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**Explaining the Behavior of Financial Intermediation:  
Evidence from Transition Economies**

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**Abstract**

This paper investigates the effects of macroeconomic and structural variables on financial intermediation. To this end, it presents a theoretical foundation for two new measures of intermediation, the money multiplier and the ratio of private sector credit to monetary base. Results from panel estimations covering 19 transition economies indicate that policy makers need to address in particular the problems of bad loans on bank balance sheets and high market concentration while maintaining a stable macroeconomic environment. Further variables, such as minimum reserve requirements and the capital adequacy ratio, are found to possess less explanatory power.

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## I. INTRODUCTION

Financial intermediation increases the efficiency of the allocation of capital and has a positive impact on economic growth. While the link between financial intermediation and economic performance has been studied extensively in the literature,<sup>1</sup> the factors contributing to deeper intermediation have remained largely unstudied. The potential negative consequences of a lack of financial intermediation for investment and growth are the key factors underlying policy makers' increased interest in strengthening financial intermediation.

The question of how to support financial development is of particular importance for transition economies: More than five years into the transition from centrally planned to market-oriented economies, financial sectors in the respective countries remain underdeveloped. Banks play a smaller role in the economy, attracting not as many deposits and giving fewer credits than in developed market economies. Chart 1.1 presents gross national savings as a percentage of GDP in 1997 for selected transition economies as well as the average for the G-7 economies. It appears that the savings ratio in most transition economies is similar to that of developed market economies. Chart 1.2 reveals, however, that financial intermediation as measured by the broad money multiplier is drastically lower in transition economies, indicating that a large part of savings is not intermediated by the financial sector.

In transition economies, basic financial reforms have been implemented, however, without resulting so far in the emergence of strong and sound financial sectors. In particular, deposit and lending rates have been liberalized and good progress has generally been achieved in setting up the supervisory and regulatory frameworks so that banks can be expected to operate in a market-oriented environment. Some areas, however, appear to need further reform, including the enforcement of property rights and the performance of the legal sector. Furthermore, inadequate accounting standards and limited inspection and intervention capabilities by bank supervisors still pose a threat to financial system soundness.<sup>2</sup>

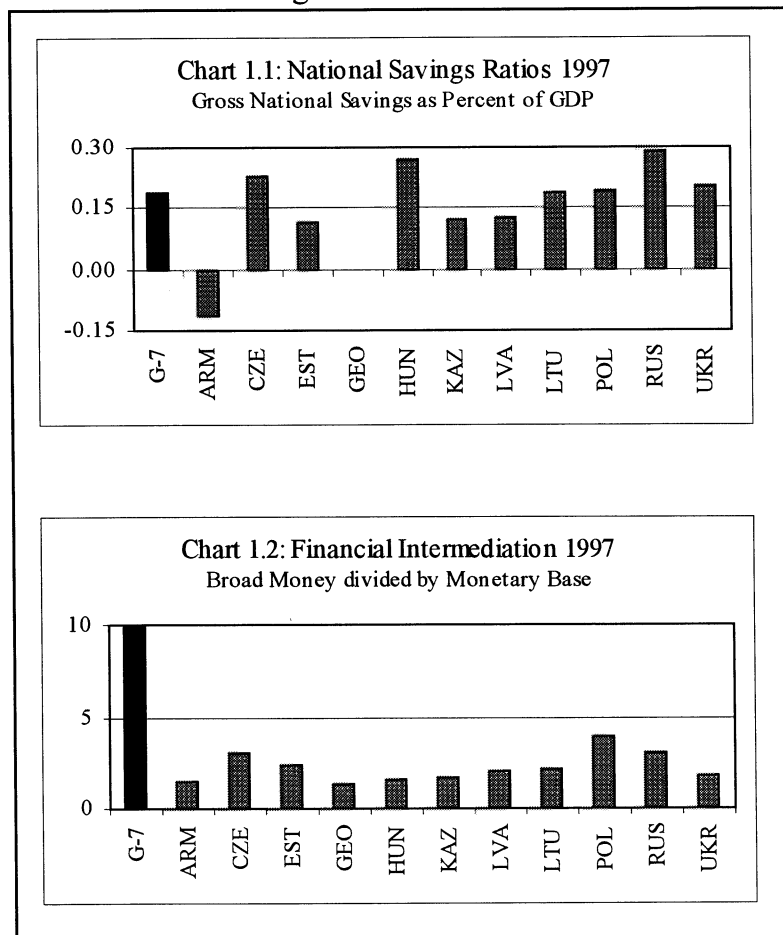
This paper provides a theoretical analysis of the factors driving financial intermediation, introducing two new measures of intermediation, the money multiplier and the ratio of private sector credit to monetary base. Based on a comprehensive collection of macroeconomic and financial sector data for 19 transition economies, the paper then proceeds to assess the relative importance of the various factors. The results provide evidence that the share of bad loans in bank portfolios, the concentration in the banking sector, and expected inflation are significant variables which may prevent deep financial intermediation. On the other hand, past inflation

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<sup>1</sup> For details see the literature presented in Section II.

<sup>2</sup> For further information on the state of financial sector reforms in transition economies, see Pazarbaşıoğlu and van der Vossen (1997), International Monetary Fund (1997), and Knight (1997).

Chart 1: Savings and financial intermediation



experience, bank capital adequacy ratios, and the level of minimum reserve requirements are found to be of less statistical significance.

The structure of the paper is as follows. Section II starts out with a survey of the possible effects of financial intermediation on economic growth which includes a brief survey of the literature. Section III presents the theoretical framework for the identification of the main factors for financial development. The fourth section then contains the results of an econometrical analysis of these potential causes using data from transition economies. Section V follows with a discussion of some policy lessons from this analysis.

## II. FINANCIAL INTERMEDIATION AND ECONOMIC ACTIVITY

### A. Theoretical Concept

The study of possible measures to enhance financial intermediation is based on the assumption that financial intermediation has a positive impact on economic growth. This section presents

the theoretical foundation for this notion and discusses its empirical implications. In addition to the effects analyzed below, it should be noted that financial intermediaries in most cases also provide payment services to the economy. While the impact of a well-functioning payment system on the level or the growth rate of economic activity is difficult to quantify, the effect will generally be positive.<sup>3</sup>

To analyze the effects of financial intermediation on the economy, it is necessary to define the functions the intermediaries perform. Financial intermediaries provide the economy with risk-return combinations for borrowing or investing capital which dominate those possible without intermediaries and, therefore, they augment an economy's production potential. Intermediaries achieve this by pooling capital and spreading risk. They do this by collecting deposits from agents wishing to invest money, and they subsequently make these funds available to agents seeking capital. The use of intermediaries allows investing agents to reduce specifically two types of risk: investment risk and liquidity risk. For borrowers, intermediaries provide large amounts of capital at low transaction costs.

Investment risk results from possible losses of investments with an uncertain outcome. To reduce investment risk, every investor has to design appropriate investment contracts and monitor the performance of his investment project. Banks, which specialize in the provision of credit, will be able to perform the above tasks more efficiently for a group of investors because only the bank incurs the cost of investment information, not each individual investor.<sup>4</sup> The costs of monitoring the bank, in turn, will be small because the bank holds a diversified portfolio. In addition, banks can allocate large amounts of capital more efficiently if there are indivisibilities regarding the investment of capital.

Liquidity risk arises from the fact that depositors themselves are subject to exogenous shocks and may need to withdraw their money early from long-term projects. By pooling the capital of several investors, banks can invest the capital in long-term projects while still allowing individual investors to withdraw money on demand.

The greater availability of investment alternatives through financial intermediation affects the economy through three separate processes: an increase in investment efficiency, a decrease in the cost of transferring capital from original lenders to final borrowers, and a change in the savings rate.<sup>5</sup> Investment efficiency in the economy should increase as a result of the information advantage held by banks in dealing with borrowers as well as their ability to pool risks as described above. By pooling information about firms, industries, and the economy as a

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<sup>3</sup> For further discussions of issues concerning payment systems see Johnson et al. (1998).

