

# Understanding the Coexistence of Formal and Informal Credit Markets in Piura, Peru

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**Summary.** — This paper examines why farm households seek informal loans in Piura, Peru, where formal lenders offer loans at lower interest rates. A panel data econometric analysis reveals that the informal sector serves various types of clients: households excluded from the formal sector but also households that prefer informal loans because of lower transaction costs or lower risk. An in-depth examination of contract terms and loan technologies permits an accurate comparison of effective loan costs and contractual risk across sectors and reveals that proximity and economies of scope enjoyed by informal lenders enable them to substitute information-intensive screening and monitoring for contractual risk and supply these various types of clients.

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## 1. INTRODUCTION

The existence of an informal credit market alongside a formal market where interest rates are substantially lower has long been recognized as a key feature of rural credit markets in developing countries and has received continuous attention in the field of development economics (Conning & Udry, 2005; Hoff & Stiglitz, 1990; Ray, 1998). Not only is the persistent segmentation of credit markets into an expensive informal sector and a cheaper formal sector puzzling, it is also worrying on equity grounds. As the poor typically rely on expensive informal credit to finance their economic activities, they may systematically earn a lower return from their investment and thereby be on a slower wealth accumulation path than the rich who borrow in formal markets (Conning & Udry, 2005).

Recent dramatic changes in credit policy had surprisingly little effect on the coexistence of loan sectors. The type of market-oriented rural credit policies currently in place in many developing countries began to be broadly implemented in the late 1980s. Previously, massive state intervention in agricultural credit markets was the rule in the developing world. State-operated lending programs offered credit at highly subsidized interest rates and poorly enforced repayment, while interest rate ceilings

were imposed in the private sector. Consequently, private banks were reluctant to lend, and, overall, the formal sector (including state programs and private banks) was unable to meet the large demand for the inexpensive loans offered, often at low risk to the borrower (Gonzalez-Vega, 1984, chap. 7; Von Pischke *et al.*, 1983). Households whose loan demand could not be met in the formal sector were quantity-rationed in that sector and had to rely on expensive informal loans to finance agricultural production. In this context, informal lenders were primarily the recipients of this “spillover” demand from the formal sector (Bell, Srinivasan, & Udry, 1997).

One of the hopes of liberalization was that the development of market-oriented financial institutions would displace the expensive

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informal sector and thereby increase equity in rural credit markets. However, empirical evidence from several countries suggests that informal credit markets persist alongside active formal credit markets several years after financial liberalization occurred.<sup>1</sup>

The theoretical literature suggests alternative explanations for why households might seek an informal loan even when a market-oriented formal credit sector is active. The first explanation, mentioned above, views the informal sector as the sector of last resort for households that are quantity-rationed in the more desirable formal sector. *Stiglitz and Weiss (1981)* show that endogenous quantity rationing may arise because formal lenders have limited local information and thus rely on collateral to overcome moral hazard and adverse selection intrinsic in credit transactions. Those who have insufficient collateral may be involuntarily excluded from the credit market but may instead obtain an informal loan since informal lenders, due to their informational advantages, can substitute information-intensive screening and monitoring for collateral (*Conning, 1996; Hoff & Stiglitz, 1990*).

Several authors challenge this view of the informal sector as the sector of last resort. Based on evidence from rural India, *Kochar (1992)* suggests that the informal sector may also be the sector of choice. She argues that informal loans, in particular those from friends or relatives, may be cheaper than formal loans and thus preferred by borrowers. *Chung (1995) and Mushinski (1999)* build on Kochar's view of the informal loan sector as the cheapest sector. They point out that high transaction costs related to loan application in the formal sector may discourage households from taking formal loans. *Barham, Boucher, and Carter (1996)* call these households transaction cost-rationed in the formal sector. Because informal lenders manage greater information about loan applicants, application procedures are easier in the informal sector and transaction costs are lower. As a result, the differences in transaction costs may drive the effective cost of informal loans below the effective cost of formal loans, and households that are transaction cost-rationed in the formal sector may take an informal loan despite its higher interest rate.

Finally, the informal sector may also be preferred because of risk. *Boucher and Guirking (2007)* argue that informal lenders' greater access to local information allows them to write contracts that are more state-contingent than formal contracts and thus are less risky for bor-

rowers. Therefore, households that unwilling to assume the risk of a formal contract, and are risk-rationed in the formal sector may seek an informal loan.<sup>2</sup>

The overall goal of this paper is to understand the persistence in the context of agricultural credit markets in Piura, one of the principal regions of commercial agriculture in Peru. Peru liberalized its financial sector in the 1990s and the rural formal credit market has shifted from being primarily state-led in the 1980s to being exclusively market-led in the late 1990s. While banks engage in rural lending, a vibrant informal credit sector continues to exist and to finance investment in agricultural production (*Trivelli, 2003*). In this context, the paper accomplishes three specific objectives. The first is to evaluate which of the explanations offered by the literature may account for the persistence of the informal loan sector in Piura. Using a household panel data set, we disentangle the motives behind households' use of informal loans and show that each of the three explanations mentioned above is operational and helps understand household demand for informal loans in the region. These econometric results suggest that credit contracts offered in the informal sector differ from contracts in the formal sector in terms of effective cost and risk. The second objective of this paper is thus to analyze these sectoral differences in contract terms. We first use the household panel data to compare interest rates, transaction costs, and collateral requirements as a proxy for contractual risk. However, as collateral requirements only partially capture contractual risk, we also explore the consequences of default based on interviews with formal and informal lenders and interviews with justices of the peace who resolve conflicts over informal contracts in rural Peru. This analysis provides a more in-depth and more accurate assessment of contractual risk than is afforded by conventional household survey data alone. The final objective of the paper is to examine how informal lenders proceed to overcome information asymmetries and alleviate quantity rationing, transaction cost rationing, and risk rationing prevalent in the formal sector. To do so, we investigate the differences in lending technologies—or strategies used to address information problems—that account for the differences in contract terms across lending sectors. We argue that informal lenders substitute screening and monitoring for contractual risk for the borrower to overcome adverse selection

and moral hazard. These practices are facilitated by informal lenders' physical and social proximity to borrowers and by the economies of scope informal lenders enjoy when they interlink credit to the other activities they engage in.

## 2. AN ECONOMETRIC ANALYSIS OF SECTORAL CHOICE IN PIURA

### (a) *Sample and data*

The data were collected in the rural coastal area of the department of Piura on Peru's north coast. A detailed survey was administered to 547 households in 1997, of which 499 were found and reinterviewed in 2003.<sup>3</sup> The population of interest includes all households that farmed at least one-half of a hectare of irrigated land in coastal Piura in 1997.<sup>4</sup> Agriculture in Piura is exclusively irrigated, highly commercial and represents one of the main sources of revenue for the region, accounting for 35% of employment and 13% of GDP (Fort, Boucher, Cortez, & Riesco, 2001). The road and port infrastructures are well developed, and part of the cotton, bananas, and mangoes produced in Piura are exported to the United States and Europe. Rice, corn, and lemon, on the other hand, are mainly sold domestically. Small farms control the majority of irrigated land. In 1997, average farm size was 3.5 ha and 90% of irrigated land was controlled by farms of a size less than 10 ha.<sup>5</sup>

In addition to conventional demographic and production sections, the survey contains two detailed credit modules. The first module captures information about all loans that were outstanding at some point during the 12 months prior to the survey. The second credit module includes a set of qualitative questions applied to households who did not borrow from the formal sector, in order to understand the reasons for non-participation in that sector. Together, these two modules permit classification of a household into one of the following formal sector rationing categories<sup>6, 7</sup>:

- *Price-rationed with loan (PRwl)*: the household borrows in the formal sector and obtains its desired amount.
- *Price-rationed without loan (PRwol)*: the household does not borrow in the formal sector because it has no profitable project that requires a formal loan.<sup>8</sup>

- *Quantity-rationed (QR)*: the household either applied for a formal loan but was rejected or does not seek a formal loan because it believes that its application would be rejected by a bank, or obtained a loan but of a lower amount than requested.

