.01
Loan Term in Months	36.74	6.11	36.20	2.79	37.74	9.53	-10.62	< 0.01
Prosper Score	5.84	2.41	5.27	2.50	6.91	1.81	-42.99	< 0.01
Credit Profiles								
1(Verified Bank Account)	1	0	1	0	1	0	–	–
Debt/Income (DTIR) (%)	21.29	44.72	22.07	46.13	19.82	41.94	2.82	0.99
1(Top Coded DTIR)	0.001	0.04	0.001	0.04	0.001	0.04	–	–
1(Missing DTIR)	0.17	0.38	0.19	0.40	0.13	0.34	–	–
1(Homeowner)	0.49	0.50	0.50	0.50	0.47	0.50	2.78	1
Amount Delinquent	1012.45	6724.71	996.73	5719.38	1041.74	8278.70	-0.33	0.37
Bankcard Utilization (%)	50.53	33.93	53.12	34.56	45.70	32.15	12.23	1
Current Credit Lines	9.06	5.29	9.08	5.31	9.04	5.26	0.36	0.64
Current Delinquencies	0.42	1.22	0.46	1.28	0.34	1.10	5.66	1
Delinquencies Last 7 Yrs	3.11	8.25	3.121	8.21	3.10	8.31	0.13	0.55
Inquiries Last 6 Months	1.35	1.92	1.54	2.12	0.99	1.40	17.80	1
Length Credit History	5939.49	2964.23	5843.95	2915.02	6117.46	3046.12	-4.96	< 0.01
Open CreditLines	8.00	4.77	8.00	4.78	8.00	4.75	-0.11	0.46
Pub Rec Last 12 Months	0.01	0.14	0.01	0.13	0.02	0.15	-1.70	0.05
Pub Rec Last 10 Years	0.24	0.67	0.24	0.67	0.25	0.66	-0.13	0.45
Revolving Credit Balance	17200.92	37234.34	17794.58	38372.88	16095.08	34992.20	2.55	0.99
Stated Monthly Income	5010.90	13875.29	4571.00	12482.46	5830.32	16122.23	-4.58	< 0.01
Total Credit Lines	24.95	13.99	25.07	14.19	24.74	13.59	1.33	0.91
Total Open Accounts	6.16	4.30	6.10	4.30	6.27	4.31	-2.16	0.02
Observations	13,017		8,470		4,547			

[a]This table presents the summary statistics of the corresponding variables from all listings. The data sampling period in this table is between August 20, 2010 and April 19, 2011. The regime change occurred on December 20, 2010. We conduct two sample t-test for each variable. Alternative is that the mean of the corresponding variable in the auction stage is less than that in the posted-price stage. The "Stated Monthly Income" and "Debt/Income" are reported by the borrowers, while other credit profiles are provided by Experian.

