Measuring the Welfare Cost of Asymmetric Information in Consumer Credit Markets

Online Appendices

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A Monopoly Extension

A.1 Equilibrium Pricing Under Monopoly

This section extends the conceptual framework of Section 2 to the case of a monopolist lender. The demand side of the model is the same as in the basic setup. The condition determining the socially efficient outcome is also identical. The key difference lies in how the market structure affects the equilibrium outcome. In the case of monopoly, the lender no longer behaves as if she were a price-taker. Instead, she chooses the interest rate to maximize her profit taken as given how demand responds to the market price.

When there is only a single lender in the market, total profits (per-dollar lent) are given by

$$\Pi(r) = \int (r - \delta(X)\theta(X)(1+r) - c)\mathbb{1}(\rho(X) \geq r)dF(X). \tag{A.1}$$

Rearranging terms in equation (A.1) yields the following alternative expression for profits:

$$\Pi(r) = \underbrace{r\int (1-\delta(X)\theta(X))\mathbb{1}(\rho(X) \geq r)dF(X)}_{\text{Expected Total Revenue}} - \underbrace{\int c(X)\mathbb{1}(\rho(X) \geq r)dF(X)}_{\text{Expected Total Cost}}.$$

Applying the definitions of the demand, average, and total cost curves simplifies this further:

$$\Pi(r) = rD(r)(1+c-AC(r)) - TC(r). \tag{A.2}$$

A monopolist lender chooses the interest rate to maximize equation (A.2) taking into account the fact that higher interest rates will both decrease demand and, due to adverse selection, increase average costs.

Taking the derivative of equation (A.2) and setting it equal to zero yields the following first-order condition:

$$r = \frac{MC(r)}{(1+c-MC(r)) + \eta(1+c-AC(r))}, \tag{A.3}$$

where $\eta = \frac{D(r)}{D'(r)r}$ denotes the inverse interest rate elasticity of demand and $MC(r)$ is defined as in equation (4). As is standard, this expression states that a monopolist will set the interest rate to be a markup over marginal cost and that the markup is decreasing in the elasticity of demand.

To provide further intuition for this equilibrium condition, let $TR(r) = rD(r)$ denote the lender's total promised revenue as a function of the offered interest rate. This is the revenue the lender earns if the borrower does not default and pays the loan off according to its stated terms.

The marginal revenue curve, defined as the change in total promised revenue when additional borrowers are drawn into the market at a marginally lower price, can be similarly expressed as

$$MR(r) = \frac{\partial TR(r)}{\partial D(r)} = \frac{D(r) + rD'(r)}{D'(r)} = r(1+\eta). \tag{A.4}$$

Because $\eta < 0$, marginal revenue is always less than the interest rate. This is the classic situation faced by a monopolist. Attracting an additional borrower by lowering the interest rate requires the lender to forgo revenue from all inframarginal borrowers who were willing to pay the previously higher price.

Rearranging equation (A.4) to solve for r and substituting into the left hand side of equation (A.3) allows us to re-express the monopolist's first-order condition as

$$MR(r) = \frac{MC(r)}{1 + c - \left(\frac{1}{1+\eta} MC(r) + \frac{\eta}{1+\eta} AC(r)\right)} \equiv \widehat{MC}(r). \tag{A.5}$$

This expression mirrors the standard monopoly pricing condition and states that, in equilibrium, the lender will set the interest rate to equate marginal revenue to a scaled version of marginal cost. The scaling factor in the denominator on the right-hand side of equation (A.5) reflects the fact that lenders do not always receive their quoted price and adjusts the marginal cost curve upward to incorporate the possibility of default.

A.2 Graphical Representation and Measuring Welfare Losses

Figure A.1 illustrates the equilibrium pricing condition from equation (A.5) graphically and compares it to the competitive outcome. Panel A., repeated from Figure I, depicts the equilibrium and efficient allocations under perfect competition. Panel B. plots these allocations under monopoly pricing. The socially efficient allocation is independent of the market structure and is governed in both cases by the intersection of the demand and $\widetilde{MC}$ curves at points B and E.

The equilibrium outcome differs across the two market structures. In Panel B., the dashed blue line plots the lender's marginal revenue curve and the dashed orange line plots the $\widehat{MC}$ curve. As is standard under linear demand, the marginal revenue curve falls twice as fast as demand and intersects the x-axis halfway between the origin and the x-intercept of the demand curve. The equilibrium outcome under monopoly occurs at point C and is determined by the intersection of the marginal revenue curve and the $\widehat{MC}$ curve. Because marginal revenue is always less than demand, the monopoly equilibrium results in a lower quantity and higher price than under perfect competition. This can be seen in the figure by the fact that $Q_M^{EQ} < Q_C^{EQ}$ and $r_M^{EQ} > r_C^{EQ}$.

Under perfect competition, the only source of inefficient pricing is adverse selection. Under monopoly, the equilibrium outcome differs from the efficient allocation due to both adverse selection and market power. That is, even in the absence of adverse selection, the monopoly outcome would be inefficient. Thus, to determine the portion of the inefficiency solely due to adverse selection, we must first solve for what the monopoly equilibrium would be in the absence of any adverse selection.

The defining characteristic of adversely selected markets is that borrowers who are willing to accept higher interest rates also have higher expected costs. This correlation between willingness to pay and expected costs is what generates the downward sloping cost curves in Figure A.1. In the absence of any selection, there would be no correlation between willingness to pay and expected costs. This means that the (scaled) marginal cost curve would be independent of the interest rate, constant across quantities, and always equal to (scaled) average cost. When marginal cost is constant, so too is the $\widehat{MC}$ curve that determines the monopoly outcome. We therefore model the elimination of adverse selection as a rotation and flattening of the $\widetilde{MC}$ curve around the efficient allocation.[1] This is depicted in Panel B. of Figure A.1 by the horizontally dashed line at $r^{EF} = \widehat{MC}_{NS} = \widetilde{MC}_{NS}$. The equilibrium in this case would occur at point D, where marginal revenue is equal to the efficient price. The difference between r_M^{EQ} and r_{NS}^{EQ} measures the additional price distortion that arises specifically due to adverse selection under monopoly. Similarly, the difference between Q_M^{EQ} and Q_{NS}^{EQ} measures the share of consumers who are inefficiently priced out of the market due to adverse selection but who would have received credit even under monopoly pricing without adverse selection.

