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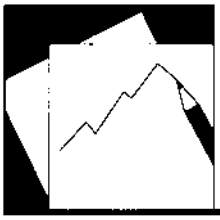

IMF Working Paper

Relative Price Stability, Creditor Rights, and Financial Deepening

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Relative Price Stability, Creditor Rights, and Financial Deepening

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Abstract

The paper provides a theoretical and cross-country empirical analysis of the determinants of financial deepening, and finds that higher credit-to-GDP ratios are associated with stronger creditor rights and lower inflation, and that the marginal effect of improvements in creditor rights protection is declining as the rate of inflation increases. The analysis suggests that in a high inflation environment, controlling inflation and reducing macroeconomic volatility should be given priority. Once these goals are achieved, the focus of attention should shift to creditor rights protection and credit information management.

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I. INTRODUCTION

Why are credit markets in some countries deeper than in others, and in particular, what explains cross-country differences in the amount of domestic credit to the private sector (measured as a percentage of GDP)? To a large extent the development of credit markets is a direct reflection of the overall level of economic development. In fact, the correlation between per capita GDP and the credit-to-GDP ratio was as high as 0.8 in a large sample of countries in 2004. Yet this strong linear dependence masks important differences between countries with similar levels of income: for instance, the credit-to-GDP ratio in Panama is almost three times that of its neighbor Costa Rica, and the gap between Malaysia and Mexico is even more striking.

Recognizing that the overall level of economic development cannot be the sole explanation, recent literature on the determinants of financial deepening focused primarily on cultural, institutional, and legal aspects (La Porta and others, 1997, 1998; Jappelli and Pagano, 2002; Stutz and Williamson, 2003; Galindo and Micco, 2004; Djankov, McLiesh, and Shleifer, 2005). Using panel data on 129 countries Djankov, McLiesh, and Shleifer (2005) found that the credit-to-GDP ratio depends positively on the level of protection of creditor rights and on the availability of credit history information, as well as on GDP. Galindo and Micco (2005) found that stronger creditor rights also contribute to lower volatility of credit to the private sector.

Another important factor determining the extent of financial deepening is macroeconomic stability. As Moore (1986) notes, high inflation is expected to have a negative impact on financial deepening at least to the extent that it erodes the real value of outstanding financial assets. In addition, macroeconomic instability raises uncertainty about borrowers' ability to meet their obligations. Higher uncertainty induces reallocation of resources away from risky projects, giving rise to credit-constrained equilibria, in which worthy private projects fail to secure adequate financing. While the literature documented the impact of both macroeconomic factors and creditor rights protection on financial deepening, to the best of our knowledge the interaction between the two and their joint importance have not been closely analyzed.

This paper examines the joint importance of both macro and micro factors affecting financial deepening. A theoretical model illustrates how both the strength of creditor rights (micro regulation) and the overall level of project risk (to a large extent determined by macroeconomic policies) jointly affect the amount of credit to the private sector. Macroeconomic policies play an important role to the extent that the dispersion of outcomes of the private sector projects is primarily determined by the variability of relative prices of inputs and outputs, which in turn depend on inflation and volatility of the real effective exchange rate. Micro factors contribute to financial deepening insofar as they affect the costs of screening, monitoring, and repossession of assets of delinquent borrowers. In addition, the macro and micro factors interact with each other, so that the marginal effect of improvements in creditor rights protection is declining as the overall level of risk in the economy rises.

The empirical analysis of panel data on 120 countries in 1997–2004 confirms that stronger creditor rights and lower inflation are associated with higher credit-to-GDP ratios and that

the marginal effect of stronger creditor rights is declining with higher inflation hitting zero as inflation rate reaches approximately 16 percent. These results, combined with the estimated differences in the coefficients of explanatory variables in the subsamples of high-inflation and low-inflation countries, suggest that while in principle both macro and micro factors determine the extent of financial deepening, in a high inflation economic environment, controlling inflation and attaining macroeconomic stability should be given priority. Once these goals are achieved, the focus of attention should shift to improving creditor rights protection and credit information management.

The rest of the paper is structured as follows. Section II discusses the links between relative price variability, creditor rights, and financial deepening. Section III illustrates the argument using a simple model of lending decisions. Section IV presents the results of a cross-country empirical study of the determinants of the credit-to-GDP ratio. Section V presents some conclusions.

II. Determinants of Financial Deepening

A. Creditor Rights

The power of creditors backed up by appropriate regulation and efficient law enforcement is clearly important for credit growth, as it facilitates repossession of assets of delinquent borrowers, reduces the cost of monitoring the quality of borrowers' assets, and improves the precision of initial screening of borrowers.

