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Efficiency in Financial Intermediation

Theory and Empirical Measurement

Thorsten Beck

This draft: March 2006

Abstract: Less developed financial systems are typically characterized by high overhead costs and interest spreads, reflecting inefficient financial service provision. This paper discusses how market frictions give rise to a wedge between the savings and borrowing interest rates and illustrates the wedge with a spread decomposition exercise. The paper then discusses different factors driving inefficient intermediation on the institution, banking market and country-level. Policy lessons are offered.

* The author is with the World Bank's research department. The author is grateful to Ed Al-Hussainy for outstanding support. This paper's findings, interpretations, and conclusions are entirely those of the author and do not necessarily represent the views of the World Bank, its Executive Directors, or the countries they represent.

There is a large variation in financial intermediary development across countries: private credit to GDP was 173% in the U.S. in 2003, but only 2% in Mozambique.¹ This variation is critical to countries' socio-economic performance: countries with higher levels of credit to the private credit as share of GDP experience higher GDP per capita growth and faster rates of reduction in the headcount, the share of population living on less than a dollar a day (Beck, Levine and Loayza, 2000; Beck, Demirguc-Kunt and Levine, 2007). However, economists and policy makers are not just interested in the amount of society's savings that is channeled by intermediaries to the most deserving borrowers, but also in the efficiency with which this happens. The interest spread – the difference between lending rate and deposit rate – has been one of the most prominent measures of efficiency. While interest rate spreads vary typically between two and four percent in developed financial systems, they often reach 10% and more in developing countries and are over 30% in Brazil (Laeven and Majnoni, 2005).

This paper first discusses the theoretical background of interest rate spreads by contrasting a world with perfect information, no agency problems and no transaction costs with the real world with these different market frictions. We then show the empirical relationship between efficiency and depth and breadth of financial system across countries. Next, we take a closer empirical look at the components of the interest rate spread, which will lead us to the driving factors behind efficiency of financial intermediation. We will distinguish between factors at the bank-, financial system and country-level. We conclude with policy lessons.

¹ Private Credit to GDP is a standard measure of financial intermediary development and is the ratio of claims by deposit money banks and other financial institutions on the private, domestic non-financial sector relative to GDP.

1. Interest spreads and credit rationing– theory

Interest rate spreads, or imperfect channeling of financial resources from savers to investors, does not exist in a purely theoretical world characterized by the absence of transaction costs and asymmetric information. In such a world, financial institutions would not be needed to mobilize savings and allocate loans, as savers would assign their savings directly to borrowers based on perfect knowledge of investment possibilities. Access to external finance would be frictionless, limited only by the inter-temporal wealth constraint of the borrower, which would be known equally well and with certainty by both the lender (saver) and the borrower (investor). Investment decisions would thus be independent of financing and consumption decisions and based purely on the expected return of the investment project.

Financial intermediaries and organized financial markets arise to alleviate market frictions, such as transaction costs, uncertainty about project outcomes, and information asymmetries.² These market frictions make it difficult to de-couple investment from financing decisions. The same market frictions` not only lead to a wedge between the interest rates that borrowers have to pay on their loans and the interest rate that savers receive on their deposits, but they also might result in credit rationing as we will discuss in the following. We will focus on three major sources of market frictions and their effects on spreads and credit rationing.³

Take first fixed intermediation costs. Transaction costs associated with screening and monitoring borrowers and processing savings and payment services drive a wedge between the interest rate paid to depositors and the interest charged to borrowers. However, these costs are not necessarily proportional to the transaction size. Fixed costs exist at the transaction, client, institution, and even system level: processing a loan application, screening borrowers ex-ante

² See Levine (1997, 2005) for an overview of this literature.

³ This is a shortened version of the discussion in Beck and de la Torre (2007) who also distinguish between payment-/savings and loan services and between idiosyncratic and systemic risk elements.

and monitoring them ex-post entail costs that are, at least in part, independent of the size of the loan. Similarly, at the level of a financial institution, operating costs range from the brick-and-mortar branch network to legal services and, to accounting systems and are largely independent of the number of clients or the size of their transactions. Fixed costs even arise at the level of the financial system, including in terms of regulatory costs and the costs of payment clearing and settlement infrastructure, which are again, and up to a point, independent of the number of regulated institutions. Intermediation costs do not only drive a wedge between savings and lending rate, in a world with uncertain revenue streams they can also lead to credit rationing of borrowers with demand for small loans, as shown –among others – by Williamson (1987). Increasing transaction costs with smaller loan sizes increases the loan interest rate the lender has to charge in order to recover her costs and thus increases the probability of non-payment.

