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Does Poor Legal Enforcement Make Households Credit-Constrained?

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Abstract

This paper analyzes the relation between the quality of the legal enforcement of loan contracts and the allocation of credit to households, both theoretically and empirically. We use a model of household credit market with secured debt contract, where the judicial system affects the cost incurred by banks to actually repossess the collateral. The model shows that the working of the judicial system affects both the probability of being credit-constrained and the equilibrium amount of debt. In the empirical part, we test our predictions using data on Italian households and on the performance of Italian judicial districts. We show that endowing high-cost judicial districts such as Campobasso or Caltanissetta (in southern Italy) with the best degree of legal enforcement would reduce the probability of resident households being credit-constrained by 70% and 63%, respectively. Moreover, the size of the debt of non-rationed households diminishes if the quality of judicial enforcement worsens. The elasticity of the debt with respect to the quality of legal enforcement ranges from 41% to 47%, depending on the measure of collateral used.

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Contents

1 Introduction

In the last few years a new line of research has begun to investigate the economic implications of different legal systems. This literature focuses on corporate credit and identifies two channels by which legal institutions may affect financial markets: the content of the law and the quality of enforcement.

Among others, La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997) document that corporate debt is higher in countries where creditors' rights are better protected. Cristini, Moya and Powell (1999) and Bianco, Jappelli and Pagano (2000) show that the quality of judicial enforcement affects the size of regional credit allocated to the corporate sector in Argentina and in Italy. Similarly, Fabbri (2001) provides evidence for Italy and Spain that differences in firms' external finance and size, as well as in banks' lending rates can be explained by differences in the performance of courts in different judicial districts.

Only a few papers examine the household credit market, all offering empirical evidence on how different legal bankruptcy arrangements affect this market and all focusing exclusively on the United States. For example, Meador (1982) and Jaffee (1985) provide evidence that U.S. mortgage interest rates were generally higher in states where the foreclosure process is longer and more costly. Gropp, Sholz and White (1996) show that in the states with more bankruptcy exemptions less credit is available to low-asset households controlling for their observable characteristics and more is available to high-asset households, while the rate on automobile loans for the same group of households is higher.

Our paper differs from the previous literature in the two ways. First, it isolates the effect of the quality of enforcement from that of the content of laws. To do so, we need to observe differences in the quality of enforcement, while holding constant the set of legal rules. The U.S. does not satisfy this requirement, in that the set of rules vary from state to state. In Italy the rules on credit relations are the same nationwide, but enforcement differs depending on judicial district. Italy thus offers a useful if not unique natural experiment that can disentangle enforcement from legislative effect.

The second original aspect of the present paper is our focus on the relation between the quality of legal enforcement and household credit constraints, by combining theoretical and empirical analysis.[1]

We develop a simple model of the the household credit market with secured debt contracts and strategic default, where the judicial system affects the enforcement of the creditor's right to repossess the collateral by determining when the transfer of assets takes place. The model identifies two main effects of weak judicial enforcement. First, households are more likely to be credit-constrained when judicial costs are high, i.e. the quality of enforcement is poor, because when contracts are weakly enforced the household's incentive to repay decreases and banks respond by rationing credit. Second, the higher the judicial costs, the smaller the amount of credit provided to households in equilibrium, because banks compensate for the lower revenues from the liquidation of the collateral asset by charging higher interest rates. This reduces the equilibrium amount of debt.

We test the validity of these theoretical predictions with two econometric exercises. First, we test whether the probability of a given household's being credit-constrained depends on judicial costs, controlling for the characteristics of the household. Second, we test whether the level of the household's debt is also sensitive to judicial costs, proxying the amount of legal costs (i.e. the degree of enforcement) with measures based on the backlog of civil trials.

We find evidence that a poorly functioning legal system does cause Italian households to be credit-constrained: households in judicial districts where the quality of legal enforcement is poorer have a higher probability of being denied loans. To quantify this distortion, we perform an experiment, computing how much the probability of being credit-constrained would change on average if we endowed all the households with the same degree of en-

[1] Recent research has focused on the institutional and social determinants of liquidity constraints, but only from an empirical perspective. For example, Guiso, Sapienza and Zingales (2001) study the role of social capital, which is measured by the electoral turnout at the province level. Using Italian data, they find that the probability of being credit-constrained is negatively correlated with social capital and provide evidence that the effect of social capital is stronger where legal institutions are weaker.

forcement. Other things being equal, endowing the households living in high-cost judicial districts like Campobasso or Caltanissetta (in southern Italy) with the best enforcement in the sample would reduce the probability of their being credit-constrained by 70% and 63%, respectively. We also document a second welfare implication of poor legal enforcement: the amount of debt of non-rationed households decreases as the quality of enforcement worsens. The elasticity of household debt with respect to the quality of enforcement ranges from 41% to 47%, depending on the measure of collateral used.

The paper is organized as follows. In section 2, we develop a simple model of the households credit market and derive testable implications of the role of the judicial system. Section 3 describes the data and discusses the measures used to proxy the quality of legal enforcement. Section 4 presents the results of the empirical analysis. Section 5 concludes.

2 The Model

We consider a credit market with secured debt contracts where households borrow and banks lend.

Each household lives for two periods and is endowed with an illiquid asset, A_i. The household works only in the second period, earning a stochastic positive wage, denoted by w_i in the good state of nature, which occurs with probability p_i, and zero otherwise.

Utility depends on consumption, c_i, and on the property of the illiquid asset A_i. It is time-additive and given by: $U_i = [A_i + \log(k + c_{1i})] + \beta_i [A_i + \log(k + c_{2i})]$, where k is a positive constant. Households want to smooth consumption over time. To finance first-period consumption, they can either borrow or dispose of the illiquid asset. Since we are interested in how the judicial system affects the credit market, however, we posit that the unit selling price of A_i, denoted by α, is low enough that it is always optimal not to sell but hold the asset as collateral in a credit contract.[2] This assumption captures two different

[2] In footnote 5, we show the condition under which it is optimal to keep the asset instead of selling it and we explain how it has been derived.

but common facts: first, the presence of transaction costs, which may sharply reduce the secondary market price of these goods; second, the personal value of goods to the owner that cannot be reflected in the market price. An example for the type of good that we have in mind is the house of residence.

The credit is provided by risk-neutral banks in a free-entry market. For simplicity, we assume a fixed interest rate, $\overline{r}$, on deposits.

Since the credit is provided in the first period and repayment is made only in the second, households face a commitment problem. According to the literature on credit rationing and imperfect information,[3] in this case it is optimal for both banks and households to sign a collateralized credit contract. Under the assumption of limited liability, the contract establishes that if the borrower fails to repay, the title to the asset A_i is transferred to the bank. However, the collateral asset does not entirely eliminate the incentive to default for households with low levels of wealth. In this case, banks are forced to ration credit to induce them to repay. Notice that even if the credit contract can be made incentive-compatible, there still exists the possibility that banks ask the courts to enforce their right to repossess, namely in cases of involuntary default, happens when households are hit by a negative income shock.

A key assumption concerns the enforcement procedure. We assume that the judicial system determines when the collateral is transferred in case of default. The worse the performance of courts, the later the transfer, and hence the liquidation of the asset. From the lender's point of view, weak legal enforcement is a cost. This cost may consist in legal expenses that depend on the length of the trial or else in a decrease in the asset's value due to depreciation. In both situations, the effective liquidation value of the collateral asset, and hence the bank's total revenues, are lower the poorer the quality of legal institutions. If we denote the degree of legal enforcement by g, where $0 \leq g \leq 1$, the liquidation value of each unit of the asset is equal to αg. Conversely household's utility increases when legal

[3] See, among others, Bester (1987)

institutions are weaker, since the defaulting borrower retains ownership of the asset until the court orders its transfer. Specifically, the borrower's utility is $(1-g)$ for each unit of collateral.

2.1 The Optimal Credit Contract

Given the assumption of free entry into the banking industry, the rents generated by the transaction are kept by the borrower, and the expected profits of the bank are zero. This means that the optimal credit contract is a pair of debt and interest rate (b_i, r_i) that maximizes the household's utility under its incentive compatibility constraint and the participation constraint of the bank. The problem is thus described by:

$$\max_{b_i r_i} EU_i = [A_i + \log(k + b_i)] + \beta_i p_i [A_i + \log(k + w_i - b_i r_i)] + \beta_i (1 - p_i) [A_i + \log(k)]$$

s.t.

$$b_i \overline{r} \leq p_i b_i r_i + \alpha(1 - p_i) g A_i \tag{1}$$

$$[(1-g)A_i + \log(k + w_i)] \leq [A_i + \log(k + w_i - r_i b_i)] \tag{2}$$

Notice that the assumption of limited liability implies that the second-period consumption in the bad state is equal to zero.

Condition 1 is the participation constraint of the bank. The assumption of free entry implies that this condition always holds with strict equality. Since the credit is collateralized, the bank's expected return is given by the repayment of the debt and the collateral's liquidation value asset. As can be seen, this second term is affected by the quality of judicial enforcement, g. To be precise, in case of default the bank only gets the lesser between the liquidation value of the asset $(g\alpha A_i)$ and repayment of the debt $(b_i r_i)$. Consider a credit contract between a bank and a consumer whose wealth is larger than his debt $(A_i > \overline{A}_i = \frac{w_i}{g\alpha[1+\beta_i]})$. This corresponds to the case in which the bank grants the credit

demanded at the lowest possible price ($r_i = \overline{r}$) without rationing, it is not worried about possible default, because the loan will always be repaid even in the bad state of nature, by foreclosure and liquidation of the collateral. Since our subject is on how legal institutions affect borrowing restrictions, we focus on situations where the value of the collateral is not enough to cover the entire debt. In this case ($A_i < \overline{A}_i$), the bank's participation constraint is defined by condition 1.

