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Обезбеђивање дугорочног финансирања у  
транзиционим земљама

Никола Тасић и Невен Валев

The Provision of Long-term Financing in the  
Transition Economies

Nikola Tasić and Neven Valev

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## Обезбеђивање дугорочног финансирања у транзиционим земљама

Никола Тасић и Невен Валеv

**Апстракт:** Нова база података указује да се приступ приватног сектора дугорочним изворима финансирања повећао. У неколико транзиционих земаља, кредит има сличну структуру рочности као у западноевропским земљама, док у другим транзиционим земљама кредит и даље знатно мање рочности. Неколико фактора објашњавају ове разлике: политичко и институционално окружење, приватизације банака, ниска стопа инфлације, ниво економског и финансијског развоја, као и оснивање институција које размењују податке о дужницима. Учешће страних банака и конкурентност банкарског сектора немају утицаја на рочност кредита.

**Кључне речи:** финансијски развој, рочност кредита, ликвидност, транзиционе земље

**JEL Code:** G21, O16, P34

## The Provision of Long-term Financing in the Transition Economies

Nikola Tasić and Neven Valev

**Abstract:** A new data set from the transition economies shows that the private sector has increasing access to long-term bank financing. In several transition countries credit has similar maturity structure to that in Western Europe, while in other transition countries credit remains mostly short-term. Several factors explain these differences: the political and institutional environment, bank privatization, sustained low inflation, the levels of economic and financial development, and the establishment of credit information sharing institutions. In contrast, the share of foreign owned banks and banking sector competition have no influence on credit maturity.

**Key words:** financial development, credit maturity, liquidity, transition economies

**JEL Code:** G21, O16, P34

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## 1. Introduction

One important function of the banking system is to finance capital investment projects that require long-term financing commitment. These projects have large scale and advanced technology, but generate returns only after years of operation. Banks provide the financing for such projects by transforming short-term liquid deposits into illiquid long-term credits. This raises productivity and long-term economic growth. These ideas are developed theoretically in the seminal work of Bencivenga and Smith (1991) and supported empirically by Tasić and Valev (2008). In both papers, economic growth is faster in countries where agents have greater access to long-term finance.

In this paper, we investigate the availability of long-term credit using data from 14 transition economies. Our focus on transition economies is motivated by three factors. First, the financial systems in that region changed dramatically in a short period of time. For example, banks were privatized, foreign ownership of banks increased, several countries implemented credit information sharing, inflation declined, and institutions improved. We can investigate the effect of these dynamics on credit maturity. Second, many transition countries have collected and published data on credit maturity that are consistent across countries and show short-term, medium-term and long-term credit. Most other countries do not publish credit maturity data and, if available, the data reveal only short-term credit. Third, the demand for investment credit in transition economies is fueled by the rapid creation of new firms and the expansion of existing firms. This reveals more distinctly the demand and supply determinants of credit maturity.

The data show that credit maturity has lengthened significantly over time reaching the structure of advanced economies in some transition countries. There are, however, substantial differences between countries. For example, 54 percent of bank credit in Lithuania has maturity longer than five years, whereas in Albania only 17 percent of credit has that maturity. These differences are explained by several factors including the strength of institutions, income levels, the development of credit markets and stock markets, the transfer of ownership from the state to the private sector, and inflation rates.

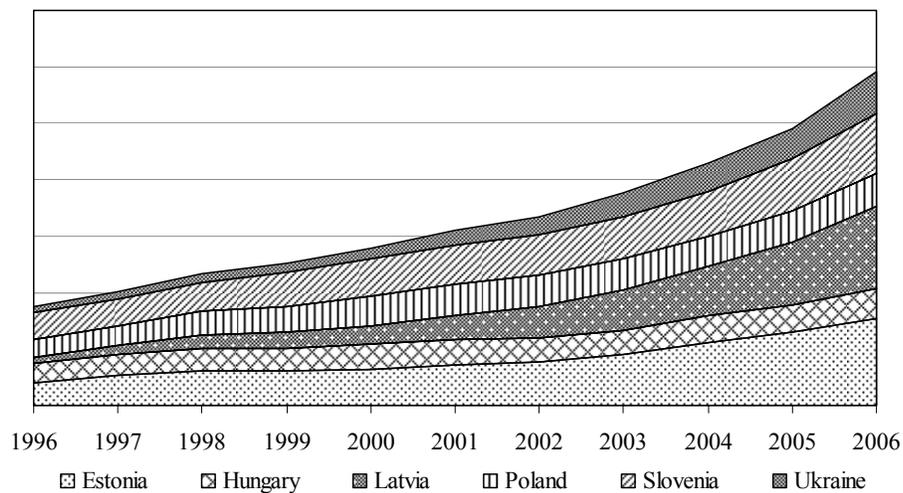
The rest of the paper proceeds as follows. We describe the credit maturity data in the following section. Section 3 draws empirical hypotheses from the literature and Section 4 describes our empirical strategy. We present the results in Section 5 and conclude in Section 6.

## 2. The maturity of bank credit – data and summary statistics

We use quarterly data on lending by commercial banks to the private sector in 14 transition countries. The sample period is from about 1992 to 2006, depending on data availability for the individual countries. The data were collected from central bank reports. Table 1 presents the definitions and the sources for each variable and Table 2 details credit maturity and shows the time period for each country in the sample. There are, on average, 35 observations per country.<sup>1</sup>

Table 2 shows large differences in terms of commercial bank credit to the private sector as share of GDP, a frequently used measure of financial development. This includes credits from all banks - government and private, as well as domestic and foreign owned. Total credit also combines domestic currency and foreign currency credit. In Albania, private credit is below 10 percent of GDP whereas in the Slovak Republic it is over 200 percent of GDP.<sup>2</sup> Credit increased over time in most, but not all, countries. Figure 1 shows the credit to GDP ratio for eleven countries with at least ten years of data. Credit as percent of GDP grew little in Hungary and Poland, while it more that tripled in Estonia, Latvia, and the Ukraine.