Consider next constraints on the ability to reduce lending risk through diversification. Idiosyncratic, i.e. borrower-specific risk would in principle be diversifiable or insurable in a world with complete markets. The limits to idiosyncratic risk diversification observed in the real world are, at least in part, a reflection of some form of market incompleteness, including the lack of sufficient markets for hedges and other insurance products. If unable to diversify risks in a competitive market, risk adverse creditors include a risk premium in the lending interest rate, increasing the lending interest rate beyond the level necessary to cover the creditor's marginal cost of funds plus the transaction costs discussed above.

Consider finally agency problems due to information asymmetries. The inability of the lender to perfectly ascertain the credit worthiness of the borrower and her project ex-ante and monitor the implementation ex-post gives rise to the classical principal-agent problem and can be

separated into adverse selection and moral hazard.⁴ The inability to ascertain the riskiness of a borrower results in the interest rate serving as screening device, with higher interest rates rationing lower risk borrowers out of the market (Stiglitz and Weiss, 1981). While higher risk can be compensated by charging a risk premium, the usefulness of the interest rate as screening device decreases with higher premiums as the degree of riskiness in the pool of interested borrowers increases. The absence of verifiable information thus can lead to the rationing of high-risk borrowers at a level below the equilibrium interest rate. Second, high costs of monitoring over the life of the loan and of enforcing the loan contract in case of default result in moral hazard risk, the risk that the borrowed resources are not used for the original purpose, but rather for consumption or for riskier investments. Again, while increasing the risk premium serves as screening tool, the interest rate's usefulness decreases in the premium as the incentive to divert resources for riskier project increases; and this can effectively result in credit rationing.

Figure 1 illustrates the non-linear relationship between the lending interest rate and the expected return for the bank. The horizontal axis denotes the nominal loan interest rate i , while the vertical axis denotes the expected return to the bank r . The 45 degree line denotes the linear relationship between nominal interest rate and expected return to the bank in a world without any market frictions. In the real world of market frictions, however, the expected return is not only lower than the nominal interest rate but also increases less than the nominal interest rate. Abstracting from the fixed component, transaction costs result in a first wedge illustrated by a parallel line to the 45 degree line, i.e. for a given interest rate i , the return to the lender is $i-c$, and where c are transaction or operating costs. The non-linearities due to scale (fixed component of transaction costs) and agency problems are illustrated by curve I. The nonlinear wedge

⁴ Empirically it is very difficult to distinguish between adverse selection and moral hazard, as discussed by Karlan and Zinman (2004).

between the 45 degree line and curve not only implies that the default probability increases with the lending interest rate, causing r to rise less than i ; it also implies that, as the lending rate increases beyond a given threshold, denoted in Figure 1 by i^* , the expected return begins to decrease. Thus, at (i^*, r^*) , the marginal revenue to the creditor due to a contractual increase in the lending interest rate is fully offset by the marginal expected loss due to a higher probability of default. Curve I, however, is drawn after subtracting from the interest rate any idiosyncratic risk premium. Curve II, on the other hand, takes into account the risk premium and, hence, is always to the right of curve I, with the vertical distance between the two curves measuring the premium charged by creditors for non-diversifiable risk. To the extent that the risk premium increases with the level of the lending rate (reflecting the increase in the ex-ante probability of default), curve II would be flatter than curve I and would have a lower flexion point, as drawn in Figure 1. Note that the widening of the wedge between i and r as i increases is common to both curves. This is because the probability of default rises with the lending interest rate, independently of the reasons (costs, risk-adjusted profits or risk premium) that push that rate up. Both curves have a flexion point and a downward-bending part; as interest rates rise beyond a threshold, the return to the lender decreases.