Condition 2 is the borrower's incentive compatibility constraint. It requires that the utility from strategic default (left-hand side) must be lower than that from repayment (right-hand side). The condition also tells us that the incentive to default in the second period is negatively related to the value of the collateral: as that value increases, the utility of repaying the loan increases more than that of defaulting. Finally, it shows that the incentive to misbehave depends negatively on the legal variable: better legal enforcement rises the cost of default (the borrower loses the property sooner) but not the benefit.

In solving the maximization problem, we first assume that the incentive compatibility constraint is not binding. This may happen if, for instance, the household is wealthy enough so that the cost of strategic default (the loss of the asset) is always greater than the benefit. In this case, we obtain the optimal credit contract by solving the maximization problem neglecting equation 2. This yields the following level of debt and interest rate:[4]

$$b_i^* = \frac{p_i w_i + \alpha(1-p_i) g A_i}{\overline{r}\left(\beta_i + \frac{1}{p_i}\right) p_i} \tag{3}$$

$$r_i{}^* = \overline{r}\left[\frac{w_i - \alpha(1-p_i) g A_i \beta_i}{p_i w_i + \alpha(1-p_i) g A_i}\right] \tag{4}$$

By substituting the two terms given by equations 3 and 4 into the incentive compatibility constraint of the borrower, we find the condition under which the borrower's promise to repay is credible:

[4] To simplify the notation, we assume that the parameter k is small enough so that all terms of the order of k can be neglected.

$$\exp(gA_i)\left[w_i p_i + \alpha(1-p_i)gA_i\right] \geq (\frac{1}{\beta_i} + p_i)w_i \tag{5}$$

Condition 5 tells us that the initial endowment of wealth, the discount factor, and the quality of enforcement all help to determine whether a consumer is rationed in the credit market. We discuss this condition in more detail in the next section. Here, we can say that if this condition is not satisfied, then the debt-interest rate pair we found earlier is not the optimal credit contract. To find the optimal, we must maximize the household's utility function simultaneously under the bank's participation constraint and the borrower's incentive compatibility condition. This amounts to solving the system consisting of the two constraints (equations 1 and 2) in the two unknowns (b_i, r_i). The solution is given by:[5]

$$b_i^c = \frac{p_i\gamma + \alpha(1-p_i)gA_i}{\overline{r}} \tag{6}$$

$$r_i{}^c = \frac{\overline{r}\gamma}{p_i\gamma + \alpha(1-p_i)gA_i} \tag{7}$$

where $\gamma = w_i\left(1 - \frac{1}{\exp(gA_i)}\right)$.

2.2 Comparative Statics

This section derives testable implications on how the quality of judicial enforcement affects the household credit market. That is, we examine whether and to what extent the legal variable affects the probability of being credit-constrained and the amount of credit received by constrained and unconstrained consumers. In what follows, before deriving the probability of being liquidity-constrained, we discuss the role of the wealth endowment.

[5]We can now explicitly derive the condition, mentioned in footnote 1 that guarantees that it is optimal for each consumer to use the wealth endowment as collateral in the credit contract instead of selling it to finance consumption. To do so, we consider a credit-constrained household and require that its expected utility from selling the illiquid asset is lower than the expected utility of keeping its asset. We find the following condition: $\alpha < \frac{p_i w_i\left(1-\frac{1}{\exp(gA_i)}\right)}{A_i[\overline{r}\exp(\beta_i p_i A_i g)-(1-p_i)g]}$. Since it has been derived by assuming that the household is credit-constrained, it follows that this condition is also sufficient to guarantee that the unconstrained consumer prefers to keep the asset.

The wealth endowment is pledged as collateral in the credit contract, affecting the consumer's incentive compatibility constraint and the bank's participation constraint. It serves as a device to reduce the borrower's incentive to default. This is captured by condition 5. On the other hand, the bank uses it to generate positive income in case of default, which is reflected in condition 1 where bank's revenue depends on the liquidation value of the asset.

Inequality 5 may be interpreted as a condition bearing on the amount of collateral necessary to avoid being credit-constrained. It has a unique solution in A_i, since the left-hand side is monotonically increasing in A_i while the right-hand side is constant. We denote this unique solution by $\widetilde{A}_i$. This is the minimum collateral requirement on the consumer in order to receive his optimal amount of credit, which depends on individual characteristics such as wage and time preferences. Notice that, by definition, $\widetilde{A}_i$ is strictly lower than $\overline{A}_i$.

To clarify the relation between the two thresholds, one can consider the case of three consumers who are equal in all individual characteristics except for wealth. In particular, let us assume that $A_1 > \overline{A}$, $\widetilde{A} < A_2 < \overline{A}$ and $A_3 < \widetilde{A}$. The three agents have the same demand for credit but get three different loans in equilibrium. The intuition is as follows. The first consumer is so wealthy that the effective liquidation value of the collateral is larger than the debt repayment. Hence, the bank is willing to supply the funds demanded at the lowest price, $\overline{r}$. In this case the bank has no risk and legal institutions play no role. The second consumer has collateral value lower than his repayment liability, so in order to break even the bank raises the interest rate above the minimum level up to the point where the supply of credit equals the demand. In this second case, the consumer receives less credit but is not rationed, since his collateral is enough to make his promise to repay credible. Finally, the third consumer is credit-rationed, because if the bank were to give him the same amount of credit provided to the second consumer he would elect not to repay, as the cost of defaulting (the loss of his asset) is very low. To avoid this situation, the bank reduces the availability of credit to the point where the consumer is indifferent between defaulting and

repaying the loan. Only in the last two cases does the degree of legal enforcement affect the allocation of credit.

Using the Implicit Function Theorem, one can show that the minimum collateral requirement is negatively related to the legal variable. It increases when the quality of legal enforcement is poorer, because households have a stronger incentive to default where courts are slower in enforcing credit contracts, in that they may continue to enjoy the property of the asset, before the final transfer of title.

Let us now derive the probability of being credit-constrained. Consider a population of heterogenous agents with different discount factors. Individuals with high β_i assign a greater weight to second-period consumption and thus have lower demand of credit, which is used to finance first-period consumption. From condition 5, we can derive the threshold value $\widetilde{\beta}_i$ that splits households with the same characteristics (wage, wealth etc.) into two groups: those with high credit demand (β_i lower than the threshold), who will be credit-constrained, and those with low demand (β_i higher than the threshold), who will not be rationed:

$$\widetilde{\beta}_i = \frac{w_i}{\exp(gA_i)\left[w_i p_i + \alpha(1-p_i)gA_i\right] - p_i w_i} \tag{8}$$

Since β_i and some of its determinants may be unknown to us as econometricians, we treat it as a random variable and assume that it is distributed across the population of households according to a probability function. So, we can define the probability that a generic household is credit-constrained, after controlling for its observable characteristics, as the value of the cumulative distribution function at $\widetilde{\beta}_i$.

With the Implicit Function Theorem it is easy to show that this threshold level is decreasing in the legal variable:

$$\frac{\partial \widetilde{\beta}_i}{\partial g} = -\frac{{\beta_i}^2 A_i \exp(gA_i)\left[p_i w_i + (1-p_i)\alpha(1+gA_i)\right]}{w_i} < 0$$

Since the threshold is lowered when the quality of judicial enforcement improves, the

probability of being credit-constrained is a decreasing function of the quality of judicial enforcement. Notice further that, other things being equal, an increment in the collateral asset and the income level lowers the threshold $\widetilde{\beta}_i$, while the effect of an increment in p_i (the probability of a household's receiving a positive income in the second period) is ambiguous.[6]

Next, we consider the effects of the quality of legal enforcement on the optimal amount of debt. One can show that the derivatives of b_i^* and b_i^c with respect to the parameter g are both positive:

$$\begin{aligned}
\frac{\partial b_i^*}{\partial g} &= \frac{p_i w_i + \alpha(1-p_i)A_i}{\overline{r}\left(\beta_i + \frac{1}{p_i}\right)p_i} > 0 \\
\frac{\partial b_i^c}{\partial g} &= \frac{A_i\left[\alpha(1-p_i) + \frac{p_i w_i}{\exp(gA_i)}\right]}{\overline{r}} > 0
\end{aligned}$$

These results show that when the quality of judicial enforcement increases, so does the amount of credit received by constrained and unconstrained consumers and in an unambiguous way. The intuition is that if the consumer is not credit-constrained an improvement in the quality of enforcement eases the bank's participation constraint by increasing effective liquidation values. Since collateral and interest rate are substitutes, and given free entry into the banking, the higher liquidation value induces the bank to reduce the cost of credit, which raises its availability in equilibrium. If the household is credit-constrained, a reduction in legal costs relaxes not only the bank's participation constraint but also the household's incentive compatibility constraint. Both effects work in the same direction and so enlarge the set of feasible solutions of the transaction. Again the result is that banks are willing to expand the availability of credit.

Finally, households with larger endowments of wealth or higher income have greater

[6] If we calculate the derivative of the threshold $\widetilde{\beta}_i$ with respect to w_i, A_i and p_i, we find the following expressions: $\frac{\partial \widetilde{\beta}_i}{\partial w_i} = \frac{\beta_i^2 \alpha g(1-p_i)A_i \exp(gA_i)}{w_i^2} > 0$; $\frac{\partial \widetilde{\beta}_i}{\partial A_i} = -\frac{\beta_i^2 g \exp(gA_i)[w_i p_i + \alpha(1-p_i)(1+gA_i)]}{w_i} < 0$; $\frac{\partial \widetilde{\beta}_i}{\partial p_i} = \frac{\beta_i^2\{A_i \alpha g \exp(gA_i) - w_i[\exp(gA_i)-1]\}}{w_i}$. While the first two signs are clear, the last one is ambiguous.

access to credit.