Firstly, banks are more willing to extend credit to the private sector when they have appropriate mechanisms to enforce the repayment of loans by seizing collateral or even gaining control of the bankrupt firm. This argument was formalized by Townsend (1979) and Aghion and Bolton (1992).

Secondly, appropriate regulation and institutional arrangements can also facilitate monitoring of the quality of borrower's assets by banks. Since the relationship between the borrower and the bank is typically a complex dynamic one, banks need to be able to establish the current value of borrower's assets and viability of borrower's projects at a given point in time. This information helps the bank make a decision regarding provision of extra financing that would enable a firm or an individual to overcome temporary difficulties versus insisting on immediate repayment of all obligations due if the asset quality is deteriorating fast with poor prospects of improvement in the future. In the case of loans to individuals, the costs of monitoring can be reduced for instance by using automatic payroll deductions of amortization payments.

Thirdly, efficient exchange of information can reduce the costs of initial screening of borrowers. This can be achieved, for example, with the help of credit agencies collecting information on credit history of legal entities and natural persons and making it available to the interested parties. The role of information in credit market development was first emphasized by Jaffe and Russell (1976) and Stiglitz and Weiss (1981).

B. Relative Price Stability

The importance of creditor rights protection stems from the intrinsic inability of lending institutions to establish with certainty the quality of borrowers' assets in the future. Less predictable future quality of assets necessitates more intensive screening and monitoring of borrowers and increases the likelihood of default, inflating the costs associated with screening, monitoring, and repossession. Thus a less risky macroeconomic environment is likely to contribute significantly to development of deeper financial markets.

Although risks of each particular borrower are diverse and may even be unique, the overall level of risk of projects seeking financing depends crucially on the variability of relative prices in the economy. High relative price variability increases the chance of prices of inputs and outputs moving abruptly and in opposite directions, leading to either soaring profits or dramatic losses, while relative price stability makes large deviations of projected outcome from the mean less likely. Hence by increasing the probability of borrower's default, higher relative price variability discourages banks from lending to the private sector (as modeled by Druck and Garibaldi, 2000).

One could argue that higher risks arising due to relative price variability could be reflected in higher interest rates charged by the banks and—as long as the expected outcome of the project justifies borrowing at a higher cost and both banks and investors are not excessively risk-averse—relative price variability should affect interest rates rather than availability of credit. However, this argument holds only if markets are frictionless.

If the costs of screening, monitoring, and repossession are not negligible, higher dispersion of project outcomes is likely to lead to higher expected costs of monitoring and repossession, resulting in a credit-constrained equilibria. Credit constrained equilibria are characterized by the existence of borrowers who are denied credit even though they are willing to pay interest at above market rates (Williamson, 1987). This situation arises if a project is both highly profitable and very risky. While the combination of risk and expected return justifies a high-interest loan, the costs of verification of the outcome of the project and repossession of assets in case of default turn out to be prohibitive. If the lender charges a higher rate on the loan, the probability of default increases, inflating monitoring and repossession costs. This urges the lender to charge an even higher interest rate, and so on. The resulting vicious circle gives rise to a credit-constrained equilibrium.

The credit constraint in this case could be alleviated either by stronger creditor rights, which would lower the screening, monitoring, and repossession costs, or by higher relative price stability, which would lower project risks. Moreover, these two considerations interact in a way that stronger creditor rights have a larger impact on the availability of credit when the overall level of risk is lower (and vice versa). Indeed, financial institutions are reluctant to lend if the projects are perceived to be too risky or the enforcement of contracts is too costly, or both. If the binding factor in most cases is the level of risk, a further reduction in contract enforcement costs will not yield a large increase in credit. By contrast, if the overall level of risk is low and the contract enforcement costs tend to be binding, an improvement in creditor rights protection can result in a substantial increase in the amount of credit available. A simple model formally illustrates this argument in Section III.

III. THE MODEL

A. Setup

The model is that of a standard banking loan with monitoring costs and generally follows Williamson (1987). Consider a market where entrepreneurs and banks are matched at the beginning of the period, so that banks enjoy monopoly power vis-à-vis their clients. A bank decides whether to give an entrepreneur a fixed-rate loan to finance a risky project. The initial investment needed is normalized to unity. The return p_i on investment of entrepreneur *i* is randomly distributed with density *f(p)*. For analytical simplicity, a uniform distribution on the interval $(\mu - b; \mu + b)$ is assumed. Parameter μ ($\mu > 1$) is the expected return at the end of the period, and parameter b ($b > 0$) reflects the degree of uncertainty surrounding the outcome of the project, since the variance of the return is $\frac{b^2}{3}$.