The non-linear relationship between nominal interest rate and return to lender can result in backward-bending supply curve and credit rationing, as shown by Stiglitz and Weiss (1981) and in Figure 2. . If the market-clearing interest rate i^M is on the backward bending part of the supply schedule, i.e. demand and supply schedules intersect at $i^M > i^*$, there will be credit rationing, illustrated by z in Figure 2. Rather than increasing the interest rate up to the point where demand is satisfied, lenders supply only up to the nominal interest rate i^* and ration out borrowers who would have been offered loans in a traditional, price-clearing market. Together,

Figures 1 and 2 illustrate that inefficiencies in financial intermediation lead not only to a higher spread between the return depositors receive on their savings and the rate borrowers have to pay for their loans, but also to lower depth and breadth of the financial system, as the riskiest and costliest borrowers are rationed out.

2. Interest spreads and credit rationing – cross-country evidence

The previous section showed that a high wedge between deposit and lending interest rates is associated with credit rationing and thus a lower level of credit channeled to borrowers. Can we confirm this theoretical prediction with data? Since there are no good comparable cross-country data on interest rate spreads, we turn to data on net interest margins and consider the empirical association of net interest margin as share of total earning assets, averaged over all banks in a country, with measures of depth and breadth of the financial system.⁵

Figure 3 shows the negative association of net interest margins with Private Credit to GDP for a sample of over 100 countries, with data averaged over the period 1999 to 2003.⁶ This suggest that countries with lower net interest margins, thus less inefficiency and less deadweight loss for savers and borrowers, experience higher levels of financial intermediary development, a higher levels of savings intermediated to the country's private sector.

Figure 4 shows that countries with lower interest rate margins experience higher use of loan services, as measured by loan accounts per capita. Here, we use data from a recent data compilation effort on the access to and use of banking services, by Beck, Demirguc-Kunt and Martinez Peria (2007). While certainly a crude and imperfect proxy for the share of the

⁵ While spreads are the difference between ex-ante contracted loan and deposit interest rates, margins are the actually received interest revenue on loan minus the interest costs on deposits. The main difference between spreads and margins are lost interest revenue on non-performing loans.

⁶ All data are from the Financial Structure Database, as described in Beck, Demirguc-Kunt and Levine (2000), unless otherwise noted.

population with access to lending services, it is the most consistent currently available indicator of lending services use across countries. Figure 3 shows that banking systems with higher interest margins are also characterized by lower outreach, i.e. by a lower penetration of the use of credit services in the economy.

The negative association between the efficiency and the depth and breadth of financial intermediation shown in Figures 3 and 4 is a correlation rather than a causal relationship. The same inefficiencies impact the shape and flexion points of the interest-return curve in Figure 1 and of the loan supply curve in Figure 2. As the theoretical analysis already suggested, we have to look for common causes of both low level and low efficiency of financial intermediation. Before we do, however, we will take a closer look into the component of interest rate spreads, i.e. we undertake a statistical decomposition of the preferred measure of bank inefficiency.

3. Decomposing spreads

The decomposition of interest rate spreads can be a useful exercise to get to the factors that drive inefficiency and thus high intermediation costs in a banking market.⁷ However, it should be stressed that such an exercise is not an end in itself, but rather a tool to find the underlying deficiencies in the environment in which banks operate and identify policies to remedy these deficiencies. In the following, we will use the example of interest rate spreads in Kenya to illustrate this process; for more detail, see Beck and Fuchs (2004).

We will start out with the cost of funding for banks, which in most cases is the weighted interest rate that banks pay on their deposits. However, not all deposits can be used for loans, a certain share has to be retained or deposited with the central bank as reserve requirements.

⁷ Throughout the paper, we abstract from non-interest revenue of banks, both directly related to savings and loan services and related to non-lending business.

Further, in many countries with deposit insurance systems, banks have to pay premiums on their total deposits, which further add to the cost of intermediation. Transaction taxes also add to the intermediation costs.

Operating costs, i.e. transaction costs related to deposit and lending services make up the largest part of the spread in most countries (Figure 5). As discussed in the previous section, these costs entail expenses related to individual transactions and customers, such a screening and monitoring of borrowers, or costs associated with savings or payment services, and general operating expenses related to branches, computer systems, security arrangements etc. In practical terms, these are wage costs, equipment costs (computers, vehicles etc.) and building costs (explicit or implicit rents). It is here that the productivity of financial institutions can make a big difference; how many clients are being served by one employee? What is the deposit and loan volume per employee? How many clients are being catered to by one branch? Or in more technical terms: how well does a bank use its inputs (labor, equipment, buildings) to produce output (loan, deposit and payment services).⁸ Overhead costs relative to total assets vary between one to two percents in many developed countries to over five percent in many developing countries (Beck, Demirguc-Kunt and Levine, 2000). In the case of Kenya, average operating costs are 5.6%, although there is a large variation across banks as we will discuss further down (Table 1).