- *Transaction cost-rationed (TCR)*: the household has a profitable project that requires outside financing but does not seek a formal loan because the transaction costs are too high.

- *Risk-rationed (RR)*: the household has a profitable project that requires outside financing but does not seek a formal loan because the risk implied by available contracts is too high.

Table 1 reports the fraction of sample households that borrowed from each sector in the two survey years. The formal sector in Piura is composed of four local banks,<sup>9</sup> while the informal sector consists of a wide range of informal lenders who, in general, do not specialize in lending but manage a portfolio of activities related to agriculture, including selling inputs and marketing or processing outputs. Most informal lenders manage a few dozen loans each year, and tend to on-lend funds that they borrowed from banks. The semi-formal sector corresponds to NGOs and government programs offering subsidized loans to targeted groups of farmers. These programs have been largely shut down during 1997–2003 due to the deterioration of their financial situation when many farmers were not able to repay their debt after El Niño in 1998. The vast majority of households in Piura have no access to these loans, and thus this sector is largely ignored in the ensuing analysis. Table 1 reveals that the majority of households participated in credit markets, as 68% and 58% of the sampled households had a loan in 1997 and 2003, respectively. The informal sector was the largest sector in terms of participation. Based on self-reported use of loans by survey respondents, more than 90% of both formal and informal loans were invested in agricultural

Table 1. *Household credit market participation (499 households)*

	1997	2003
Only formal loan	19%	18%
Only informal loan	27%	26%
Both	7%	7%
Semi-formal loan	15%	7%
None	32%	42%

Table 2. *Informal loan use by formal sector outcome (sample pooled across years)*

Formal sector outcome	Frequency	Percentage using informal loans
PRwl	220	16
PRwol	224	25
QR	292	50
TCR	105	45
RR	157	41
Total	998	35

production. This high dependency on outside finance for farming is related to the high input requirements of the crops farmers grow.<sup>10</sup>

Table 2 reports the frequencies of formal sector rationing categories, and the percentage of households who use informal loans in each category. It reveals that, while only about 16% of households who borrow in the formal sector (PRwl) and 25% of those who have no project to finance with a formal loan (PRwol) use an informal loan, 41–50% of households in the other categories (QR, TCR, and RR) use an informal loan.<sup>11</sup> This suggests that households who lack access to formal loans (QR) as well as households who are discouraged by either the transaction costs (TCR) or the risk (RR) of formal loans are more likely to seek informal loans than price-rationed households. All three explanations identified in the literature seem, therefore, to contribute to the coexistence of an informal credit sector alongside the formal credit sector in Piura.<sup>7</sup> To more formally test this hypothesis, we now turn to a simple multivariate analysis of the probability of using an informal loan.

(b) *Empirical strategy, estimation, and results*

(i) *Empirical strategy*

Consider the following binary outcome model where the dependent variable  $I_{it}$  takes value one if household  $i$  has an informal loan at time  $t$  and zero otherwise:

$$I_{it} = \alpha_1 + \alpha_2 QR_{it} + \alpha_3 TCR_{it} + \alpha_4 RR_{it} + \gamma' X_{it} + \delta_i + \varepsilon_{it} \tag{1}$$

$QR_{it}$ ,  $TCR_{it}$  and  $RR_{it}$  are dummy variables indicating the rationing category of the household. Price-rationed households who either have a formal loan of their desired amount ( $PRwl_{it} = 1$ ) or no profitable project requiring

a formal loan ( $PRwol_{it} = 1$ ) constitute the omitted category.  $\alpha_1$ ,  $\alpha_2$ ,  $\alpha_3$ ,  $\alpha_4$ , and  $\gamma'$  are parameters to be estimated.  $\delta_i$  is a time-invariant, individual specific unobserved effect and  $\varepsilon_{it}$  is a mean zero error term.  $X_{it}$  is a vector of household characteristics that affect loan demand and supply in the informal sector. It includes household wealth, farm size, dependency ratio, number of household members, the proportion of land in banana production, and dummy variables controlling for the valley the household lives in and indicating whether or not the household farms, has a member with a regular non-farm income, has any annual crops or uses a semi-formal loan. The definition and means of all regressors are given in Table 3.

The primary parameters of interest are  $\alpha_2$ ,  $\alpha_3$ , and  $\alpha_4$ , as they identify the motives behind households' participation in the informal credit market. If the informal sector supplies those excluded from the formal sector, households who are quantity-rationed in the formal sector ( $QR_{it} = 1$ ) should be more likely to borrow in the informal sector than price-rationed households (the omitted category). Consequently, the parameter  $\alpha_2$  should be strictly positive. Similarly, if the informal sector is preferred by households discouraged either by transaction costs or contract risk in the formal sector,  $\alpha_3$  or  $\alpha_4$  should be strictly positive.

The parameter estimate on bananas is expected to be negative because, in contrast to other crops grown in Piura, bananas provide relatively high monthly income, so that households who grow bananas are likely to have a relatively low credit demand. In contrast, the parameter estimate on annual crops is expected to be positive as annual crops have high variable input needs in comparison to banana or fruit trees.<sup>12</sup> Households who abandoned farming during 1997–2003 as well as those who have a semi-formal loan are expected to be less likely to need informal loans and therefore the parameter estimates on these variables are expected to be negative. There is no clear prediction about the sign of parameters on the remaining variables in  $X_{it}$  as they are likely to impact both supply and demand in opposite direction and thus to have an ambiguous impact on the dependent variable.<sup>13</sup>

(ii) *Estimation technique*

We use two different econometric specifications to estimate Eqn. (1): a logit with random effects and a logit with fixed effects. Both

Table 3. *Definition and summary statistics of explanatory variables (pooled sample)*