In this setting entrepreneurs have the same ex ante information about the distribution of the outcome of the project as the banks, which rules out adverse selection and eliminates screening costs. Moral hazard is also ruled out since the outcome of the project does not depend on entrepreneur's effort.

However, banks do incur monitoring and repossession costs, since *ex post*, upon completion of the project, information about its outcome becomes asymmetric. While it is available to the entrepreneur at no cost, the lender has to pay $\frac{\gamma_i}{c}$ to learn the true realized value of the project. The parameter γ_i is an independent realization of a random variable uniformly distributed on the interval $(0; 2(\mu - i))$. This parameter is thus project-specific and can be interpreted as the cost of verifying the quality of borrower's assets (after the start of the project) and repossessing entrepreneur's property in case of bankruptcy: if the entrepreneur fails to repay the debt (totaling r_i including interest), the bank, upon incurring the cost of γ_i, can establish the true realized value of the assets p_i and gain possession of the project.

While monitoring and repossession costs are project-specific, the average magnitude of these costs depends on the level of creditor rights protection and the efficiency of the judiciary in a given country. These considerations are proxied by the parameter c ($0 < c \leq 1$), so that higher values of c correspond to stronger creditor rights in the economy: with nonexistent creditor rights (c close to zero) the repossession costs become infinitely high, while with $c = 1$ the project-specific verification and repossession costs are the lowest.

B. Interest Rates

The bank's expected return on the loan to entrepreneur *i* (ρ_i) is given by:

$$\rho_i = r_i\left(1 - \int_{\mu-b}^{r_i} f(p)dp\right) + \int_{\mu-b}^{r_i} pf(p)dp - \frac{\gamma_i}{c}\int_{\mu-b}^{r_i} f(p)dp \qquad (1)$$

The first term in equation (1) is the expected return in the case of orderly debt repayment (the product of the total amount due and the probability that the realized value of the project exceeds this amount). The second term is the expected value of the repossessed property in case of bankruptcy (i.e. if the realized value of the project is insufficient to repay the debt). The third term is the expected cost of verification of the value of the project and repossession in case of bankruptcy (calculated as the product of the monitoring and repossession costs and the probability of bankruptcy).[2]

The bank will exercise its monopolistic power by offering entrepreneur-specific interest rate ($r_i^* - 1$) to maximize the expected return on every loan. The interest rate offered is given by (for derivations see Appendix):

$$r_i^* - 1 = (\mu - 1) + b - \frac{\gamma_i}{c} \qquad (2)$$

It is thus determined by three factors. The positive dependence of r_i^* on μ is a reflection of the monopolistic power of the bank: if the expected value of the project is higher, the bank demands a higher interest rate, essentially sharing the extra profits with the investor. Higher uncertainty (proxied by b) also drives the optimal interest rate up as banks demand a risk premium.

Interestingly—and maybe somewhat counterintuitively—higher costs of monitoring and repossession depress the optimal interest rate. The intuition here is as follows: an attempt to apply a higher interest rate increases the probability of the entrepreneur's insolvency (in line with an increase in entrepreneur's end-of-period obligations). Since higher values of $\frac{\gamma_i}{c}$ imply a higher expected cost of entrepreneur's insolvency to the bank, the losses from prospective insolvency more than offset gains from higher interest payments in cases when the project is profitable. Consequently, the bank targets a lower probability of bankruptcy by charging a lower interest rate.

C. Financial Deepening

However, the optimal interest rate that the bank can offer (defined in equation (2)) may not be sufficiently high to justify lending to an entrepreneur characterized by high costs of monitoring and repossession. A risk-neutral bank will approve an application only if the expected return on the loan at least matches the return i on a risk-free asset[3]:

$$\rho_i (r_i^*, \gamma_i) \geq i \qquad (3)$$

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[2] In this model the entrepreneurs always repay the debt if they have sufficient funds and the banks do not need to verify the outcome of successful projects.

[3] It is assumed that $\mu - i < b$, otherwise the return on a risky project always exceeds that on a risk-free asset.

This yields a critical value of the monitoring and repossession cost γ*:

$$\gamma^* = 2bc\left(1-\sqrt{1-\frac{\mu-i}{b}}\right) \tag{4}$$

The bank will grant loans to all the entrepreneurs characterized by lower repossession costs ($\gamma_i \leq \gamma^*$) and will reject all applications when $\gamma_i > \gamma^*$.