The testable implications derived in the theoretical analysis can be summarized as follows:

Proposition 1 *When legal enforcement improves, the probability of being credit-constrained decreases and the amount of credit received by constrained and unconstrained consumers increases.*

The next section checks whether the empirical evidence is consistent with these theoretical predictions.

3 Data

3.1 Household Data

Household data come from the Survey of Household Income and Wealth (SHIW), which the Bank of Italy has conducted every other year since 1984. The SHIW is a representative national household survey providing data on income, consumption and households' characteristics. See Brandolini and Cannari (1994) for a detailed description of the survey.

Here we use data from three waves: 1989, 1995 and 1998,[7] a total of 23,556 observations.

This survey is an invaluable source of information for our inquiry, mainly because self-reported measures allow us to identify households that are credit-constrained, not requiring arbitrary identification restrictions. We define as credit-constrained each household that responds positively to at least one of the following questions: "During the year did you or a member of your household think of applying for a loan or a mortgage to a bank or other financial intermediary, but then change your mind on the expectation that the application would be turned down?"; "During the year did you or a member of your household apply for a loan to a bank or other financial intermediary and have the application partially or

[7] The variables used in this paper are available only for these three waves; that is, only for these three years can we distinguish households that applied for a loan from those that did not.

totally rejected?". On this basis,[8] we find that around 2.44% of the sample households are credit-constrained. However, around 30% of the households that actually apply for a loan (7.86% of the sample apply) are subject to credit rationing.

The survey also gives detailed information on real assets. This is quite important because it allows us to experiment with different proxies for the collateral, which is not observable.[9] Real assets include houses, lands, valuables and the business, if any, owned by the households and average €110,075 of 1998 prices. Around 64% of the sample own their primary residence, which is worth on average €100,704.

Data on liabilities are also quite detailed, and they allow to identify the amount borrowed to finance the purchase of houses, real goods such as valuables and jewelry, cars, other durable good such as furniture and appliances, and non-durable consumption. The average amount of debt is €2,508. Around 81% of this credit goes to purchase a house, 0.28% to buy real goods, such as valuables and jewelry, 14% for cars and 2.9% for other durables. The rest is used to finance non-durable consumption.

Conditional on being actually indebted, the amount borrowed to finance these types of consumption were, respectively: €20, 651, €2,927, €5,901, €2,381, and €4,615 at the end of the year.

The proportion of households who are indebted to finance these purchases were, respectively: 10.74%, 0.26%, 6.22%, 3.12%, and 0.96% at the end of the year. These figures together show that households borrow almost entirely to purchase houses, cars, and other durables.

Table 1 summarizes these statistics.

[8] A similar definition appears in Jappelli (1990) who uses an American survey, the Survey of Consumer Finances, with a structure similar to the SHIW to identify credit-constrained households in the U.S..

[9] As a rule, of course, mortgage contracts require the house being purchased to be used as collateral for the loan.

3.2 The Quality of Judicial Enforcement

This section documents the differences between Italian judicial districts in the degree of legal enforcement of creditor rights. Before illustrating our measures and their geography, a brief discussion on how the judicial system works will be helpful.

Italy is a civil-law country. This implies that the main attribute of the judicial system is enforcing the law. Italian laws regulate criminal and civil offenses separately. Correspondingly, separate branches of the judicial system deal with them.

Civil trials can undergo three degrees of judgment. The first degree (lower court), a second degree (appeals court), and a third degree that can only deal with formal aspects of the summon issued in the former degrees. Readers familiar with the American system will recognize some similarities. This work concentrates on civil trials in the lower and appeals courts, which are the most relevant when households fail to honor their debts.[10] By law, the competent court is that of the borrower's district of residence.

We draw data on trials from an annual survey conducted by the National Institute of Statistics (ISTAT), for the years 1989-1998. The primary sample units are the judicial districts. Roughly, each district corresponds to a region. In some regions (Lombardy, Campania, Puglia, Calabria, Sicily and Sardinia) there is more than one judicial district,[11] while, Valle d'Aosta is in the Piedmont judicial district. Table 2 shows the matching of judicial districts with regions and provinces.

Consistently with our model, we assume that the cost faced to a lender of enforcing the right to repossess in case of default depends on the degree of congestion of the judicial district. This is proxied by the backlog of trials pending. However, this variable depends on the size of the judicial district and does not necessarily reflect poor functioning. Accordingly, we normalize backlogs by using alternatively the number of incoming trials, the population,[12]

[10] The data used to construct our indicators of legal enforcement include all civil trials except labor and work-related cases.

[11] About 30% of the Italian population resides in those regions.

[12] Bianco, Jappelli and Pagano (2000) also proxy the degree of legal enforcement by using the backlog of trials pending divided by the population.

the number of judges, and the number of judges and the administrative staff.[13]

Figure 1 displays the backlog of trials pending divided by the number of incoming trials. Each of the four panels shows the evolution of this measure in different areas of the country, i.e. northern, central and southern Italy and the island regions. In figures 2, 3 and 4 the number of trials pending is divided by the population, by the number of judges, and by the number of judges plus administrative staff.

All the measures trend upward in all districts: this means that the quality of judicial enforcement is worsening across the country. However, the differences between districts persist. The horizontal line in each graph is the country-wide average in the sample period. The backlog whether normalized by the number of incoming cases, the population, the number of judges or the size of the administrative staff plus judges is higher than the country-wide average in Southern Italy and in some of the districts in Sicily and Sardinia. For instance, in Catanzaro the stock of trials pending divided by incoming cases averages 2.9, ranging from 1.77 in 1989 to 4.74 in 1998. Trento is the best district: the stock of trials pending divided by incoming cases averages 1.7 and it was 1.22 in 1989 and 1.69 in 1998 with a peak of 1.87 in 1997. The pattern emerging from the other graphs is similar: the quality of judicial enforcement is worse in southern Italy and in the island regions.

This is consistent with the evidence provided in table 3, showing that the sample correlation among these four measures is high, ranging from 0.52 to 0.94. However, these coefficients conceal some important differences. Namely, the number of incoming trials is a better proxy of the demand for justice, because it responds to the business cycle more closely than does the population, the number of judges or the size of the administrative staff. This is because the population is almost constant in the sample period and the number of judges and the size of the administrative staff are set according to the population of each district.[14] Moreover, the number of incoming trials reflects differences in the degree

[13] Data on the number of judges and the size of the administrative staff of each judicial district come from the Italian Ministry of Justice. We thank Tullio Jappelli and Marco Pagano for providing these data.

[14] The sample correlation coefficient between the number of judges and the population is 0.9; that between

of litigation, which are not captured by population and judicial personnel. For instance, the number of judges in the judicial district of Naples is 10% greater than in Milan but the number of incoming trials is almost twice as greater.

Therefore, in the empirical analysis we proxy the quality of judicial enforcement by using the backlog of trials pending divided by the number of incoming cases.

4 Results

4.1 Law Enforcement and Borrowing Restrictions

In this section, we explore the relation between the degree of legal enforcement and the probability of a household's being credit-constrained. As noted in section 3, we rely on self-reported measures to identify credit-constrained households. In our model, the probability of being credit-constrained depends on individual as well as on institutional variables. We include among the set of explanatory variables those commonly supposed to affect the consumer's demand for credit and those that are used by banks in screening.

We estimate a probit model with sample selection. We need to correct for selection because we exclude households that do not apply for credit[15], and the probability of asking for credit and the probability of being credit-rationed are potentially affected by the same set of unobservable factors. To estimate the model, we need to find at least one variable that affects the decision to ask for a loan, but not the probability of being credit-constrained. We chose the size of the city where the household resides, *city size*, since the coefficient of this variable turns out to be statistically significant in the decision to ask for a loan but not in the probit for credit-constrained households.

Table 4 displays the probit estimation of the selection equation, where the dependent variable is a dummy, called *Credit market participation*, that takes value one when the household asks for credit. Table 5 reports the results for the probability of being credit-

the size of the administrative staff and the population is 0.89.

[15] However, we count discouraged borrowers as households asking for credit.

constrained. Here, the dependent variable is a dummy, *Credit rationing*, that takes value one if the household is credit-constrained.[16]

Each column of tables 4 and 5 refers to a particular measure of the collateral asset. We experiment with different measures because we cannot observe the asset that is actually pledged. The collateral is proxied successively by the amount of real assets held by the household, by the stock of land and houses, by the value of the house of residence and by the stock of land and houses less the value of the house of residence.

All the specifications include a set of year dummies, because households coming from different waves are pooled together, and, we add a full set of dummies at judicial district level to control for heterogeneity. Furthermore, in order to avoid any potential bias due to variation in sample design between waves, we use throughout the sample weights to compute our estimates. Finally, standard errors are corrected for clustering and stratification to take into account that SHIW has a panel component and is sampled in 51 strata.

Before analyzing the determinants of the probability of being credit-constrained, let us briefly describe the variables that affect the decision to apply for a loan. From table 4, we can see that this decision is positively correlated with the age of the household head in a non-linear way: the coefficient of age is positive and that of age squared is negative. This is in line with our model, as the assumptions that individual income increases with age and agents would like to smooth consumption over time imply that they want credit in the first period of life. An analogous argument explains the negative correlation between the probability of asking for a loan and individual income.

The probability also increases with household size, which can be considered as a proxy for family needs; and the probability is higher for people living in a city of more than 200,000 population. The reason why the variable *City size* shows a positive coefficient could be that family networks, which often provide an alternative to the formal credit market, are weaker in larger cities.