Figure A.2 illustrates the welfare losses that arise under monopoly pricing with adverse selection. As before, the total deadweight loss can be calculated as the difference between consumers' willingness to pay and lender's marginal cost summed across all consumers who are inefficiently priced out of the market in equilibrium. The large shaded region (ACE) depicts these losses. The darker region (BCD) measures the portion of these losses that would arise under monopoly pricing even in the absence of adverse selection. The lighter region (ABDE) measures the additional losses due to adverse selection alone.

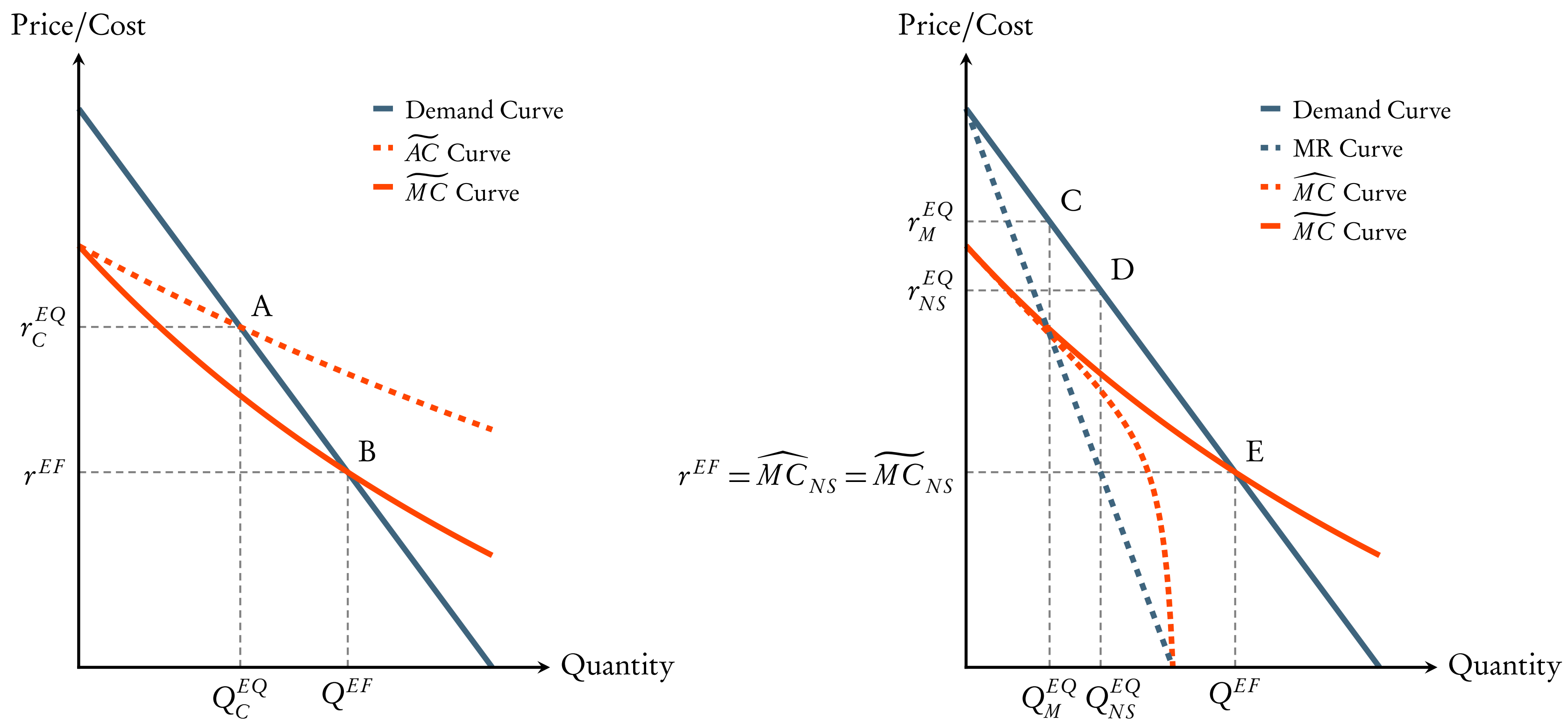
[1]Strictly speaking, the level of marginal cost in the absence of adverse selection and thus the point around which the $\widetilde{MC}$ curve is rotated are not uniquely determined. However, rotating the curve around the efficient outcome provides a natural counterfactual as doing so holds constant the equilibrium outcome under perfect competition without selection. An alternative approach would be to rotate the *average* cost curve around its minimal value as in Mahoney and Weyl (2017). This approach has the advantage of holding constant the average cost in the population, but would result in a different efficient outcome and therefore not allow for a clean comparison to the perfect competition benchmark. Nonetheless, our empirical results below are similar if we pursue this alternative approach instead.

A.3 Empirical Estimates

In Table A.1, we report empirical estimates of these quantities that are based on the same underlying demand and average cost curve estimates from Table II. The top two rows report the equilibrium price and quantity that would arise under monopoly in the presence of adverse selection. These estimates correspond to point C in Figure A.1 and imply that a monopoly lender facing the demand and cost curves we estimate would set a very high interest rate of almost 100 percent. In reality, the average interest rate the lender in our experiment offers is only 28.8 percent. This is much closer to the implied equilibrium interest rate of roughly 30 percent that would prevail under perfect competition (see Table II). We view this as a useful piece of evidence justifying our use of a competitive equilibrium benchmark in our main analysis.