Assuming that the distribution of monitoring and repossession costs (γ) is independent of the distribution of returns on investment (*p*), the share of approved applications *D* can be expressed as:

$$D = \frac{bc}{\mu-i}\left(1-\sqrt{1-\frac{\mu-i}{b}}\right) \tag{5}$$

The share of approved applications can be broadly interpreted as the depth of credit market.

Proposition 1. $\frac{\partial D}{\partial b} < 0$, $\frac{\partial D}{\partial c} > 0$, $\frac{\partial^2 D}{\partial b \partial c} < 0$.

For proof see Appendix.

Proposition 1 implies that credit markets are deeper when the projects on average are less risky ($\frac{\partial D}{\partial b} < 0$) and when creditor rights are stronger ($\frac{\partial D}{\partial c} > 0$).[4] However, these factors do not act independently of each other. In fact, the marginal effectiveness of creditor rights protection is declining in the overall level of risk ($\frac{\partial^2 D}{\partial b \partial c} < 0$). In other words, the same improvement in the level of creditor rights protection will have a larger impact on financial deepening when the overall level of risk in the economy is low compared with when it is high. Likewise, the marginal effect of reducing the overall level of risk is higher when creditor rights are stronger.

In the following section the theoretical predictions of the model are tested empirically in a cross-country context.

[4] It can also be shown that financial deepening is increasing in the gap between the average return on risky projects and the return on risk-free assets (μ – *i*).

IV. EMPIRICAL EVIDENCE

A. Econometric Strategy

As discussed above, the overall level of project risk is closely associated with relative price variability. Although comparable cross-country data on relative price variability are not available, its impact on financial deepening can be estimated indirectly. The extent of relative price variability is determined by both real factors (such as structural shifts in demand and supply) and monetary factors (such as the level of inflation, and the volatility of the exchange rate). While the structural factors are difficult to measure, the cross-country data on the monetary developments are generally available.

Higher inflation is known to lead to higher relative price variability, since prices of certain goods tend to be more sticky while prices of others adjust more rapidly. Numerous empirical studies have confirmed this conjecture, both in time-series and in cross-sectional contexts (Lach and Tsiddon, 1992; Jaramillo, 1999; Debelle and Lamont, 1997).

Likewise, changes in exchange rate affect relative prices of imports, exports, and domestic goods and services. Therefore higher real exchange rate variability is also expected to be associated with lower credit-to-GDP ratios.

The level of protection of creditor rights is proxied by an index of creditor rights published by the World Bank in the *Doing Business* Report (2007). It takes discrete values from 0 (low protection) to 10 (high protection), and reflects the ease with which creditors are able to get hold of the collateral or the assets of borrowers that have not fulfilled their obligations. In particular it takes into account whether general description of assets and debt is permitted in the collateral agreement, whether the government, the workers, or secured creditors have the priority in claiming obligations of an insolvent creditor, whether management retains administration of a company pending the resolution of a reorganization, whether reorganization requires creditors' consent or is restricted in other ways, whether parties may agree on enforcement procedures by contract, whether any legal or natural person may grant or take security in the property, whether a unified registry operates that includes charges over movable property, and the circumstances in which creditors may or may not seize collateral.

In addition, a credit information index ranging from 0 (poor information) to 6 (broad information) reflects the coverage and availability of credit information (whether the information provided is both positive and negative, both on firms and individuals, whether the data from retailers, trade creditors and utilities are collected in addition to the data from financial institutions, whether more than two years of historical data are distributed, whether small loans are included, and whether borrowers have a legal right to access their data). The credit information index thus reflects the ease with which lenders can screen potential customers and is expected to affect financial deepening positively.

Finally, PPP-adjusted GDP per capita is included in the empirical model to control for the level of economic development. The specification to be estimated is thus:

$$CREDIT_{it} = \alpha + \beta CRI_{it} + \theta CII_{it} + \delta INF_{it} + \phi ERV_{it} + \lambda GDP_{it} + \varepsilon_{it} \quad (6)$$

where $CREDIT_{it}$ is the ratio of credit to the private sector to GDP in country *i* in year *t*; *CRI* is the creditor rights index; *CII* is the credit information index; *INF* is inflation; *ERV* is the volatility of real effective exchange rate (REER); *GDP* is the logarithm of per capita GDP; and ε is the error term. The key hypotheses can be formalized as $\beta > 0$, $\delta < 0$, and $\phi < 0$.