Provisions for loan losses are part of the interest rate spread as banks have to take into account historic losses when contracting new loans. Historic and projected loan losses relate directly to the agency problems and the lack of diversification possibilities discussed above. Non-performing loans add to the cost of intermediation, because they represent opportunity costs in terms on non-paid interest revenue and because they tie resources that could otherwise be lent.

⁸ See Berger and Humphrey (1997) for an overview over this literature.

It is here that sound credit policies and banks' risk management come to play, as well as the contractual and information framework in which financial institutions operate and which we will discuss further down.

The residual between the sum of deposit rate, i.e. the marginal cost of funding, reserve requirements and other indirect taxes, overhead costs and loan loss provisions, on the one hand, and the lending rate, on the other hand, are before-tax profits, out of which profit taxes have to be paid. While text-book models suggest that perfect competition should do away with any profits, one has to remember that growing banks need a certain minimum amount of profits to maintain their capital adequacy ratio, i.e. they need some profit to keep capital in line with a growing loan book. However, there are large differences across countries in profitability of financial institutions, which can either indicate large variation in competitiveness of banking systems or variation in country risk; especially foreign banks might insist on large returns in small developing countries to compensate for a high degree of country-level economic and political uncertainty. In the case of Kenya, we note a relatively high profit margin, but again with variation across different banks (Table 1).

4. Explaining spreads

While the decomposition of spreads allows us to identify the items in the banks' balance sheets that make up the spread, this rather mechanical exercise is only the first step towards analyzing the driving factors behind high intermediation costs. For the purpose of the following discussion, we will distinguish between factors at three different levels: the level of individual institutions, the level of the banking system and the country-level. While such a division might

seem somewhat artificial when it comes to certain factors, it is helpful in discussing policy options that help reduce intermediation costs.

Take first the level of the individual institutions. The composition of both deposit and loan portfolio can be an important driver. Lending to certain sectors, such as agriculture, is riskier and might imply higher costs. The absence of risk diversification possibilities can also lead to prohibitively high risk premiums and credit rationing. Ownership is an important determinant of efficiency. While government-owned banks are consistently found to have higher margins and spreads (Demirguc-Kunt, Laeven and Levine, 2004; Micco, Panizza and Yanez, 2007), there is mixed evidence in the case of foreign-owned banks: while foreign-owned banks in developed economies are typically less efficient, foreign-owned banks in developing countries are often more efficient, i.e. have lower overhead costs and net interest margins.⁹ Interestingly, the lower overhead costs and net interest margins are often in spite of higher wage costs due to expatriate salaries; this seems to be more than offset by a higher productivity. This is illustrated in the case of Kenya. While foreign-owned banks have higher overhead costs than domestic banks, they have lower interest spreads than government-owned banks and only somewhat higher spreads than private domestic banks. The difference is explained by the much higher loan loss provisions of government-owned bank compared to privately-owned banks, both domestic and foreign (Table 1).

Bank size can also be a driving factor for intermediation efficiency. Larger banks can enjoy scale economies by spreading the fixed component of transaction costs over more clients and over more volume of deposit and loans (Demirguc-Kunt, Laeven and Levine, 2004). Larger banks might also be able to better diversify risk stemming from different sources, i.e. both from agency problems as well as from borrower-specific production risk.

⁹ See Clarke et al. (2003) for an overview.