Part of the reason the monopoly price is so high is due to market power and part is due to adverse selection. The second two rows of Table A.1 report estimates of the implied monopoly price and quantity that would arise in the absence of adverse selection. These estimates correspond to point D in Figure A.1 and indicate that much of the inefficient pricing is due to market power. Without adverse selection, a monopolist lender facing the demand curve we estimate would set an interest rate of roughly 90 percent. In both cases, the monopoly outcome features a substantially higher interest rate and lower take-up rate than the efficient outcome, which is repeated from Table II in the third and fourth rows for reference.

The last three rows of Table A.1 report estimated welfare losses. Under monopoly pricing, the total deadweight loss that arises in equilibrium due to both market power and adverse selection is equal to about 12.5 percent of the loan amount. Given the average loan size reported in Table I, this works out to a welfare loss of ¥788, or approximately $113 per applicant. Of that 12.5 percent loss, approximately 11.4 percent is due to market power. This implies that the welfare losses due to adverse selection alone are equal to only about one percent of the loan amount, or roughly ¥63 ($9) per applicant. Interestingly these losses are very similar to the losses we estimate under perfect competition. Given this, and the fact that the implied monopoly price is substantially higher than the prices actually charged by the lender in the data, we prefer to stick with a perfect competition benchmark for our main analysis.



Panel A. Competitive and Efficient Allocations

Panel B. Monopoly and Efficient Allocations

FIGURE A.1
Equilibrium and Efficient Outcomes Under Perfect Competition and Monopoly

NOTE.— This figure provides a graphical illustration of how adverse selection affects the equilibrium allocation of credit in both perfectly competitive and monopolistic markets. In both panels, the x-axis measures the share of potential borrowers in the market and the y-axis measures the price or cost of the loan as a share of the initial loan amount. The scale of these axes is the same across panels. The market depicted in the figure features adverse selection because the scaled marginal cost curve is downward-sloping. Borrowers who select into the market at the highest posted interest rates are also those with the highest expected costs. Panel A. illustrates the effect of adverse selection on the equilibrium market outcome under perfect competition. The competitive equilibrium is determined by the intersection of the demand and $\widetilde{AC}$ curves. The efficient allocation is determined by the intersection of the demand and $\widetilde{MC}$ curves. Panel B. illustrates the effect of of adverse selection on the equilibrium market outcome under monopoly. The monopoly equilibrium under adverse selection is determined by the intersection of the marginal revenue and $\widehat{MC}$ curves. This outcome is inefficient due to both adverse selection and market power. In the absence of adverse selection, the scaled marginal cost curve would be constant and is assumed to be equal to the efficient price. The monopoly outcome in this case would occur at point $(r_{NS}^{EQ}, Q_{NS}^{EQ})$, where the efficient price crosses the marginal revenue curve.