Since the study focuses on cross-country differences in credit-to-GDP ratios and their long-run determinants, equation (6) is estimated using the *between* panel estimator, which exploits differences in time averages for different cross-sectional units. In addition, the cross-section for the latest available year was estimated by OLS.

B. Data

The panel dataset includes 120 industrial and developing countries for which data were available for the period 1997–2004 (for the full list of countries see the Appendix). The choice of a relatively short time-series dimension of the panel is explained by the cross-sectional focus of the study. It is also consistent with the notion that economic agents tend to make judgments about the extent of relative price stability and the strength of creditor rights protection from the *recent past*, rather than either from a distant past or exclusively from contemporaneous developments.

Credit-to-GDP ratios are taken from the World Bank New Database on Financial Development and Structure, which provides a broader coverage of lending financial institutions (see Beck, Demirgüç-Kunt, and Levine (2000) for details).

Volatility of the real effective exchange rate is measured by the coefficient of variation (the ratio of the standard deviation to the mean) of monthly averages of REER during the preceding four years (e.g., for year 2004 the coefficient of variation is computed using the monthly data for 2001–04). Other windows (e.g., seven-year history) were also considered with a similar effect.

Finally, the episodes of hyperinflation (over 50 percent a year) were excluded (in line with Cagan, 1956). Table 1 summarizes descriptive statistics for selected variables.

Table 1. Descriptive Statistics for Selected Variables

(In percent, unless otherwise indicated) 1/

	Mean	Standard Deviation	Median	Coefficient of Variation
Domestic private credit to GDP ratio	47	46	28	98
Inflation rate 2/	11.2	25.6	4.4	229
Monthly REER volatility (2001–04)	8.2	11.2	5.2	137
Creditor rights index	4.8	2.0	5.0	42
Credit information index	3.2	2.1	3.0	66
GDP per capita (in thousands of US$ at PPP)	10.2	10.8	5.3	106

Sources: IMF, International Financial Statistics; IMF, Information Notice System; World Bank, Doing Bu
Report; World Bank, New Database on Financial Development and Structure.

1/ As of year 2004 unless otherwise indicated, based on 120 observations.
2/ Excludes two cases of hyperinflation (above 50 percent).

C. Results

Estimation results summarized in Table 2 support the key hypotheses. Column A reports the results obtained by applying OLS to cross-sectional data for 2004 while Column B reports the results of the between estimation. The coefficients on inflation and creditor rights have the expected signs and are statistically significant at the 1 percent level.

Ceteris paribus, a 1 percentage point increase in inflation leads to a 1.4 percent of GDP decrease in credit to the private sector. The coefficient on the index of creditor rights suggests that a "one-step" improvement in the relevant regulation results in an increase in domestic private credit of 5 percent of GDP. The coefficient on the credit information index is positive, as expected, and is occasionally statistically significant at the 10 percent level. A one-step improvement in the availability of credit information is associated with a 2.8 percent of GDP increase in credit to the private sector. Doubling GDP per capita is associated with a 17 percent of GDP increase in credit to the private sector. All these factors together explain about 65 percent of the variation in credit-to-GDP ratios. At the same time, exchange rate volatility turned out to have a small and highly statistically insignificant coefficient. This result is robust to the use of alternative measures of exchange rate volatility and alternative specifications and time periods, therefore this variable has been dropped from later specifications (Column C).

Table 2. Determinants of Domestic Private Credit

Dependent Variable	Domestic Private Credit to GDP Ratio 1/			
Column	*A*	*B*	*C*	*D*
Method	OLS	Panel Between	Panel Between	Panel Between
Time Period	2004	1997–2004	1997–2004	1997–2004
Inflation rate	–0.011	–0.014	–0.013	0.007
	(0.004)***	(0.004)***	(0.003)***	(0.009)
Volatility of real effective exchange rate	0.0011	0.003		
	(0.0027)	(0.004)		
Index of creditor rights	0.054	0.050	0.048	0.080
	(0.014)***	(0.013)***	(0.013)***	(0.018)***
Credit information index	0.015	0.028	0.026	0.018
	(0.016)	(0.016)*	(0.015)	(0.015)
Index of creditor rights * * Inflation rate				–0.005
				(0.002)**
GDP per capita, log, PPP-adjusted.	0.213	0.173	0.175	0.161
	(0.029)***	(0.030)***	(0.030)***	(0.030)***
Constant	–1.639	–1.293	–1.276	–1.274
	(0.219)***	(0.224)***	(0.218)***	(0.214)***
R^2 (between)	0.63	0.65	0.64	0.66
Number of countries	105	119	120	120
Number of observations	105	885	893	893

Source: Authors' calculations.