Consider next the level of the banking system. Both ownership structure and size structure can have important repercussions here, too. A large share of government-owned banks does not only drive up the average spread faced by depositors and borrowers, but through their dominating role, inefficient government bank can provide rents to privately-owned more efficient banks that charge the same spread while enjoying higher profits. This does not seem to be the case in Kenya, where government-owned banks have actually the highest profit margins of all banks (Table 1); however, it can be argued that the rents provided by government-owned banks allow foreign-owned banks to be less efficient and less innovative in their quest to lower overhead costs. Strong entry by foreign banks, on the other hand, can put competitive pressure on domestic banks (Claessens, Demirguc-Kunt and Huizinga, 2001). Scale economies on the individual bank level also have repercussions on the level of the banking system. On the one hand, small banking systems with a few large banks might be able to overcome disadvantages of small size. On the other hand, relying only on a few large banks might have negative repercussions for the competitiveness of the financial systems. It is to note, however, that market structure indicators such as the number of banks, concentration ratios or Herfindahl indices are not very good indicators of competitiveness (Demirguc-Kunt, Laeven and Levine, 2004; Claessens and Laven, 2004). More important than the market structure is the contestability of the market, i.e. the ease with which new banks can enter the market. This puts the focus on regulatory policies that critically influence the contestability of the banking system. However, it also emphasizes the importance of supervisory practices; allowing undercapitalized and fragile banks to compete with healthy can result again in rents for the healthy institutions, as is the case in Kenya, where a history of small bank failures in recent history has created mistrust by the public in small private

banks, which in turn gives large foreign-owned banks a stronger market position than their market share and structural market indicators would suggest (Beck and Fuchs, 2004).

On the country-level, the contractual and informational frameworks and the macroeconomic environment are critical in determining intermediation efficiency. Financial contracts depend on the certainty of legal rights and predictability and speed of their fair and impartial enforcement and a more efficient contractual framework can have a dampening effect on several components of the intermediation spread (Demirguc-Kunt, Laeven and Levine, 2004; Laeven and Majnoni, 2005): it helps reduce overhead costs as the cost of creating, perfecting and enforcing collateral decreases; it reduces loan loss provision as better contract enforcement reduces incentives for borrowers to default willing full and increases the share that creditors can recover in case of default.¹⁰ And it can reduce the profit margin by affecting competition: lower costs of creating and perfecting collateral can lower the costs of switching creditors and reduce hold-up of borrowers by the main creditor. Similarly, improvements in the informational framework can reduce information costs. More transparent financial statements and credit information sharing lower the cost of screening and monitoring borrowers, reduce adverse selection by making it more likely that lender choose plums rather than lemons, thus reducing future loan losses.¹¹ Sharing negative information on borrowers through credit registries also reduces the perverse incentive to willing full default on one's commitments. By allowing borrowers to build up "reputation collateral" in the form of a credit history, finally, credit information sharing can have a positive impact on competition, as borrowers are able to offer their positive credit history to other creditors. Macroeconomic instability, finally, can drive up

¹⁰ There is a recent, but large literature on the relationship between legal system efficiency and financial development, following the seminal work by La Porta et al. (1997). For an overview, see Beck and Levine (2005).

¹¹ See among others, La Porta et al. (1997), Jappelli and Pagano (2002), Miller (2003), Love and Mylenko (2003).

spreads as it exacerbates the information asymmetries discussed in section 1 (Huybens and Smith, 1999; Demirguc-Kunt, Laeven and Levine, 2004).

Country characteristics beyond the institutional framework, such as size and the general costs of doing business can be an important factor of the efficiency with which financial institutions operate. Take first size. Many developing countries suffer from the triple problems of smallness: small clients, small institutions, and small markets. These diseconomies of scale and lower possibilities of diversifying risk lead to higher intermediation costs and can, as discussed in section 1, result in rationing of clients. Figure 6 illustrates this by plotting net interest margins against the absolute size of financial systems in US dollars – countries with smaller financial system experience higher margins. Small countries should therefore put a premium on policies encouraging entry of foreign banks that are able to reap benefits of scale economies across subsidiaries in different countries, on integration of financial markets across countries, and on allowing their citizens access to financial services across borders. General costs of doing business constitute another country-level constraint and include high costs due to deficiencies in the transportation and communication networks and electricity provision.¹² Inefficiencies in input markets, such as labor markets or telecommunication markets might drive up costs and impede innovation.¹³

5. Conclusions and policy lessons

Market frictions give rise to financial intermediaries and organized financial markets, but it is the efficiency with which financial institutions can reduce these market frictions that

¹² Beck, Demirguc-Kunt and Martinez Peria (2005) find a positive cross-country association of geographic branch and ATM penetration with rail and communication infrastructure.