Figure 1. Credit as a Share of GDP



<sup>1</sup> Although credit data are available for a few other transition countries, we could not include them in the sample because of missing explanatory variables. For example, although quarterly credit data for Bosnia and Herzegovina are available from 1997 to 2007, we were unable to obtain GDP for the same period.

<sup>2</sup> Note also that we divide the stock of credit by quarterly, and not by yearly GDP, in order to preserve the consistency between the summary statistics discussed here and the estimations of the following sections. Therefore, the numbers are about four times greater compared to the commonly used measure.

**Table 1.** Variable definitions and Sources

Variable	Definition	Sources
Credit / GDP	Credit by deposit money banks and other financial institutions to the private sector divided by quarterly GDP.	Central bank of the corresponding country. Consulted were the official publications and websites.
Percent of Credit with Maturity Longer than One Year	Credit with original contractual maturity longer than one year divided by total credit.	
Percent of Credit with Maturity Longer than Five Years	Credit with original contractual maturity longer than five years divided by total credit.	
Real Per Capita GDP Growth	Percent increase in real per capita GDP during the previous year.	The official statistical institute or the central bank of the corresponding country. Data were cross checked with IMF's IFS, Eurostat, and OECD's quarterly national accounts.
Per Capita GDP	Real per capita GDP in US dollars at the beginning of a year.	
Inflation	Percent increase in the CPI from the previous quarter.	
Rule of Law	Index that measures "the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement."	Kaufmann, Kraay, and Mastruzzi (2007).
Banking Industry Concentration	The assets of the three largest banks as a share of the assets of all commercial banks.	Beck, Demirgüç-Kunt, and Levine (2000).
Credit Information Sharing	Dummy taking 1 if public credit registry or private credit bureau operates in a country during a year, 0 otherwise.	Author constructed from Brown, Japelli, and Pagano (2007).
State Banks' Asset Share	Share of majority state-owned banks' assets in total bank sector assets.	EBRD "Structural change indicators."
Foreign Banks' Asset Share	Share of total bank sector assets in banks with foreign ownership exceeding 50%.	
Stock Market Turnover	Stock Market volume traded during a quarter divided by quarterly GDP.	Official stock exchange of corresponding country.
Output Volatility	Root mean squared errors from $y_t = \alpha + \varepsilon_t$ , using data from the preceding 10 quarters, where $y$ is Real GDP growth.	Author constructed from data on Real GDP growth.

Credit is decomposed into three categories: short-term credit with contractual maturity of one year or less, medium-term credit with contractual maturity between one year and five years, and long-term credit with contractual maturity longer than five years. Table 3 shows that, looking across all countries, about 41 percent of credit has maturity shorter than one year and about 32 percent has maturity longer than five years.

There are substantial differences between countries. From Table 2, 54 percent of credit in Lithuania has maturity longer than five years whereas less than 20 percent of credit in Albania and Romania is long-term. The percent long-term credit has trended upwards for most countries, although the trend varies, as Figure 2 illustrates. The share of long-term credit in Latvia grew from 4 percent in 1996 to 52 percent in 2006, whereas it grew from 30 percent to 55 percent in the Czech Republic. Overall, by

2005 credit maturity in many transition countries was similar to that in Western Europe.<sup>3</sup>

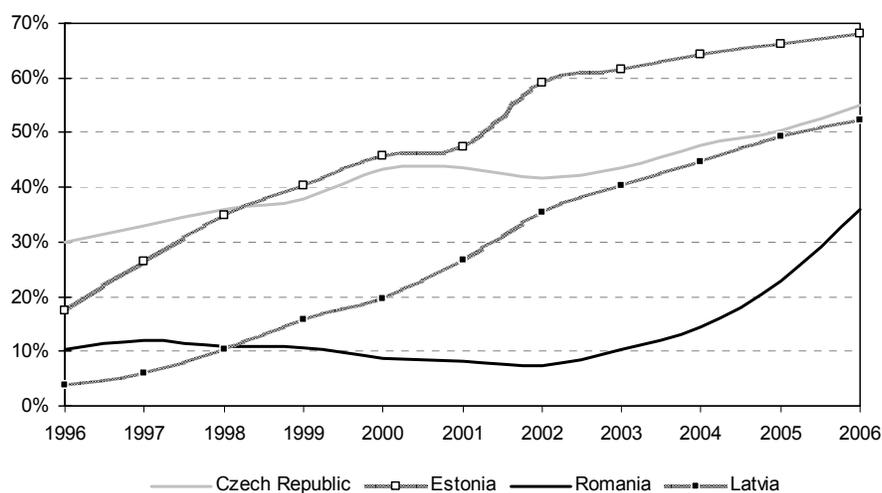
**Table 2.** Bank Credit and Bank Credit Maturity by Country

Country	Country Average Values for the Available Quarters			Coverage	
	Credit as Share of Quarterly GDP	Percent of Credit with Maturity		From	To
		over 1 year	over 5 years		
Albania	9.32	52.03	17.42	Q3/2003	Q1/2006
Bulgaria	124.48	62.95	20.96	Q4/1999	Q1/2007
Czech Republic	195.96	64.46	39.64	Q1/1993	Q1/2007
Estonia	151.02	80.93	42.79	Q1/1994	Q1/2007
Hungary	85.73	52.60	34.40	Q4/1995	Q1/2007
Latvia	105.13	62.80	22.30	Q4/1992	Q1/2007
Lithuania	71.53	60.66	53.55	Q1/1995	Q4/2004
Macedonia, FYR	65.81	52.87	-	Q4/2000	Q4/2006
Poland	101.12	63.28	34.80	Q4/1996	Q1/2007
Romania	57.61	44.41	15.41	Q4/1997	Q1/2007
Serbia, Republic of	100.80	56.09	-	Q1/1999	Q1/2007
Slovak Republic	210.14	41.49	25.52	Q4/2002	Q2/2007
Slovenia	120.37	59.83	-	Q1/1992	Q1/2006
Ukraine	89.23	39.73	-	Q4/1996	Q2/2007
<i>Sample</i>	<i>112.32</i>	<i>59.02</i>	<i>31.59</i>		

Notes: For variable definitions, please see Table 1.