[16] See the data appendix to know which questions were used to define these two dummy variables.

The same table also shows that the probability of asking for credit does not depend on the collateral, educational attainment or the marital status of the household head. Similarly, whether the household head is retired or not does not affect the decision to ask for a loan.

We also find that unemployed individuals are less likely to ask for credit. This is not surprising, given that loosing the job reduces income and hence the desired level of consumption.

Finally, per capita GDP and the quality of legal enforcement in the district does not appear to affect the probability of asking for credit. One possible reason why the GDP is not significant may be that the heterogeneity has already been captured by the dummies at judicial district level. That the decision to ask for a loan is independent of the quality of legal institutions is reasonable, since it is presumed to be affected by individual more than by aggregate variables.

Let us now concentrate on the determinants of the probability of a household's being credit-constrained. From table 5, we see that this is higher for households headed by persons with more education or by the unemployed. The positive coefficient of *Years of schooling* may be due to the fact that the better educated have a steeper income profile, which is typically associated with greater desired consumption and borrowing restrictions early in life (typically, at the beginning of the career).

Now, consider the variable *Unemployed*. We can interpret this variable, according to our model, by relating it to the probability of receiving an income, p_i. Under this interpretation, unemployed individuals are the ones with a low p_i, and the converse for employed. From the comparative statics performed in section 2.2, we know that the effect of p_i on the threshold $\widetilde{\beta}_i$ is ambiguous.[17] The intuition behind this result is that an increment in p_i has two opposite effects on the probability of being credit-constrained. First, it increases expected income and hence the demand for credit. Other things being equal, this tightens borrowing restrictions. Second, it increases the bank's expected repayment (in the good state of

[17] It depends on the sign of the following term: $\{A_i \alpha g \exp(gA_i) - w_i[\exp(gA_i) - 1]\}$.

nature) and so relaxes the participation constraint. Given the assumption of free entry, this induces the bank to increase the availability of credit, which reduces the probability of liquidity-constraints. Our evidence seems to suggest that the latter effect dominates.

Households able to pledge more collateral are less likely to be credit-constrained. Again, this result is in line with the predictions of the model (in section 2.2 we show that the threshold $\widetilde{\beta}_i$ is decreasing in the collateral value), and it is also consistent with the evidence provided by Jappelli (1990) and Cox and Jappelli (1990) for the American household credit market. Also, married couples are less likely to be credit-constrained, perhaps because they can underwrite the loans jointly.

Households with higher income are less likely to be credit-constrained. At first sight this evidence might seem to contradict the prediction of the model derived in section 2.2, where we show that $\frac{\partial \widetilde{\beta}_i}{\partial w_i} > 0$. However, in our model the consumer gets a positive income only in the second period. Hence, w_i is not only a measure of the income but also of the difference in the individual income levels over time. Given this and given the individual preferences for consumption smoothing, an increment in w_i always increases expected consumption and hence the demand for credit, which tightens borrowing restrictions. This would not be the case if we were to increase the income equally in both periods.

The other individual characteristics appear not to be correlated with the likelihood of being credit-constrained. For instance, we find that being retired or having a big family has no apparent effect. Similarly, the coefficients of age and age-squared are rightly signed but not significant at the standard levels. If we consider agents with income that is increasing in time and with preferences for consumption smoothing, as in our simple model, we should expect younger individuals to have higher demand for credit. Hence, other things being equal, we should find a negative correlation between age and credit-constraints, as in table 5. The lack of significance can be due to the fact that in the model age and income play the same role.

Having examined the effects of the individual variables, let us now consider the role

played by macroeconomic and institutional variables. To account for macro-effects, we added regional per capita GDP, which has a coefficient that is negative but not statistically significant. Again, this may be because the heterogeneity has been already captured by the dummy variables for judicial districts, which broadly corresponds to the regions.

Finally, we come to the variable *Justice*, which proxies the quality of legal enforcement of credit contracts by measuring the backlog of pending trials divided by incoming trials in each judicial district. This is posited to capture the legal costs that the lender sustains to recover his credit if the borrower defaults. In line with our theoretical predictions, we find that the coefficient of *Justice* is positive and significant, meaning that the weaker legal enforcement the more likely households are to be credit-constrained.

At this point, one naturally suspects that the effect we are capturing is actually due to social or economic factors that are correlated with our measures of legal enforcement.[18] However, micro-data allow us to control for regional effects by including a full set of regional dummies to disentangle the quality of judicial enforcement from influences operating at regional level. Furthermore, the use of micro-data is also required by the assumption that the quality of judicial enforcement is not affected by whether or not a household is credit-constrained, an assumption that would be much less tenable with macro-data, if the proportion of credit-constrained households affected the quality of judicial enforcement. Hence, this empirical result supports the thesis that the poor performance of legal institutions can entail substantial social costs, restricting access to credit.

To appreciate the importance of this distortion, we compute how much the probability of being credit-constrained changes on average if one endows all households with the same quality of legal enforcement (see table 6). Rows refer to judicial districts sorted from north to south and columns to different degrees of legal enforcement. In the first column, we set the quality of judicial enforcement equal to the maximum in the sample, in the second to the mean and in the third to the minimum. Each entry is computed as the ratio of

[18] It is well known that Italy displays enormous interregional differences in social and economic indicators.

the probability of being credit-constrained given the column's degree of legal enforcement (maximum, mean, minimum) to that in the row's judicial district minus one.

Table 6 shows that endowing all households with the best legal enforcement would reduce the probability of being credit-constrained. The decrease is generally more pronounced for southern judicial districts. For instance, endowing the households living in high-cost southern districts such as Campobasso and Caltanissetta with the best quality of legal enforcement would reduce the probability of being credit-constrained by 70% and 63%, respectively. These are the largest and second largest reductions in the sample. The smallest (around 2%) corresponds to households in the Trento judicial district.[19]. In the second column of the table, when all households are assigned the mean value for legal enforcement, the probability of being credit-constrained decreases in southern districts and increases in northern. Finally, in the third column, where all the households are given the lowest degree of enforcement, the probability increases in all districts. As expected, the increase is greater in the best districts such as Turin, Milan and Trieste (in northern regions) and smaller in Campobasso and Salerno (in southern regions).

The effect on the probability of being credit-constrained is not the only welfare implication of poor legal enforcement. As the model suggests, there could also be a welfare effect for households who are not credit-constrained, via the cost of finance. We now turn to this issue.

4.2 Law Enforcement, Collateral and the Availability of Credit

This section investigates how the relation between household credit and collateral is affected by the quality of law enforcement.

As we said, the collateral is used by banks to guard against accidental default. If a house-

[19]The reason the probability of being credit-constrained changes even for households in Trento, which is the best judicial district, is that the probability of being credit-constrained in each district has been found by taking the average across periods, while the top quality of legal enforcement is the single highest value in the sample.

hold does not repay, the bank repossesses the collateral, at a cost that depends crucially on the quality of judicial enforcement. The poorer the enforcement, the higher the cost of acquiring ownership of the asset. This lowers the effective liquidation value of the collateral and induces banks to compensate by charging a higher interest rate. Therefore, according to our model, we should expect that if the quality of judicial enforcement improves, other things being equal, the equilibrium amount of debt increases.

To test this theoretical prediction, we estimate a tobit model with a term that corrects for endogenous selection. Tobit model is required by the fact that data are censored to the left, endogenous selection term because we exclude households that are credit-constrained and because the probability of being constrained and the amount of debt are potentially affected by the same set of unobservable factors.[20]

Table 7 shows the results of the estimation. As in table 5, columns differ in the measure of collateral used. In the first column, we take real wealth, which includes land, houses and the business, if any, owned by the household. In the second column, we restrict the measure to land and houses. The third column proxies collateral by the value of the house of residence, while the fourth excludes from the stock of land and houses the house of residence.

In line with our model, we find that unconstrained households able to pledge more collateral and unconstrained higher-income households have a larger amount of debt. The collateral positively affects the individual's credit rating because it provides better insurance for the bank. An increment in income has two effects: first, it increases the demand for consumption in the first period and, other things being equal, the demand of credit. Second, it relaxes the bank's participation constraint and increases the availability of finance. Therefore, in equilibrium at least a positive share of the new household demand is satisfied.

We also find that unconstrained households headed by individuals with better educations hold more debt. As we focus on those individuals who are not constrained, the positive

[20] Details on the econometric model are given in the appendix.

coefficient of the variable *Years of schooling* might be capturing the fact that, as mentioned, the better-educated have a steeper income profile, which is typically associated with higher desired consumption and higher demand for credit early in life.

Finally, let us focus on the role played by judicial institutions. In line with our theoretical predictions, we find that the coefficient of the variable *Justice* is negative and significant. Recall that we are measuring the cost of a badly functioning judicial system. Hence, the negative coefficient means that if the quality of the judicial enforcement worsens, the amount of debt held by unconstrained households decreases. We interpret this finding, in our model, as evidence that poorer judicial enforcement is associated with higher cost of debt.[21]

Quantifying this effect, we find that it is economically significant. Table 8 shows how much a household's debt increases as judicial costs fall computing the elasticity of households' debt with respect to the quality of judicial enforcement. As in table 7, columns differ for the measure of collateral. The elasticity ranges from 41% to 50% depending on the measure of collateral. This implies that if the backlog of trials pending increases by 5,000 units (i.e. by around 5% of the national average) and the number of incoming trials stays constant, the average household debt capacity is reduced by around €900.

Taken together, these results suggests that judicial costs do affect the average amount of household debt and that the effect does not vary greatly with the different measures of collateral.