¹³ See for example discussion on South Africa (World Bank, 2004), and the discussion in Claessens, Dobos, Klingebiel and Laeven (2003).

determine the depth, breadth and efficiency of the financial system. While the efficiency of financial institutions is reflected in interest spreads and margins, one has to consider the underlying causes in order to formulate sensible policy lessons. Profit-maximizing financial institutions aim to provide financial services in a cost-effective manner, but subject to two important constraints: the competitive environment and the general institutional framework. Over the past years, financial institutions around the globe have developed new products (simple transaction account), new delivery channels and methods (correspondent banking, mobile branches, phone and e-finance), new lending techniques (group lending, non-traditional collateral), and new screening methodologies (credit scoring) with direct repercussions for overhead costs and spreads. Many of these innovations have also helped expand the universe of the bankable population.

While technology certainly has played an important role, it is competitive pressure, which at the end pushes financial institutions to be more efficient, and it is here that we can identify a first important role for government. Allowing or even encouraging entry by sound and prudent new institution, whether they be domestic or foreign, is important to maintain contestability. Creating a level playing field by avoiding that privately-owned banks benefit from government-owned banks' need to earn higher spreads, helps increase efficiency and outreach. Looking beyond the commercial banking system and allowing competition from the non-bank financial sector can be important. Avoiding segmentation in the financial sector through expanding access to the payment system or the credit information sharing system beyond the commercial banks to banklike institutions such as cooperatives or regulates MFIs can help the financial system stay competitive.

These market-enabling policies, however, find their limit in constraints imposed by the institutional and macroeconomic environment. Market-developing policies, i.e. policies addressing deficiencies in the contractual and informational frameworks and policies maintaining macroeconomic stability can have important medium- to long-term repercussions for the efficiency with which financial institutions operate. Beyond the financial system, the cost of doing business can impose important constraints.

A proper and careful analysis of a country financial system cannot only help identify deficiencies, but can also help policy maker prioritize. What is the binding constraint on financial institutions to become more efficient and thus to help deepen and broaden the financial system? If it is lack of competition, market-enabling policies fostering contestability, are called for. If it deficiencies in the contractual and informational frameworks, reforms in these areas are at a premium. If the problem is part of wider problems of high costs of doing business, then they should be addressed.

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Table 1: Spread decomposition for Kenyan Banks

| | All banks | State-owned banks | Domestic private | Foreign banks |
|----------------------|-------------|-------------------|------------------|---------------|
| Average deposit rate | 3.2 | 19.8 | 17.2 | 17.7 |
| Average lending rate | 18.1 | 2.9 | 4.7 | 2.2 |
| Overhead cost | 5.6 | 4.4 | 5.3 | 6.6 |
| Loan loss provisions | 2.5 | 4.9 | 1.5 | 1.8 |
| Reserve requirements | 0.3 | 0.3 | 0.4 | 0.2 |
| Tax | 1.9 | 2.2 | 1.6 | 2.1 |
| Profit margin | 4.5 | 5.2 | 3.7 | 4.9 |
| Total spread | 14.9 | 16.9 | 12.5 | 15.5 |

Source: Beck and Fuchs (2004) and author's calculations using data from the CBK. All data are for 2002.