Variable	Definition	Mean	Std. dev.
wealth	Total wealth (\$1,000)	3.91	8.50
farm size	Farm size in hectares	4.36	5.40
semiformal	= 1 if household has a semi-formal loan	0.13	0.33
ancrop	= 1 if household has annual crops	0.75	0.43
banana	proportion of land with banana	0.11	0.26
Reginc	= 1 if household has a non-ag permanent job	0.38	0.49
nofarm	= 1 if household is not farming	0.03	0.17
hh size	Number of household members	5.26	2.46
dep	Dependency ratio, # children(<15)/# hh members	0.26	0.27
education	Household head's years of education	4.69	3.77
BajP	= 1 if household is in valley Bajo Piura	0.27	0.44
AltP	= 1 if household is in valley Alto Piura	0.14	0.35
Chira	=1 if household is in valley Chira	0.42	0.49
SanLo	=1 if household is in valley San Lorenzo	0.07	0.25

specifications assume a logistic distribution for the error term,  $\varepsilon_{it}$ , but they differ with respect to the assumptions regarding the time-invariant individual effect,  $\delta_i$ . The random effects specification assumes no correlation between  $\delta_i$  and the explanatory variables, while the fixed effects specification allows  $\delta_i$  to be correlated with explanatory variables. The logit fixed effects estimation is thus not subject to potential biases due to time-invariant omitted variables. However, the fixed effects logit has a major drawback for small samples: identification of the parameters is based on households that switch their value of the dependent variable (informal loan use) across time periods. Consequently, only 196 out of 499 households are included in the estimation. For robustness check, we also estimate alternative models: with no socio-economic variables, grouping all non-price rationing categories in one and restricting the sample to non-borrowers in the formal sector.<sup>14</sup>

### (iii) Results

Table 4 reports the results of the estimations. Each model is estimated first with random effects and then with fixed effects. Columns (i) and (ii) report the parameter estimates of the full model as described by Eqn. (1), estimated with random and fixed effects. Columns (iii) and (iv) correspond to the parsimonious specification that only includes the formal sector outcome variables. Columns (v) and (vi) present the parameter estimates of the full model with all non-price rationing categories grouped in one (nPR). Columns (vii) and (viii) correspond to the estimation of the full model on

the restricted sample of non-borrowers in the formal sector.

The parameter estimates on formal sector outcomes are similar in terms of their sign, significance, and size across random versus fixed effect estimations and across specifications. When all non-price-rationed outcomes are grouped in one category (Columns (v) and (vi)), this variable appears to have a strong positive impact on the probability of using an informal loan.<sup>15</sup> The exclusion of formal borrowers from the sample (Columns (vii) and (viii)) confirms that, among non-borrowers in the formal sector, non-price-rationed households are more likely to borrow in the informal sector than price-rationed households. We are thus confident that the difference in informal sector participation between price and non-price-rationed households is not driven by the fact that the majority of formal borrowers are price-rationed. The ensuing discussion refers to the full model (Columns (i) and (ii)). A Hausman test suggests that the random specification should be preferred over the fixed effect specification. A likelihood ratio test that compares the random effect to a pooled estimation confirms the presence of random effects. As a result we focus on the results of the random effect estimation presented in Column (i).

For the model described by Eqn. (1), the coefficients on formal sector outcomes, QR, TCR, and RR are all positive and statistically different from zero. As expected, households who use semi-formal loans are significantly less likely to borrow in the informal sector, while those cultivating annual crops are more likely to do so. The parameter estimate on bananas

Table 4. *Parameter estimates from the use of informal loan regression (standard errors in parentheses)*

Variable	Full model		No control		Grouping non-price-rationed		Excluding formal borrowers		Marginal effects <sup>a</sup> of (i)
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	
QR	1.64*** (0.23)	1.50*** (0.31)	1.55*** (0.21)	1.39*** (0.27)			1.16*** (0.27)	1.63*** (0.48)	0.39*** (0.05)
RR	1.13*** (0.25)	1.06*** (0.38)	1.15*** (0.24)	1.08*** (0.35)			0.78*** (0.27)	1.08** (0.48)	0.27*** (0.06)
TCR	1.36*** (0.28)	1.41*** (0.41)	1.33*** (0.28)	1.33*** (0.39)			0.94*** (0.31)	1.46*** (0.50)	0.33*** (0.06)
wealth	-0.01 (0.02)	0.03 (0.05)			-0.01 (0.02)	0.02 (0.05)	-0.01 (0.02)	0.01 (0.08)	
farm size	0.05* (0.03)	0.03 (0.11)			0.05 (0.03)	0.03 (0.12)	0.05 (0.03)	0.09 (0.16)	
semiformal	-1.10*** (0.29)	-1.33*** (0.40)			-1.04*** (0.28)	-1.25*** (0.39)	-1.25*** (0.31)	-1.73*** (0.49)	
ancrop	0.57** (0.27)	0.14 (0.37)			0.59** (0.27)	0.18 (0.37)	0.93*** (0.31)	0.62 (0.49)	
banana	-0.54 (0.43)	-1.17 (1.16)			-0.54 (0.42)	-1.33 (1.16)	-0.47 (0.49)	-1.21 (1.47)	
reginc	0.01 (0.18)	0.12 (0.29)			0.00 (0.18)	0.16 (0.29)	0.06 (0.21)	0.41 (0.41)	
nofarm	-1.54** (0.73)	-1.18 (0.82)			-1.48** (0.73)	-1.22 (0.81)	-1.29* (0.74)	-0.89 (0.91)	
hh size	0.06 (0.04)	0.02 (0.08)			0.06 (0.04)	0.02 (0.08)	0.07 (0.05)	-0.04 (0.10)	
dep	-0.31 (0.46)	-0.44 (0.81)			-0.32 (0.46)	-0.45 (0.80)	-0.26 (0.53)	-0.56 (1.05)	
education	0.04* (0.02)				0.04* (0.02)		0.05* (0.03)		
BajP	0.73** (0.36)				0.74** (0.36)		0.65 (0.40)		
AltP	0.85** (0.38)				0.83** (0.38)		0.80* (0.42)		
Chira	0.35 (0.35)				0.38 (0.35)		0.46 (0.41)		
SanLo	-0.89 (0.59)				-0.84 (0.59)		-0.97 (0.67)		
t	0.11 (0.18)				-0.02 (0.17)		-0.14 (0.21)		
nPR					1.42*** (0.19)	1.39*** (0.27)			
Constant	-2.91*** (0.47)		-1.58 (0.16)		-2.88*** (0.47)		-2.80*** (0.53)		

\*\*\*, \*\*, and \* indicate that the parameter is significantly different from 0 at 1%, 5% and 10%, respectively.

<sup>a</sup> Marginal effects are computed at the mean value of continuous variables, for a household who farms, has no semi-formal loan, has no bananas, has annual crops, and lives in Chira.

has the expected sign (it is negative) but it is not significant.

Column (ix) reports the marginal effects of the formal sector outcome variables on the probability of using an informal loan for the model estimated in Column (i). The results suggest that households who either do not borrow

in the formal sector because they are denied access or borrow but do not obtain their desired loan amount in the formal sector are 39% more likely to use an informal loan than households who are price-rationed in the formal sector. Similarly, households who are discouraged by the high level of transaction costs are 27% more

likely to use an informal loan, while households discouraged by the risk-sharing rules of formal contracts are 33% more likely to use an informal loan than households in the base category.