<sup>4</sup> See for a brief formal presentation Diamond (1996).

<sup>5</sup> See also Pagano (1993).

whole banks should be able to judge expected returns from investment projects better than individuals and allocate the resources appropriately.

Financial sector development should also induce lower costs of financial intermediation. These costs which are represented by the spread between bank borrowing and lending interest rates should decrease as banks gain experience and an increased supply of financial services leads to more competition among the financial service providers. With lower intermediation costs, a larger share of the savings deposited with banks will find its way to the ultimate borrowers.

The third way in which financial sector development affects the real economy is through the savings rate. However, the sign of this effect is ambiguous. The risk-reducing function of financial intermediation induces higher expected returns for savers at any level of risk. This may induce savers either to save more as saving becomes more attractive or to save less as a smaller amount of saving is now required to achieve a given savings goal. The overall result depends in particular on the agents' risk preferences. In addition, the availability of household credit may affect agents' saving behavior negatively since it allows greater dissaving by households. Finally, financial development may result in higher real interest rates on deposits, because of lower intermediation spreads. Here, again, the effect on the savings rate is ambiguous as is the effect on the demand for investment credit.

The overall effect of financial intermediation on economic growth is positive as long as the possible negative effects on the savings rate are not too strong. An assessment of the relative impact of the effects described above requires empirical analysis. A particular problem for the empirical work on the effects of intermediation, however, is to determine the direction of causality. Empirical concepts of causality (e.g. Granger causality) are based on evaluating the temporal structure of events; if one type of event consistently precedes another type, it is assumed to be causal. This, however, is not the same as causation in the theoretical sense as, for example, when both types of events may well be caused by a third, unobserved, category. In the case of financial intermediation and economic growth a strong bi-directional relationship seems plausible: Financial intermediation facilitates growth, and at the same time the increased demand for financial services in a growing economy induces growth in the financial sector. In this situation, econometrical concepts of causality are not very helpful and empirical research often is confined to the analysis of correlation structures.

## **B. The Literature on Financial Intermediation**

Based on the ideas presented in the seminal contributions to the literature by Gurley and Shaw (1955, 1960, 1967), and McKinnon (1973), the recent contributions to the literature on financial intermediation center on two issues: (i) the theoretical analysis of the functions of

financial intermediaries in the economy, and (ii) the empirical analysis of the effects of financial intermediation on economic activity and growth.<sup>6</sup>

The theoretical strand of literature presents financial intermediation in a framework of endogenous growth models. In this setting, the specific characteristics of intermediation are then analyzed, such as the reduction of liquidity risk (Bencivenga and Smith (1991)) based on Diamond and Dybvig (1983); the informational role (Greenwood and Jovanovic (1990), and Boyd and Smith (1992)); or the diversification of portfolio risk (Levine (1991), and Saint-Paul (1992)). With regard to the determination of the level of financial development the papers by Greenwood and Jovanovic (1990) and Saint-Paul (1992) offer frameworks where economic and financial development are jointly determined. Roubini and Sala-i-Martin (1992) discuss the effects of public policy on financial development and show that financial repression may lie in the short-term interest of policy makers as it allows them to collect revenues, for example, through the application of minimum reserve requirements and inflation. Empirically, they find a negative correlation between financial repression and economic growth.

Empirical approaches have been used to assess the impact of financial intermediation on economic activity. A comprehensive study by King and Levine (1992) finds a strong correlation between the two variables; in addition, the same authors (1993) present multi-country evidence that financial development precedes and predicts economic growth. Despite this temporal pattern, however, the question concerning the direction of causality remains open since unobserved variables may drive both developments or financial markets might anticipate future real developments. A similar study has been presented by Atje and Jovanovic (1993).

A potential explanation why financial intermediation could cause economic growth is presented and tested by Rajan and Zingales (1996), who conduct an empirical study based on the assumption that deeper financial intermediation results in lower external financing costs for enterprises. In their empirical analysis, the authors rank industries by their dependence on external financing and then check whether those industries relying more heavily on external financial sources become stronger in countries with more developed financial sectors. Analyzing a large sample of developed as well as developing economies, they find indeed a positive link between financial sector development and the success of externally financed industries which supports the validity of the underlying theoretic consideration.

Despite the considerable scientific interest in financial intermediation, no comprehensive study yet exists on the relative impact of possible impediments on financial intermediation. While the theoretical approaches generally abstract from these issues the empirical studies focus rather on the effects of financial intermediation on economic activity taking the development of the financial sector as given.

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<sup>6</sup> For a comprehensive survey of the literature, see Levine (1997).

### III. THE FACTORS DRIVING FINANCIAL INTERMEDIATION

The above theoretical and empirical results support the view that financial intermediation has a positive effect on economic growth and, therefore, the possible causes of intermediation deserve to be analyzed. This requires first a decision how to measure financial intermediation, which follows. Based on this, the various factors affecting financial intermediation will be analyzed, separating supply side from demand side factors. This analysis is based on the assumption that the observed degree of financial intermediation and the corresponding interest rate spreads are equilibrium outcomes on domestic financial markets where a large number of nonbank agents meets a limited number of banks. It should be noted that several of the factors discussed may affect both, the supply of as well as the demand for financial intermediation.

#### A. Measuring Financial Intermediation

##### 1. Deposit and Credit Based Measures

The literature on financial intermediation presents several different measures of financial intermediation, such as the ratio of broad money to GDP or of credit to GDP.<sup>7</sup> This is not necessarily a problem because different studies may focus on different aspects of financial intermediation in line with their respective objectives.<sup>8</sup> In analyzing the causes of financial intermediation, the definition of the term needs to reflect the specific role of banks and financial institutions in the economy. In this paper, two measures for financial intermediation will be employed: (i) the broad money multiplier, and (ii) the ratio of credit to the private sector over the monetary base. A discussion of the rationale for this choice follows below.

Let us start with an economy without banks but with the use of a unique transaction medium, cash money. The amount of money in this economy is equal to the monetary base. The distinguishing feature of banks developing from this situation is their power to create additional deposit money from the monetary base (cash) on the liability side and credit to the economy on the asset side of their balance sheet. The amount of money in the economy with banks is the sum of the monetary base outside banks and the deposits of nonbanks on the bank balance sheets. The degree to which the banks collect the cash and create deposits represents the degree of financial intermediation. Arithmetically, the degree of financial intermediation is given by the money multiplier, or the ratio between deposit money and the monetary base.

The use of the additionally created deposits can be inferred from the asset side of the balance sheet. For economic growth, finance to the private sector appears to be of particular

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<sup>7</sup> See King and Levine (1992) for a selection.

<sup>8</sup> It should be noted, however, that the choice of variables is in many cases not based on theoretical considerations.



importance. The second measure of financial intermediation, therefore, measures to what extent banks generate funds for external finance in the private sector from the monetary base.

Two major differences between the measures for financial intermediation, the deposit-based multiplier and the credit-based indicator, should be noted. First, the money multiplier does not capture the use of the financial resources generated through the banking system.

Consequently, assuming that financing private sector development represents the critical link between financial intermediation and economic growth, the analysis of the money multiplier may be inappropriate if a large part of the funds is used to finance the government. Second, while the money multiplier measures domestic financial intermediation based on residence, the credit-based measure captures international financial intermediation because domestic bank credit to the private sector may either be financed by domestic deposits or by credit from foreign agents, in particular banks. Consequently, the ratio of credit over the monetary base also reflects the domestic banks' ability to intermediate between foreign depositors and domestic borrowers.