**Figure 2.** Percent Long-Term Credit

Presented are yearly average values of the credit with maturity longer than 5 years as a share of total credit



<sup>3</sup> To illustrate, in 2005 credit with maturity longer than one year was 72.4 percent of all credit in the transition economies, while it was 73.9 percent in the rest of Europe.

**Table 3.** Summary Statistics

	Credit / GDP	Credit w/ Maturity over 1 year (%)	Credit w/ Maturity over 5 years (%)	Real Per cap. GDP Growth	Per Capita GDP	Rule of Law	Inflation	Credit Info. Sharing	State Banks' Asset Share	Foreign Banks' Asset Share	Banking Industry Conc.	Output Volatility	Stock Market Turnover
<i>Panel A: Descriptive Statistics</i>													
Mean	112.32	59.02	31.59	3.92	3,903	0.18	13.75	0.69	22.16	50.45	0.71	2.66	0.10
Minimum	6.14	4.12	1.04	-31.34	590	-1.14	-1.65	0	0	0	0.36	0.44	0
Maximum	371.55	92.95	69.50	37.13	11,382	1	331.09	1	90.90	99.40	1	13.09	0.89
Std. Dev.	66.46	17.22	17.10	5.71	2,323	0.58	29.82	0.46	22.96	31.16	0.18	2.19	0.14
<i>Panel B: Correlations</i>													
Credit / GDP	1.00												
Maturity over 1 year (%)	0.47*	1.00											
Maturity over 5 years (%)	0.66*	0.81*	1.00										
Growth	0.17*	0.42*	0.40*	1.00									
Per Capita GDP	0.43*	0.33*	0.75*	0.00	1.00								
Rule of Law	0.48*	0.46*	0.72*	0.07	0.82*	1.00							
Inflation	-0.20*	-0.29*	-0.40*	-0.45*	-0.07	-0.35*	1.00						
Credit Info. Sharing	0.08	0.23*	0.38*	0.18*	0.27*	0.36*	-0.26*	1.00					
State Banks	0.06	-0.29*	-0.24*	-0.31*	0.04	-0.23*	0.51*	-0.30*	1.00				
Foreign Banks	0.09	0.40*	0.41*	0.24*	-0.09	0.28*	-0.43*	0.26*	-0.62*	1.00			
Bank. Ind. Conc.	0.13*	0.11*	0.18*	-0.16*	0.04	0.15*	0.16*	0.19*	0.10*	0.09	1.00		
Output Volatility	-0.33*	-0.24*	-0.36*	0.20*	-0.45*	-0.53*	0.55*	-0.11*	0.46*	-0.19*	0.12*	1.00	
Stock Market	0.02	0.02	0.26*	0.04	0.04	0.24*	-0.07	0.16*	-0.2*	0.17*	0.16*	-0.13*	1.00
EU membership	0.24*	0.26*	0.16*	-0.02	0.56*	0.82*	0.00	0.24*	0.00	0.23*	0.22*	-0.33*	0.10*

Notes: \* denotes significance at the 5 percent. For variable definitions, please see Table 1.

### **3. The determinants of bank credit maturity – empirical hypotheses**

#### **3.1. Institutions**

Diamond (1991; 1993) and Rajan (1992) show that short-term lending facilitates the enforcement of credit contracts as it limits the period during which an opportunistic firm can exploit its creditors without being in default. Diamond (2004) argues that “maturity acts as a substitute contracting tool to control borrower risk,” and that bank loan maturity is especially sensitive to the legal environment. Giannetti (2003) also argues that if the law does not guarantee creditor rights, lenders would prefer short-term debt to control entrepreneurs’ opportunistic behavior by using the threat of not renewing their loans. In line with these theories, we expect to find that weak institutions contribute to shorter credit maturity. We measure legal institutions using a Rule of Law index described in Table 1. The index ranges from -1.14 in Serbia in 2000 to 1 in Slovenia in 2002. As Table 3 shows, the rule of law is positively and significantly correlated with credit maturity measures.

#### **3.2. State Ownership of Banks**

Demirgüç-Kunt and Maksimovic (1999) note that the government can promote long-term financial contracting by granting implicit loan guarantees when it adopts a policy of subsidizing loss-generating firms. The authors find that government subsidies to the corporate sector lengthen credit maturity. Furthermore, La Porta, Lopez-de-Silanes, and Shleifer (2002) note that government ownership of banks has an even stronger effect, as the government has more power to choose projects. According to this view, the ownership of banks enables the government to direct funds toward strategic long-term projects. However, government ownership of banks may also be associated with inefficiencies; the transfer of ownership into private hands might improve information gathering and processing, and the monitoring of borrowers. Therefore, the theoretical effect of government ownership on credit maturity is ambiguous.

#### **3.3. Foreign Ownership of Banks**

Berglof and Bolton (2002) and Eller, Haiss, and Steiner (2005) argue that foreign ownership leads to greater efficiency of the financial sectors in the transition countries. Foreign banks enhance transparency and corporate governance with a stronger commitment in these areas compared to domestic banks (Naaborg et al. 2003). Foreign-owned banks also utilize greater risk management expertise and can diversify risk across several countries (de Haas and van Lelyveld 2006). All of those contribute to greater availability of long-term credit. However, foreign owned banks

may also face difficulties gathering and evaluating information on local borrowers, especially in the transition countries where few borrowers have credit history.