This analysis reveals a positive and strong correlation between the probability of using an informal loan and the probability of being non-price-rationed in the formal loan sector. These results are consistent with the various roles attributed to the informal lending sector in the literature. We take that these results are suggestive rather than conclusive though, as we cannot completely rule out problems of endogeneity with the formal sector rationing categories. If omitted variables are correlated both with the rationing categories and the probability of using an informal loan, our parameter estimates would be biased. We take comfort in the fact that the results hold to the inclusion of household specific fixed effects that effectively control for any time *invariant* omitted variable bias, so that the remaining sources of endogeneity may only be omitted *time varying* factors.<sup>16</sup> We now turn to a more detailed exploration of the loan markets in Piura, which will add credit to the hypothesis that informal lenders overcome various forms of non-price rationing in the formal sector. Specifically we first evaluate how risk-sharing rules of credit contracts and transaction costs vary across sectors and then analyze how informal lenders manage to overcome quantity, transaction cost, and risk rationing prevalent in the formal credit market.

### 3. AN EXPLORATION OF SECTORAL DIFFERENCES IN LOAN TERMS

In order to evaluate average loan costs across sectors, we use household data on interest rates, the costs of loan applications, and the amount and maturity of loans. We then take up the issue of the measurement of contractual risk. We compare collateral requirements between sectors, since collateral is an indicator of what borrowers might lose if they default. However, collateral only imperfectly captures the risk of a loan. On the one hand, a positive collateral requirement may overstate the risk born by the borrower since lenders do not typically foreclose as soon as a borrower fails to comply with the initial repayment schedule. On the other hand, an absence of collateral may understate this risk since default may have negative consequences for reputation or future loan ac-

cess. In order to compare risk between sectors, it is, therefore, necessary to understand what the real consequences of default are. To do so, we complement the quantitative survey data with qualitative information from interviews with lenders, justices of the peace, and farmers.

#### (a) *A first look at contract terms using the household panel data*

Table 5 reports key contract terms in the two sectors for the two years of the survey. The differences between formal and informal loans in terms of amount, interest rate, and maturity are large. In both years, formal loans are about four times as large as informal loans. In 2003, for example, the average formal loan is \$1,560 while the average informal loan is only \$350. Formal loans also have significantly longer maturities. The average maturity of an informal loan is 6 months, which corresponds to the duration of a crop cycle, while, on average, formal loans were granted for 9 and 13 months, respectively, in 1997 and 2003.<sup>17</sup>

The mean interest rates reported in the table are striking for two reasons. First, the annual interest rates in the informal sector are nearly double the rates in the formal sector. Second, both are exceptionally high.<sup>18</sup> In calculating

Table 5. *Comparison of mean contractual terms between sectors*

	1997	2003
<i>Loans size (2003 US\$)</i>		
Formal sector	2900 <sup>a</sup>	1560 <sup>a</sup>
Informal sector	490	350
<i>Maturity (month)</i>		
Formal sector	9 <sup>a</sup>	12 <sup>a</sup>
Informal sector	6	5
<i>Annual interest rate</i>		
Formal sector	58% <sup>a</sup>	69% <sup>a</sup>
Informal sector	101%	121%
<i>Transaction costs (\$ and % of loan size)</i>		
Formal sector	74.5 (3.7%)	
Informal sector	5.5 (2%)	
<i>Mortgage requirement<sup>b</sup></i>		
Formal sector	59% <sup>a</sup>	58% <sup>a</sup>
Informal sector	2%	9%

<sup>a</sup> Term significantly different (at 5%) from the same term in the informal sector.

<sup>b</sup> As the figures are computed using household level data, they are indicative of borrowers' perception of these requirements.

the interest rate in the informal sector, loans with zero explicit interest rates were excluded.<sup>19</sup> The reason is that the majority are interlinked transactions that combine a credit transaction with either the purchase of inputs or the sale of outputs. Part of the loan cost born by borrowers is then the over-pricing of inputs or under-pricing of outputs, and implicit interest rates cannot be calculated for these loans.<sup>20</sup> By excluding them from the calculation of average interest rates, we assume that their cost is similar to loans with explicit interest rates.<sup>21</sup>

The contractually stipulated interest rates do not capture the full cost of a loan, if borrowers incur transaction costs. These transaction costs, in turn, may vary across sectors. Table 5 reports means of borrowers' self-reported transaction costs associated with loan application for the 1997 survey.<sup>22</sup> These costs include opportunity cost of time, and travel and legal costs, such as hiring notaries and obtaining the certification that the property serving as collateral is free of lien.<sup>23</sup> Taken together, the cost of application represents \$75, or 3.7% of the average loan amount in the formal sector, and about \$6, or 2.0% of the average loan amount in the informal sector. This is consistent with the view that transaction costs are lower in the informal sector. However, note that for a loan of an amount equal to the average informal loan amount, effective loan cost (the sum of average interest payments and transaction costs) remains lower in the formal sector.<sup>24</sup> For very small loans though, the informal sector may be cheaper since transaction costs have a large fixed component.<sup>25</sup>

Finally, the last row of Table 5 compares the frequency of collateral use across sectors. While 58% of formal loans require a mortgage, fewer than 10% of informal loans do.<sup>26</sup> At first sight, this difference suggests that formal loans are riskier than informal ones since borrowers from the formal sector may lose their land. However, as mentioned above, the stated collateral requirement may not capture the true contractual risk. It was thus necessary to collect additional data on the exact consequences of default, which we present and analyze in the next section.

#### (b) *A deeper look at contractual risk*

The qualitative data that allow a more in-depth analysis of the risk-sharing rules of credit contracts were collected from three main sources: (1) interviews with formal and infor-

mal lenders; (2) interviews with justices of the peace; (3) interviews with eight farmers from the sample who defaulted on a loan in 2003.

The main objectives of interviews with formal and informal lenders were to collect information about key characteristics of their agricultural loan portfolios and to understand their lending technology. Special attention was devoted to the actions they take in case of delinquent debt. We interviewed 20 informal lenders as well as bank managers and several agricultural loan officers in each of the four local banks operating in the study area. The second qualitative data source consists of interviews conducted with the 23 justices of the peace (*juezes de paz*) operating in the survey communities. Justices of the peace are members of these communities and are the elected, local representative of the judicial system in rural Peru. One of their primary responsibilities is to resolve conflicts over debt, and they have the authority to seize borrowers' assets.<sup>27</sup> As such, justices of the peace are an invaluable source of information for evaluating the risk associated with informal loans. Finally, we revisited eight farmers who reported having defaulted on a loan in the 2003 household survey, in order to determine the reasons and consequences of not repaying their loan on time.

Table 6 provides a brief synthesis of what these data reveal about the consequences of default across loan sectors. In the remainder of this section, we detail and discuss these consequences successively in the formal and informal loan sectors.