[21] We also estimated the effect of the degree of legal enforcement on the availability of credit for constrained households. The results, not reported in the text, show that the variable *Justice* is not significant at the standard level. As the model suggests, the only channel through which the legal variable affects the equilibrium amount of debt is the collateral (see equation (6) where g is always multiplying A_i). This could explain why the effect of changes in the degree of legal enforcement is neglegible for the constrained households, which typically have very little collateral.

5 Conclusions

We have analyzed the relation between the quality of judicial enforcement of creditors' rights and the allocation of credit to households,both theoretically and empirically.

The model identifies two main effects of poor enforcement. First, households are more likely to be credit-constrained because whenever contracts are weakly enforced, the household's incentive to repay is reduced and banks respond by rationing credit. Second, the quality of enforcement also affects households who are *not* credit-constrained, through its effect on the cost of debt. We show that when enforcement is weak, banks tend to compensate for the lower liquidation value of the collateral pledged by raising interest rates, which reduces the equilibrium amount of debt.

To test our theoretical predictions we use data for Italian households drawn from the Survey of Household Income and Wealth, and data on the performance of judicial districts. An important characteristic of our data set is that it has a self-reported indicator of credit-constrained households. To be consistent with our model, where the working of the legal system is supposed to affect the costs of repossession, we proxy the quality of legal enforcement by using measures based on the backlog trials pending.

In line with our theoretical predictions, we find that better quality of judicial enforcement reduces the probability of being credit-constrained. Households in judicial districts where enforcement is poorer are more likely to have a loan application denied. We find that, other things being equal, endowing the households in highest-cost judicial districts, Campobasso and Caltanissetta, in the South of Italy, with the best degree of legal enforcement would reduce the probability of being credit-constrained by 70% and 63%, respectively. Moreover, we show that weak legal institutions also have a second welfare implication: the amount of debt of non-rationed households decreases when the quality of enforcement worsens. The magnitude of this effect varies with the measure of collateral used, ranging from 33% to 47%.

Table 1: Summary Statistics

	Mean	*Standard deviation*
Real assets	110075	1781.726
House of residence	100703.6	1167.566
Percentage of home-owners	0.64	
Debt for house purchase	20650.87	666.8814
Debt for purchase of valuables	2927.016	930.6384
Debt for car purchase	5900.812	274.5024
Debt for other durables purchases	2380.99	153.8591
Debt for non-durable consumption	4615.367	1064.337
Percentage of households holding debt for house purchase	10.74	
Percentage of households holding debt for purchase of valuables	0.26	
Percentage of households holding debt for car purchase	6.22	
Percentage of households holding debt for other durables purchases	3.12	
Percentage of households holding debt for non-durables consumption	0.96	
Percentage of credit-constrained households	2.44	
Percentage of households that participate to the credit market	7.86	

Note: figures are in 1998 euro except for those that are explicitly cited as percentage. Debt is measured as the amount of end-of-year household liabilities. The figures for debt are computed including only those households that are actually indebted. The inverse of the inclusion probability has been used as sample weight.

Table 2: Matching of Judicial Districts with Regions and Provinces

Judicial Districts	*Corresponding Regions and Provinces*
Turin	*Piedmont* (all provinces), *Valle d'Aosta* (all provinces)
Genoa	*Liguria* (all provinces) and *Tuscany* (Massa Carrara)
Milan	*Lombardy* (Milan, Como, Varese, Pavia, Sondrio, Lecco, Lodi)
Brescia	*Lombardy* (Brescia, Bergamo, Cremona, Mantua)
Trento	*Trentino-Alto Adige* (Trento)
Bolzano	*Trentino-Alto Adige* (Bolzano)
Venice	*Veneto* (all provinces)
Trieste	*Friuli-Venezia Giulia* (all provinces)
Bologna	*Emilia Romagna* (all provinces)
Ancona	*Marche* (all provinces)
Florence	*Tuscany* (all provinces excluding Massa Carrara)
Perugia	*Umbria* (all provinces)
Rome	*Lazio* (all provinces)
Naples	*Campania* (Naples, Avellino, Benevento, Caserta)
Salerno	*Campania* (Salerno)
L'Aquila	*Abruzzo* (all provinces)
Campobasso	*Molise* (all provinces)
Bari	*Puglia* (Bari, Foggia)
Lecce	*Puglia* (Lecce, Brindisi)
Taranto	*Puglia* (Taranto)
Potenza	*Basilicata* (all provinces)
Catanzaro	*Calabria* (Catanzaro, Cosenza, Crotone, Vibo Valentia)
Reggio Calabria	*Calabria* (Reggio Calabria)
Palermo	*Sicily* (Palermo, Agrigento, Trapani)
Messina	*Sicily* (Messina)
Caltanissetta	*Sicily* (Caltanissetta, Enna)
Catania	*Sicily* (Catania, Ragusa, Siracusa)
Cagliari	*Sardinia* (Cagliari, Oristano)
Sassari	*Sardinia* (Sassari, Nuoro)

Note: the table matches judicial districts with Italian regions and provinces. The names of the regions are italicized, those of provinces bracketed. Roughly, each district corresponds to a region. In a few regions (Lombardy, Campania, Puglia, Calabria, Sicily and Sardinia) there is more than one judicial district. Provinces located in two different regions (Valle d'Aosta and Piedmont) belong to one judicial district, called Turin. Finally, the judicial district of Genoa includes not only all the provinces located in Liguria but also one province in Tuscany. The source is ISTAT: "Annuario delle Statistiche Giudiziarie Civili".

Table 3: Matrix of Correlation Among the Measures of Legal Enforcement

	(1)	*(2)*	*(3)*	*(4)*
Backlog of pending/incoming trials	1.0000			
Backlog of trials pending/population	0.6834	1.0000		
Backlog of trials pending/judges	0.6229	0.8243	1.0000	
Backlog of trials pending/judges plus staff	0.5245	0.8138	0.9445	1.0000

Note: the table shows the sample correlations among the four measures of legal enforcement. The first column refers to the backlog of pending/incoming trials, the second to the trials pending/population, the third to the trials pending/judges and the fourth to the trials pending/judges plus staff.

Table 4: Credit Market Participation

Age of the household head	0.0190	0.0192	0.0197	0.0194
	(0.0084)*	(0.0085)*	(0.0086)*	(0.0085)*
Age squared of the household head	-0.0374	-0.0375	-0.0378	-0.0376
	(0.0086)**	(0.0086)**	(0.0087)**	(0.0086)**
Labor household income	-0.0035	0.0033	0.0033	0.0034
	(0.0011)**	(0.0011)**	(0.0010)**	(0.0010)**
Collateral	0.0009	0.0007	-0.0001	0.0010
	(0.0004)*	(0.0004)	(0.0017)	(0.0005)
Years of schooling	0.0034	0.0036	0.0045	0.0039
	(0.0048)	(0.0048)	(0.0049)	(0.0048)
Family size	0.0566	0.0571	0.0580	0.0573
	(0.0096)**	(0.0095)**	(0.0096)**	(0.0095)**
Retiree	-0.0739	-0.0776	-0.0790	-0.0773
	(0.0439)	(0.0432)	(0.0431)	(0.0432)
Unemployed	-0.1856	-0.1889	-0.1912	-0.1899
	(0.0687)**	(0.0694)**	(0.0685)**	(0.0696)**
Marital status	0.0737	0.0746	0.0761	0.0753
	(0.0421)	(0.0424)	(0.0416)	(0.0426)
City size	0.1500	0.1497	0.1495	0.1496
	(0.0410)**	(0.0409)**	(0.0409)**	(0.0409)**
Per-capita gross domestic product	0.0006	0.0006	0.0006	0.0006
	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Justice	0.3578	0.3603	0.3572	0.3601
	(0.5822)	(0.5810)	(0.5816)	(0.5816)
Constant	-1.7876	-2.2080	-2.2374	-1.8086
	(0.3114)**	(0.4976)**	(0.5088)**	(0.3119)**
No. of observations	23132	23132	23132	23132

Note: The dependent variable is a dummy, *Credit market participation*, that takes value equal to one if the household responds positively to the question: "During the year did you or a member of your household apply for a loan or a mortgage to a bank or other financial intermediary?". Standard errors robust to unknown form of heteroskedasticity and corrected for the cluster effect are reported in parentheses. In the first column, the collateral is proxied by the amount of real assets held by the household, in the second by the stock of land and houses, in the third by the value of the house of residence, and in the fourth by the stock of land and houses minus the value of the house of residence. All the specifications include a full set of judicial district and year dummies. * significant at 5% level; ** significant at 1% level.