Table 3: Summary Statistics: Funded Loans

	All Loans[a]		Auction Stage		Posted-Price Stage			
Variable	**Mean**	**sd**	**Mean**	**sd**	**Mean**	**sd**	**t − stat**	**p − value**
Listing Characteristics								
# of Bids	123.20	97.55	140.51	108.45	109.97	86.03	10.15	1
1(Electronic Transfer)	1.00	0.05	1.00	0.07	1.00	0.00	-3.01	< 0.01
1(With Description)	1.00	0.04	1.00	0.02	1.00	0.05	1.93	0.97
1(Group Member)	0.06	0.23	0.07	0.26	0.04	0.21	3.54	1
1(Images)	0.12	0.32	0.27	0.44	0.001	0.03	26.21	1
Amount Requested	6108.74	4321.44	5234.43	4057.03	6776.35	4398.17	-12.11	< 0.01
Contract Interest Rate (%)	22.79	9.08	24.25	9.32	21.68	8.73	9.36	1
Estimated Loss (%)	10.37	6.09	11.61	7.22	9.42	4.85	11.47	1
Initial Interest Rate (%)	23.30	9.24	25.44	9.46	21.68	8.73	13.58	1
Listing Effective Days	7.69	5.93	6.32	3.18	8.74	7.19	-15.07	< 0.01
Loan Term in Months	36.48	7.03	36.25	3.36	36.66	8.86	-2.12	0.02
Prosper Score	6.76	1.99	6.49	2.19	6.97	1.80	-7.75	< 0.01
Credit Profiles								
1(Verified Bank Account)	1.00	0.00	1.00	0.00	1.00	0.00	–	–
Debt/Income (DTIR) (%)	19.77	33.48	19.68	31.32	19.84	35.05	-0.16	0.44
1(Top Coded DTIR)	6.75e-04	0.03	5.20e-04	0.02	7.93e-04	0.03	–	–
1(Missing DTIR)	0.10	0.31	0.11	0.32	0.10	0.30	–	–
1(Homeowner)	0.51	0.50	0.52	0.50	0.50	0.50	1.49	0.93
Amount Delinquent	765.44	6035.19	661.71	4283.06	844.65	7087.08	-1.07	0.14
Bankcard Utilization (%)	50.73	32.59	52.88	33.07	49.09	32.13	3.83	1
Current Credit Lines	9.24	5.18	9.20	5.12	9.27	5.23	-0.45	0.33
Current Delinquencies	0.34	1.13	0.35	1.16	0.33	1.12	0.77	0.78
Delinquencies Last 7 Years	2.91	7.66	2.67	6.89	3.09	8.20	-1.89	0.03
Inquiries Last 6 Months	0.94	1.38	0.99	1.47	0.91	1.30	1.87	0.97
Length Credit History	5997.56	2821.95	5945.18	2843.14	6037.56	2805.56	-1.08	0.14
Open Credit Lines	8.15	4.67	8.10	4.64	8.19	4.70	-0.65	0.26
Pub Rec Last 12 Months	0.01	0.120	0.01	0.10	0.02	0.13	-1.38	0.08
Pub Rec Last 10 Years	0.26	0.65	0.26	0.64	0.27	0.67	-0.42	0.34
Revolving Credit Balance	16409.10	34784.77	16615.13	33808.10	16251.77	35518.38	0.35	0.64
Stated Monthly Income	5533.68	12454.72	5040.51	4108.85	5910.26	16136.82	-2.60	< 0.01
Total Credit Lines	25.43	13.56	25.21	13.61	25.60	13.53	-0.95	0.232
Total Open Accounts	6.26	4.19	6.21	4.13	6.30	4.23	-0.73	0.23
Observations	4446		1925		2521			

[a]This table presents the summary statistics of the corresponding variables from the funded loans. The data sampling period in this table is between August 20, 2010 and April 19, 2011. The regime change occurred on December 20, 2010. We conduct two sample t-test for each variable. The alternative is that the mean of the corresponding variable in the auction stage is less than that in the posted-price stage. The "Stated Monthly Income" and "Debt/Income" are reported by the borrowers, while other credit profiles are provided by Experian.

Figure 1: Daily Percentage of Funded Loans before and after the Regime Change[16]