## 2. Foreign Currency Items

With regard to the inclusion of foreign currency items, the above argument can be applied to both measures of financial intermediation in the same way. The discussion focuses on the money multiplier. Banks create foreign currency deposits on the basis of the circulating foreign monetary base (cash) in the economy. Consequently, the ideal measure of financial intermediation is domestic deposit money ( $M2$ ) plus foreign currency deposits divided by the sum of domestic monetary base and foreign cash in the economy, that is,

$$fin\_int = \frac{M2 + FCD}{B + Cash_f},$$

where  $fin\_int$  stands for the degree of financial intermediation,  $FCD$  indicates foreign currency deposits,  $B$  the domestic monetary base, and  $Cash_f$  foreign cash in the economy. The last variable, however, poses a problem for the empirical analysis because the volume of foreign cash in an economy is difficult to measure, particularly in many transition economies. For practical reasons, therefore, the ratio between the sum of domestic currency deposits and foreign currency deposits on the one hand and the domestic monetary base on the other is used to measure the degree of financial intermediation,

$$fin\_int = \frac{M2 + FCD}{B}.$$

While the inclusion of foreign currency items captures the activity of the domestic banking sector without being biased by the agents' preferences for specific currencies, this treatment also poses the problem of which exchange rate to choose for the conversion. Using current (flexible) exchange rates, exchange rate changes may result in changes in the indicator while the underlying financial activity remains constant. As a result, the indicators may present a

biased picture of financial intermediation. On the other hand, the choice of a fixed exchange rate for the conversion, which might appear preferable given the uncertainties concerning exchange rate effects, would introduce a considerable degree of arbitrariness into the construction of the indicator. In the face of substantial exchange rate movements in the transition economies during the sample period the idea of searching for one representative exchange rate for each country would be ill-advised.

From Chart 2 one can infer that exchange rate depreciations may indeed have caused a bias in the credit indicator for Turkmenistan in 1996 and, to a lesser extent, for Kazakhstan in 1993. In both countries, substantial exchange rate depreciations coincided with a drastic increase in the credit-based indicator whereas the deposit-based indicator remained broadly unchanged. Two reasons may be responsible for the volatility of the credit-based indicator. First, the higher elasticity of the credit indicator with respect to exchange rate changes may result from a higher share of foreign currency stocks in the overall indicator, that is, the share of foreign currency credits in overall credit exceeds that of foreign currency deposits in broad money. Second, the speed of the adjustment process caused by exchange rate changes may differ between the deposit and the credit side of bank balance sheets. While households can adjust their money holdings rapidly in response to an exchange rate depreciation, the commercial banks' ability to adjust their credit portfolio may be limited. This is a direct consequence of the maturity transformation as discussed in the theoretical section. Thus, while a depreciation may result in a shift in the credit indicator, the deposit indicator may remain constant as depositors adjust their portfolios immediately.

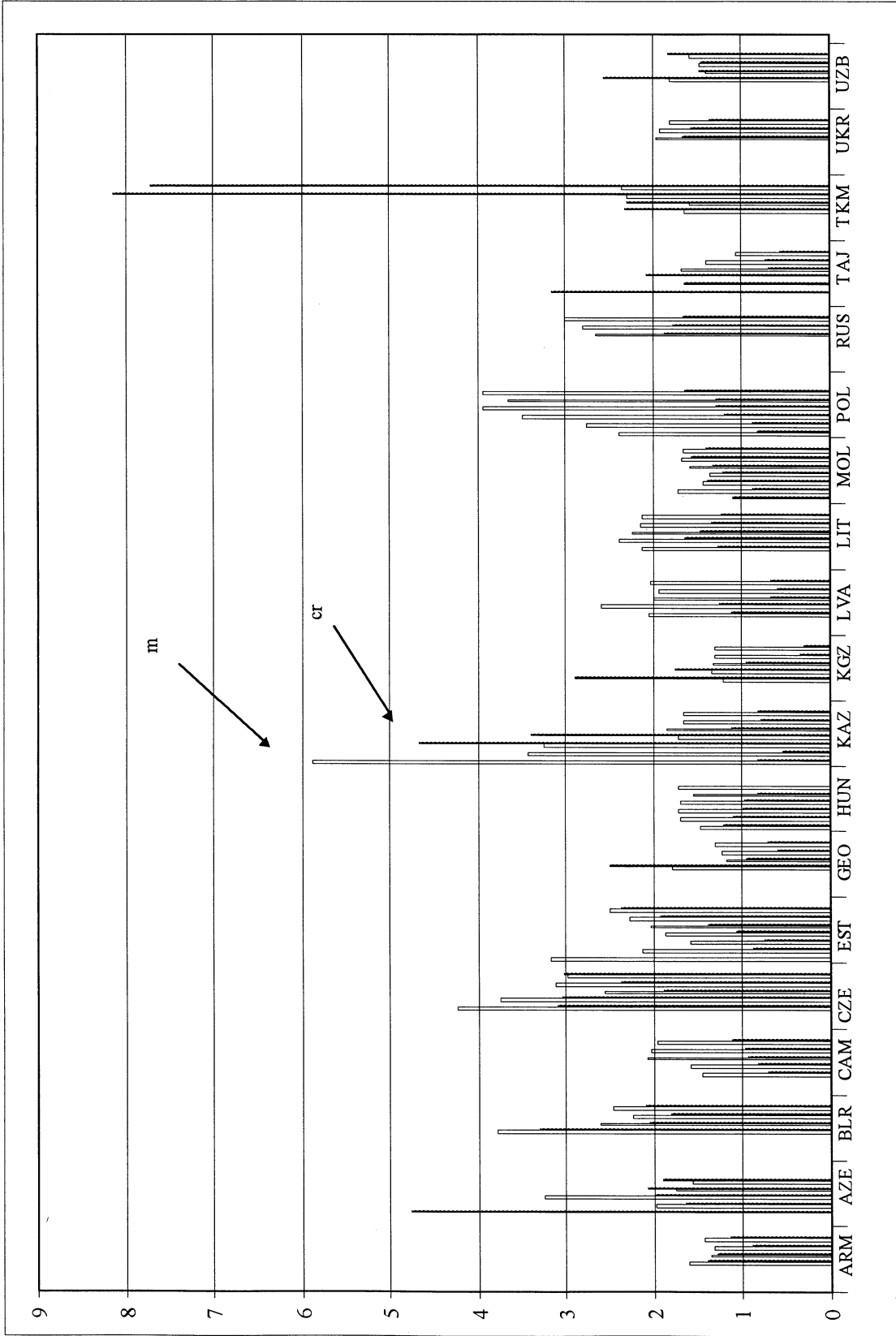
A formal test of the explanatory power of the two conjectures above would require detailed data on the currency composition of deposits and credits, the latter of which is largely unavailable. For Turkmenistan, however, the data show that roughly half of the credit to the non government sector at end-1995 was denominated in foreign currency while foreign currency deposits contributed only 5 percent to broad money. Consequently, the effect of the exchange rate depreciation in 1996 on the credit indicator exceeded that of the deposit indicator by a factor of ten.

The relative stability of the deposit-based indicator indicates that it is less affected by the exchange rate movements during the transition period and, consequently, it is expected to reflect financial activity more reliably. Whether this is due to more flexible portfolio reallocation or simply because of relatively lower shares of foreign currency deposits cannot be determined in this paper.<sup>9</sup>

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<sup>9</sup> In addition to the exchange rate problem, the available data for most of the countries show only aggregate credit by commercial banks and the central bank to borrowers outside the central government without permitting one to distinguish among subaggregates. Consequently, this measure is in reality less attractive for empirical work than what could be expected from theoretical considerations.

Chart 2: Money and credit based indicators for intermediation



The figure presents annual observations for the money multiplier and the credit based indicator for all countries in the study. The transparent columns depict the money multiplier, the solid columns the credit based indicator. The different number of columns per country reflects variations in data availability.

### 3. Evaluation of the Concept

A potential weakness of the money multiplier and the ratio of credit to the monetary base, respectively, as measures of financial intermediation, is that they do not capture financial intermediation taking place outside banks. One example is that of securities exchanges. By issuing bonds and selling them directly to the public, enterprises can attract capital for investments and households receive an opportunity to store wealth. The same holds true for equities. Therefore, the degree of development of stock and bond exchanges would usually contribute to describe the depth of financial intermediation in an economy. However, given the low degree of development of these institutions in the countries in this study, their exclusion should not invalidate the results. Another example are nonbank financial intermediaries, such as building societies and insurance companies. While these institutions also provide financial intermediation, their importance for financial intermediation as described in the theoretical section appears to be lower as they usually do not provide insurance against the liquidity risk of depositors. Furthermore, their contribution to economic growth due to their role as financial intermediaries appears limited.