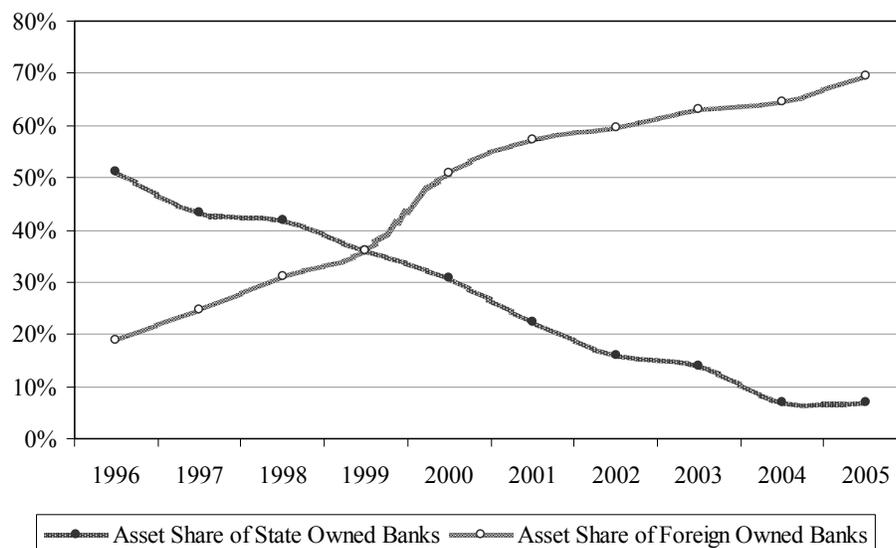
Figure 3 shows that private and foreign ownership of banks have increased dramatically over time across the region. There are, however, differences across countries. Some countries privatized banks earlier than others. For example, while the government owned almost 98 percent of banks in Albania in 1994, Macedonia had privatized the entire banking sector by 1996. By 2005, the asset share of foreign owned banks was above 50 percent in most countries, while in the Baltic countries it was close to 100 percent. Table 3 shows that the asset share of state owned banks is negatively correlated, while the asset share of foreign owned banks is positively correlated with the share of long-term credit.

### 3.4. Credit Information Sharing

Zhang and Sorge (2007) show theoretically that credit information sharing is used by banks as a screening device; it leads to an equilibrium where long-term contracts are preferred. Empirically, Zhang and Sorge show that information sharing leads to longer credit maturity for publicly traded companies. We expect to find the same effect using bank credit to the entire private sector. Table 3 shows that the presence of a credit information sharing institution is positively and significantly correlated with credit maturity measures.

**Figure 3.** State and Foreign Ownership of Banks.

Presented are assets owned by each type of banks as a share of all bank assets. These are averages across countries.



### **3.5. High Inflation**

Boyd, Levine, and Smith (2001) and Rousseau and Wachtel (2002) argue that high inflation discourages long-term financial contracting by raising uncertainty about the real value of future nominal payments. Therefore, high inflation should reduce the fraction of credits with long-term maturity. In our sample, inflation has been moderate for most countries with a period average of 13.75. There are, however, periods of very high inflation as in Latvia in 1992 (331.09 percent). Table 3 shows that inflation is negatively and significantly correlated with both maturity measures.

### **3.6. Output Volatility**

In the context of international lending, Valev (2007) finds that greater output volatility in a country leads U.S. banks to shorten the maturity of credit to that country. The argument is that output volatility proxies for the short-term operational component of business risk. We expect to find the same effect with domestic credit. Output volatility, defined as in Table 1, has been lowest in Bulgaria in 2003, while it has been highest in Serbia in 2002. Table 3 reveals that the correlation of output volatility and both maturity measures is indeed negative and significant.

### **3.7. Overall Level of Bank Credit**

Diamond (1984) highlights the function of banks as delegated monitors that reduce the cost of monitoring borrowers by exploiting economies of scale. Without banks, individual savers would incur the cost of assessing and monitoring investment projects. With economies of scale, a larger banking system would have lower monitoring costs, which reduces lending risk and increases the supply of long-term debt. Therefore, we expect that higher credit levels will be associated with more long-term credit. The correlations in Table 3 give preliminary support to this hypothesis.

### **3.8. Banking Sector Competition**

Banking sector competition can have a dual effect on the provision of external financing and the provision of long-term financing in particular. High concentration may raise the cost of funds and reduce external financing (Pagano 1993). Alternatively, high concentration may foster close relationships between banks and borrowers; this lowers information asymmetries and the cost of monitoring borrowers (Mayer 1988; Mayer and Hubbard 1990; Petersen and Rajan 1995). Testing the bank-firm relationship hypothesis Giannetti (2003) finds that, contrary to (her) expectations, maturity is shorter in countries where the banking system is more concentrated. Using the asset share of the three largest banks to measure concentration, the least concentrated banking sector was that of Serbia in 2005 where

the three largest banks had a market share of 36 percent, while the most concentrated banking sectors were in Estonia and Romania where the three largest banks owned all assets for a number of years. In Table 3, banking industry concentration and the maturity measures are positively correlated, i.e. more concentrated banking system are associated with longer credit maturity.

### **3.9. Stock Market Development**

Stock market development also has an ambiguous effect on credit maturity. Diamond (1997) argues that developed stock markets cause the banking sector to shrink, primarily through reduced holdings of long-term assets. According to this view, selling equity is a substitute source of long-term financing; therefore, stock market development reduces the demand for long-term bank credit. An alternative view explains that stock markets reveal information about firms and this helps them access long-term bank financing (Grossman 1976; Grossman and Stiglitz 1980). The stock market turnover, which we use to measure stock market development, ranges from 0 in Latvia in the first quarter of 1996 to 89 percent of GDP in Estonia in the first quarter of 2005. In Table 3, the correlation of the stock market turnover with the fraction of credit with maturity longer than five years is positive and significant.

### **3.10. Real Per Capita GDP**

Ravid (1996) points to the “industry paradigm” of matching maturities introduced by Morris (1976): firms with long-term assets should use long-term debt. If debt maturity is longer than the asset life, borrowers will have to identify new investment opportunities while having to continue servicing their debt. If debt maturity is shorter than the asset life, then borrowers may become short on cash when debt payments are due. Stohs and Mauer (1996) find evidence for maturity matching on the firm level. Following Demirgüç-Kunt and Maksimovic (1999), we use per capita GDP to proxy for the amount of fixed assets in a country, with richer countries having a larger stock of long-term assets. Thus, higher GDP per capita is expected to be associated with longer debt maturity. From Table 3, we see that the per capita GDP is indeed positively and significantly correlated with both maturity measures.