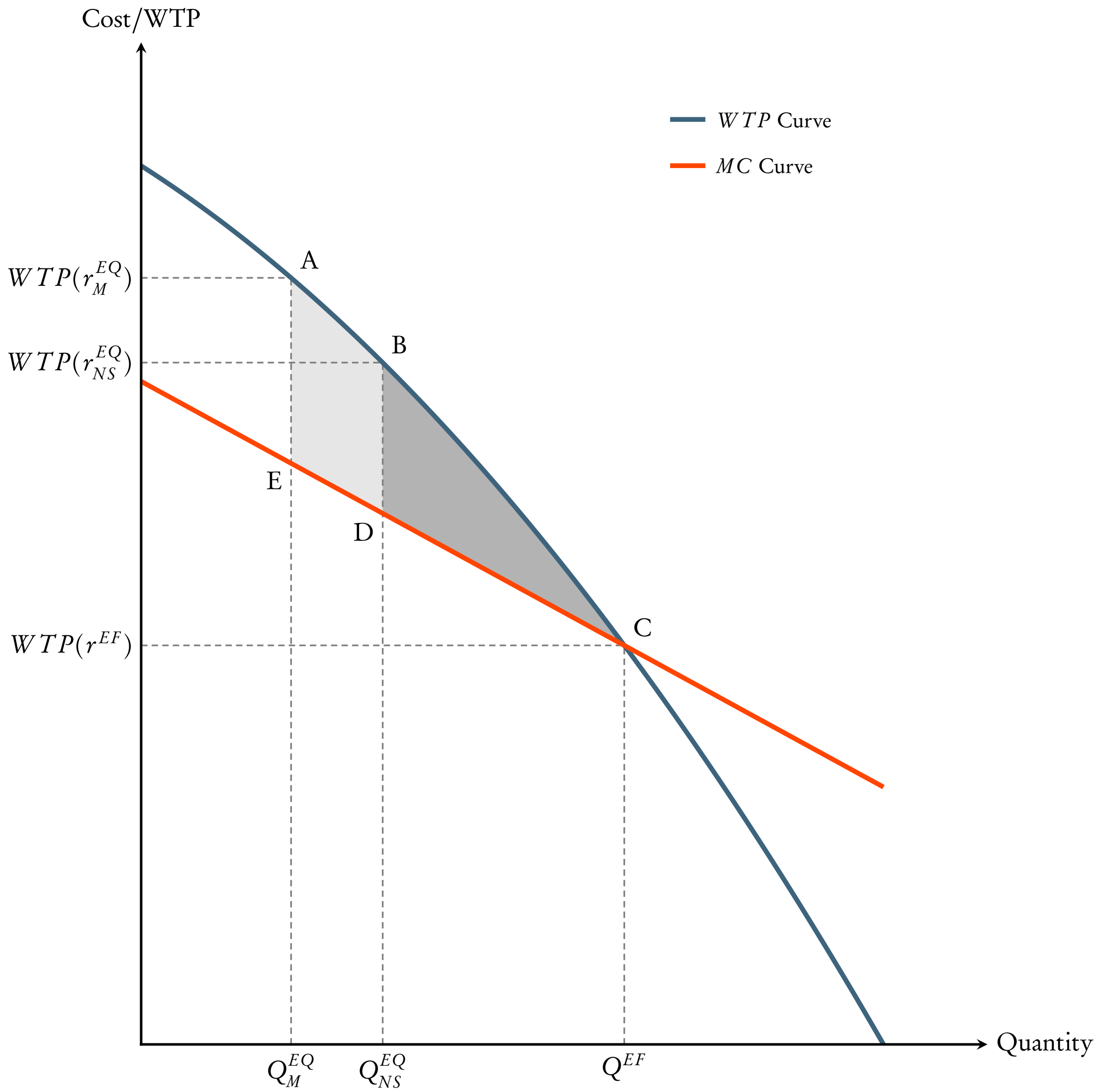


FIGURE A.2
Welfare Cost of Adverse Selection Under Monopoly

NOTE.— This figure provides a graphical illustration of the welfare cost of adverse selection in monopolistic markets. The x-axis measures the share of potential borrowers in the market and the y-axis measures the cost or willingness to pay for the loan as a share of the initial loan amount. The market depicted in the figure features adverse selection because the marginal cost curve is downward-sloping. Borrowers with the highest willingness to pay are also those with the highest expected costs. The monopoly outcome under adverse selection features inefficiently high equilibrium pricing and an underprovision of credit. This inefficiency arises due to both market power and asymmetric information. The total welfare loss due to both forces can be calculated as the difference between consumers' willingness to pay and lender's marginal cost summed across all consumers who are priced out of the market in equilibrium. The large shaded region (ACE) depicts these total losses. Some of these consumers would have been inefficiently priced out of the market under monopoly even in the absence of asymmetric information. The smaller dark shaded region (BCD) depicts the welfare losses that would arise under monopoly pricing in the absence of asymmetric information. The difference between these two areas (ABDE) depicts the portion of the overall losses under monopoly due to adverse selection alone.

TABLE A.1

IMPLIED QUANTITIES AND WELFARE ESTIMATES UNDER MONOPOLY

	(1)	(2)	(3)	(4)
Monopoly Outcome with Adverse Selection				
Price	0.972	0.978	0.978	0.987
Quantity	0.319	0.319	0.319	0.318
Monopoly Outcome without Adverse Selection				
Price	0.897	0.904	0.905	0.915
Quantity	0.351	0.350	0.350	0.348
Efficient Outcome				
Price	0.085	0.088	0.091	0.095
Quantity	0.703	0.701	0.700	0.697
Welfare Loss (per ¥100)				
With Adverse Selection	12.453	12.490	12.436	12.461
Without Adverse Selection	11.397	11.454	11.412	11.463
Loss Due to Adverse Selection	1.056	1.037	1.024	0.998
Demographics		X	X	X
Geography			X	X
Loan Size and Rating				X

NOTE.—This table reports estimates of the welfare losses due to adverse selection under monopoly pricing. These estimates are derived from the same underlying demand and average cost curve estimates reported in columns (1)–(4) of Table II, Panels A. and B. The top two rows of the table report the implied equilibrium monopoly price and quantity under adverse selection. The second two rows report the implied equilibrium monopoly price and quantity in the absence of adverse selection. The efficient price and quantity do not depend on the market structure are are repeated from Table II in the third and fourth rows for reference. Estimated welfare losses are reported in the bottom three rows. Losses with adverse selection include losses due to both market power and adverse selection. Losses without adverse selection include only losses generated by market power. The difference between these two quantities measures the additional losses that arise under monopoly pricing due specifically to adverse selection. All losses are calculated using the exact functional forms for the willingness to pay and marginal cost curve. See the text of Online Appendix A for details on how these implied quantities are calculated.

B Additional Descriptive Statistics

B.1 Continuous Covariate Distributions

Figure B.1 extends the covariate balance tests from Table I by showing the full distribution for the two continuous covariates in our analysis: loan size and borrower age. Each panel of the figure plots the distribution of the indicated variable separately for the High-Price and Low-Price groups. The vertically dashed orange line marks the mean value of the variable as reported in Table I. As is clear from the figure, the two treatment arms are similar along these dimensions both in terms of means and distributions. This provides further assurance that the randomization in the experiment we study was successful.

B.2 Sample Representativeness

In Table B.1 we compare the loans and borrowers in our sample to those from the ten largest online lending platforms in China, based on the transaction volume in the first quarter of 2018. The comparison data for other lending platforms were hand collected from WDZJ, an online platform used to compare lenders and loan terms. The summary statistics on loan terms and borrower characteristics for our sample are reported in the first column and those for other lending platforms in the second.

There is no evident first-order difference between loans offered on the platform we study and those offered by industry peers—except for loan size. The average loan size in our sample (¥6,255) is much lower than the industry average of ¥18,000. Borrowers in our sample are, however, similar to those borrowing on other platforms in terms of age distribution and marital status. As in our sample, the set of borrowers using other platforms also tilts male, although slightly less so (65 versus 77 percent).