Table 5: Law Enforcement and the Probability of Being Credit-Constrained

Age of the household head	-0.0143	-0.0130	-0.0140	-0.0156
	(0.0298)	(0.0302)	(0.0303)	(0.0307)
Age squared of the household head	0.0230	0.0217	0.0224	0.0230
	(0.0342)	(0.0350)	(0.0350)	(0.0359)
Labor household income	-0.0095	-0.0084	-0.0079	-0.0083
	(0.0040)*	(0.0039)*	(0.0036)*	(0.0040)*
Collateral	-0.0076	-0.0102	-0.0143	-0.0111
	(0.0033)*	(0.0042)**	(0.0062)*	(0.0061)
Years of schooling	0.0151	0.0159	0.0142	0.0126
	(0.0066)*	(0.0064)*	(0.0066)*	(0.0059)*
Family size	0.0433	0.0411	0.0391	0.0407
	(0.0335)	(0.0344)	(0.0331)	(0.0352)
Retiree	-0.3061	-0.2834	-0.2639	-0.2876
	(0.1658)	(0.1685)	(0.1646)	(0.1666)
Unemployed	0.7289	0.7469	0.7614	0.7542
	(0.2513)**	(0.2492)**	(0.2509)**	(0.2562)**
Marital status	-0.3976	-0.3989	-0.4048	-0.3993
	(0.1320)**	(0.1311)**	(0.1338)**	(0.1332)**
Per-capita gross domestic product	-0.0001	-0.0001	-0.0001	-0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Justice	2.8573	2.8140	2.8583	2.8377
	(1.1972)*	(1.7189)*	(1.2003)*	(1.7641)*
Constant	-2.3718	-1.8312	-2.3207	-2.3759
	(1.7120)	(1.7535)	(1.1786)	(1.7641)
No. of observations	1817	1817	1817	1817

Note: the dependent variable is an indicator variable, *Credit rationing*, taking value equal to one if the household is credit-constrained, i.e. responds positively to at least one of the following questions: "During the year did you or a member of your household think of applying for a loan or a mortgage to a bank or other financial intermediary, but then change your mind on the expectation that the application would be turned down?"; "During the year did you or a member of your household apply for a loan to a bank or other financial intermediary and have the application rejected partially or totally?". Standard errors robust to unknown form of heteroskedasticity and corrected for the cluster effect are reported in parentheses. In the first column, the collateral is proxied by the amount of real assets held by the household, in the second by the stock of land and houses, in the third by the value of the house of residence, and in the fourth by the stock of land and houses minus the value of the house of residence. All the specifications include a full set of judicial district and year dummies. * significant at 5% level; ** significant at 1% level.

Table 6: Changes in the Probability of Being Credit-Constrained

Turin	-0.1590	0.2125	1.6104
Genoa	-0.1763	0.0555	0.6934
Milan	-0.1033	0.2316	1.3537
Brescia	-0.1626	0.0672	0.6981
Trento	-0.0284	0.1889	0.7202
Venice	-0.2590	0.0199	0.9766
Trieste	-0.2417	0.0342	1.1610
Bologna	-0.1393	0.0789	0.6872
Ancona	-0.2857	-0.0683	0.5706
Florence	-0.1641	0.0924	0.8434
Perugia	-0.1625	0.0759	0.7749
Rome	-0.2760	-0.0687	0.5333
Naples	-0.1616	0.0026	0.4034
Salerno	-0.2812	-0.1182	0.3237
L'Aquila	-0.0834	0.1469	0.7293
Campobasso	-0.7059	-0.5403	0.1381
Bari	-0.1935	-0.0124	0.4181
Lecce	-0.3416	-0.0608	0.9803
Taranto	-0.5262	-0.2724	0.7162
Potenza	-0.2237	-0.0282	0.4831
Catanzaro	-0.2514	-0.0751	0.4146
Reggio Calabria	-0.5167	-0.3046	0.4729
Palermo	-0.2726	-0.0244	0.8483
Messina	-0.3050	-0.0906	0.4763
Caltanissetta	-0.6346	-0.3196	1.5934
Catania	-0.1664	0.0819	0.7877
Cagliari	-0.2269	0.0663	0.9599
Sassari	-0.5632	-0.3450	0.4594

Note: Rows refer to judicial districts sorted from north to south and columns to different qualities of legal enforcement. In the first column, we set the quality of judicial enforcement to the sample maximum, in the second to the mean and in the third to the minimum. Each entry is computed as the ratio of the probability of being credit-constrained taking the degree of legal enforcement corresponding to the column (maximum, mean, minimum) to that in the row's judicial district minus one.

Table 7: Law Enforcement, Collateral and the Availability of Credit for Unconstrained Households

Labour household income	0.1479	0.1227	0.0987	0.1030
	(0.0653)*	(0.0627)	(0.0631)	(0.0640)
Collateral	0.0262	0.0352	0.0573	0.0305
	(0.0052)**	(0.0066)**	(0.0098)**	(0.0105)**
Years of schooling	0.3851	0.3315	0.4149	0.5025
	(0.1372)**	(0.1312)*	(0.1376)**	(0.1420)**
Mill's ratio	-10.8877	-8.1090	-7.6165	-11.2229
	(2.9906)**	(2.6889)**	(2.8442)**	(3.3005)**
Justice	-22.7736	-20.8656	-22.0101	-20.4338
	(9.8385)*	(9.3120)*	(9.4381)*	(9.5070)*
Constant	7.0460	6.8464	6.4232	8.1441
	(2.7873)**	(2.6104)**	(2.6804)*	(2.7223)**
No. of observations	1271	1271	1271	1271

Note: The dependent variable is the amount of debt held by non-credit-constrained households. Standard errors robust to unknown form of heteroskedasticity and corrected for the cluster effect are reported in parentheses. In the first column, the collateral is proxied by the amount of real assets held by the household, in the second by the stock of land and houses, in the third by the value of the house of residence, and in the fourth by the stock of land and houses minus the value of the house of residence. * significant at 5% level; ** significant at 1% level.

Table 8: Law Enforcement, Collateral and the Availability of Credit for Unconstrained Households, Elasticities

	(1)	(2)	(3)	(4)
Elasticity	-0.4658	-0.4266	-0.4512	-0.4192
Standard Errors	(0.1960)**	(0.1863)**	(0.1889)**	(0.1906)**

Note: Each entry in the first row is the elasticity of the household debt with respect to different measures of collateral. In the second row we report the standard errors. Columns differ in the measure of collateral. In the column (1) the collateral is proxied by the amount of real assets held by the household, in (2) by the stock of land and houses, in (3) by the value of the house of residence and in (4) by the stock of land and houses minus the value of the house of residence.