Figure 1: Market frictions and the interest rate spread

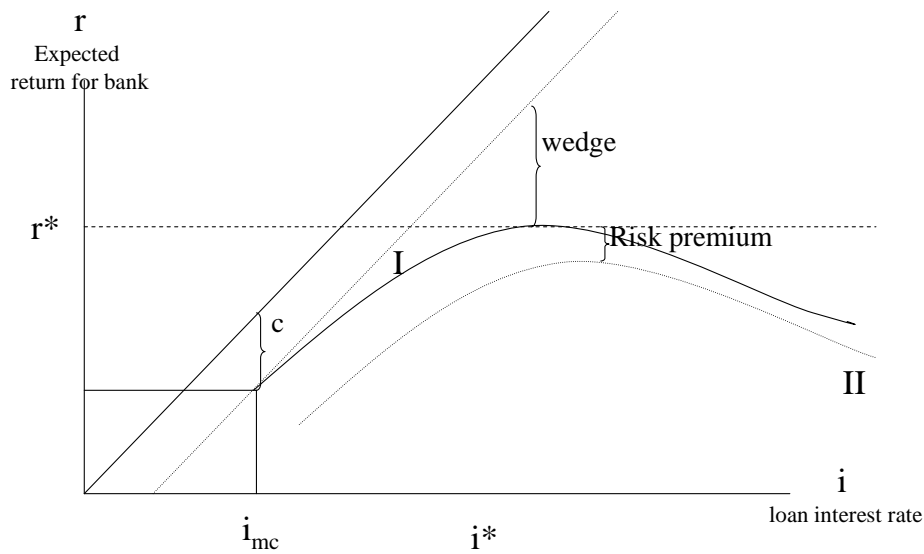


Figure 2: Market frictions and credit rationing

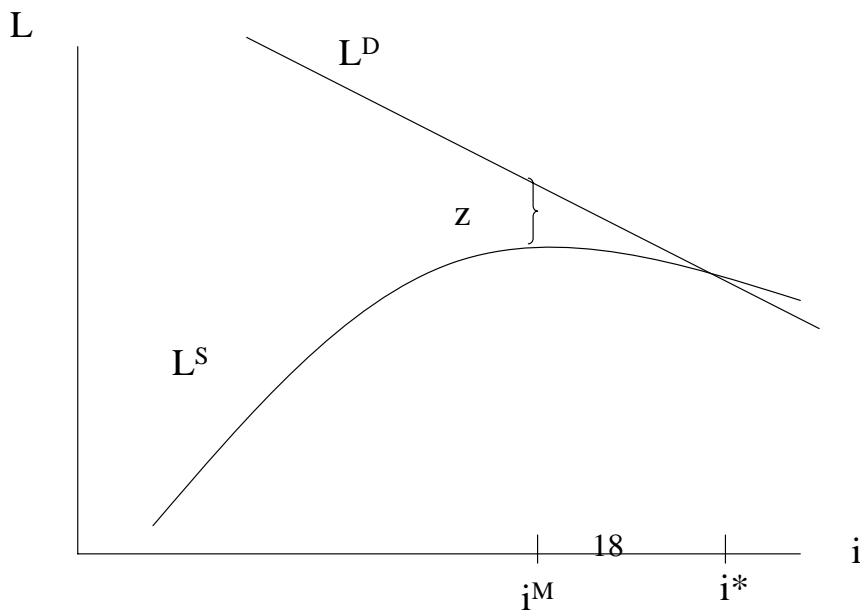


Figure 3: Development and Efficiency of Financial Intermediaries

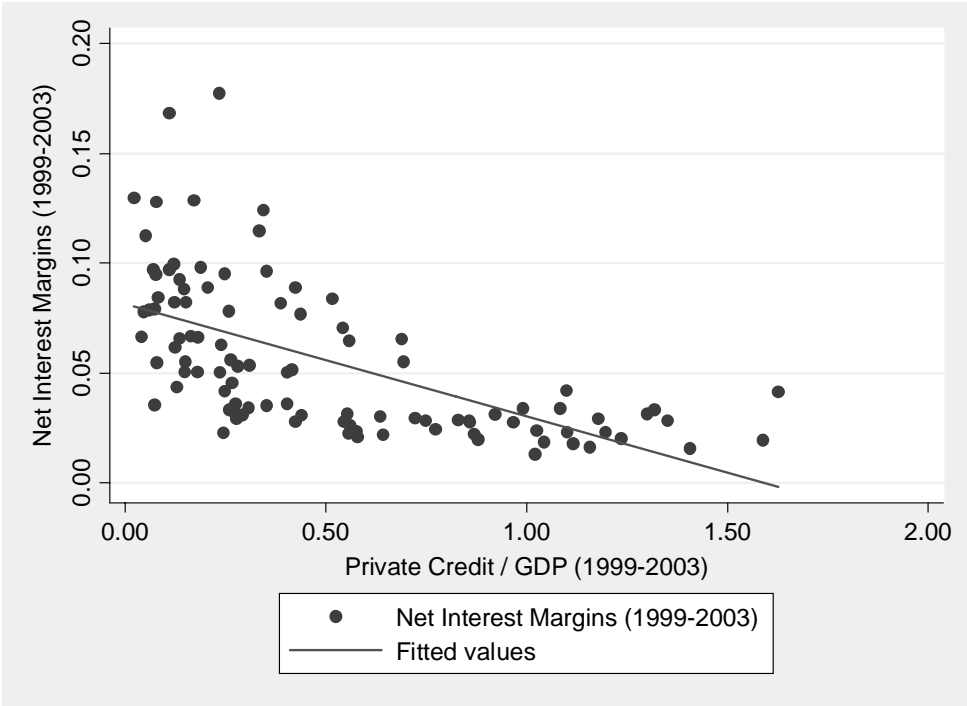