An additional potential problem for the indicators presented above are structural increases in minimum reserve requirements. In general, increases in reserve requirements could result in decreases of the indicators as the monetary base increases and, regarding the credit-based indicator, credit to the economy may fall. If the increase in the reserve requirements is motivated by monetary policy considerations, this impact correctly reflects the behavior of financial intermediation because the objective of monetary tightening is specifically to reduce financial intermediation. However, structural increases in reserve requirements, for instance, their original introduction, induce an increase in the monetary base and thus a decrease in the indicators which may not reflect actual changes in the provision of financial intermediation to the economy and thus distort the information from the indicator. In the empirical analysis, a dummy variable might capture this one-time effect on the intermediation indicators. This would, however, presuppose that a single period can be identified where the new reserve requirement became binding. Given the continuous problems concerning compliance with reserve requirements in transition economies, however, this approach appears impractical in the current study.<sup>10</sup>

Compared to other measures of financial intermediation that have been presented in the literature, the variables presented above have the advantage of specifically capturing the activity banks perform in a monetary economy.<sup>11</sup> In particular, the definitions are more precise than the ratio of broad money to output which has been used in various empirical studies. This

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<sup>10</sup> See, for example, Zamalloa (1997).

<sup>11</sup> It should be noted that banks are defined here solely by their function as financial intermediaries. Many banks perform other activities, such as dealing in securities, which are not analyzed in this paper.

variable is in fact a measure of the use of money relative to economic activity and represents a composition of financial intermediation and the supply of monetary base in the economy, as can be seen from the following decomposition,

$$\frac{M2}{Y} = \frac{M2}{B} \frac{B}{Y},$$

where  $Y$  represents a measure of output. Since the second term on the right hand side is exogenous to the commercial banks, it should not be included in a measure of their activity. In particular, by using money over output as an indicator, economies with identical intermediation rates but differing monetary policies as reflected in the ratio of monetary base to output would wrongly appear to feature financial sectors of unequal depth. The same holds true for changes in the credit-based indicator.

Using the conventional indicator,  $M2/Y$ , empirical analyses will produce results different from those in this study to the extent that the correlation pattern of the explanatory variables with regard to  $B/Y$  differs from that with regard to  $M2/B$ . One example is the level of nonperforming loans which is found to affect negatively the degree of financial intermediation as measured by the money multiplier. Regressions with  $M2/Y$  as the dependent variable, on the other hand, failed to produce significant results which may be explained by a weak or non-existent link between nonperforming loans and the variable  $B/Y$ .

### **B. Supply Side Factors**

The willingness of banks to raise deposits and to grant credits defines the supply of financial intermediation in the economy. This supply of intermediation through the financial sector is determined by a strict upper limit—imposed by reserve requirements combined with limited availability of central bank money—on the one hand and profit considerations on the other. These are discussed in the following paragraphs.

#### *Technical Limits on Financial Intermediation*

The main technical factors are the legal reserve requirements and the amount of base money technically required for the settlement of payments. These two requirements are largely exogenous to the banking business and, in combination with the restricted availability of central bank money, represent constraints within which the actual degree of financial intermediation is determined by supply and demand factors. To account for the different potentials for financial intermediation in a cross country study, it is possible to scale the degree of actual financial intermediation by that country's specific upper limit for intermediation. This would allow an unbiased comparison between different countries. However, this approach is impractical in the current environment since it would require data in degree of detail that is unavailable. Different reserve requirements for diverse monetary assets imply that the multiplier for broad money depends on the composition of this aggregate

so that the determination of the absolute upper limit requires assumptions on the composition. The same holds for the cash to deposits ratio.<sup>12</sup>

#### *Factors Affecting Expected Profits*

The profits from financial intermediation are given by the difference between income and business expenses. The expenses comprise interest expenditure, administrative costs, foregone interest on reserve requirements, and costs from observing prudential regulations. The income derives from the investment of funds in credits and other services provided by banks. Since the decision to provide financial intermediation is based on expectations, the probabilities attached to income and expenses play an important role. For example, the expected return on a credit diminishes with a decreasing probability of the credit being repaid. Consequently, the degree of uncertainty concerning financial contracts plays an important role, including the uncertainty regarding specific projects and enterprises as well as regarding macroeconomic fluctuations.<sup>13</sup> The major factors influencing bank profitability are discussed below.

#### *Interest Rate Spread*

The interest rate spread, or the difference between interest rates on credits and those on deposits, combines the effects of interest income and interest expenditures as calculated in a bank's profit calculation. The decision to provide additional financial intermediation is based on expected marginal profits. Therefore, the factors considered should relate to future acts of financial intermediation and the interest rates to be considered are the rates for new deposits and loans.

#### *Expected Inflation*

In addition to affecting the expected costs and returns arising from financial contracts, inflation expectations may also include some information about the general expectations concerning macroeconomic policy and the future economic development. Therefore, they are included in the study as a separate explanatory variable. It should be noted that the long-term nature of many financial contracts makes them particularly susceptible to variations in inflation expectations.

#### *Bad Loans*

Bad loans in the portfolio affect a bank's decision to provide financial intermediation because they increase the risk of violating prudential regulations and can induce limitations for the bank's business. As a result, banks may try to cover possible losses from bad loans with profits from new credits that would increase the interest rate spread. Such attempts may be

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<sup>12</sup> Because the empirical analysis will deal with first differences in intermediation for the panel data, the problem of different national legal and technical reserve requirements does not distort the results. In addition, the empirical analysis indicates that in the sample countries the minimum reserve requirement does not appear to limit the degree of financial intermediation.

<sup>13</sup> See Brock (1996) for an analysis of the specific factors.

limited if there are banks without a bad loan portfolio in the market, for example foreign banks or newly established institutions.

#### *Capital Adequacy*

The financial soundness of banks can be expected to affect their behavior since financially healthy banks are more likely to engage in longer term lending to the private sector. With a weak capital base, on the other hand, banks are more likely to seek short-term profits that may reduce their intermediation activities.

#### *Concentration Ratio*

The market structure also may affect banks' supply of financial intermediation. In an oligopolistic market, banks may succeed in limiting the supply of financial intermediation and reaping excessive profits.

#### *Reserve Requirements*

As discussed above, minimum reserve requirements impose an upper limit on the creation of deposit money. Furthermore, they induce additional costs on financial intermediation, if their remuneration is less than what banks would receive were they able to invest the money without restrictions and thus affect profitability.

#### *Legal System*

The reliability of the legal system provides another factor affecting the supply of intermediation because as the actual working of the legal system can affect the probability of returns on funds invested.

#### *Further Variables*

Primarily data limitations prohibit the analysis of a number of further potential explanatory variables. First, instead of attracting deposits from nonbanks and investing the money in credits, banks can limit their activities to the interbank market and to transactions with the government. Interest rates on the interbank market and on government paper, therefore, represent the opportunity costs of banking with the public. However, a lack of interbank market data for the majority of countries in this study precludes the empirical analysis of this relationship. Second, the effect of further regulations concerning the financial sector might be of interest for the study. In this case, however, a homogenous index for financial sector supervision and regulation would need to be constructed for the full sample—a task that is beyond the scope of this paper. Finally, this paper does not provide a further investigation of the cost structure of banks in the transition economies, which might include productivity measures and a study of relative wages. It should be noted, however, that as long as the differences of the above variables between countries remain constant over time they will be captured by the country specific fixed effects in the regression.