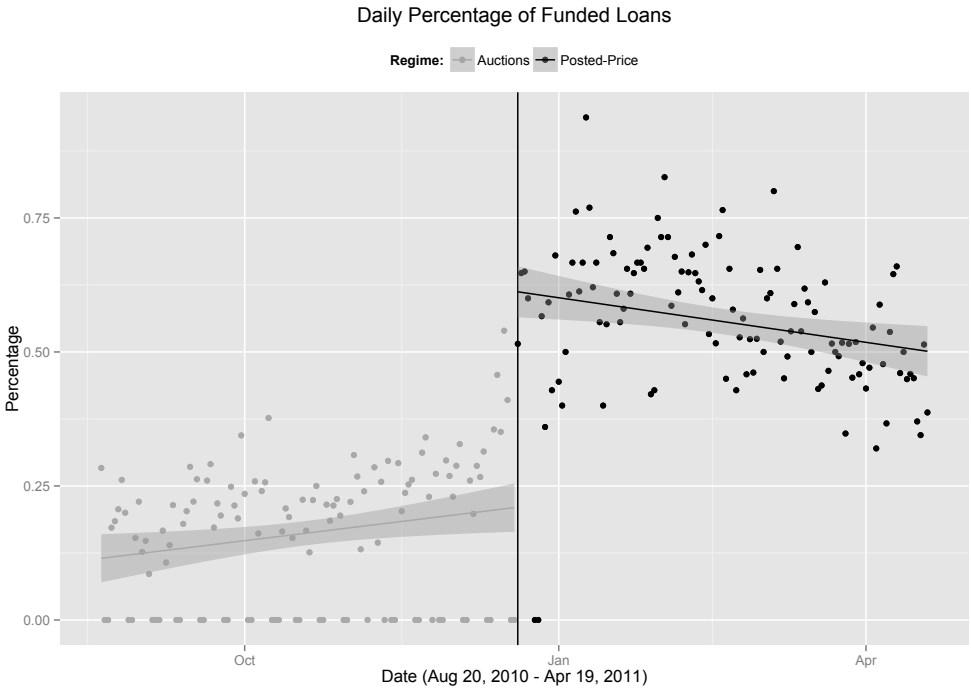
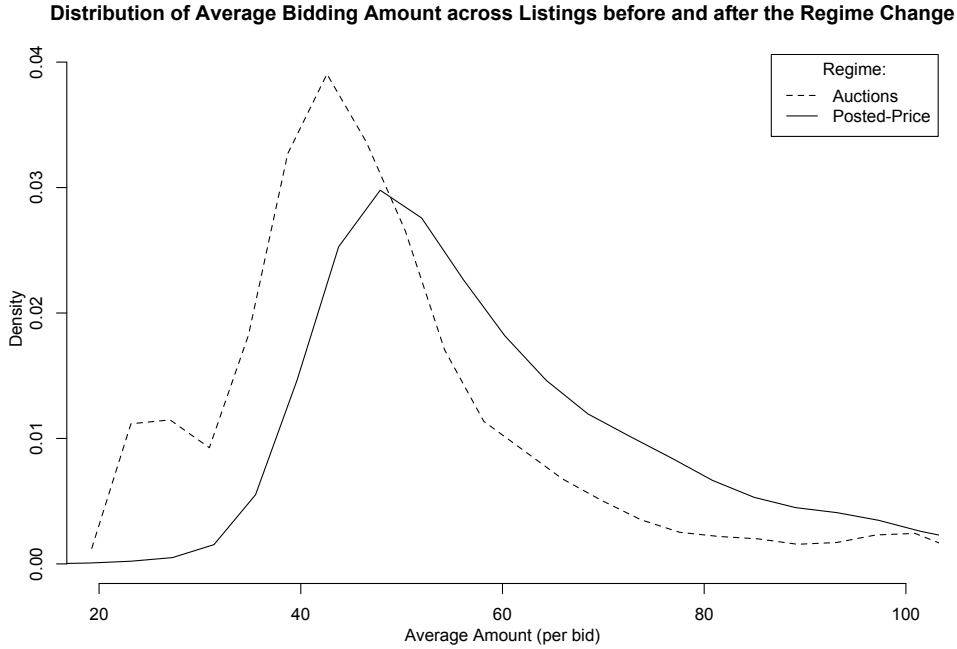


Figure 2: Distribution of Average Amount across Listings before and after the Regime Change



[16]The regime change date is December 20, 2010.

Table 4: Length of Time (hours) until Receiving Full Funding

	Auctions[a]	**Posted-Price**
Statistics	Hours until Fully Funded	Hours until Fully Funded
Median	**164.40**	**80.26**
Mean	132.70	127.80
s.d.	48.49	119.95
Min.	0.19	0.02
Max.	169.10	336.20
Num. obs.	1925	2521
Typical Listing Duration (days)	7	14

[a]This table contains summary statistics on the length of elapsed time (in hours) before a loan receives full funding. Thus the sample used in this table contains all funded loans.