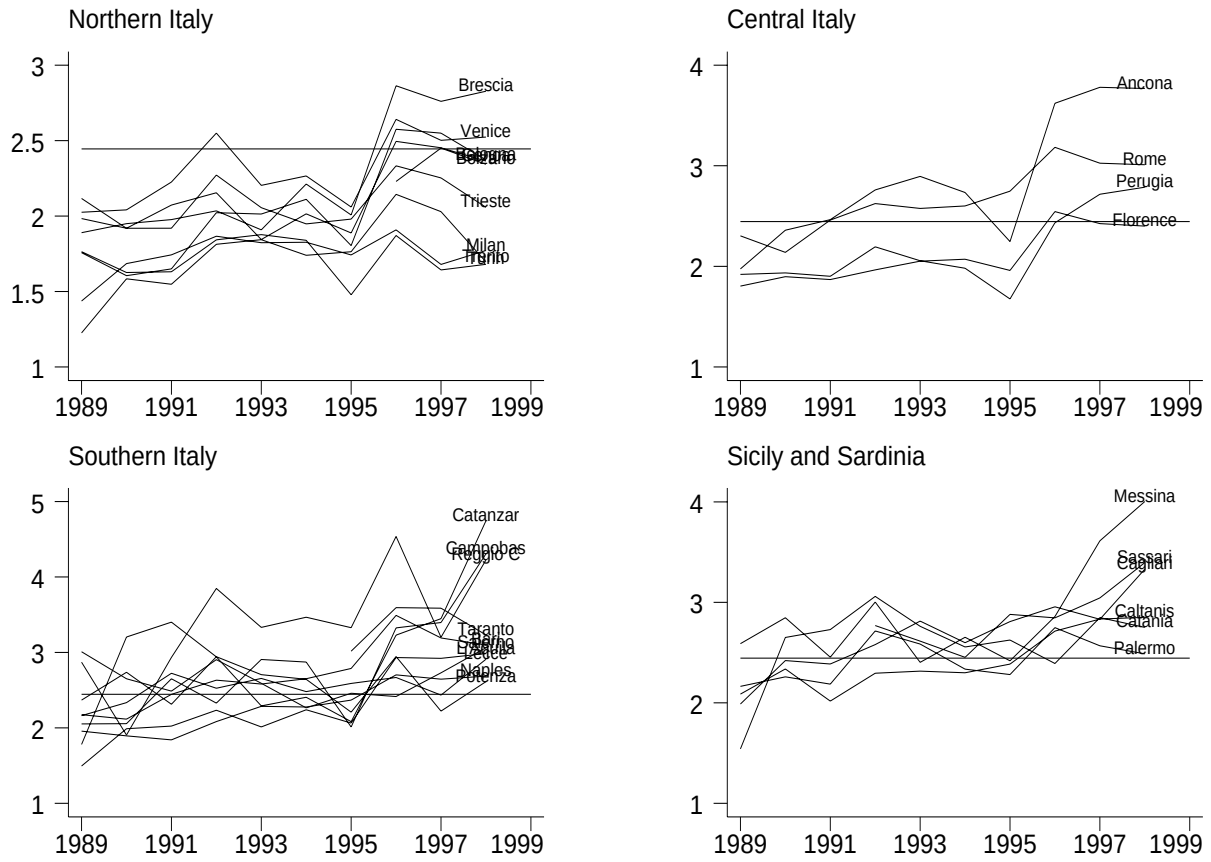

Figure 1: Backlog of trials pending divided by incoming trials

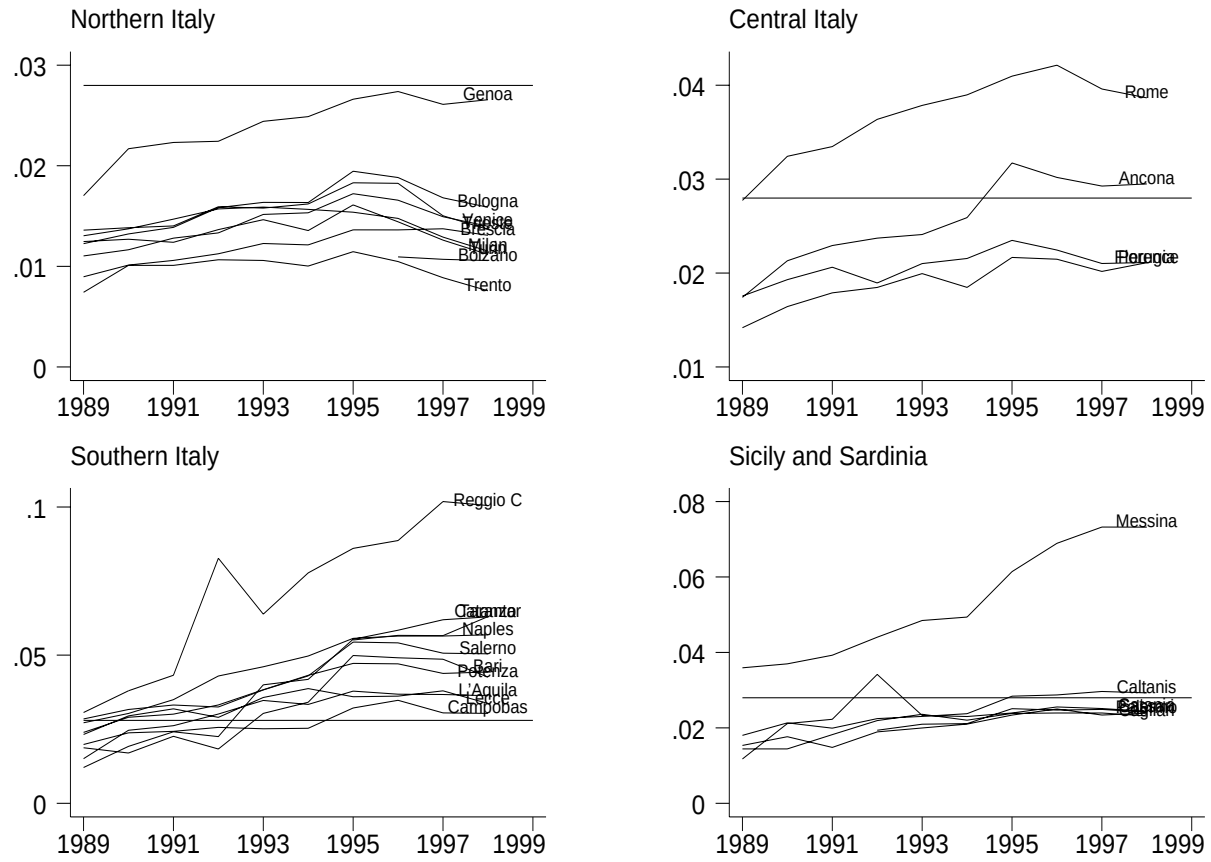

Figure 2: Backlog of trials pending divided by population

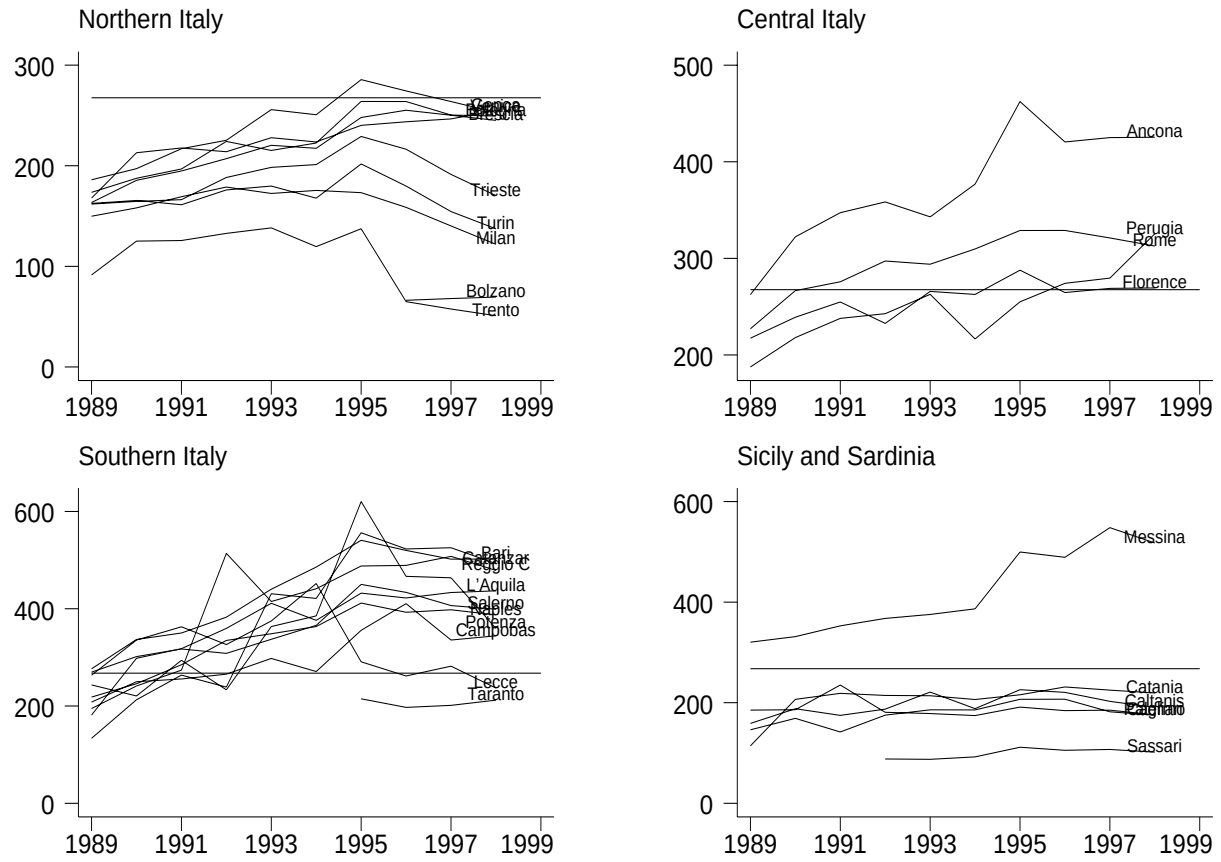

Figure 3: Backlog of trials pending divided by judges

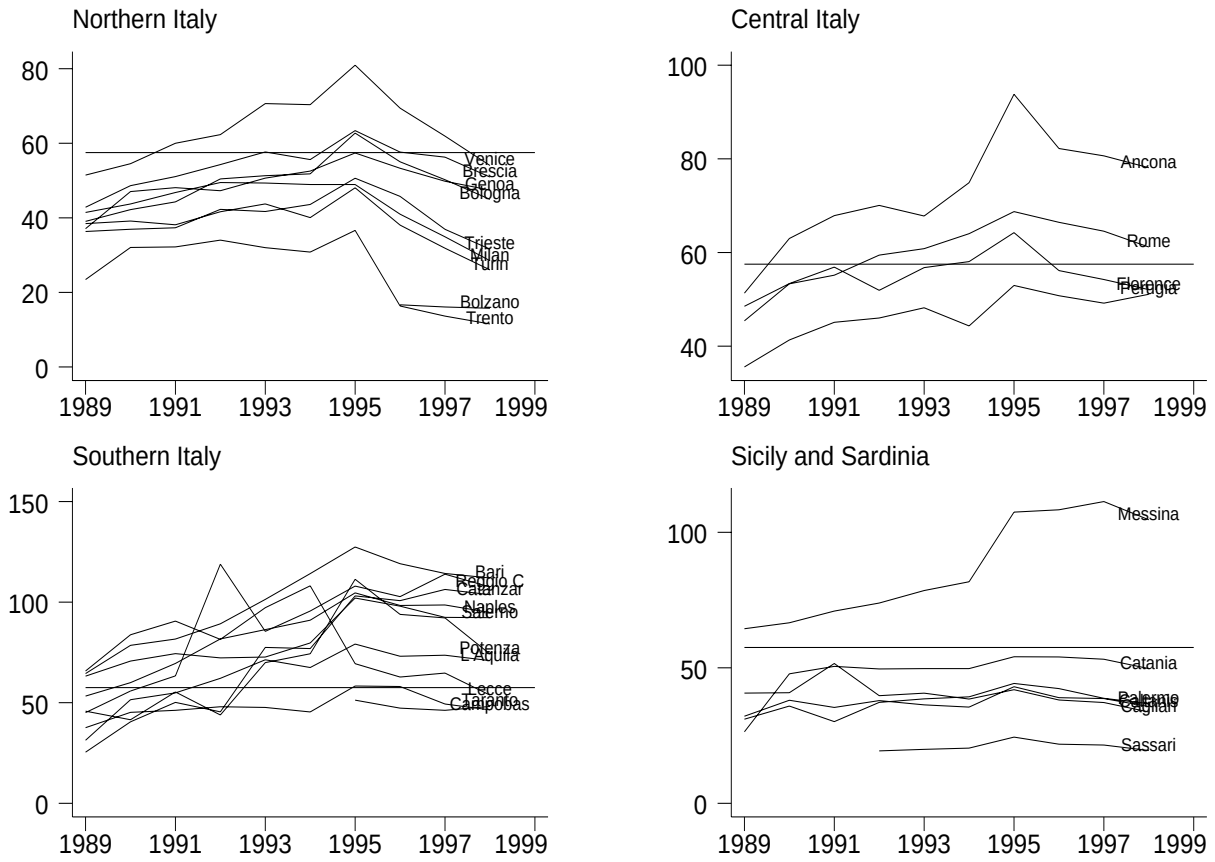

Figure 4: Backlog of trials pending divided by judges and staff

A The Data

Household data are drawn from the 1989, 1995 and 1998 waves of the Survey of Household Income and Wealth, a national sample survey conducted by the Bank of Italy.