### C. Demand Side Factors

An analysis of the demand for financial intermediation should keep in mind that there is normally no demand for intermediation by individual economic agents; rather, the demand is the result of the aggregation of supply of deposits by nonbanks on the one hand and the demand for credit by different nonbanks on the other. Therefore, the aggregate demand for financial intermediation will be affected by factors determining the supply of deposits and the demand for funds in the economy. The following factors are expected to affect the aggregate demand for financial intermediation in addition to the level of economic development.

#### *Interest Rates and Expected Inflation*

The demand for financial intermediation depends on the level of the real interest rate as well as that of the interest rate spread. While, as described above, the effect of the real return on the savings rate is ambiguous, it is expected to have a positive impact on the level of deposits as financial savings become more attractive than nonfinancial savings with higher interest rates. On the other hand, the real interest rate should be negatively correlated with the demand for investment credit, making the overall effect of the interest rate level on financial intermediation ambiguous. In addition, the interest rate spread should be negatively correlated with the demand for financial intermediation. The discussion of the impact of expected inflation on the supply of intermediation holds analogously for the demand side.

#### *Past Inflation Costs*

The public's trust in the general stability of the currency is likely to affect the demand for financial intermediation. With a history of hyperinflation in many of the countries in the sample, the overall confidence in the domestic financial system may be low. This effect is captured by a variable measuring the cumulated costs of past inflations relative to current output.

#### *Institutional Deposit Security*

An economic agent will only deposit funds with banks if the agent believes that the funds will be available when due. The perception about deposit security is influenced by the soundness of the financial sector and the existence of deposit insurance schemes. Indicators of banking soundness are the existence and fulfillment of capital adequacy requirements, as well as the share of bad loans in the overall loan portfolio. An additional indicator may be the change in the number of banks as a sharp decrease may indicate a banking crisis which may induce a loss of confidence in the financial sector.

#### *Additional Variables*

The opportunity cost of not using the financial system for depositors is in most cases likely to be equal to the nominal interest rate on deposits. In the current study, however, this effect cannot be separated from the interest rate effects discussed above. For borrowers, the opportunity cost is more difficult to determine as the cost of sources of funds outside the financial sector—such as self finance—is difficult to observe. In addition, incomplete markets



may entail rationing outcomes, which would mean infinite opportunity costs. As a result of these problems the analysis does not include proxies for the opportunity costs.

Another variable which may contribute to the explanation of the degree of financial intermediation is the share of the shadow economy in overall economic activity. Where agents prefer to conduct transactions without any official records, the development of the financial system will be negatively affected. While potentially sizeable, however, this effect is difficult to measure.

#### D. Financial Intermediation in Equilibrium

From the above, the supply of financial intermediation services ( $S$ ) can be described as a function of seven variables, the interest rate spread ( $ispr$ ), expected inflation ( $ein$ ), the level of nonperforming loans ( $nonpf$ ), the capital adequacy ratio ( $cap\_ad$ ), the minimum reserve requirements ( $mr$ ), the provision of property rights ( $prp\_rgts$ ), and the concentration ratio ( $cr$ ), that is

$$S = f(ispr, ein, nonpf, cap\_ad, cr, mr, prp\_rgts, X^S),$$

+   -   -   +   -   -   +

where  $X^S$  stands for the additional variables not covered in this study. The signs of the partial derivatives stand below the variables. Analogously, the demand for financial intermediation ( $D$ ) can be described by the following equation,

$$D = g(w, ispr, idr, ein, icst, nonpf, cap\_ad, X^D),$$

+   -   +/-   -   -   -   +

where  $w$  denotes wealth,  $idr$  stands for the deposit interest rate,  $icst$  represents past inflation costs, and  $X^D$  denotes further variables affecting the demand. Combining the two relationships above, the level of financial intermediation in equilibrium depends on the variables in the following way:

$$fin\_int = h(w, ispr, idr, ein, icst, nonpf, cap\_ad, cr, mr, prp\_rgts),$$

+   +/-   +/-   -   -   -   +   -   -   +

where the additional variables influencing supply and demand have been omitted. The first five variables are macroeconomic factors, comprising wealth, two interest rate measures and two variables reflecting future and past inflation costs, respectively. The remaining five variables, on the other hand, reflect the structural environment for financial intermediation, reflecting nonperforming loans, the capital adequacy ratio, minimum reserve requirements, and property rights. From the theoretical considerations, only the interest rate variables have an ambiguous effect on financial intermediation, depending on the relative strength of the price elasticities in the supply and demand functions.

#### IV. EMPIRICAL ANALYSIS

This section discusses the econometrical analysis that has been conducted on the basis of the above theoretical considerations. The econometrical investigation employs tools designed for the analysis of panel data to fully exploit the combined cross sectional and intertemporal variation in the data. For selected countries, the results of individual time series analysis are also reported.

While similar from a theoretical point of view, the two indicators for financial intermediation presented in this paper differ with regard to their empirical implementation. Specifically, the credit-based indicator may be affected by data limitations since data are only available for the domestic banking system's credit to nongovernment borrowers. This may include central bank credit to nonfinancial enterprises as well as directed credit and credit to quasi-public enterprises. All three categories cannot be expected to behave in the same way as commercial bank credit to private enterprises, thus distorting the information content of the indicator. Therefore, the interpretation of the results for the credit indicator may require somewhat more caution and the empirical analysis leans toward the money multiplier.

##### A. The Data

The data have been derived from IMF sources, such as *International Financial Statistics*, the *World Economic Outlook* data base, departmental data bases, country reports, and other sources. They cover the period from the first quarter of 1991 through the third quarter of 1997. It should be noted, however, that for certain time series the sample covered by the data for a particular country may be considerably shorter and not all series are available for each of the countries. Furthermore, several variables are only available on an annual basis. The panel estimation approach presented below uses all available observations for each individual regression which implies that the number of observations may vary between different estimations.

Nineteen transition economies have been included in the study, including three countries from eastern Europe, the Czech Republic, Hungary, and Poland; the Baltic states, Estonia, Latvia, and Lithuania; the other countries of the former Soviet Union, Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, the Kyrgyz Republic, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan; as well as Cambodia. The inclusion of Turkmenistan, however, induced marked changes in the results for some of the regressions due to extreme values for capital adequacy and the credit based indicator for this country as well as the impact of exchange rate changes on the dependent variable discussed above. Therefore, only regression results excluding Turkmenistan are reported in the paper.

The following macroeconomic variables have been used in the analysis. The degree of financial intermediation is measured by the ratio of broad money (including foreign currency deposits) to the monetary base,  $m$ , and the ratio of credit to nongovernment borrowers to the monetary base,  $cr$ . The degree of economic development,  $w$ , is represented by real per capita

income expressed in U.S. dollars.<sup>14</sup> To represent the inflation expectations,  $ein$ , in the economy, a three quarter moving average of the previous, the current, and the following period's inflation rates is employed in the study based on the assumption that agents have some information concerning future inflation which is not reflected in current inflation. The interest rate spread,  $ispr$ , is given by the difference between bank short- and medium-term lending and deposit rates. To derive real deposit rates,  $idr$ , the nominal interest rate has been weighted by expected inflation.

Past inflation cost,  $icst$ , is the cumulated real cost of inflation in terms of broad money divided by current gross domestic product. The cost of inflation in every period is given by the inflation rate multiplied by the average stock of money in the respective period. The costs for all periods are added up and divided by current output to produce the inflation cost measure. A mathematical approximation for the inflation loss relative to current output  $k$  in a given period with an inflation rate  $\pi$ , an average stock of money  $M2$ , and output  $Y$  is:

$$k = \frac{M2 - M2/(1 + \pi)}{Y}$$

The cumulated loss due to inflation relative to current income is therefore:

$$K_T = \frac{\sum_{t=1}^T \frac{\pi_t}{(1 + \pi_t)} M2_t}{Y_T}$$

Time series that exhibit seasonal patterns in the quarterly frequency have been seasonally adjusted.