E Estimation Results

Table 5: Comparison of *Initial* Interest Rates

	OLS Results				
Dep. var.: Initial Interest Rate	Spec 1	Spec 2	Spec 3	Spec 4	Spec 5[a]
1(Posted-Price) (β_1)	-3.604***	-2.445***	-2.007***	-1.001***	1.113***
	(0.164)	(0.160)	(0.158)	(0.142)	(0.083)
1(Electronic Transfer)		-3.160***	1.512	0.830	-0.508
		(0.898)	(1.072)	(0.993)	(0.608)
1(With Description)		0.955	14.543***	11.800***	2.927***
		(1.842)	(1.983)	(1.644)	(0.829)
1(Group Member)		0.421	1.083***	0.721**	0.526***
		(0.341)	(0.337)	(0.298)	(0.202)
1(Images)		-0.288	-0.218	0.012	0.285*
		(0.223)	(0.217)	(0.198)	(0.151)
Amount Requested		-0.001***	-0.001***	-0.001***	-0.125e-03***
		(0.144e-04)	(0.148e-04)	(0.151e-04)	(0.111e-04)
Self-Reported Credit Information					
Debt/Income (DTIR)			0.053***	0.053***	4.292e-04
			(0.007)	(0.008)	(0.002)
1(Top Coded DTIR)			-47.923***	-52.613***	-3.646
			(7.366)	(7.781)	(2.425)
1(Missing DTIR)			3.566***	4.486***	0.322*
			(0.311)	(0.308)	(0.178)
Stated Monthly Income			-0.995e-05*	-0.122e-04**	0.301e-05*
			(0.533e-05)	(0.530e-05)	(0.166e-05)
Credit Profile from Borrower's Credit Report					
1(Homeowner)				-1.285***	-0.078
				(0.178)	(0.110)
DTIR * 1(Homeowner)				0.880*	0.454**
				(0.476)	(0.220)
Bankcard Utilization				0.076***	-0.001
				(0.002)	(0.002)
Current Delinquencies				0.779***	0.066
				(0.104)	(0.050)
Inquiries Last 6 Months				1.106***	0.053*
				(0.043)	(0.029)
Open Credit Lines				0.022	0.112***
				(0.050)	(0.036)
Public Records Last 12 Months				-0.184	-0.069
				(0.475)	(0.252)
Revolving Credit Balance				-0.550e-05***	0.867e-06
				(0.190e-05)	(0.137e-05)
Total Credit Lines				-0.012*	-0.011**
				(0.007)	(0.005)
Length Credit History				-0.916e-04***	0.906e-04***
				(0.252)	(0.015e-03)
Amount Delinquent				-0.011e-03	-0.103e-04
				(0.012e-03)	(0.747e-05)
Current Credit Lines				-0.070	-0.119***

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	OLS Results				
Dep. var.: Initial Interest Rate	Spec 1	Spec 2	Spec 3	Spec 4	Spec 5[a]
				(0.047)	(0.034)
Delinquencies Last 7 Years				0.117***	0.026***
				(0.009)	(0.005)
Public Records Last 10 Years				0.761***	0.330***
				(0.127)	(0.066)
(Intercept)	25.580***	33.063***			
	(0.102)	(2.050)			
Employment Status	No	No	Yes	Yes	Yes
Borrower Occupation	No	No	Yes	Yes	Yes
Borrower State	No	No	Yes	Yes	Yes
IR Category FE	No	No	No	No	Yes
Adj. R^2	0.034	0.196	0.906	0.923	0.966
Num. obs.	13017	13017	13017	13017	13017

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

[a]This table contains the estimation results from simple linear regression models that explores the regime change effect on the *initial* interest rates. In Spec 3, 4, and 5, we include dummies for borrower demographics, such as dummies of borrower states and occupations. Robust standard errors are reported in this table.

Table 6: Matching Estimates for the Comparison of *Contract* Interest Rates

	Spec 1[a]			**Spec 2**		
$y =$ *Contract* Interest Rates	$M = 1$	$M = 4$	$M = 8$	$M = 1$	$M = 4$	$M = 8$
1(Posted-Price)	0.482	-0.135	-0.268	1.065	1.205**	1.423***
	(0.813)	(0.606)	(0.485)	(0.779)	(0.554)	(0.455)
Num. obs.	4446	4446	4446	4446	4446	4446

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

[a]This table presents the nearest-neighbor propensity score matching estimates of the average treatment effect (ATE). Those empirical models explore the regime change effect on the *contract* interest rates for funded loans. In Specification 1, the matching covariates include all the exogenous covariates as in Spec 3 of Table 5. In Specification 2, we include all the covariates as in Spec 5 of Table 5. M is the number of matches that should be found. Typically the rule of thumb for this number is 3 or 4. The standard errors reported in this table are calculated by the method suggested in Abadie and Imbens (2006). All the estimations are performed in R (see Sekhon (2011)).