#### (i) *Informal sector*

Interviews with lenders and farmers reveal that, in the informal sector, most cases of default lead to a restructuring of delinquent debt. The terms of the agreements are relatively standard across informal lenders. The main source of variation is the amount of additional time the borrower is granted to repay his debt which depends upon the lender's evaluation of the borrower's repayment capacity. In general, it is at least the length of an agricultural cycle (6–12 months), and the borrower is typically required to repay after the next harvest.<sup>28</sup> A surprising feature, common to all the informal lenders we interviewed and confirmed by farmers, is that no interest is charged during the loan extension. The debt is said to be "frozen."<sup>29</sup>

If lender and borrower do not reach an agreement over the repayment of the delinquent



Table 6. *Summary of the consequences of default in the formal and informal loan sectors*

	Formal sector	Informal sector
Refinancing	Common	Common
Term	≥ 1 crop cycle	≥ 1 crop cycle
Interest rate charged?	YES	NO
Financial penalties charged?	YES	NO
Judicial action	Relatively rare	Relatively rare
Authority in charge	Civil judge	Justice of the peace
Length of the procedure	Several months, years	Couple of days
Results	Collateral foreclosure	Refinancing (common) Asset seizure (rare)
Other consequences of default	Bad credit record	Bad reputation (only if unresolved)

debt, typically because the lender considers that the borrower has the capacity to repay but refuses, the lender takes one of two actions. Either he writes off the debt or he appeals to a justice of the peace.<sup>30</sup> The judicial process involving a justice of the peace is both fast and cheap. Justices of the peace call a mediation meeting with both parties within a week of the appeal. The total cost of the procedure incurred by the lender does not exceed \$4.<sup>31</sup> Before calling a meeting between borrower and lender, the justice of the peace conducts an investigation to verify the facts reported by the lender (loan amount, maturity...) and to evaluate the repayment capacity of the borrower. The terms of the agreements reached during the mediation meeting are similar to the agreements resulting from the direct negotiation between borrowers and lenders. No interest is charged for the time in delinquency, so that the borrower is liable only for the amount he owed when the loan entered into delinquency. Again, the greatest source of variation across agreements is the repayment schedule, which depends on the reasons for default and the income flow of the borrower.

Justices of the peace are allowed to seize goods equivalent to the value of the debt if the delinquent borrower does not comply with the agreement signed during the mediation meeting. However, only one of the justices of the peace surveyed had confiscated borrowers' assets in the 12 months prior to the survey. This was not the only case of non-compliance with the agreement reached during mediation, but often lenders do not seek asset seizure as it may be perceived by other community members as a severe and excessive response. The lender's social and business relationships may suffer if he is regarded as exploitative by mem-

bers of his community, and therefore he may prefer to give up on a debt rather than entering an open conflict with a borrower. For the same reason, an informal lender may be unwilling to appeal to a justice of the peace and may choose to write off a debt instead.

#### (ii) *Formal sector*

As in the informal sector, in the formal sector, a negotiation process follows default and the lender typically offers to restructure the delinquent debt. The crucial difference between informal and formal loan restructuring is cost. While an informal debt is frozen at the end of the original term, in the formal sector interest continues to accumulate and penalties are charged so that the price of a formal loan may be quickly driven above that of an informal loan.<sup>32</sup>

This suggests that while a formal loan is cheaper than an informal loan when the borrower repays on time, it is more expensive when the borrower does not. This raises questions about the difference in expected loan cost across sectors: if default is frequent, informal loans may be on average cheaper than formal loans, even if reported interest rates are higher in the informal sector. This does not appear to be the case in Piura. In fact, formal and informal lenders report very similar and low default rates, of about 3% on average.<sup>33</sup> As a consequence, even if informal loans are cheaper in case of default, they remain more expensive in expected cost terms.

If the negotiation has not been successful, or if the borrower does not repay his restructured loan, the bank may initiate a judicial process to seize the borrower's collateral. Yet cases of collateral seizures are rare. One local bank manager estimated that less than a dozen cases

had been carried out by all banks in Piura during 1998–2004.<sup>34</sup> Collateral seizure is the result of a judicial procedure that is both long and complex compared to the cases settled by justices of the peace. The procedure is as follows: First a judge decides that the lender has the right to proceed with foreclosure. Then a government auction is organized and announced in the official newspaper. During this auction, the collateral is sold to the highest bidder. A common problem is that there may be no buyer for the land under these circumstances: given the agrarian structure in Piura and the small size of parcels, the pool of potential buyers is typically limited to neighbors or members of the same community who are reluctant to enter into conflict with the borrower. As a result, foreclosure can take many years. An additional difference between sectors is that default in the formal sector is automatically reported to credit bureaus. This information becomes available to other formal lenders, and it may affect future credit access.<sup>35</sup>

To summarize, even though formal lenders rarely foreclose, default in the formal sector is systematically punished via financial penalties associated with loan restructuring. Default in the informal sector also leads to loan restructuring but with radically different conditions. In fact, in the informal sector, the average effective interest rate is lower when the borrower defaults than when he pays on time. Consequently, instead of being punished in case of default, the borrower is given a “discount.” If, in some instances, a delinquent borrower suffers damages in terms of reputation and future access to informal loans, this occurs only in those few cases of default that lead to a conflict between borrower and lender. Thus, while punishing default is the rule in the formal sector, it is rare in the informal sector. All in all, if a farmer is hit by an adverse shock and unable to repay a loan, he is better off with an informal debt than with a formal one.

#### 4. DIFFERENCES IN LENDING TECHNOLOGIES AND THE ABILITY OF INFORMAL LENDERS TO ALLEVIATE QUANTITY, TRANSACTION COST, AND RISK RATIONING

The analysis in the previous section raises questions about how informal lenders overcome moral hazard and adverse selection. Indeed, in the formal sector, punishing default

discourages those who have a high probability of defaulting from applying and therefore limits adverse selection. In addition, the threat of punishment prevents moral hazard and it provides strong incentive for those who borrow to work hard and repay on time. In contrast, the lack of punishment in the informal sector may increase problems of moral hazard and adverse selection. Still, default rates in the informal sector are as low as in the formal sector. This suggests that informal lenders are able to directly screen out undesirable applicants and both monitor borrowers and directly enforce repayment. To confirm this conjecture, we now explore how formal and informal lenders select, monitor, and enforce repayment in Piura and show how differences in lending technologies explain that informal lenders alleviate quantity rationing, transaction cost rationing, and risk rationing in the formal sector.

##### (a) *Selection of loan applicants*

The selection process in the formal sector is more standardized than in the informal sector. It is based primarily on a series of institutionally set requirements such as owning at least one hectare of titled land, having no negative entry in one’s credit history, and having paid the irrigation water bill.<sup>36</sup>

In contrast, informal lenders select their borrowers based on their prior knowledge of the person and on the information they obtain during a careful investigation of the activities of the applicant. Recall that most informal lenders manage businesses related to agriculture, primarily the sale of inputs and the purchase of crops. Similar to what Conning (1996) describes in Chile and Aleem (1993, chap. 10) in Pakistan, these lenders typically accept loan applications from the pool of their clients in these complementary businesses, as their direct observations of crop yields or input use enable them to accurately evaluate the profitability of their clients’ farm. They also often know neighbors of the applicant, whom they can consult as character references. Some, but not all, lenders we interviewed also explained that they give a call to other informal lenders they trust to check the applicant is not in debt with them. Many mentioned how easy this sharing of information has become since the introduction of cell phones.