Data on the performance of judicial districts, the number of judges and the size of the administrative staff are available for the same years for 29 judicial districts. Each district is defined by the jurisdiction of an appeals court. Roughly, each district corresponds to a region. In a few regions (Lombardy, Campania, Puglia, Calabria, Sicily and Sardinia) there is more than one judicial district. In one case a district (denominated as Turin) comprises two different regions (Valle d'Aosta and Piedmont). Finally, the judicial district of Genoa includes not only all the provinces of Liguria but also one province of Tuscany. Table 2 shows the matching of judicial districts with provinces and regions. For the reader's convenience, we also give a map of Italy (see figure 5).

Below, find the definition and source of the variable used in the estimation.

Credit market participation, by household. Dummy variable that takes value equal to one if the household responds positively to the question: "During the year did you or a member of your household applies for a loan or a mortgage to a bank or other financial intermediary?", Source: *Survey of Household Income and Wealth*, years: 1989, 1995 1998, Bank of Italy.

Credit rationing, by household. Dummy variable that takes value equal to one if the household is credit constrained, i.e. responds positively to at least one of the following questions: "During the year did you or a member of your household think of applying for a loan or a mortgage to a bank or other financial intermediary, but then change your mind on the expectation that the application would be turned down?"; "During the year did you or a member of your household apply for a loan to a bank or other financial intermediary and have the application rejected partially or totally?". Source: *Survey of Household Income and Wealth*, years: 1989, 1995 1998, Bank of Italy.

Debt, by household. Total amount of debt (i.e. amount borrowed to purchase houses, valuables, vehicles and other durable goods and to finance non-durable consumption) at the end of the year. Source: *Survey of Household Income and Wealth*, years: 1989, 1995 1998, Bank of Italy.

Age of the household head, by household. Age in years. Source: *Survey of Household Income and Wealth*, years: 1989, 1995 1998, Bank of Italy.

Labor household income, by household. Sum of labor incomes of all members of the household who worked at least part of the year. It does not include pension income of retired members, income from capital and transfers. Source: *Survey of Household Income and Wealth*, years: 1989, 1995 1998, Bank of Italy.

Collateral, by household. Proxy for collateral assets as measured by the stock of real assets, the stock of land and houses, the value of the house of residence, and the stock of land and houses minus the value of the house of residence. Source: *Survey of Household Income and Wealth*, years: 1989, 1995 1998, Bank of Italy.

Years of schooling, by household. The variable is originally coded in the following classes: no education (0 years), completed elementary school (5 years), completed junior high school (8 years), completed high school (13), completed university (18), graduate education (20 years). The variable is coded according to the values given in parenthesis. Source: *Survey of Household Income and Wealth*, years: 1989, 1995 1998, Bank of Italy.

Family size, by household. Number of the members of the household. Source: *Survey of Household Income and Wealth*, years: 1989, 1995 1998, Bank of Italy.

Retiree, by household. Dummy variable that takes value equal to one if the head of the household is retired. Source: *Survey of Household Income and Wealth*, years: 1989, 1995 1998, Bank of Italy.

Unemployed, by household. Dummy variable that takes value equal to one if the head

of the household is unemployed. Source: *Survey of Household Income and Wealth*, years: 1989, 1995 1998, Bank of Italy.

Marital status, by household. Dummy that takes value equal to one if the head of the household is married. Source: *Survey of Household Income and Wealth*, years: 1989, 1995 1998, Bank of Italy.

City size, by household. Dummy that takes value equal to one if the household's city of residence has more than 200,000 inhabitants. Source: *Survey of Household Income and Wealth*, years: 1989, 1995 1998, Bank of Italy.

Per capita gross domestic product, by region. Gross domestic product divided by population. Source: *Conti Economici Regionali*, years 1989-1998, National Institute of Statistics (ISTAT).

Backlog of trials pending, by judicial district. Backlog of civil trials pending (lower and appeals court). Source: *Annuario delle Statistiche Giudiziarie Civili*, years 1989-1998, Italian National Institute of Statistics (ISTAT).

Number of incoming trials, by judicial district. Number of incoming civil trials at the first and the second degree of judgement (lower and appeals court). Source: *Annuario delle Statistiche Giudiziarie Civili*, years 1989-1998, National Institute of Statistics (ISTAT).

Population, by judicial district. Source: *Annuario delle Statistiche Giudiziarie Civili*, years 1989-1998, National Institute of Statistics (ISTAT).

Number of judges, by judicial district. Number of civil court judges of jurisdiction assigned to each judicial district. Source: *Italian Ministry of Justice*, years 1989-1998.

Size of the administrative staff, by judicial district. Number of administrative officers assigned to each judicial district. Source: *Italian Ministry of Justice*, years 1989-1998.

B The Econometric Model

B.1 The probit

This section describes how the probability of being credit-constrained is derived and estimated. To do so we run a probit model that allows for endogenous selection due to the fact that the decision to participate in the credit market and the probability of being credit-constrained may depend upon the same set of unobservable factors.

A household is credit-constrained if it is rejected for credit credit.[22] This involves two logical steps in the construction of the model. First, we focus on the decision to apply for a loan. Household i applies for a loan if:

$$y_{i1}^{*} = x_{i1}\beta_1 + u_{i1} \geq 0$$

where y_{i1}^{*} is the utility of applying for a loan net of the costs and depends on observable (i.e. x_{1i}) and unobservable (i.e. u_{1i}) factors.

Second, among those that apply for a loan we distinguish constrained from unconstrained households. Household i is not credit-constrained if:

$$y_{i2}^{*} = x_{i2}\beta_2 + u_{i2} \geq 0$$

where x_{2i} and u_{2i} are, respectively, observable and unobservable variables.

We define:

$$y_1 = \begin{cases} 1 & \text{if } x_1\beta_1 + u_1 \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

and

$$y_2 = \begin{cases} 1 & \text{if } x_2\beta_1 + u_2 \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

Thus, y_1 and y_2 take value 1 for those that participate in the credit market and for unconstrained households, respectively.

We assume that u_1 and u_2 are jointly normal with mean zero and variance given by:

$$\Sigma_{12} = \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix}$$

[22] For simplicity of exposition we neglect here discouraged borrowers

The probability of being credit-constrained is thus specified as:

$$P\left(y_2 = 0 | y_1 = 1\right) = \frac{\int_{-x_1\beta_1}^{+\infty} \int_{-\infty}^{-x_2\beta_2} f\left(u_1 u_2\right) du_1 du_2}{\int_{-x_1\beta_1}^{+\infty} f\left(u_1\right) du_1}$$

where:

$$f\left(u_1 u_2\right) = \frac{1}{2\pi\sqrt{1-\rho^2}} \exp[-\frac{1}{2\left(1-\rho^2\right)}\left(u_1^2 - 2\rho u_1 u_2 + u_2^2\right)]$$

and

$$f\left(u_1\right) = \frac{1}{\sqrt{2\pi}} \exp[-\frac{1}{2}u_1^2]$$

The estimation is carried out using maximum likelihood.

B.2 The tobit

Here, we discuss the derivation and the estimation of the household's debt capacity.

If household i is not credit-constrained, the observed amount of debt is given by:

$$D_i = x_{3i}\beta_3 + u_{3i}$$

where x_{3i} and u_{3i} are, respectively, observable and unobservable factors that affect the household's debt capacity. Since debt is not allowed to be negative, it must hold that $u_{3i} \geq -x_{3i}\beta_3$. This implies that the debt capacity of those that have debt, that are not credit-constrained and that participate in the credit market is given by:

$$x_3\beta_3 + E\left(u_3 | u_3 \geq -x_3\beta_3, u_2 \geq -x_2\beta_2, u_1 \geq -x_1\beta_1\right) \tag{9}$$

where we drop the subscript i to simplify the notation. We assume that u_1, u_2 and u_3 are jointly distributed according to a trivariate normal with zero mean and variance given by:

$$\Sigma_{123} = \begin{bmatrix} 1 & \rho & 0 \\ \rho & 1 & \rho \\ 0 & \rho & 1 \end{bmatrix}$$

Defining:

$$\begin{aligned} h &\equiv -x_3\beta_3 \\ k &\equiv -x_2\beta_2 \\ h^* &\equiv \frac{h-\rho k}{\sqrt{1-\rho^2}} \\ k^* &\equiv \frac{k-\rho h}{\sqrt{1-\rho^2}} \end{aligned}$$

and using the formulas on the page 368 in Maddala (1984), the second term of (9) becomes:

$$\lambda(h,k,h^*,k^*) = \frac{\phi(h)}{F(h,k)}[1-\Phi(k^*)] + \rho\frac{\phi(k)}{F(h,k)}[1-\Phi(h^*)] \tag{10}$$

where $\Phi(\cdot)$ is the cumulative standard normal distribution function, $\phi(\cdot)$ the associated probability density function and $F(h,k)$ is given by:

$$\int_h^{+\infty}\int_k^{+\infty} \frac{1}{2\pi\sqrt{1-\rho^2}} \exp[-\frac{1}{2(1-\rho^2)}\left(u_1^2 - 2\rho u_1 u_2 + u_2^2\right)]du_1 du_2$$

The model is estimated in two steps as discussed by Gronau (1974) and Heckman (1974).

In the first step we run a bivariate probit on those households that are not credit constrained and hold some debt. This allows us to obtain a consistent estimate of $F(h|k)$ and of (10). In the second step, we restrict the sample to those that are not credit-constrained. This gives the following expected value for household debt capacity:

$$F(h|k)\, x_3\beta_3 + F(h|k)\,\lambda(h,k) \tag{11}$$

Then, we regress the amount of debt multiplied by $F(h|k)$ on the consistent estimate of (11) obtained in the first step.

Figure 5: Map of Italy

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