Table 7: Comparison of Funding Probabilities

	Logit Results (Average Partial Effects[a])				
Dep. var.: 1(Loan Funded)	Spec 1	Spec 2	Spec 3	Spec 4	Spec 5
1(Posted-Price)	0.289***	0.313***	0.308***	0.286***	0.238***
	(0.006)	(0.007)	(0.007)	(0.007)	(0.008)
1(Electronic Transfer)		0.166**	0.151**	0.134**	0.070
		(0.070)	(0.068)	(0.067)	(0.064)
1(With Description)		0.086	0.057	0.064	0.078
		(0.088)	(0.088)	(0.089)	(0.085)
1(Group Member)		0.077***	0.031*	0.038**	-0.002
		(0.018)	(0.018)	(0.018)	(0.018)
1(Images)		0.019	0.021*	0.015	-0.003
		(0.012)	(0.012)	(0.011)	(0.011)
Amount Requested		-0.143e-04***	-0.015e-03***	-0.185e-04***	-0.243e-04***
		(0.917e-06)	(0.921e-06)	(0.938e-06)	(0.104e-05)
Self-Reported Credit Information					
Debt/Income (DTIR)			-0.001***	-0.002***	-4.226e-04*
			(2.324e-04)	(2.908e-04)	(0.022e-02)
1(Top Coded DTIR)			0.936***	1.715***	0.289
			(0.260)	(0.293)	(0.231)
1(Missing DTIR)			-0.120***	-0.145***	-0.049***
			(0.016)	(0.016)	(0.016)
Stated Monthly Income			-0.161e-06	-0.118e-06	-0.271e-06
			(0.260e-06)	(0.257e-06)	(0.251e-06)
Credit Profile from Borrower's Credit Report					
1(Homeowner)				0.022**	0.009
				(0.010)	(0.009)
DTIR * 1(Homeowner)				0.014	0.016
				(0.022)	(0.019)
Bankcard Utilization				-0.932e-04	0.001***
				(1.236e-04)	(1.364e-04)
Current Delinquencies				-0.020***	-0.005
				(0.004)	(0.004)
Inquiries Last 6 Months				-0.044***	-0.017***
				(0.003)	(0.003)
Open Credit Lines				0.002	4.505e-04
				(0.003)	(0.003)
Public Records Last 12 Months				-0.060*	-0.056*
				(0.031)	(0.030)
Revolving Credit Balance				-0.260e-06**	-0.271e-06**
				(0.121e-06)	(0.120e-06)
Total Credit Lines				0.001*	4.489e-04
				(4.055e-04)	(3.948e-04)
Length Credit History				0.155e-05	-0.141e-05
				(0.147e-05)	(0.143e-05)
Amount Delinquent				-0.141e-05**	-0.140e-05**
				(0.690e-06)	(0.655e-06)
Current Credit Lines				0.001	0.001
				(0.003)	(0.003)
Delinquencies Last 7 Years				-0.001***	1.082e-04

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	Logit Results (Average Partial Effects[a])				
Dep. var.: 1(Loan Funded)	Spec 1	Spec 2	Spec 3	Spec 4	Spec 5
				(0.001)	(0.001)
Public Records Last 10 Years				0.016***	0.022***
				(0.006)	(0.006)
Employment Status	No	No	Yes	Yes	Yes
Borrower Occupation	No	No	Yes	Yes	Yes
Borrower State	No	No	Yes	Yes	Yes
IR Category FE	No	No	No	No	Yes
Num. obs.	13017	13017	13017	13017	13017

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

[a]This table presents the estimation results of logit models that explores the regime change effect on the funding probability. We report average partial effects. Similar results hold for marginal effects at the mean. In Spec 3, 4, and 5, we include dummies for borrower demographics, such as dummies of borrower states and occupations.