1/ Robust standard errors in parentheses. Values significant at the 10 percent level are marke at the 5 percent level, with **; at 1 percent level, with ***.

The theoretical model further predicted that the marginal effect of creditor rights will be decreasing in the level of inflation. To test this hypothesis, equation (6) was augmented with an interaction term *CRI * INF*:

$$CREDIT_{it} = \alpha + \beta CRI_{it} + \delta INF_{it} + \eta CRI_{it} * INF_{it} + \theta CII_{it} + \lambda GDP_{it} + \varepsilon_{it} \quad (7)$$

The marginal effect of improvements in creditor rights can thus be expressed as:

$$\frac{\partial CREDIT_{it}}{\partial CRI} = \beta + \eta INF_{it} \quad (8)$$

In line with the theoretical argument, one would expect the overall effect of improving creditor rights to be positive at low levels of inflation ($\beta > 0$), but to decrease as the level of inflation rises ($\eta < 0$).

The results for equation (7) are presented in Column D of Table 2. The coefficient on the index of creditor rights almost doubles relative to Column C because now it shows the marginal effect of a one-step improvement in creditor rights protection (estimated at 8 percent of GDP) *in the absence of inflation*. However, the statistically significant correlation on the interaction term confirms that this marginal effect decreases in the rate of inflation. In fact, as inflation reaches 16 percent the overall marginal effect of creditor rights improvement hits zero (as can be inferred from equation (8)), suggesting that while strengthening creditor rights makes an important contribution to the availability of credit in a low inflation environment, in a very risky environment it may no longer have any significant impact on financial deepening.

The coefficient on the inflation rate changes its sign and loses its statistical significance. However, it should be noted that the coefficient in Column D shows the marginal effect of reducing inflation with no creditor rights in place, rather than the average impact of lowering inflation (as in Column C), and therefore the estimates are in fact mutually consistent.

An alternative way of testing the hypothesis about the interaction between micro and macro determinants of financial deepening is to look at the marginal effects of different factors in the subsamples of low-inflation and high-inflation countries by estimating the following model:

$$CREDIT_{it} = \alpha + \beta_1 CRI_{it} * Low\text{-}Inflation_i + \beta_2 CRI_{it} * High\text{-}Inflation_i + \delta_1 INF_{it} * Low\text{-}Inflation_i + \delta_2 INF_{it} * High\text{-}Inflation_i + \phi_1 CII_{it} * Low\text{-}Inflation_i + \phi_2 CII_{it} * High\text{-}Inflation_i + \lambda GDP_{it} + \varepsilon_{it} \quad (9)$$

where *Low-Inflation* is a dummy variable for countries where the average inflation was below the median for the sample and *High-Inflation* is a dummy variable for the countries with above-median average inflation. The marginal effect of creditor rights protection is expected to be significantly higher in the subsample of low inflation economies compared to the subsample of high inflation ones ($\beta_1 > \beta_2$).

Table 3. Determinants of Domestic Private Credit in Subsamples of Countries

Dependent Variable	Domestic Private Credit to GDP Ratio 1/				
Column	*A*	*B*	*C*	*D*	*E*
Subsample		Low inflation	High inflation	Rich	Poor
Inflation rate	–0.013	–0.063	–0.004	–0.027	–0.003
	(0.003)***	(0.023)***	(0.004)	(0.005)***	(0.004)
Index of creditor rights	0.048	0.053	0.016	0.052	0.018
	(0.013)***	(0.016)***	(0.014)	(0.016)***	(0.017)
Credit information index	0.026	0.069	0.005	0.030	0.019
	(0.015)	(0.020)***	(0.015)	(0.019)	(0.019)
GDP per capita, log PPP-adjusted	0.175	0.122		0.164	
	(0.030)***	(0.028)***		(0.027)***	
Constant	–1.276	–0.815		0.301	
	(0.218)***	(0.213)***		(0.100)***	
(Differences between the coefficients in the subsamples)					
Inflation rate		–0.060		–0.024	
		(0.022)***		(0.006)***	
Index of creditor rights		0.037		0.033	
		(0.018)**		(0.021)	
Credit information index		0.065		0.011	
		(0.022)***		(0.023)	
R^2 (between)	0.64	0.72		0.69	
Number of observations	893	893		893	
Countries in the subsample	120	60	60	60	60

Source: Authors' calculations.

1/ Estimated by the between estimator. Robust standard errors in parentheses. Values significant at the 10 percent level are marked with *; at the 5 percent level, with **; at 1 percent level, with ***.