Figure 3: Outreach and Efficiency of Financial Intermediaries

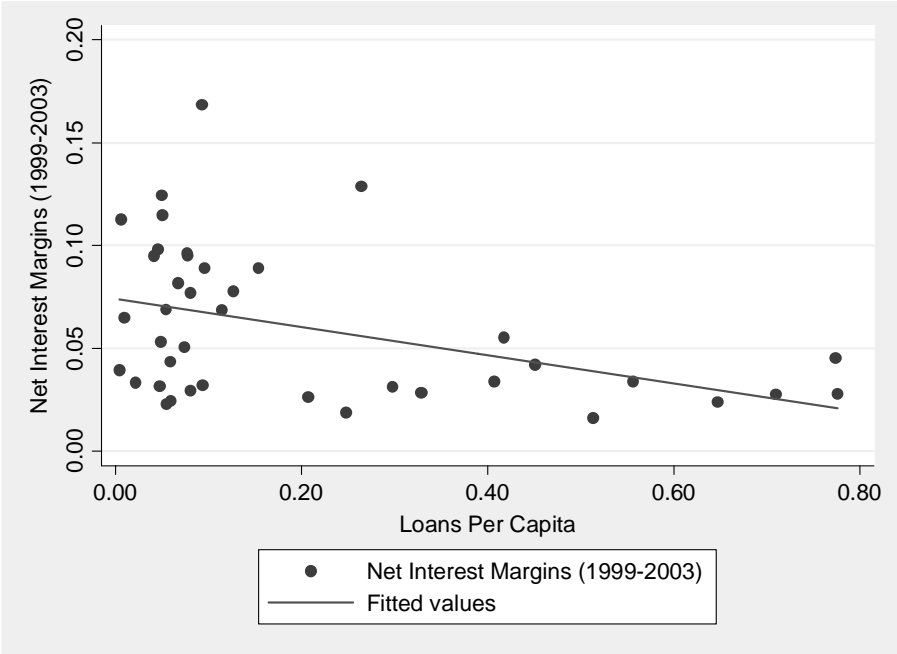


Figure 5: Overhead Cost drive Interest Margins

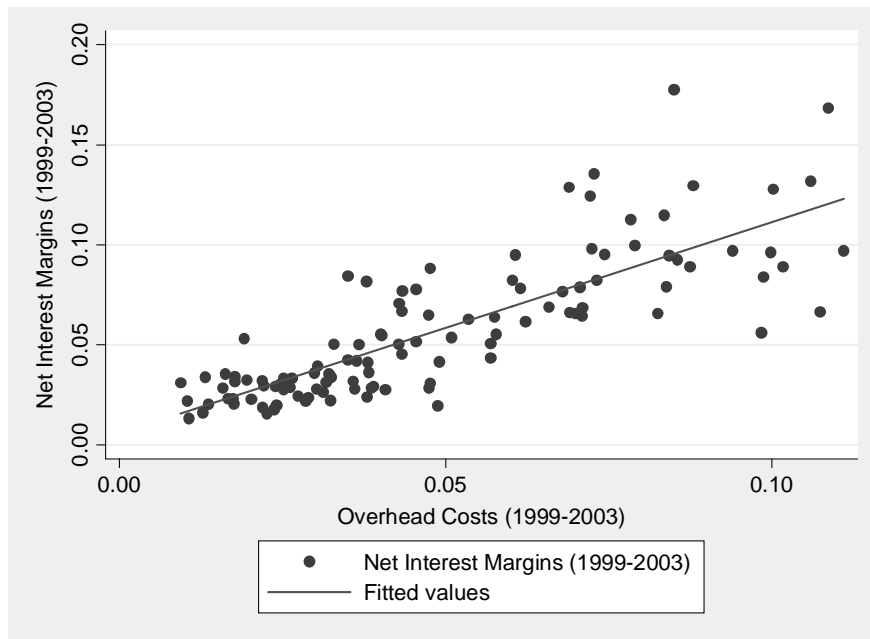


Figure 6: Small financial systems have higher net interest margin.