Table 8: Comparing the Loan Outcomes (Loan Default Rates)

	Logit Results (Average Partial Effects[a])			
Dep. var.: 1(Loan Defaulted)	Spec 1	Spec 2	Spec 3	Spec 4
1(Posted-Price)	0.023***	0.027***	0.026***	0.019*
	(0.008)	(0.009)	(0.009)	(0.010)
1(Electronic Transfer)		-0.111**	-0.118**	-0.106*
		(0.052)	(0.060)	(0.060)
1(Group Member)		-0.042*	-0.035	-0.024
		(0.023)	(0.024)	(0.025)
1(Images)		-0.011	-0.011	-0.003
		(0.015)	(0.016)	(0.016)
Amount Requested		-0.554e-05***	-0.375e-05***	0.282e-05*
		(0.128e-05)	(0.140e-05)	(0.169e-05)
Self-Reported Credit Information				
Debt/Income (DTIR)			-0.942e-04	0.318e-04
			(1.508e-04)	(1.587e-04)
1(Top Coded DTIR)			0.128	-0.009
			(0.175)	(0.178)
1(Missing DTIR)			-0.017	-0.009
			(0.019)	(0.019)
Stated Monthly Income			-0.601e-05***	-0.356e-05*
			(0.213e-05)	(0.214e-05)
Credit Profile from Borrower's Credit Report				
1(Homeowner)				-0.011
				(0.011)
DTIR * 1(Homeowner)				0.014
				(0.017)
Bankcard Utilization				-2.678e-04*
				(1.459e-04)
Current Delinquencies				0.010***
				(0.003)
Inquiries Last 6 Months				0.011***
				(0.003)
Open Credit Lines				-0.007**
				(0.003)
Public Records Last 12 Months				0.003
				(0.032)
Revolving Credit Balance				-0.207e-06
				(0.243e-06)
Total Credit Lines				-0.001
				(4.667e-04)
Length Credit History				0.319e-05**
				(0.162e-05)
Amount Delinquent				0.201e-06
				(0.508e-06)
Current Credit Lines				0.005
				(0.003)
Delinquencies Last 7 Years				-4.012e-04
				(0.001)
Public Records Last 10 Years				-0.004

Continued on next page

	Logit Results (Average Partial Effects[a])			
Dep. var.: 1(Loan Defaulted)	Spec 1	Spec 2	Spec 3	Spec 4
				(0.007)
Employment Status	No	No	Yes	Yes
Borrower Occupation	No	No	Yes	Yes
Borrower State	No	No	Yes	Yes
IR Category FE	No	No	No	Yes
Num. obs.	4062	4062	4062	4062

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

[a]This table contains the estimation results from logit models that explore the effect of the regime change on the probability of default for funded loans. In the logit models we focus on loans with 36-month maturity. We look at the repayment status at the loans' 12th-month maturity. The results are robust to the choice of maturity. The average partial effects are reported. Similar results hold for marginal effects. In Spec 4, we include dummies for borrower demographics, such as dummies of borrower states and occupations.

F Lenders' Herding Behavior

Table 9: Comparison of Herding Behavior

	Within Estimates[a]	
Dep. var.: Daily fund received	**Auctions**	**Posted-Price**
Lag Cum Amount	0.027*	-0.172***
	(0.014)	(0.018)
Lag Percent Needed	-0.005***	-0.003***
	(0.000)	(0.001)
Lag Min Rate	-0.098***	
	(0.022)	
Lag Bids	-0.001	0.015***
	(0.001)	(0.001)
Lag Cum Amount * Lag Percent Needed	0.001***	0.008***
	(0.000)	(0.000)
Listing FE	Yes	Yes
Day of Listing FE	Yes	Yes
Weekday FE	Yes	Yes
Adj. R^2	0.090	0.252
Num. obs.	24773	21366

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

[a]This table presents the within estimates of a panel model that explores the correlation between the funds received in a day, and the total funds received by the end of previous day. The dependent variable is the daily total amount of funds a listing receives before it expires. This key independent variable records the cumulative funding that a listing receives at the beginning of each day before it expires. The complete specifications can be found in Zhang and Liu (2012). Note that the listings sampled in this table include only those with at least one bid.