### **3.11. Real Per Capita GDP Growth**

Smith and Watts (1992) note that GDP growth rates can proxy for investment opportunities: the demand for external financing would increase in boom times and will recede in recession periods. It is not clear, however, whether expansions would stimulate the demand for long-term and short-term credit in different ways. Nonetheless, we follow the literature (Demirgüç-Kunt and Maksimovic 1999; Qian

and Strahan 2007; Tasić and Valev 2008) and include real per capita GDP growth in our estimations.

The literature (e.g., Fink, Haiss, and Mantler 2005; Fink, Haiss, and Vukšić 2004) also points out that the stage of transition is important, with more advanced economies having more developed financial sectors. We include a dummy variable for EU membership as an indicator of transition progress. In summary, the empirical hypotheses are as follows:

$$\text{Percentage of Long-Term Credit} = f \left( \begin{array}{l} \text{rule of law}^{+}, \text{inflation}^{-}, \text{GDP growth}^{+/-}, \text{credit info. sharing}^{+}, \\ \text{banking industry concentration}^{+/-}, \text{credit}^{+}, \text{output volatility}^{-}, \\ \text{stock market}^{+/-}, \text{GDP per capita}^{+}, \text{state banks}^{+/-}, \text{foreign banks}^{+/-} \end{array} \right).$$

Some of the explanatory variables: legal institutions, state and foreign bank ownership, inflation, banking sector concentration, financial development, and credit information sharing affect the availability of long-term financing primarily through the supply side. Other variables: stock market development, per capita GDP, and economic growth affect the maturity of credit primarily through the demand side.

#### 4. Methodology

By construction private credit and credit maturity are determined jointly and we need to allow for endogeneity. Therefore, we implement the Hausman-Taylor (1981) estimator to correct for correlation between the explanatory variables and the country-level random-effects. This is a suitable procedure that does not require external instruments. For robustness, we also apply a fixed-effects estimator to eliminate country specific effect and a generalized least squares (GLS) random-effects estimator that controls for a heteroscedastic error structure.

One additional concern is that the dependent variable is a ratio (between 0 and 100 percent), making OLS problematic as the predicted values might lay outside the unit interval (Papke and Wooldridge 1996). This may require the transformation of the dependent variable using a log-odds ratio ( $\log(y/1-y)$ ). However, the coefficient estimates using the log-odds ratio are difficult to interpret in a panel setting and therefore we follow the previous literature (Demirgüç-Kunt and Maksimovic 1999; Rodrik and Velasco 1999; Tasić and Valev 2008; Valev 2006; 2007) and do not perform the transformation. Furthermore, less than 1 percent of the predicted values from the models are outside the unit interval.

## 5. Results

Table 4 presents the empirical results using the Hausman-Taylor estimation.<sup>4</sup> We begin with an equation that includes rule of law, GDP per capita and its growth, credit variables, and the bank ownership variables. We then add the uncertainty measures, followed by the financial sector development measures. In columns (4) and (8) we report estimations from regressions where we include all explanatory variables. There are two dependent variables – the percentage of credit with maturity longer than one year and the percentage of credit with maturity longer than five years.

Greater rule of law is associated with longer credit maturity in all specifications. Furthermore, the coefficients using credit with maturity longer than five years are generally greater than the coefficients using maturity longer than one year, i.e. weak rule of law has a stronger negative effect over longer time horizons.

Based on column (4), a one standard deviation decrease in the rule of law, e.g. from the level in Poland to the level in Bulgaria, is associated with 5.16 percentage points ( $0.58 \times 8.905$ ) decrease in the percent of credit with maturity longer than one year. The coefficient estimates in the remaining columns predict an even stronger effect on the percent of credit with maturity longer than five years.

The asset share of state owned banks has a negative and statistically significant effect on both measures of maturity. In contrast, the asset share of foreign owned banks is not statistically significant in any of the specifications. In this set of countries, private banks raise the provision of long-term financing regardless of their ownership – domestic or foreign. Looking at the results in column (4), a one standard deviation decrease in the asset share of state banks increases the portion of credit with maturity longer than one year by 6.06 percentage points ( $22.96 \times 0.264$ ).

To test whether information sharing affects credit maturity, we follow Qian and Strahan (2007) and include a dummy variable that equals 1 if a country had either a public credit registry or a private credit bureau at the beginning of the year. Using credit with maturity longer than one year produces two negative and statistically significant coefficients and two positive ones depending on the set of controls. The effect of credit with maturity longer than five years is unambiguously negative – credit information sharing reduces the percent long-term debt. We revisit this surprising result in the next section.

Credit as percent of GDP has a positive and, in most specifications, statistically significant effect on both maturity measures. Countries with deeper financial markets have a greater fraction of credit with longer maturity. The effect of economic

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<sup>4</sup> Table A1 in the appendix present the results from the fixed-effects and the GLS estimations, along with the Hausman-Taylor results. Table A2 presents the same results when the dependent variables are the portion of short-term credit and the portion of medium-term credit.

development is similar – countries with greater GDP per capita have longer credit maturity. The effect is particularly strong for long-term credit with maturity longer than five years. In terms of sizes of the effects, an increase in private credit from the level of Macedonia (65.81 percent) to the level of Bulgaria (124.48 percent) is associated with a 2.21 percentage points increase in the fraction of credit with maturity longer than one year. An increase in per capita GDP of \$1,000 results in an increase in the portion of credit with maturity longer than five years by between 13.68 and 15.61 percentage points. This is not a negligible effect.