The estimation results presented in Table 3 (Columns B and C) are consistent with this hypothesis. In the subsample of low inflation countries both the creditor rights and the availability of credit information have large and statistically significant coefficients, while in the subsample of high inflation countries the coefficients are smaller and statistically insignificant. All the differences between the marginal effects are statistically significant at the 5 percent level. The coefficient on inflation also loses its statistical and economic significance in the subsample of high inflation countries, suggesting that when the prevalent inflation is high small reductions in the inflation rate have little impact on credit, if any (for instance, the marginal effect of reducing inflation from 10 percent to 4 percent would be significantly higher than that of reducing inflation from 40 percent to 34 percent).

One could argue that the identified differences could simply reflect the fact that creditor rights protection and information availability have greater impacts on financial deepening in rich countries compared to poor countries, and rich countries tend to have lower inflation. For instance, Djankov, McLiesh, and Shleifer (2005) find that creditor rights protection has a much greater impact on the credit-to-GDP ratio in rich countries, and so does inflation.

To see if differences in wealth rather than macroeconomic stability account for the results, we constructed two similar dummy variables: *Rich* for countries with per capita GDP above the median and *Poor* for countries with per capita GDP below the median. Notably, the correlation between being rich and having low inflation turned out to be far from perfect: more than one third of rich countries were classified as high inflation, while more than one third of poor countries qualified as low inflation countries (Table 4).

Table 4. Distribution of Countries by Subsamples

(Number of countries)

	Poor	Rich	**Total**
High inflation	39	21	**60**
Low inflation	21	39	**60**
Total	**60**	**60**	**120**

Source: Authors' calculations.

The results for the subsamples of poor and rich countries are presented in Columns D and E of Table 3. While the explanatory power of the creditor rights index, creditor information index, and inflation is indeed higher in the subsample of rich countries, the differences are much less pronounced than those between the coefficients in the subsamples of low-inflation and high-inflation countries. In particular, the differences between the coefficients on the creditor rights index and creditor information index are not statistically significant at the 10 percent level.

V. CONCLUSION

A theoretical model of a banking loan with monitoring and repossession costs analyzed in the paper shows that both strong creditor rights and low overall level of risk are important for

financial deepening. The latter points towards the importance of sound macroeconomic policies. By contributing to relative price stability, lower inflation reduces the overall level of uncertainty about the ability of borrowers to meet their obligations, and the resulting less risky environment facilitates financial deepening. Furthermore, the theoretical analysis suggests that the marginal effect of stronger creditor rights on financial deepening is also higher when the overall level of risk in the economy is lower.

The results of the empirical analysis of panel data on 120 industrial and developing countries during the period 1997–2004 are consistent with these hypotheses. The analysis confirms that both the strength of creditor rights and relative price stability are important conditions for financial deepening: an improvement of creditor rights protection from a low to a medium level has approximately the same positive impact on the credit-to-GDP ratio as a permanent 18 percentage point reduction in the rate of inflation.

The analysis further revealed that the positive effect of stronger creditor rights on financial deepening is particularly strong in countries with low inflation, but as the rate inflation reaches about 15 percent, improvements in the level of creditor rights protection no longer have any positive effect on the credit-to-GDP ratio. The analysis of the determinants of financial deepening in the subsamples of low-inflation and high-inflation countries further confirmed that in low-inflation countries credit-to-GDP ratios appear to be several times more responsive to improvements in creditor rights protection and availability of credit information than in high-inflation countries.

These results suggest that while micro-level regulation and macroeconomic stabilization are both important for achieving high levels of financial deepening, they could be prioritized. In a high inflation environment efforts should focus on controlling inflation and ensuring macroeconomic stability. Once these goals are achieved, the focus of attention should shift to strengthening creditor rights and improving credit information management.

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APPENDIX

Derivation of equation (2):

$$\rho_i = r_i\left(1-\int_{\mu-b}^{r_i} f(p)dp\right) + \int_{\mu-b}^{r_i} pf(p)dp - \frac{\gamma_i}{c}\int_{\mu-b}^{r_i} f(p)dp =$$

$$\frac{1}{2b}\left(-\frac{r_i^2}{2}+\left(b+\mu-\frac{\gamma_i}{c}\right)r_i+(\mu-b)\left(\frac{\gamma_i}{c}-\frac{\mu-b}{2}\right)\right)$$

The first-order condition for profit maximization is:

$$\frac{\partial\rho_i}{\partial r_i} = \frac{-r_i+b+\mu-\gamma_i/c}{2b} = 0$$

Hence $r_i^* = b + \mu - \frac{\gamma_i}{c}$.