An additional screening device in the informal sector is to “test” borrowers by giving them small loans at first and progressively

offering them larger loans and better terms. Gosh and Ray (2001) explore this practice theoretically and show that it can be an equilibrium outcome when information is imperfectly shared by lenders. Progressive lending enables lenders to identify “bad borrowers” (or “natural defaulters”) to whom they immediately stop lending.<sup>37</sup>

These differences in the selection process across sectors are consistent with the observation that households who are excluded from the formal sector may be able to obtain an informal loan: the lack of property title or a bad formal credit history is not taken as a sign of credit unworthiness by informal lenders. Furthermore, differences in the selection process also explain why informal loan applications imply lower transaction costs for the applicant than formal applications. In the formal sector, applicants must pay fees to register their mortgages with the Public Registry, and complete lengthy paperwork, while in the informal sector, they just need to manifest their demand.<sup>38</sup>

#### (b) *Loan monitoring and recovery*

Two key lending practices enable informal lenders to control the use of their loans and to update their expectation of the borrower's repayment capacity: the active gathering of information and the in-kind nature of disbursement.

Lenders seek information about their borrowers' production after the first instalment in order to gauge the borrower's future output and to adjust loan sizes and disbursement dates. In general, they directly visit their borrowers. Their deep knowledge of farming enables them to evaluate whether a crop needs fertilizer, whether it should be weeded, or whether it suffers some pest infection for example. They may thus disburse the loan in accordance to the crop requirements. Furthermore, they are able to determine whether the input they financed has been applied by checking on the crop a couple of days after the date of the supposed application. In case they do not trust the borrower to actually apply the needed treatment, some lenders even hire daily workers to do the job. Neighbors of farmers are also good informant, especially when lenders have a store where farmers buy their inputs. These stores are often in the main commercial areas of villages where farmers of surrounding areas get all their supplies. Lenders may easily engage in conver-

sation with farmers who pass by their borrowers' field daily and obtain information about the state of their borrowers' crops. These various types of information also enable informal lenders to precisely evaluate farmers' harvest and thus distinguish between voluntary and involuntary defaults. As documented above, voluntary default has more severe consequences as it may lead to a conflict between borrower and lender. In fact if the lender believes that a borrower has enough liquidity to repay his loan but simply “lacks the desire” to do so, he may start a judicial procedure with a justice of the peace as soon as the loan is overdue.

Second, informal lenders generally disburse part of the loan in-kind which limits the diversion of credit to non-production uses. The most common practice is to provide borrowers with inputs, such as fertilizer and, in some cases, hired labor. Both active information seeking and in-kind disbursement raise the probability that a borrowers' farm revenue is high enough to cover his debt. In other words, these monitoring techniques help informal lenders overcome *ex-ante* moral hazard.<sup>39</sup> While formal lenders also monitor borrowers, they do so significantly less than informal lenders. Loans are always disbursed in cash, so formal lenders have no direct control over input use. Still, they try to time loan disbursements to match the farmers' need for liquidity over the course of the season.<sup>40</sup>

Loan recovery technologies also vary greatly across sectors. In the formal sector, borrowers are expected to visit the bank to repay their loan. If they do not repay on time, the loan immediately enters into delinquency and the procedure described in Section 3 is initiated. While there are a variety of loan recovery practices within the informal sector, repayment is often in-kind, especially when the lender is a trader, and the lender picks up the crop in the farmer's field at harvest. The latter practice is a common feature of informal credit market (Ray, 1998) that considerably limits the scope for voluntary default as the lender gets to place first claim on the product. It thereby helps informal lenders overcome *ex-post* moral hazard.<sup>41</sup> Finally, as informal lenders need not rely on contractual risk to overcome information asymmetries, they can offer loans that entail lower risk than formal loans and thereby informal lenders may alleviate risk rationing in the formal sector.

(c) *Economies of scope, locational advantage, and access to funds*

From the previous discussion, two key elements emerge and explain the ability of informal lenders to overcome moral hazard and adverse selection without relying on contractual risk. First, informal lenders are closer to borrowers both physically and socially. Because they live in the same community as their borrowers, they have prior knowledge about loan applicants and it is easy for them to gather additional information. Second, informal lenders enjoy economies of scope. They tend to interlink credit with the other activities they engage in, which help them screen, monitor, and enforce loan repayment at low cost. Recall that proximity and the fact that informal lenders engage in other business activities with members of their borrowers' communities also prevent them from enforcing repayment with measures that would be perceived as exploitative.<sup>42</sup> As a result, while proximity and economies of scope enjoyed by informal lenders contribute to raising efficiency in the credit market by helping lenders overcome information asymmetries, they also limit lender's use of coercive methods.

Finally the ability of informal lenders to fill in for the imperfectly functioning formal sector hinges on their access to funds from the formal sector. Indeed, as mentioned above, the majority of informal lenders finance their lending activities with a combination of own funds and credit from formal intermediaries.<sup>43</sup> Informal lenders may thus be viewed as intermediaries between formal financial institutions and farmers who are either excluded from the formal sector or discouraged by the transaction costs or risk sharing rules of formal loans. [Conning and Udry \(2005\)](#) develop a model of delegated monitoring and show that lending to informed intermediaries who monitor at low cost enables uninformed lenders to reach farmers who cannot be the subject of direct credit. They discuss the problem of moral hazard between the two types of lenders when the success of the intermediate lender's investment depends on the unobserved intensity of monitoring.<sup>44</sup> In Piura, the scope for moral hazard between formal and informal lenders is very limited as loans obtained by informal lenders are typically fully collateralized with land or business assets. The downside is that the amount that informal lenders may leverage is limited to the value of their assets. Still this direct relationship between formal and informal lenders suggests

that the persistence of informal lending should not be associated with a failure of the formal sector to deepen financial intermediation. Part of the development of financial markets actually takes place through the informal sector, as informal lenders leverage funds in the formal sector to serve borrowers that do not qualify for formal loan or prefer contract terms in the informal sector.

## 5. CONCLUSION

The description of the lending technologies adopted by formal and informal lenders in Piura fits a textbook picture. More geographically and socially distant formal lenders rely on contractual incentives, in the form of harsh punishment in case of default, to overcome information asymmetries, whereas more informed informal lenders substitute information-intensive lending technologies for contractual risk. While these contrasts across sectors have been reported in other contexts, their full consequences on household's choice of loan sector have been largely overseen in the empirical literature on credit markets. In addition to enabling informal lenders to supply those excluded from the formal sector, screening, monitoring, and recovery techniques adopted by informal lenders enable them to offer contracts that are preferred by some households, despite their larger interest rate. First, screening methods in the informal sector do not require an expensive loan application process. As a result, transaction costs in the informal sector are lower than in the formal sector, which may drive the effective cost of an informal loan below that of a formal loan. For some households, an informal loan may thus be the cheapest option, in terms of effective cost. Second, efficient direct screening, monitoring, and loan recovery techniques enable informal lenders to offer loans with more generous restructuring conditions in case of default, and thus lower risk than formal loans. Consequently, risk averse households may prefer an informal loan, even if it is more expensive.