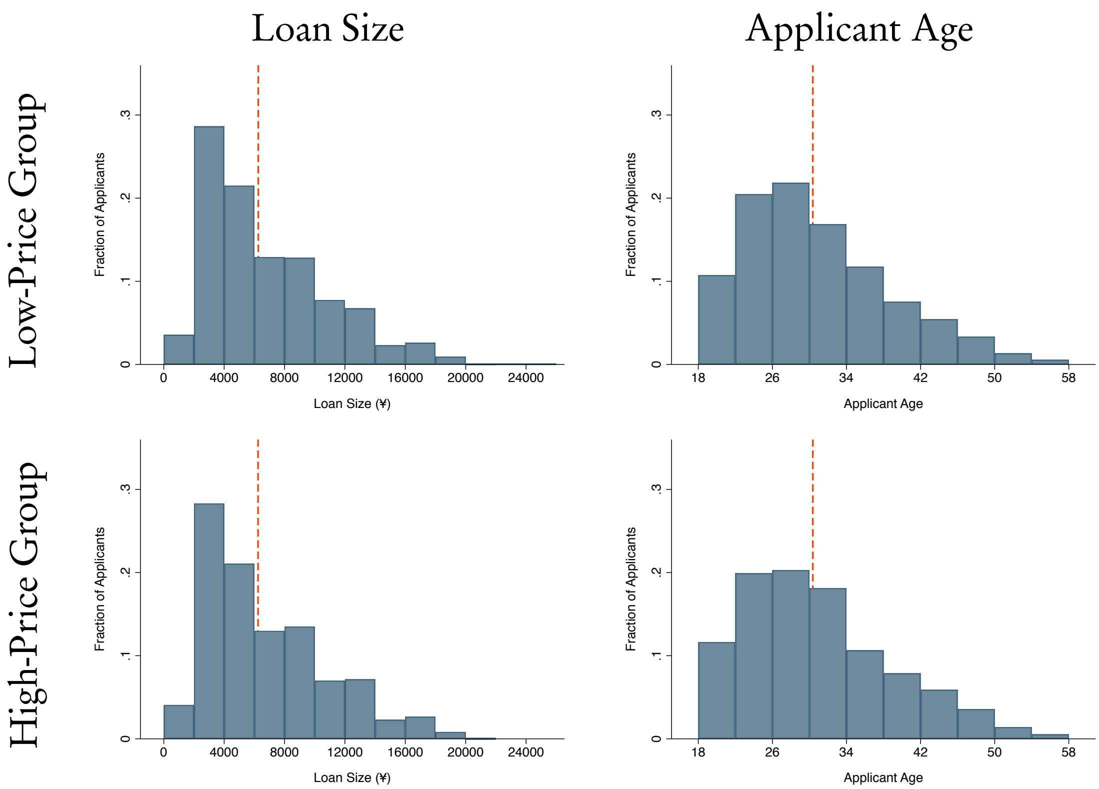


FIGURE B.1
Distributions of Loan Size and Applicant Age by Treatment Arm

NOTE.—This figure plots histograms showing the distribution of loan size (first column) and applicant age (second column) in the Low-Price (top row) and High-Price (bottom row) experimental treatment arms. The vertically dashed orange line marks the mean value of the variable in each sample.

TABLE B.1
LOAN AND BORROWER REPRESENTATIVENESS

	Our Sample	Industry Peers
Loan Characteristics		
Loan Size (¥)	6,255	18,000
Maturity (months)	12	12.65
Investment Return (%)	10.83	9.81
Borrower Characteristics		
Age Under 40 (%)	85	83
Male (%)	77	65
Single (%)	51	53

NOTE.—Summary statistics for industry peers are calculated based on the ten largest online lending platforms in China by transaction volume as of the first quarter of 2018. Data are hand collected from a portal website for online lending platforms: https://www.wdzj.com/. For example, statistics on loan characteristics are from https://www.wdzj.com/zhuanti/2018report/ and borrower characteristics are from https://www.wdzj.com/news/yc/2326325.html.

C Supplementary Empirical Results

C.1 First Stage Regression Results

Table C.1 and Table C.2 report the first stage regression results for the demand and cost curve regressions, respectively. In both tables, the dependent variable is the interest rate and the excluded instrument is an indicator variable for whether the borrower was assigned to the High-Price group. The samples used to estimate these regressions are the same as in Table II and control variables are introduced in the same order across columns.[2] The bottom panel of each table reports the F-statistic from a test of the significance of the excluded instrument. The results from both tables indicate that being assigned to the High-Price group leads to a statistically significant increase of 14.5 percentage points in the interest rate. Given random assignment, this difference is identical to the simple mean difference in interest rates across the two groups as reported in the first row of Table I.

C.2 Objective Function Convexity for Fixed Cost Estimation

In column 5 of Table II we estimate the fixed cost parameter c by minimizing the squared euclidean distance between the model-implied equilibrium outcome, (r^{EQ}, Q^{EQ}), and the mean interest rate and take-up rate in the data. Figure C.1 plots the value of this objective function at each candidate fixed cost we consider on an evenly spaced grid ranging from 0 to 0.25 with a step size of 0.0001. The vertically dashed orange line marks the estimated value for the fixed cost parameter, which is equal to 0.1309. As the figure makes clear, the objective function is convex over the range of values we consider. This implies that our estimated fixed cost represents a unique solution to the minimization problem over the range of values we consider.

C.3 Confidence Intervals for Implied Quantities

Table C.3 reports bootstrapped ninety-five percent confidence intervals for our baseline welfare estimates as well as all other implied quantities of interest reported in Table II. To construct these confidence intervals, we draw 1,000 independent samples from our data and then reestimate the demand curve, cost curve, and all implied quantities separately in each sample. The upper and lower bound of each confidence interval is given by the 97.5th and 2.5th percentiles of the distribution of estimates across bootstrap replicates. For example, the numbers reported in the second row of the first column indicate that the implied equilibrium price fell below 0.294 or above 0.317

[2] The first stage regressions for both the demand and cost curve in column 5 of Table II are identical to those in column 4 and are omitted from these tables.

in only 5 percent of the 1,000 random samples in which we estimated it. For reference, the table also repeats our baseline estimates from the full sample as reported in Panel C. of Table II.

C.4 Sensitivity of Welfare Estimates to the Demand Elasticity

Our empirical results indicate that the welfare loss from asymmetric information in the market for Chinese fintech consumer installment loans is small. This finding is driven by the fact that demand in this market is relatively inelastic, which implies that large price distortions generate only modest distortions in equilibrium quantities.