The second-order condition for maximum is satisfied:

$$\frac{\partial^2\rho_i}{\partial r_i^2} = -\frac{1}{2b} < 0$$

Derivation of equation (4):

$$\rho_i(r_i^*, \gamma_i) - i = \frac{1}{2b}\left(-\frac{\left(b+\mu-\gamma_i/c\right)^2}{2}+\left(b+\mu-\frac{\gamma_i}{c}\right)^2+(\mu-b)\left(\frac{\gamma_i}{c}-\frac{\mu-b}{2}\right)\right) - i =$$

$$= \frac{1}{4bc^2}\left(\gamma_i^2 - 4bc\gamma_i + 4bc^2(\mu-i)\right) \geq 0$$

If $\frac{\gamma_i}{c} \geq 2b$, the costs of monitoring and repossession exceed the difference between the best and the worst outcome of the project. Therefore the bank will have to assume that the project always fails and will refrain from lending to customers with $\gamma_i \geq 2bc$.

In nontrivial cases $\gamma_i < 2bc$ and $b > \mu - i$, and hence the solution to this inequality is $\gamma_i \leq \gamma^*$, where:

$$\gamma^* = 2bc\left(1-\sqrt{1-\frac{\mu-i}{b}}\right)$$

Derivation of equation (5):

$$D = \frac{\gamma^*}{2(\mu-i)} = \frac{bc}{\mu-i}\left(1-\sqrt{1-\frac{\mu-i}{b}}\right)$$

D is well-defined (i.e. $D \in [0; 1]$), since $\lim_{b\to(\mu-i)+} \frac{bc}{\mu-i}\left(1-\sqrt{1-\frac{\mu-i}{b}}\right) = c$ and $0 < c \leq 1$.

Proof of proposition 1.

$$\frac{\partial D}{\partial b} = \frac{c}{(\mu-i)\sqrt{1-\frac{\mu-i}{b}}}\left(2\sqrt{1-\frac{\mu-i}{b}} - 2 + \frac{\mu-i}{b}\right) = -\frac{c\left(1-\sqrt{1-\frac{\mu-i}{b}}\right)^2}{(\mu-i)\sqrt{1-\frac{\mu-i}{b}}} < 0$$

$$\frac{\partial D}{\partial c} = \frac{b}{\mu-i}\left(1-\sqrt{1-\frac{\mu-i}{b}}\right) > 0$$

$$\frac{\partial^2 D}{\partial b \partial c} = -\frac{\left(1-\sqrt{1-\frac{\mu-i}{b}}\right)^2}{(\mu-i)\sqrt{1-\frac{\mu-i}{b}}} < 0$$

Table A1. Countries in the Sample

Albania	Ghana	Nigeria
Algeria	Greece	Norway
Angola	Guatemala	Oman
Argentina	Haiti	Pakistan
Armenia	Honduras	Panama
Australia	Hungary	Papua New Guinea
Austria	India	Paraguay
Bangladesh	Indonesia	Peru
Belgium	Iran	Philippines
Benin	Ireland	Poland
Bolivia	Israel	Portugal
Botswana	Italy	Romania
Brazil	Jamaica	Russia
Bulgaria	Japan	Rwanda
Burkina Faso	Jordan	Saudi Arabia
Burundi	Kazakhstan	Senegal
Cambodia	Kenya	Sierra Leone
Cameroon	Kuwait	Singapore
Canada	Kyrgyz Republic	Slovak Republic
Central African Republic	Lao	Slovenia
Chad	Latvia	South Africa
Chile	Lesotho	Spain
Hong Kong	Lithuania	Sri Lanka
Colombia	Macedonia	Sweden
Congo, Democratic Rep.	Madagascar	Switzerland
Congo	Malawi	Syrian Arab Republic
Costa Rica	Malaysia	Tanzania
Côte d'Ivoire	Mali	Thailand
Croatia	Mauritania	Togo
Czech Republic	Mexico	Tunisia
Denmark	Moldova	Turkey
Dominican Republic	Mongolia	Uganda
Ecuador	Morocco	United Kingdom
Egypt	Mozambique	United States
El Salvador	Namibia	Uruguay
Ethiopia	Nepal	Venezuela
Finland	Netherlands	Vietnam
France	New Zealand	Yemen
Georgia	Nicaragua	Zambia
Germany	Niger	Zimbabwe

Source: Authors.