In order to design appropriate instruments that would strengthen the formal sector and raise efficiency and equity, it is essential to understand the various reasons why households use informal loans. This paper shows that the existence of an expensive informal credit market cannot be equated with problems of access to the formal credit market. It suggests that

land titling programs that have been initiated in various countries with the hope of enabling farmers to use their land as collateral may have disappointing results if households are discouraged by the transaction costs or the risk implied by a formal loan. The inability of farm households to insure themselves against the myriad risks that they face, combined with the high cost of formal loan application and the inability of banks to offer low risk loans to borrowers, reduces households' participation in formal credit markets. This suggests that improvements in risk management mechanisms at the household level would have positive spill-over

effects into the performance of credit markets. In addition, if lenders themselves operate in a risky environment and lack access to insurance, they may act as risk averse and offer contracts that pass on more risk to the borrower than is strictly necessary to overcome information asymmetries. In such a case, increasing lenders' access to insurance may also increase efficiency in the market by potentially raising credit supply and reducing contractual risk. To address transaction cost rationing, appropriate policy responses may include improvement in the efficiency of legal systems that would reduce the cost of collateral registration.

## NOTES

1. Coexistence of formal and informal credit markets has been reported for example by Conning (1996) in Chile, Trivelli (2003) in Peru, and Mosley (1999) in four different African countries.
2. A risk-rationed household is one that needs funds and has access to a credit contract but does not seek it because it is not willing to assume the downside risk implied by the available contract (Boucher, Carter, & Guirking, 2008).
3. We discuss potential attrition biases in Section 3(ii).
4. Households were randomly chosen from each of the four agricultural valleys, among households who farmed at least one hectare of irrigated land in 1997. The sample was drawn from the exhaustive list of farmers maintained in the local irrigation institution. Boucher (2000) provides a detailed description of the sample and of its construction.
5. This figure was computed using the lists of water users maintained by the local irrigation commissions.
6. This credit module expands on the Jappelli (1990) and Feder (1985) method of direct elicitation of credit constraints. Boucher, Guirking, and Trivelli (2005) provide a methodological discussion of the classification used here. It combines observed outcomes and qualitative questions. The first step is to separate households that applied versus those that did not apply for a formal loan. Applicants are classified according to the outcome: rejected applicants or those who obtained less than they asked for are quantity-rationed, while those whose demand was met are price-rationed. Non-applicants were asked whether or not any formal lender would offer them a loan if they were to apply. If they said yes, they were asked why they had not applied. According to their response they were classified as price-, transaction cost-, or risk-rationed. Finally, those that stated that no formal lender would offer them a loan were asked whether or not they would apply for a loan if they were guaranteed that a bank would approve their application. Those that said yes were classified as quantity-rationed. Those that said no were asked why and then classified either as price-, transaction cost-, or risk-rationed.
7. Households who choose not to borrow in the formal sector consider the various dimensions of loan contracts simultaneously. As a result, transaction cost rationing and risk rationing categories may not be exactly mutually exclusive, in the sense that reducing transaction costs in the formal sector may not be sufficient to convince transaction cost-rationed households to switch from an informal to a formal loan, if they also prefer the risk sharing rule of informal contracts. Practically we rely the reason provided by respondent to classify them as either risk or transaction cost rationed.
8. Price rationing is the equilibrium outcome in a market with perfect information cleared by price. Households that are price-rationed in the credit market have their loan demand met in that market, whether or not they borrow.
9. These banks are the Caja Municipal de Ahorro y Credito (CMAC) Piura, the CMAC Sullana, the Caja Rural de Ahorro y Credito (CRAC) Paita, and the CRAC San Martin.
10. To cultivate one hectare of rice, farmers spend about \$1,000 on fertilizer, pesticides, machinery rental, and labor. For a farmer cultivating three hectares, these expenses represent 70% of the average sampled household income in 2003.

11. One may wonder why 21% of all price-rationed households—that supposedly have no excess demand for formal loan—seek informal finance. A plausible answer is that, since formal loans are nearly exclusively granted for a planned investment, borrowers in the formal sector may still rely on informal finance for small immediate cash needs of their agricultural production. While 90% of informal loans are for production purposes, the informal sector may also fulfill a marginal demand for emergency loans that might be difficult to obtain in the formal sector.
12. We do not examine loans for the establishment of perennial crops, since these loans are extremely rare in the sample.
13. For example, there is an extensive theoretical literature on the relationship between wealth and credit constraints which shows that, in the presence of information asymmetries, the poor are more likely to face all three forms of non-price rationing (Barham *et al.*, 1996; Boucher *et al.*, 2005; Carter, 1988). Holding the formal sector outcome constant, the poor may thus be more likely to be constrained in the informal sector, and therefore less likely to use informal loans. However, among those who are constrained in the formal sector, the poorest may also be less able to self-finance production and thus may have a greater need for informal loans. Wealth may thus have opposing effects on the probability of using an informal loan and the net impact of wealth must be resolved empirically.
14. To get a feel for whether attrition is likely to bias the results of our analysis, we ran a probit of attrition against the explanatory variables of the full model plus the residual from Eqn. (1) estimated with a logit model on the complete 1997 data set. The coefficient on the residuals is not significantly different from zero, suggesting that, once we control for observed characteristics, attritors are not systematically different from non-attritors in a way that influences the use of informal loans.
15. A chi-square test on the equality of the coefficients across non-price rationing categories reveals that we cannot rule out the hypothesis that the coefficients on the various non-price rationing outcomes in column (i) are equal.
16. A natural solution would then be the use of instrumental variables. We do not have enough convincing time variant candidates to successfully instrument for the three rationing categories. We thus chose to develop an argumentation and draw on descriptive evidence from various sources to investigate whether and how informal lenders overcome the various types of non-price rationing outcomes that emerge in the formal loan sector.
17. This increase in the average maturity in the formal sector is, at least in part, due to the long-term refinancing of a few loans on which farmers defaulted in 1998 following El Niño.
18. The increase in the average interest rate in the formal sector may be surprising given that overall interest rates on credit in Peru were lower in 2003 than in 1997. This increase may partly be a consequence of the crisis that followed El Niño in 1998. Commercial banks, that were offering cheaper loans than local banks in 1997, pulled out of the sector of agricultural loans at this time. In addition, local banks have increased their level of monitoring for agricultural loans across survey years.
19. As a consequence, 30% and 21% of informal loans are excluded from the computation of interest rates in 1997 and in 2003, respectively.
20. Note that, in contrast to what has been described in other contexts (e.g., Kochar, 1992), few loans correspond to unlinked transactions with zero interest rate made by family and friends (3.4% and 3.8% in 1997 and 2003, respectively).
21. The analysis of specific contracts for rice shows that indeed these implicit interest rates are very similar to the explicit rates. In 2003, for example, a common contract between a rice mill and a farmer was to deliver 1.5 bags of rice for each bag of urea lent 3 months before the harvest. The bag of urea was worth 38 soles at that time while the rice sold for 25 soles at harvest. The corresponding simple interest is 11% per month and is in line with the mean explicit interest rate from the household survey.
22. The 2003 household survey did not precisely capture transaction costs. If anything, transaction costs have decreased during 1997–2003 as reforms of the legal system have reduced the costs of registering mortgages.
23. In addition to monetary transaction costs, the process of applying for a formal loan may also generate social discomfort or feelings of shame. This was often brought up by farmers during interviews. In a society such as rural Peru where class structures are very rigid and rural farming populations are at the bottom of the social scale, it is not surprising that illiterate farmers associate strong discomfort with dealing with highly educated employees of formal, urban institutions. This feeling is absent from transactions with informal lenders who are much closer socio-economically to them. While not quantifiable, the discomfort associated with formal loans contributes to raising the utility cost of formal loans.