**Table 4.** Determinants of Credit Maturity

	Percentage of Credit with Maturity Longer than 1 year				Percentage of Credit with Maturity Longer than 5 years			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rule of Law	11.334 (0.005)	14.724 (0.000)	5.399 (0.210)	8.905 (0.009)	15.743 (0.000)	14.465 (0.000)	9.580 (0.009)	10.744 (0.004)
State Banks' Asset Share	-0.106 (0.005)	-0.240 (0.000)	-0.091 (0.020)	-0.264 (0.000)	-0.074 (0.007)	-0.067 (0.115)	-0.103 (0.001)	-0.113 (0.007)
Foreign Banks' Asset Share	0.035 (0.216)	-0.022 (0.343)	0.023 (0.404)	-0.034 (0.129)	-0.010 (0.577)	-0.027 (0.216)	-0.002 (0.924)	-0.025 (0.242)
Credit Info. Sharing	-2.729 (0.051)	2.661 (0.025)	-2.679 (0.048)	2.642 (0.024)	-3.709 (0.000)	-3.096 (0.007)	-3.158 (0.001)	-2.597 (0.019)
Credit	5.016 (0.002)	3.391 (0.014)	1.807 (0.268)	3.764 (0.005)	2.081 (0.101)	1.918 (0.164)	3.164 (0.014)	3.208 (0.021)
Per Capita GDP	3.983 (0.000)	1.293 (0.182)	7.376 (0.000)	2.122 (0.036)	15.757 (0.000)	15.560 (0.000)	16.838 (0.000)	15.609 (0.000)
Previous Year GDP Growth	0.365 (0.000)	1.215 (0.000)	0.183 (0.040)	1.236 (0.000)	0.010 (0.927)	-0.007 (0.960)	-0.115 (0.250)	-0.052 (0.692)
Inflation		-15.352 (0.006)		-21.541 (0.000)		-10.121 (0.188)		-14.898 (0.048)
Output Volatility		0.074 (0.791)		0.170 (0.537)		-0.234 (0.468)		-0.059 (0.861)
Stock Market Turnover			2.525 (0.498)	-6.257 (0.042)			-6.966 (0.030)	-8.758 (0.009)
Banking Indust. Conc.			-5.568 (0.209)	-3.587 (0.309)			0.845 (0.766)	2.386 (0.439)
EU Member	-15.920 (0.149)	-11.467 (0.323)	-29.647 (0.206)	-11.792 (0.404)	-44.510 (0.043)	-48.288 (0.121)	-36.244 (0.000)	-30.835 (0.000)
Constant	49.195 (0.000)	54.938 (0.000)	59.538 (0.008)	57.806 (0.000)	11.669 (0.580)	18.783 (0.528)		
Hausman $\chi^2$ (df)	3.18 (7)	0.78 (9)	4.31 (8)	1.1 (11)	4.16 (7)	1.16 (8)	4.07 (9)	4.5 (10)
<i>p</i> -value	0.868	0.999	0.828	0.827	0.761	0.997	0.907	0.923
Observations	411	358	344	317	241	218	223	211
Countries	14	14	11	11	10	10	9	9

Notes: See Table 1 for variable definitions. Results are based on Hausman-Taylor estimation, where Credit is endogenous. *P*-values are reported in parentheses below coefficients. The Hausman test has a null hypothesis that the explanatory variables are not correlated with the country-specific random-effects.

Per capita GDP growth significantly increases the portion of credit with maturity longer than one year, indicating that demand for investment credits increase during

expansions. Conversely, high inflation leads to a shift towards short-term credit indicated by the negative and statistically significant coefficient on inflation in three of the four specifications where inflation is included. Looking at the coefficient in column (4), an increase in inflation by one standard deviation decreases the portion of credit with maturity longer than one year by 6.42 percentage points ( $-21.541 \times 0.298$ ). Stock market development is also negative and statistically significant in three out of four specifications. Moreover, this negative effect is greater in magnitude (by about 40 percent) for the portion of credit with maturity longer than five years. Therefore, the results suggest that stock markets in the transition countries are an alternative source of long-term financing, especially at longer time horizons.

Output volatility and banking industry concentration are not significant determinants of credit maturity. The negative coefficient estimate of the EU membership dummy suggests that countries at the earlier stage of transition have a greater portion of credit with maturity longer than five years. The bias toward long-term credit may be attributed to the high prevalence of credits to public sector enterprises in the early years of transition. In many cases, these credits were restructured under government directive extending their maturity and easing other credit terms.

In summary, there are several supply-side factors explaining credit maturity in the transition economies. Improved rule of law, greater levels of financial development, bank privatization, and relatively low inflation rates have contributed to lengthening the maturity of bank credit. Demand factors have played a role too. Stock market development has reduced the demand for long-term bank financing but rapid economic growth and increasing income levels have generated strong demand for long-term credit. Overall, the results show that the changes associated with transition are contributing factors for increasing the availability of long-term finance. Countries that have advanced rapidly in terms of institutional and economic development have also enjoyed the greatest gains in terms of long-term credit.

### **5.1. Credit information sharing and credit maturity**

For each country in this paper, Brown, Jappelli, and Pagano (2007) collected information about the year when a public credit registry or a private credit bureau was established. In addition, the authors identify whether these institutions collect information on consumers and/or firms, positive and/or negative information, how long the information is kept, and what is the minimum amount of loans for which data are collected. We use this information to construct a quality index for both types of institutions, similar to the one in Brown, Jappelli, and Pagano (2007). If the institution is present, the index takes on a value of 1, and 0 otherwise. If the institution existed for at least six consecutive quarters, an additional point is added to the index. If information is kept on both firms and consumers, an additional point is added to the index. Similarly, an additional point is added if both positive and negative

information is reported. An additional point is added if information is kept for at least two years. The final point is added if the minimum amount of a loan for which the institution collects data is below yearly per capita GDP (or if the threshold does not exist). Therefore, the quality index for each type of institution ranges from 0 (if the institution does not exist) to 6 (if it meets all criteria listed above). The quality index for the public credit registry and the private credit bureau are added together to form an overall quality index.