In Figure C.3 we show how the estimated welfare losses depend on the elasticity of demand. To generate this figure, we recalculate the welfare losses under a range of alternative slope coefficients for the demand curve while holding constant the cost curve parameters. For each candidate slope coefficient, we re-solve for the implied equilibrium and efficient allocations and calculate the elasticity at the midpoint between these allocations. We consider slope coefficients ranging from −0.1 to −1.2, which correspond to elasticities of roughly −0.02 and −1.03, respectively.

The orange dot plots our actual estimate from column 1 of Table II, which corresponds to a slope coefficient of −0.433, an elasticity of −0.13, and a welfare loss of 0.835 per ¥100 principal. Holding the parameters of the cost curve constant, larger elasticities (in absolute value) lead to larger welfare losses. For example, at a demand elasticity of −1, which is similar to the elasticity that Alessie, Hochguertel and Weber (2005) estimate for Italian consumer installment loans, the estimated welfare loss would equate to 5 percent of the loan amount on a per-applicant basis.

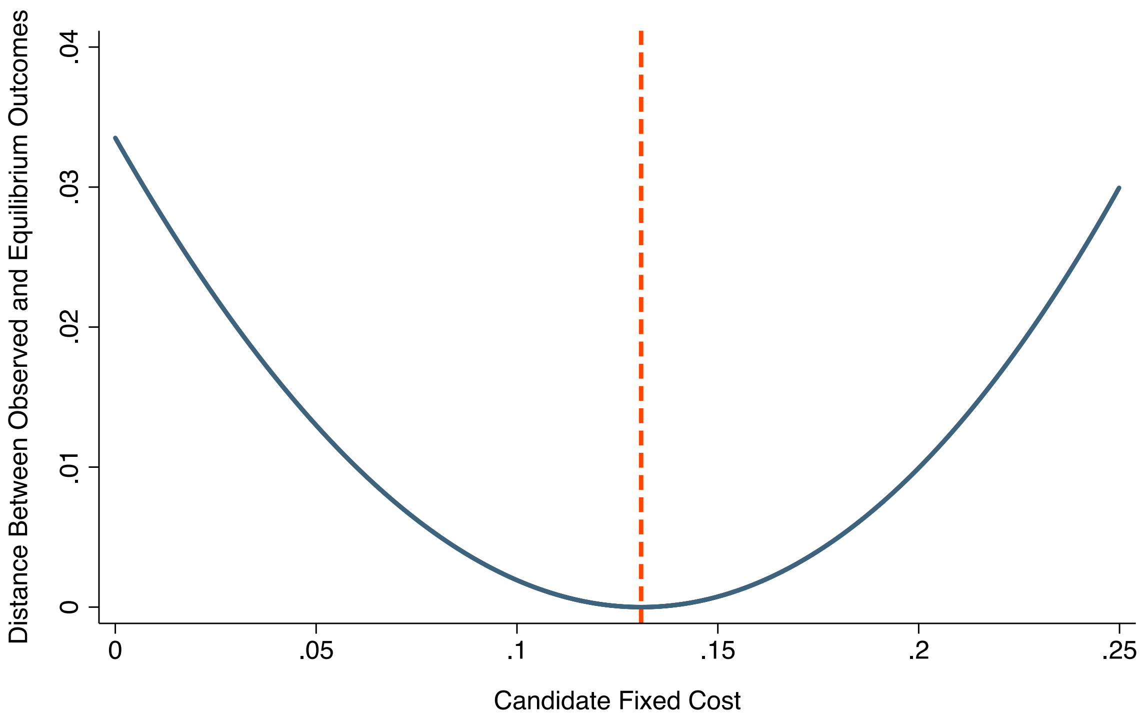


FIGURE C.1
Objective Function Values for Fixed Cost Estimation

NOTE.—This figure plots the value of the objective function used to estimate the fixed cost parameter c at each candidate fixed cost on an evenly spaced grid ranging from 0 to 0.25 with a step size of 0.0001. For each candidate fixed cost, we estimate the demand and average cost curves and compute the implied equilibrium outcome (r^{EQ}, Q^{EQ}). The objective function is the squared euclidean distance between this implied equilibrium outcome and the observed outcome in the data, which we take to be the average observed interest rate and take-up rate across the two treatment arms. The vertically dashed orange line marks the estimated value for the fixed cost parameter (i.e., the point at which the distance between the equilibrium and observed outcomes is minimized).