The following variables are used to describe the structure of the financial sector: the ratio of nonperforming loans to total assets,  $nonpf$ , captures the effect of bad loans on financial intermediation. To assess the extent of the bad loan problem more precisely, it may appear adequate to account for provisions for bad loans since only the net exposure of banks should affect their solvency.<sup>15</sup> Two problems prevent the analysis of provisions in this study. The first is a lack of data. Second, when adjusting bad loans for banks' provisions, other sources of adjustment (e.g., implicit government guarantees) should also be included. These are, however, difficult to measure. Given this potential source of bias, unadjusted figures were employed.

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<sup>14</sup> Quarterly data have been interpolated from the annual *World Economic Outlook* time series assuming constant quarterly growth rates.

<sup>15</sup> In fact, anecdotal evidence suggests that while all transition economies require banks to provide provision for bad loans, the actual ratios of provisions relative to bad loans differ significantly between countries.

Further variables are the concentration ratio of the five largest banks in terms of assets, *cr5*, the average risk-weighted capital adequacy ratio, *cap\_ad*, and the minimum reserve ratio, *mr*, in combination with a variable showing whether reserves are remunerated. The property rights indicator of the Heritage Foundation,<sup>16</sup> *prp\_rgts*, which is employed as a measure for the legal environment in which banks operate, indicates a higher enforcement of property rights by a lower indicator value. The first two and the last of the above variables are available only with an annual frequency. Since changes in the minimum reserve requirements occurred infrequently, this series also was used only with annual frequency.

## B. Panel Estimation

Before presenting the estimation results this section discusses the econometric modeling strategy as well as the tests employed for model specification.

### 1. Estimation Approach

The choice of the specific econometric technique as well as of possible data transformations depends on the time series properties of the data, among other issues. With stationary data, dynamic models including distributed lags may be appropriate while, with non stationary data, analysis may in general proceed by using differences and possibly testing for cointegration among the levels of the variables concerned. With regard to panel analyses it should be noted that the inclusion of lagged endogenous variables results in biased estimates, particularly in panels with few observations in the time dimension.<sup>17</sup> The SURE approach recently proposed by Pesaran (1997) alleviates this problem; however, it requires a balanced panel which would result in the loss of a large number of observations in the present study.

Given these considerations, a methodology for determining the stationarity of the variables involved in the estimations is required. Im, Pesaran, and Shin (1997) propose an econometric technique for assessing the stationarity of time series in a panel data environment. Basically, the approach consists in taking the average of augmented Dickey Fuller test statistics for the individual countries to judge the stationarity in the whole panel.<sup>18</sup> The results from this test, however, are likely to be affected by outliers, that is, a single country with a very high t-statistic for the Dickey Fuller test introduces a bias towards stationarity in the overall result for the panel. Thus, particularly in an environment with short time series for some countries, the above approach appears valid only as an indication.

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<sup>16</sup> See Heritage Foundation (various years).

<sup>17</sup> See Nickell (1981) and Sevestre and Trognon (1996).

<sup>18</sup> Details can be found in the Appendix.

The results of the panel cointegration test in the current sample confirm the above caveat. For some variables, the test statistic points to stationarity because of the impact of the results for one or two countries while the individual results for the remaining countries indicate non stationarity. This holds true in particular for the financial intermediation variables, whose stationarity is crucial for the estimation technique.

As a result of the above considerations, the study proceeds with a cautionary approach. All macroeconomic variables are taken in first differences. As interest rates are usually found to be stationary variables, those variables in the study, that is, the interest rate spread and the deposit rate level, are also introduced in levels. While simultaneity may pose a problem in the estimation, good instruments for the variables affected are lacking so that there is a trade off between simultaneity bias and poor instruments. In particular, the correlation between first differences of the variables and their respective lags is generally low, indicating that the latter are not appropriate instruments. In addition, using lags would further reduce the sample size. Finally, using lagged variables in the individual country regressions reported below did not substantially alter the regression results, indicating the impact of the simultaneity bias may be limited.

To check for the appropriate model specification, various tests have been conducted for each regression in addition to the conventional tests for the significance of individual parameters as well as of the complete set of parameters. First, the results include the estimation of autocorrelation of the error terms which may provide some information concerning dynamic mis-specification. Second, the final specification of the regression equation has been tested against three alternative specifications to check for the explanatory power of the assumed model relative to more restricted specifications. The specification which is presented in the results is of the form

$$y_{it} = \alpha_i + \beta'x_{it} + \epsilon_{it} ,$$

where  $\beta'$  is the coefficient vector and  $x_{it}$  is the vector of explanatory variables. This represents the most general form in a fixed effect setting and can be tested against the following nested models:

$$\begin{aligned} y_{it} &= \alpha + \epsilon_{it} ; \\ y_{it} &= \alpha_i + \epsilon_{it} ; \\ y_{it} &= \alpha + \beta'x_{it} + \epsilon_{it} . \end{aligned}$$

In the first specification above, the dependent variable is regressed on the same constant for all groups (countries) in the sample while the second specification assumes country specific effects without any further explanatory variables. The third specification, finally, introduces further explanatory variables but implies no country specific effects. If the general

specification above provides more information on the underlying economic relationships than the three nested alternatives, it should be statistically significantly different from those specifications. This will be tested through the Likelihood Ratio (LR) and F tests. It should be noted that due to its asymptotic properties the LR test may be inferior to the F test in small samples.

Estimations with quarterly data consider the relationship between the macroeconomic variables only, or wealth, interest rate variables, and past and expected inflation, while regressions using annual data also include the structural variables introduced above. The fixed effects model employed for the tests has been adjusted for groupwise heterogeneity because the variances for individual countries are likely to differ from each other.

## 2. Regression Results

The preferred specification results are shown in Table 1.<sup>19</sup> As explained above, the time series of macroeconomic variables are taken in differences except for the interest rate spread and the real deposit rate which also appear in levels. The time series of structural variables have been used in levels.

Equations 1 and 2 present the preferred specifications using macroeconomic and structural variables for the money-based indicator and the credit-based indicator for financial intermediation, respectively. In equation 1, changes in wealth affect changes in intermediation negatively as does the level of the real deposit interest rate and the level of nonperforming loans. Changes in past inflation cost, on the other hand, have a positive impact on changes in intermediation. All coefficients are significant at least close to the 10 percent level. The model explains nearly four fifths of the variations of changes in financial intermediation, residual autocorrelation is low with a coefficient of  $-0.21$ . With 30 observations, four explanatory variables and 14 constants picking up country specific effects there remain 12 degrees of freedom. The explanatory power of the model is significantly different from alternative specifications containing only a single constant, only country specific effects, or only explanatory variables without country specific effects, respectively.

Equation 2 presents the results of an analogous estimation with the credit-based indicator as dependent variable. The impact of changes in wealth on changes in intermediation is very similar to that in the first equation. Of the remaining macroeconomic variables, only changes in past inflation costs are found to have a significantly negative impact, while the real interest rate level remains insignificant. The impact of nonperforming loans on intermediation is, again, similar to that in the first equation while the negative effect of the concentration ratio is

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<sup>19</sup> The results shown in the table represent the preferred specifications. Additional specifications not shown here point to the same behavior of the variables as indicated in the tables, however with inferior results concerning the statistical tests.