Table 5 presents the results when we estimate the impact of different measures of credit information sharing on both maturity measures. The results are based on a full set of determinants, but for brevity we do not report the coefficients of the other determinants. Columns (1) and (5) correspond to the estimated coefficients from columns (4) and (8) of Table 4. The presence of credit information sharing institutions increases the portion of credit with maturity longer than one year, while it decreases the portion of credit with maturity longer than five years. When we introduce separately public and private credit institutions in columns (2) and (6), we see that the results are driven by the presence of private credit bureaus. The presence of a public credit registry does not have a significant influence on either maturity measure.

**Table 5.** Credit Maturity and Credit Information Sharing

	Percentage of Credit with Maturity Longer than 1 year				Percentage of Credit with Maturity Longer than 5 years			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Presence	2.642 (0.024)				-2.597 (0.019)			
Credit Information Sharing	Public Credit Registry	0.603 (0.664)			1.586 (0.235)			
	Private Credit Bureau	3.869 (0.002)			-7.067 (0.000)			
	Quality Index (Overall)		0.628 (0.003)				-0.828 (0.000)	
	Quality Index (Public)			1.178 (0.001)				-1.818 (0.000)
	Quality Index (Private)				-0.033 (0.932)			0.601 (0.115)

Notes: See Table 1 and text for variable definitions. Estimation based on Hausman-Taylor model with a full set of determinants, as in columns (4) and (8) of Table 4. *P*-values are reported in parentheses below coefficients.

Similar results are obtained in columns (3) and (7) when we use the index of overall quality, as defined above, instead of an indicator for the existence of an institution. Greater quality of the information sharing mechanisms increases the portion of credit with maturity longer than one year, while it decreases the portion of credit with maturity longer than five years. When the overall quality index is decomposed into a quality index of public credit registries and a quality index of private credit bureaus in columns (4) and (8), we see that the results are driven by the

quality of public credit registries. The quality of private credit bureaus does not have a significant influence on either measure of maturity.

In summary, the results suggest that private credit bureaus affect credit maturity; public credit registries affect credit maturity as well, but only if they have enhanced features. Yet, in either case, the effect of credit information sharing is to reduce short-term and long-term credit and, by default, to increase the fraction of medium-term credit. This result counters our empirical hypothesis that information sharing would lengthen credit maturity across the board. One possible explanation for this finding can be found in Diamond (1991). With asymmetric information, firms have incentives to borrow short-term in order to signal the quality of their projects to lenders and to extract the benefits of good news. They also have an incentive to borrow long-term to lower liquidity risk. Therefore, the shares of short-term credit and long-term credit expand at the expense of medium-term credit. One can argue that credit information sharing reduced information asymmetry and reverses this tendency: short-term and long-term borrowing decline while medium-term borrowing increases.

## 5.2. Institutions and credit maturity

We introduce several additional variables to explore the effect of institutions in greater detail: 1) an index of government effectiveness measuring the quality of public services, the quality of the civil service and the degree of its independence from political pressures; 2) political stability reflecting perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means; 3) control of corruption measuring the extent to which public power is exercised for private gain; 4) regulatory power measuring the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development; and 5) an EBRD index of banking reform and interest rate liberalization. The first four indexes are from Kaufmann, Kraay, and Mastruzzi (2007) and range from -2.5 to 2.5. The EBRD index ranges from 1 to 5.

**Table 6.** Credit Maturity and Alternative Institutional Measures

Dependent Variable	Rule of Law	Government Effectiveness	Political Stability	Control of Corruption	Regulatory Power	EBRD Reform Index
Percentage of Credit with Maturity Longer than 1 year	8.905 (0.009)	17.026 (0.000)	2.909 (0.160)	16.171 (0.000)	10.101 (0.000)	11.061 (0.000)
Percentage of Credit with Maturity Longer than 5 years	10.744 (0.004)	14.024 (0.000)	9.556 (0.000)	14.648 (0.000)	3.671 (0.217)	7.767 (0.000)

Notes: See Table 1 for variable definitions. Estimation based on Hausman-Taylor model with a full set of determinants, as in columns (4) and (8) of Table 4. *P*-values are reported in parentheses below coefficients.

Table 6 presents the estimation results when we substitute the rule of law index with different institutional measures. The results are based on a full set of determinants, but for brevity we do not report the coefficients of the other determinants. The statistically significant coefficients in almost all specifications confirm the importance of institutions and provide a few additional interesting observations. For example, political instability is only a long-term concern affecting only credit with maturity longer than five years. The remaining institutional effects work at medium and long-term horizons.

## **6. Conclusion**

A new data set from the transition economies reveals that the maturity of bank credit to the private sector has lengthened substantially over time. Several factors contribute to this trend: the improvements in the political and institutional environment, the privatization of banks, the sustained low to moderate inflation, and the increasing levels of economic and financial development. By 2005, credit in several transition countries had maturity structure similar to that in Western Europe. Yet, credit in other transition countries remains mostly short-term.

Several factors that are not significant determinants of credit maturity are also worth mentioning. The growing share of foreign owned banks has not contributed to longer credit maturity. Similarly, we find no evidence that competition in the banking system contributes to longer credit maturity. Output volatility is also not significant which brings up an interesting comparison with the effect of institutions – our results suggest that credit maturity is affected by political and institutional uncertainty more so than by economic uncertainty.

There are various ways to build on this analysis. Future research can explore in more detail the effect of banking sector competition. We use market concentration but there are other measures that can be used to investigate the role of competition in making long-term finance available. Similarly, future research can investigate the role of state owned versus private banks in broader samples. The “developmental view” argues that government banks increase the provision of long-term financing in strategic areas. Our results suggest that private banks accomplish this task more effectively. Whether this result holds in broader samples has important implications for the desirability of government development banks. Similarly, whether competition matters for long-term finance has important implications for banking policy and regulations.