24. These figures may however underestimate the transaction costs that would be born by non-borrowers if they were to take a formal loan, since households who potentially face high transaction costs, other things equal, are more likely to be transaction cost-rationed in the formal sector.
25. We obtain a rough estimate of the threshold amount below which informal loans are cheaper by combining interest rate data with an estimation of the fixed and variable components of transaction costs (respectively, the intercept and the slope parameter of an OLS regression of loan amount on transaction costs). For a maturity of 6 months, we find that the switching amount is \$140, suggesting that loans smaller than \$140 are cheaper in the informal sector, once transaction costs are accounted for. Less than 25% of informal loans fall into this category in 1997.
26. Ninety-eight percentage of the mortgages in the formal sector are in the form of agricultural land; the remaining 2% are mortgages on houses. Interviews with loan officers at local banks suggest that the percentage of formal loans that require collateral is even higher than that suggested by the household reported figures. Loan officers claim that unsecured loans are very rare, and by no means amount to 40% of all formal sector loans. One explanation for the difference between the collateral requirements reported by borrowers and by lenders is that the same mortgage can be used for several subsequent loans from the same bank. Consequently, some borrowers reported the mortgage in the survey only when they had completed its registration when applying for the particular loan that was discussed. Thus, the survey provides a lower bound of the percentage of loans that required a mortgage.
27. According to Peruvian law, justices of the peace can resolve conflicts on debt up to \$1,000. Their other primary responsibilities include resolving conflicts over alimony and domestic disputes.
28. If the borrower's household has monthly income, the borrower may be asked to pay monthly instalments.
29. Loans that are repaid in kind presented the same feature. We did not find evidence of non-interest related obligations accompanying loan extension.
30. Twelve out of twenty informal lenders have appealed to a justice of the peace and, in all but one case, the procedure was at least partly successful. Resorting to this legal procedure remains rare, though. Informal lenders reported that, generally, less than 1% of all loans they ever gave out led to an appeal to a justice of the peace. Similarly all but six lenders reported having written off debt, but for less than 2% of all loans they made.
31. The calculation is based on lenders' surveys. This amount includes potential travel expenses of the justice of the peace when he investigates the case and paper-work expenses, such as letters sent to the delinquent borrower. The justice of the peace is not paid by the parties for his services, and, to our knowledge, there is no bribe.
32. To illustrate the difference in restructuring costs between sectors, consider the following case based on the agricultural loan policy of one local bank. Imagine that a farmer took a loan of \$1,000 for 6 months. However, his harvest failed, so he cannot repay. The borrower would likely be given an additional 12 months to repay the loan with his next harvest. While the annual interest rate on the original \$1,000 loan is 57%, the bank charges a penalty so that the restructured annual interest rate reaches 117%. Thus, for the first 6 months the farmer owes 26.5% of the principal in interest payment and this, added to the principal, defines the amount restructured (\$1,265). For the last 12 months, he is charged 117% of the restructured amount in interest. After 18 months, total interest payments on the original loan represent \$1,745. Now imagine that the same loan of \$1,000 was made by an informal lender for 6 months but with the average informal interest rate of 121% (Table 5). When the loan reaches its term and it is clear that the borrower cannot repay, lender and borrower agree on restructuring the loan for the same additional term of 12 months. In that case, since interest freezes, total interest payments after 18 months are only 60.5% of the principal, or \$605, which is less than half the total interest payments in the formal sector.
33. These default rates are based on information given by formal and informal lenders during interviews. They correspond to the average percentage of loans that are not fully recovered on time each agricultural season. These low default rates imply that, even if informal lenders would forgive debts when borrowers default, informal loans would still be more expensive than formal ones.
34. This represents less than 0.0005% of the total number of loans given out during this period.
35. Credit bureaus in Peru are well developed. They provide information about individual credit history and debt status in any bank as well as in many unregulated microfinance institutions. In addition, credit bureaus maintain information about denunciations filed at the chamber of commerce and unpaid taxes or utility bills.

36. The water bill (plan de cultivo de riego) is paid annually to the irrigation district to guarantee right to irrigation water.
37. In addition, progressive lending helps to guarantee repayment in a context of competition because it makes termination costly for borrowers. Even if defaulters find a new loan, they will have to go through a lengthy testing period before having access to better terms.
38. Note that we omit from this discussion the “building of trust” that may be necessary to obtain a loan in the informal sector. If applicants in the informal sector need to engage first in non-credit transactions before obtaining a loan, the application process may actually be long and expensive. It is difficult to directly assess this non-monetary cost, but two pieces of evidence suggest that it is not an obstacle to obtaining informal loans. First, our discussions with farmers suggest that they generally have no difficulties finding an informal lender willing to offer them a loan. Second, the ease of the application process was cited as a major advantage of the informal loan sector compared to the formal sector during focus group meetings with farmers.
39. Ex-ante moral hazard occurs when the lender cannot control borrowers’ actions that are taken between loan disbursement and maturity and that may influence the repayment of the loan. Ex-post moral hazard would correspond to voluntary default once the loan reaches maturity.
40. As in the case of informal loans, the average number of disbursements for formal loans was 2.5 in 1997. Loan officers visit each borrower at least once during the agricultural season, but their visits are extremely short, and only enable them to detect major problems.
41. Similarly to what Conning (1996) describes in Chile, the challenge for lenders adopting this practice in Piura is to be at the farm during harvest to avoid “pirate sales” to other traders. Crop pick-up in the field is, therefore, an efficient loan recuperation method for crops that have a short and well defined harvest period, as in the case of rice in Piura. In the case of cotton that is picked four times over a two-month period, pirate sales are more difficult to avoid and loans from traders are small and rarer. This observation is consistent with what Simwalla *et al.* (1990) report for manioc and sugar cane in the Philippines.
42. Lenders worry all the more about their reputation when borrowers have a choice of lenders. The existence of harsh competition in the informal loan sector as well as in the input and output markets, therefore, contributes to reduce the use of coercive recuperation methods.
43. While business loans are slightly cheaper than agricultural loans, informal lenders have a high cost of fund. They pay an annual interest rate of 50% on their formal loans.
44. Conning and Udry (2005) describe a sophisticated system where informed lenders use bills of exchange signed by individual farmers to secure loans they obtain from less informed, or “outside” lenders. To reduce the potential for moral hazard between the two types of lenders, the outside lender requires the informed lender to have a sufficiently high stake in the borrower’s project. There is one example of such system in Piura, between cotton traders and cotton gins. To obtain a loan from the gin, traders collect bills of exchange that farmers sign in front of justices of the peace. Cotton traders we interviewed financed one third of their loan portfolio with their own liquidity and two third with credit from the gin. While limited to a small segment of the market, this system provides a great illustration of how an outside lender may take advantage of the informal lender’s social and geographic proximity to farmers to channel loans that are heavily monitored instead of relying on indirect incentives to overcome asymmetries of information. We thank an anonymous referee for suggesting investigating this practice in Piura.

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