Table 1: Results from panel estimation

Equ.	Financial Intermediation				Int. Spread
	Annual Data		Quarterly Data		5 <i>ispr</i>
	1 <i>dm</i>	2 <i>dcr</i>	3 <i>dm</i>	4 <i>dcr</i>	
<i>dw</i>	-0.00165** 0.00084	-0.00245** 0.00000	-0.00094** 0.03592	-0.00099** 0.04026	
<i>dispr</i>			-0.00207** 0.00001	-0.00162* 0.08493	
<i>idr</i>	-0.00674 0.10137		0.00285** 0.00219	0.00448** 0.00272	
<i>didr</i>			-0.00299** 0.02251	-0.00272 0.18007	
<i>dein</i>			-0.00007* 0.06073		
<i>dicst</i>	0.18264** 0.00987	-0.12212** 0.00000	-0.01026* 0.08329	-0.01605 0.18545	
<i>nonpf</i>	-0.04207** 0.00094	-0.01045** 0.01667			0.87048** 0.00083
<i>cr5</i>		-0.01659** 0.00555			-0.24849** 0.04976
R <sup>2</sup>	0.78	0.86	0.24	0.25	0.90
AR	-0.21	-0.32	-0.12	-0.28	-0.10
Obs, dgf	30,12	37,17	149,128	150,130	31,16
Spec.	F/F/F	F/F/F	F/F/LR	F/F/F	F/LR/F

For the variables, the prefix *d* indicates annual or quarterly differences, in line with the frequency of the data; *R*<sup>2</sup> is the coefficient of multiple determination; *AR* is the first order autocorrelation coefficient of the residuals; *Obs.* is the number of observations, *dgf* is the number of degrees of freedom; *Spec.* contains the results of the Likelihood Ratio- and F- specification tests against the three nested alternative models, separated by a "/". Significance at the 10 percent level is indicated by *LR* and *F*, respectively. If both tests are significant, only *F* is reported. The number under the coefficients is the probability level for the coefficient, \*\* indicates significance at the 5 percent level, \* indicates significance at the 10 percent level.

significant only for the credit-based indicator. The fit of the model exceeds that of the previous specification slightly while autoregression remains in the moderate range.

Given the theoretical considerations above, the number of variables found to possess a significant impact on intermediation appears relatively small. In particular, only two of the five structural variables turn out significant while the capital adequacy ratio, minimum reserve requirements, and the level of property rights do not appear to have a strong impact on intermediation. Also, contrary to the expectations, expected inflation, the interest rate spread, and changes in the interest rate level do not appear to contribute to the explanation of financial intermediation. A potential reason for this outcome may lie in the properties of the data. For the annual frequency, the limited number of observations puts a constraint on the

number of possible estimation models. In addition, the estimations may suffer from multicollinearity. In particular, the interest rate variables may be collinear with structural variables because of a strong economic interaction between the two groups of variables. This would explain why interest rate variables show little effect in the first two equations where structural variables are included.

Focusing only on the macroeconomic variables allows one to check the validity of the model with quarterly data. For both indicators, the equations show that in addition to changes in wealth, changes in the interest rate spread, in past inflation costs, and in the interest rate level have a negative impact on changes in intermediation while the level of the interest rate affects intermediation positively. For the credit based indicator, significance levels for changes in the interest rate level and in past inflation costs are, however, low. The money based indicator is also negatively affected by changes in expected inflation. The sharp drop in the fit of the estimations indicates that quarterly changes in intermediation are subject to further shocks not captured in the model. In addition, the length of the respective time series may provide an explanation because the lower number of degrees of freedom in the estimation with annual data induces an upward bias for the  $R^2$ .

The conjecture of multicollinearity discussed above and the absence of a measurable impact of the level of the interest rate spread on intermediation call for an investigation of the relationship between the interest rate spread and structural variables. The result, presented in equation 5, shows that two of the structural variables, nonperforming loans and the concentration ratio, do indeed possess a significant impact on the intermediation spread—the former with a positive sign and the latter with a negative one. The impact of minimum reserve requirements, the capital adequacy ratio, and property rights remains insignificant.

### **C. Level Estimations**

The panel estimations conducted so far do not permit firm conclusions concerning the level effects of the macroeconomic variables on financial intermediation. To address this issue, the countries with the longest macroeconomic time series—Estonia, Hungary, and Poland—have been selected for individual time series analyses with the money multiplier as the dependent variable. On the basis of Augmented Dickey Fuller stationarity tests for the macroeconomic variables, regressions using the levels of the variables were conducted to detect long run effects.

A survey of the results of the stationarity tests is presented in Table 2. In line with the results from the tests, a regression in levels was estimated for Estonia. For Hungary and Poland, a two step cointegration approach was applied. First, a regression using only nonstationary variables was computed. Second, the errors from this regression were tested for stationarity. With stationary errors, the nonstationary level variables can be assumed to cointegrate. In the equations presented below, the error terms were found to be stationary.



Table 2: Stationarity results

	Estonia		Hungary		Poland	
	stat.	non-stat.	stat.	non-stat.	stat.	non-stat.
<i>m</i>	✓			✓		✓
<i>w</i>		✓	✓			✓
<i>ein</i>	✓			✓		✓
<i>ispr</i>		✓		✓		✓
<i>icst</i>		✓		✓	✓	
<i>idr</i>	✓		✓		✓	

The preferred specifications for each country are presented in Table 3, further specifications yielded similar results underlining their robustness.<sup>20</sup> The results complement those from the panel estimation. The results for Estonia show a negative impact of expected inflation and the real interest rate level on financial intermediation. The results for Poland are also as expected, with a positive coefficient for income and a negative coefficient for the interest rate spread. The results for Hungary, finally, show that the level of past inflation costs does have a negative impact on the level of intermediation, a link that could not be detected by the panel estimations in first differences. With regard to the interest rate spread, it should be noted that the positive correlation occurred with low variations of the financial intermediation variable. This link appears to be reversed for higher variations of intermediation as shown by the Polish case.

Overall, the analysis of level variables confirms the results found so far. The different outcome of the stationarity tests for the same variable in different countries provides further support for the approach of using first differences in the panel regression. Moreover, the estimations provide further evidence supporting the theoretical considerations above while, in addition, presenting new evidence on the negative impact of the level of past inflation costs on financial intermediation.

#### D. Interpretation of Results

The econometrical analysis above has yielded a meaningful explanation of the behavior of financial intermediation and some evidence regarding the interest rate spread. In line with the above classification, the following discussion distinguishes between macroeconomic and

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<sup>20</sup> The coefficients for the constant term as well as lagged endogenous variables are not reported.

Table 3: Level estimations

	<i>w</i>	<i>ein</i>	<i>ispr</i>	<i>icst</i>	<i>idr</i>	R <sup>2</sup>
Est		-0.00502 (-7.318)			-0.00853 (-2.599)	0.95
Hun			0.03324 (3.162)	-0.13465 (-3.848)		0.74
Pol	0.00037 (2.623)		-0.05263 (-2.654)			0.91

The numbers in parentheses are t-values.

structural variables. On a general note, the two indicators for financial intermediation yield similar results with the credit indicator showing an impact of the concentration ratio that is absent in the specification for the money-based indicator.

Starting with the macroeconomic variables, the effect of real per capita income is evident in all estimations. While not of major concern for policy decisions, the estimations reveal an interesting behavior of income and intermediation in the short run: The analysis points to a strong negative relationship between changes in per capita income and changes in financial intermediation while at the same time there appears to be a long-term positive relationship between the levels, as has been shown in the literature and also revealed in the level regression for Poland. This indicates that in spite of the positive long-run relationship, other factors may dominate this relationship in the short run. It should be noted, however, that the fall in output in transition countries during the early stages of transition may have generally been overestimated which may induce a negative bias in the panel estimation results.

The results relating to the interest rate spread indicate a negative correlation between the market price of financial intermediation in transition economies and the amount of intermediation provided. High levels of the interest rate spread prevent deep financial intermediation, as indicated by the level regression for Poland. The panel analysis provides further strong evidence as increases in intermediation coincide with negative changes in the interest rate spread, independent of which intermediation indicator is chosen. In other words, given a downward sloping demand curve, an increase in the supply of intermediation results in a higher equilibrium volume at lower prices, which induces the above result.

With regard to the real interest rate, the panel regression analysis points to an ambiguous effect of the interest rate level on changes in intermediation. The interest rate is found to have a positive or a negative impact on intermediation, depending on the specification of the regression equation. The negative impact of changes in the interest rate level on changes in intermediation, as shown in the equations 3 and 4, may serve as an additional warning signal for policy decisions because an increase in the real deposit rate tends to induce a decrease in

the degree of financial intermediation. Thus, policies targeted at increasing real interest rates may not result in stronger financial intermediation in the short run. This result is supported by the country regression for Estonia where high interest rate levels coincide with low levels of intermediation.