## Appendix. Additional Estimation Results

Table A1. Additional Estimators

	Percentage of Credit with Maturity Longer than 1 year			Percentage of Credit with Maturity Longer than 5 years		
	Fixed Effects	GLS	Hausman- Taylor	Fixed Effects	GLS	Hausman- Taylor
Rule of Law	8.663 (0.015)	13.757 (0.000)	8.905 (0.009)	10.508 (0.009)	16.573 (0.000)	10.744 (0.004)
Inflation	-20.679 (0.061)	-53.893 (0.000)	-21.541 (0.000)	-15.085 (0.066)	-18.562 (0.086)	-14.898 (0.048)
Previous Year GDP Growth	1.213 (0.000)	1.535 (0.000)	1.236 (0.000)	-0.080 (0.429)	0.786 (0.000)	-0.052 (0.692)
Credit	3.312 (0.039)	9.605 (0.000)	3.764 (0.005)	2.572 (0.135)	7.423 (0.000)	3.208 (0.021)
Per Capita GDP	2.690 (0.045)	-1.412 (0.001)	2.122 (0.036)	16.551 (0.000)	3.496 (0.000)	15.609 (0.000)
Credit Information Sharing	2.536 (0.010)	-0.128 (0.907)	2.642 (0.024)	-3.030 (0.004)	5.513 (0.000)	-2.597 (0.019)
Banking Industry Concentration	-4.134 (0.259)	4.680 (0.153)	-3.587 (0.309)	1.870 (0.535)	6.347 (0.073)	2.386 (0.439)
Stock Market Turnover	-5.823 (0.009)	-21.639 (0.000)	-6.257 (0.042)	-8.744 (0.007)	-1.646 (0.767)	-8.758 (0.009)
Output Volatility	0.119 (0.682)	1.258 (0.001)	0.170 (0.537)	-0.032 (0.918)	-0.029 (0.950)	-0.059 (0.861)
State Banks' Asset Share	-0.254 (0.000)	-0.404 (0.000)	-0.264 (0.000)	-0.109 (0.014)	-0.095 (0.023)	-0.113 (0.007)
Foreign Banks' Asset Share	-0.036 (0.095)	-0.087 (0.001)	-0.034 (0.129)	-0.030 (0.174)	0.002 (0.951)	-0.025 (0.242)
EU Member		-5.148 (0.180)	-11.792 (0.404)		-5.722 (0.123)	-30.835 (0.000)
Constant	47.115 (0.000)	63.263 (0.000)	57.806 (0.000)	-33.942 (0.000)		
Hausman test: $\chi^2$ (d.f.)		8.99 (11)	1.05 (11)		201.14 (11)	0.37 (11)
<i>p</i> -value		0.6232	0.827		0.000	1.000
Observations	317	317	317	211	211	211
Countries	11	11	11	9	9	9

Notes: See Table 1 for variable definitions. *P*-values are reported in parentheses below coefficients. In the Hausman-Taylor estimation Credit is endogenous. The Hausman test has a null hypothesis that the explanatory variables are not correlated with the country-specific random-effects. Per Capita GDP is in thousands of USD.

**Table A2.** Alternative Measures of Credit Maturity

	Percentage of Credit with Maturity of 1 year or Less			Percentage of Credit with Maturity from 1 year to 5 years		
	Fixed Effects	GLS	Hausman- Taylor	Fixed Effects	GLS	Hausman- Taylor
Rule of Law	-8.663 (0.015)	-13.757 (0.000)	-8.905 (0.009)	-10.568 (0.000)	5.235 (0.028)	-10.348 (0.002)
Inflation	20.679 (0.061)	53.893 (0.000)	21.541 (0.000)	-51.884 (0.000)	-95.924 (0.000)	-52.583 (0.000)
Previous Year GDP Growth	-1.213 (0.000)	-1.535 (0.000)	-1.236 (0.000)	0.406 (0.001)	0.319 (0.026)	0.384 (0.001)
Credit	-3.312 (0.039)	-9.605 (0.000)	-3.764 (0.005)	-2.215 (0.066)	-2.533 (0.000)	-2.836 (0.015)
Per Capita GDP	-2.690 (0.045)	1.412 (0.001)	-2.122 (0.036)	-7.475 (0.000)	-5.906 (0.000)	-6.640 (0.000)
Credit Information Sharing	-2.536 (0.010)	0.128 (0.907)	-2.642 (0.024)	3.696 (0.000)	-2.984 (0.001)	3.238 (0.001)
Banking Industry Concentration	4.134 (0.259)	-4.680 (0.153)	3.587 (0.309)	-2.064 (0.376)	-4.137 (0.117)	-2.491 (0.349)
Stock Market Turnover	5.823 (0.009)	21.639 (0.000)	6.257 (0.042)	2.624 (0.322)	5.414 (0.201)	2.733 (0.346)
Output Volatility	-0.119 (0.682)	-1.258 (0.001)	-0.170 (0.537)	0.407 (0.218)	2.202 (0.000)	0.457 (0.118)
State Banks' Asset Share	0.254 (0.000)	0.404 (0.000)	0.264 (0.000)	-0.158 (0.000)	-0.391 (0.000)	-0.158 (0.000)
Foreign Banks' Asset Share	0.036 (0.095)	0.087 (0.001)	0.034 (0.129)	-0.117 (0.000)	-0.241 (0.000)	-0.124 (0.000)
EU Member		5.148 (0.180)	11.792 (0.404)		84.248 (0.000)	74.932 (0.000)
Constant	52.885 (0.000)	36.737 (0.000)	42.194 (0.002)	79.467 (0.000)		
Hausman test: $\chi^2$ (d.f.)		537.00 (9)	5.10 (6)		118.12 (8)	3.95 (7)
$p$ -value		0.000	0.5316		0.000	0.785
Observations	317	317	317	211	211	211
Countries	11	11	11	9	9	9

Notes: See Table 7 for variable definitions. P-values are reported in parentheses below coefficients. In the Hausman-Taylor estimation Credit is endogenous. The Hausman test has a null hypothesis that the explanatory variables are not correlated with the country-specific random-effects. Per Capita GDP is in thousands of USD.

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