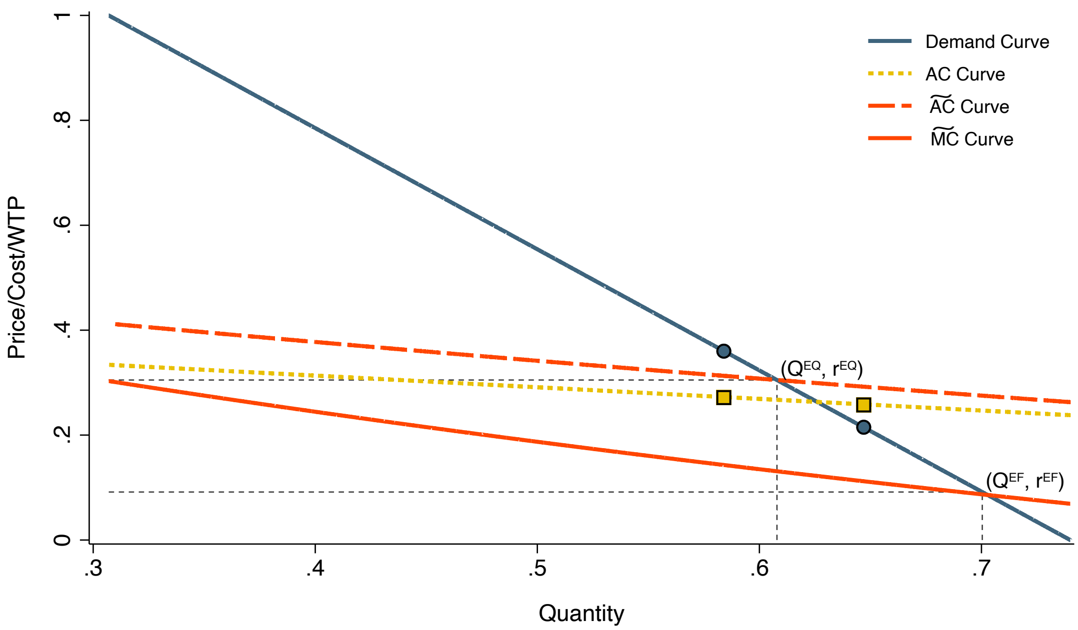


FIGURE C.2
Equilibrium and Efficient Allocations Under Asymmetric Information

NOTE.—This figure presents an extended version of Panel A. of Figure III. The x-axis measures the share of potential borrowers in the market. The y-axis measures price, cost, or willingness to pay for the loan as a share of the initial loan amount. The demand and average cost curves plotted correspond to those estimated in column 1 of Table II. The shaded circles and squares plot the actual data used to estimate these two curves. The two circles indicate the average observed interest rate and take-up rate in the High- and Low-Priced groups, whereas the two squares indicate the average observed cost (fixed cost plus charge-off rate) in each group. The scaled cost curves $\widetilde{AC}$ and $\widetilde{MC}$ are derived from the demand and average cost curves as described in Section 4. The competitive equilibrium is determined by the intersection of the demand and $\widetilde{AC}$ curves. The efficient allocation is determined by the intersection of the demand and $\widetilde{MC}$ curves. The equilibrium price and quantities (P^{EQ}, Q^{EQ}) and efficient price and quantities (P^{EF}, Q^{EF}) are denoted in the figure.

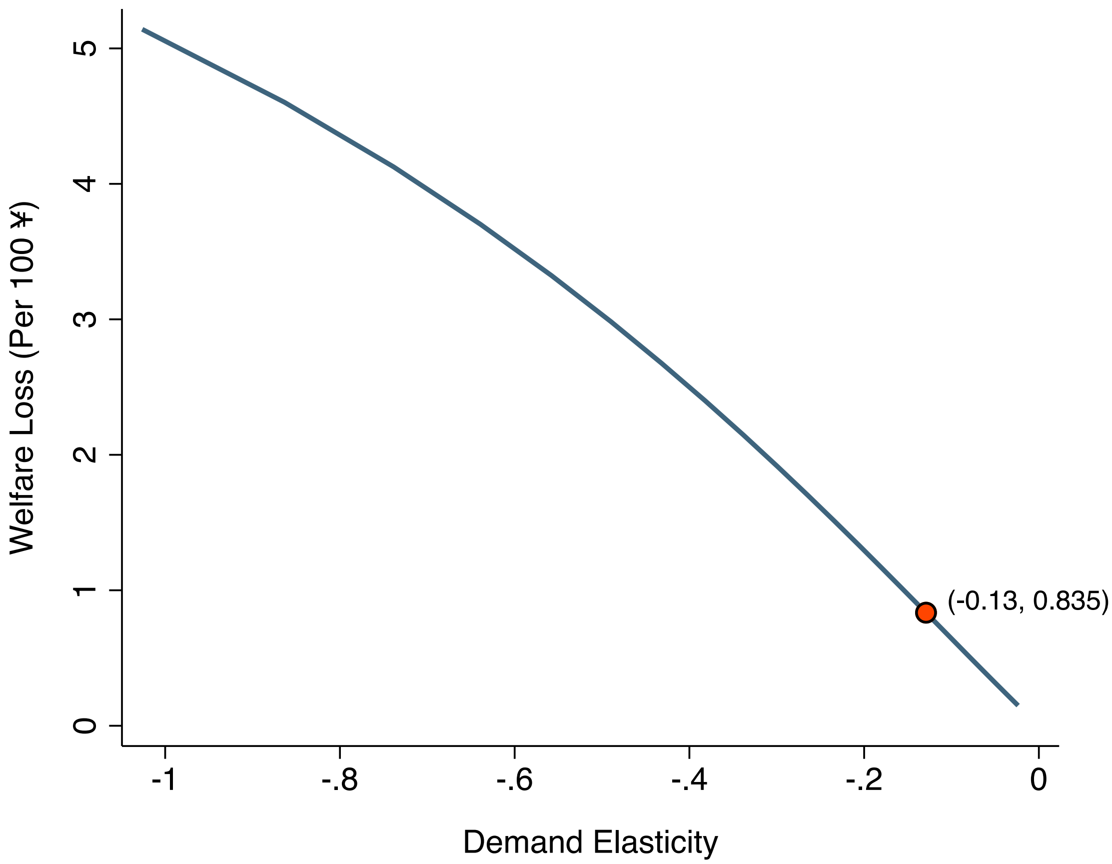


FIGURE C.3
Welfare Losses Under Alternative Demand Elasticities

NOTE.—This figure plots estimates of the welfare losses arising from asymmetric information under various alternative values for the interest rate elasticity of demand. Each point on the blue line represents a separate estimate of the welfare loss calculated using the same demand intercept and cost curve parameters from Table II, but altering the slope of the demand curve. For each candidate slope coefficient, we calculate the elasticity at the midpoint between the implied equilibrium and efficient allocations. The orange dot plots our actual estimate from column 1 of Table II, which corresponds to a slope coefficient of −0.433, an elasticity of −0.13, and a welfare loss of 0.835 per ¥100 principal.