The results for changes in expected inflation point to a negative relationship with changes in intermediation, however only for the money based indicator. Thus, increasing inflation expectations tend to reduce financial intermediation. This conclusion is supported by the level regression for Estonia which shows a strong negative link between expected inflation and intermediation.

The regressions provide contradictory evidence concerning the relationship between past inflation and intermediation, showing a positive or a negative impact of changes in past inflation costs on changes in intermediation depending on the dependent variable and the data frequency. This finding might lead to the conclusion that the past inflation cost variable presented here does not reliably reflect the impact of past inflation experiences on the demand for intermediation. Nevertheless, for the level of past inflation costs the regression for Hungary points to the expected negative impact on intermediation, indicating that high inflation can have a negative long term impact on financial development.

Turning to the structural variables, the level of nonperforming loans exhibits a negative link with intermediation in the panel regression exercise. In particular, a high level of nonperforming loans prevents the development of financial intermediation. This is in line with the expected results from the theoretical analysis. The outcome is different for the concentration ratio whose negative impact on financial intermediation is found only for the credit indicator, suggesting that high concentration may inhibit in particular private sector lending. Anecdotal evidence that some private enterprises in transition economies find it hard to obtain bank credit tends to support this conjecture.

For the other structural variables, no significant link with financial intermediation has been found. This allows the conclusion that, compared with nonperforming loans and the concentration ratio, the capital adequacy ratio, the minimum reserve requirements, and the property rights play a secondary role. At least with regard to the property rights, this result is surprising and invites further investigation. One possible explanation may lie in the low degree of variation of the measure for property rights.

From the regression results, there is some evidence of multicollinearity among the explanatory variables. In particular, in equation 5 the level of nonperforming loans is found to have a strong positive impact on the interest rate spread—a one percentage point increase in the level of nonperforming loans results in a 0.9 percentage point increase in the interest rate spread. The negative impact of the concentration ratio on the interest rate spread provides evidence against conjectures that higher concentration in the financial sector leads systematically to higher prices for intermediation services. Rather, it appears that, while high market

concentration inhibits financial deepening, this occurs through direct quantitative limitations in the supply of private sector credit at a relatively low interest rate spread.

## V. LESSONS FOR POLICY DECISIONS

The analysis of the behavior of financial intermediation in transition economies has identified three major areas for policy makers to enhance financial development. The first two, nonperforming loans and the structure of the market for financial intermediation, relate directly to financial sector policy while the third, expected inflation, refers to the macroeconomic environment.

First, high levels of nonperforming loans represent a double obstacle to financial development. On the one hand, a high level of nonperforming loans reduces the confidence of potential depositors in the ability of banks to repay their deposits when due, thus inducing a lower supply of funds to the financial sector. On the other hand, a large share of bad loans in the portfolio induces banks to widen the spread between borrowing and lending interest rates so as to accumulate profits which could be used as buffer against losses from writing off nonperforming loans. The impact of nonperforming loans on financial intermediation—directly as well as indirectly through the interest rate spread—is evident from the regression results. Given the important impact of nonperforming loans on the development of the financial sector, addressing this problem effectively is a prerequisite for long-term financial sector development.

Second, the structure of the market for financial intermediation, measured by the concentration ratio, is important because high concentration enables banks to limit credit expansion and thus inhibit economic development. As the regression results show, the distortionary effect of high market concentration appears to work through direct limitation of credit to the private sector rather than through high intermediation spreads. However, these results do not imply that policy makers should encourage new, unexperienced banks to enter into their financial systems with little supervision, because this strategy would be bound to produce further increases in bad loans and a further loss of confidence in the stability of the financial system. Rather, policy makers need to establish a stable legal environment, including modern accounting and supervision standards, to attract new participants, domestic or foreign, to their markets. With the entry of new participants, intermediation spreads could even widen temporarily as more credit is extended to the private sector, which is prepared to pay higher risk premia.

Third, expected future inflation possesses a significant impact on financial development. Low inflation expectations, or a stable macroeconomic environment, induce economic agents to enter into long-term financial contracts which increases the demand for and the supply of financial intermediation. This provides a further argument to policy makers that low inflation supports long-term economic growth. The effect of past inflation, on the contrary, appears less clear cut, indicating that past inflation experiences do not necessarily inhibit financial intermediation if current policies provide for a stable macroeconomic framework.

While the above results may appear self-evident and not in need of support from a comprehensive analytical study, it should be noted that the present study also provides evidence on the relative importance of further variables that have been proposed in the discussion of financial development. First, an increase in the capital adequacy ratio of the financial services industry is not found to have a positive effect on financial deepening. Two possible explanations come to mind. On the supply side, low capital adequacy ratios may not yet induce strong regulatory measures from the banking supervision authorities, thus reducing the ratio's importance for bank decisions. On the demand side, information on bank balance sheets may not be regarded sufficiently accurate to have an impact on depositor decisions. The behavior on both sides may change as transparency increases and regulatory rules are enforced. Second, the level of minimum reserve requirements remains insignificant in the estimations, indicating that at the present level of development their effect on the supply of financial intermediation is limited. With the further development of the financial industry in the transition economies this can be expected to change. Third, the results caution against the use of changes in the real interest rate level to induce higher levels of intermediation apart from the general objective of preventing extreme positive or negative real rates. Increases in the rates induce decreases in intermediation. Regarding the interest rate level, the empirical analysis reflects the ambiguity found also in the theoretical discussion.

The results concerning the influence of the legal environment require further investigation. In addition to its intuitive appeal the significance of this variable is supported by strong anecdotal evidence making it one of the crucial variables in actual policy advice to transition economies. A more focused modeling of this effect may be expected to contribute more to the explanation of financial intermediation.

### STATIONARITY TESTS FOR PANEL DATA

Consider an individual time series,  $y$ , observed over  $T$  time periods, then the conventional Dickey-Fuller test for stationarity consists of estimating the equation

$$\Delta y_t = \alpha + \beta y_{t-1} + \epsilon_t,$$

where  $\Delta$  stands for the difference operator, the indicator  $t$  describes the time period, and  $\epsilon$  is the error term. The integration test is then based on the null hypothesis

$$H_0: \beta = 0,$$

and Dickey and Fuller provide the critical values for the test.

Im, Pesaran, and Shin (1997) adapt this basic strategy to a panel environment with a sample of  $N$  groups (countries) and — to start with — the same number of  $T$  periods for each group, i.e., a balanced panel. They obtain from the regression

$$\Delta y_{i,t} = \alpha_i + \beta_i y_{i,t-1} + \epsilon_{i,t},$$

where  $i$  indicates the group (country), the statistic  $\overline{t_{NT}}$  as a simple average of individual  $t$  statistics, i.e.,

$$\overline{t_{N,T}} = \frac{1}{N} \sum_{i=1}^N t_{i,T}.$$

They then show that for  $N \rightarrow \infty$  and under the assumption that the  $\epsilon_{i,t}$  are independently and normally distributed random variables with zero mean and finite variances,

$$\Gamma_i = \frac{\sqrt{N} (\overline{t_{N,T}} - E(t_T | \beta_i = 0))}{\sqrt{\text{Var}(t_T | \beta_i = 0)}} \Rightarrow N(0, 1),$$

where  $E(t_T | \beta_i = 0)$  and  $\text{Var}(t_T | \beta_i = 0)$  are the common mean and variance of  $t_{i,T}$ , obtained under  $\beta_i = 0$ . This means, with large  $N$ ,  $\Gamma$  is standard normal distributed even when  $T$  is small. Values for  $E(t_T | \beta_i = 0)$  and  $\text{Var}(t_T | \beta_i = 0)$  are derived from Monte Carlo simulations and published in the article. It is then possible to extend this approach to account for serially correlated errors (i.e. the equivalent of an augmented Dickey-Fuller test) as well as for unbalanced panels, and Im, Pesaran, and Shin also provide tables for these cases. It should be noted, however, that with serially correlated errors  $N$  and  $T$  need to be large with  $N/T \rightarrow k$ , a finite positive constant.

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