TABLE C.1
FIRST STAGE ESTIMATES FOR DEMAND CURVE

	(1)	(2)	(3)	(4)
	Interest Rate			
High-Price Group	0.145***	0.145***	0.145***	0.145***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.215***	0.215***	0.215***	0.215***
	(0.000)	(0.000)	(0.000)	(0.000)
Demographics		X	X	X
Geography			X	X
Loan Size and Rating				X
F-statistic	84,945	84,945	85,015	87,371
Number of Observations	10,991	10,991	10,991	10,991

NOTE.—This table reports first stage results for the demand curve regressions. The first stage coefficient estimate on the excluded instrument is reported in the top row. The F-statistic from a test of the significance of the excluded instrument is reported in the bottom of the panel for each specification. Across columns we gradually add controls for demographics, borrower geography, credit rating, and loan size. Demographics include a linear term in age as well as indicator variables for gender, marital status and highest degree completed. Geographic controls include a series of indicator variables for city tier. We control for loan size using a linear term and credit rating with a series of indicator variables. All control variables are demeaned prior to estimation so that the intercept term can be interpreted similarly across specifications. Significance levels 10%, 5%, and 1% are denoted by *, **, and ***, respectively.

TABLE C.2
FIRST STAGE ESTIMATES FOR AVERAGE COST CURVE

	(1)	(2)	(3)	(4)
	Interest Rate			
High-Price Group	0.145***	0.145***	0.145***	0.145***
	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.211***	0.211***	0.211***	0.211***
	(0.000)	(0.000)	(0.000)	(0.000)
Demographics		X	X	X
Geography			X	X
Loan Size and Rating				X
F-statistic	59,143	59,083	59,092	60,439
Number of Observations	6,761	6,761	6,761	6,761

NOTE.—This table reports first stage results for the average cost curve regressions. The first stage coefficient estimate on the excluded instrument is reported in the top row. The F-statistic from a test of the significance of the excluded instrument is reported in the bottom of the panel for each specification. Across columns we gradually add controls for demographics, borrower geography, credit rating, and loan size. Demographics include a linear term in age as well as indicator variables for gender, marital status and highest degree completed. Geographic controls include a series of indicator variables for city tier. We control for loan size using a linear term and credit rating with a series of indicator variables. All control variables are demeaned prior to estimation so that the intercept term can be interpreted similarly across specifications. Significance levels 10%, 5%, and 1% are denoted by *, **, and ***, respectively.

TABLE C.3

BOOTSTRAPPED CONFIDENCE INTERVALS FOR IMPLIED QUANTITIES OF INTEREST

	(1)	(2)	(3)	(4)	(5)
Equilibrium Price	0.304	0.304	0.304	0.304	0.288
	[0.294, 0.317]	[0.294, 0.317]	[0.294, 0.316]	[0.294, 0.317]	[0.278, 0.299]
Equilibrium Quantity	0.608	0.608	0.608	0.608	0.615
	[0.597, 0.618]	[0.598, 0.618]	[0.598, 0.618]	[0.597, 0.618]	[0.605, 0.625]
Efficient Price	0.085	0.088	0.091	0.095	0.081
	[-0.131, 0.286]	[-0.133, 0.294]	[-0.128, 0.294]	[-0.129, 0.299]	[-0.141, 0.285]
Efficient Quantity	0.703	0.701	0.700	0.697	0.703
	[0.614, 0.781]	[0.612, 0.782]	[0.612, 0.780]	[0.608, 0.777]	[0.615, 0.783]
Welfare Loss (per ¥100): Approximate	0.835	0.806	0.787	0.750	0.743
	[0.025, 2.684]	[0.012, 2.647]	[0.009, 2.625]	[0.004, 2.555]	[0.005, 2.547]
Welfare Loss (per ¥100): Exact	0.849	0.820	0.800	0.762	0.754
	[0.006, 3.306]	[0.001, 3.291]	[0.001, 3.202]	[0.000, 3.127]	[0.000, 3.066]
Demographics		X	X	X	X
Geography			X	X	X
Loan Size and Rating				X	X
Estimated Fixed Cost					X

NOTE.—This table reports bootstrapped ninety-five percent confidence intervals (in brackets) for each point estimate reported in Panel C. of Table II. Confidence intervals are constructed by drawing 1,000 independent samples with replacement and reestimating the demand curve, cost curve, and all implied quantities separately in each sample. The ninety-five percent confidence interval is given by the 97.5th and 2.5th percentiles of the distribution of estimates across bootstrap samples. Point estimates for each implied quantity are also reported for reference and constructed as described in Section 4. Controls are introduced across columns in the same order as in Table II. Demographic controls include a linear term in age as well as indicator variables for gender, marital status and highest degree completed. Geographic controls include a series of indicator variables for city tier. We control for loan size using a linear term and credit rating with a series of indicator variables. All control variables are demeaned prior to estimation. In columns (1)–(4) the fixed cost parameter is calibrated to external estimates. In column (5) the fixed cost parameter is estimated to minimize the squared euclidean distance between the model-implied equilibrium outcome and the mean observed interest rate and take-up rate across the two treatment arms.

TABLE C.4
HETEROGENEITY IN DEMAND SENSITIVITY

	Age		Gender		Marital Status		Education		City Tier	
	Young	Old	Male	Female	Single	Married	Low	High	Big	Small
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Interest Rate	-0.390***	-0.465***	-0.442***	-0.404***	-0.564***	-0.292***	-0.405***	-0.462***	-0.437***	-0.427***
	(0.092)	(0.088)	(0.072)	(0.133)	(0.089)	(0.090)	(0.085)	(0.096)	(0.080)	(0.104)
Constant	0.756***	0.723***	0.732***	0.765***	0.758***	0.719***	0.758***	0.717***	0.737***	0.745***
	(0.027)	(0.026)	(0.021)	(0.039)	(0.026)	(0.027)	(0.025)	(0.029)	(0.024)	(0.031)
Number of Observations	5,164	5,827	8,494	2,497	5,590	5,401	6,037	4,954	6,891	4,100

NOTE.—This table reports estimates of the demand curve for various subgroups of loan applicants. Each column reports a separate regression that was estimated in the subsample of applicants indicated in the column header. The regression specification is the same as in column 1 of Table II and does not include any control variables. High education borrowers are those who have completed at least a high school degree. Large city borrowers are those living in city tiers 4–6. For age, the sample was split at the median.