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Benchmarking Financial Systems

Introducing the Financial Possibility Frontier

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Abstract

Across the world, supply for financial services rarely matches the demand, given multiple market frictions. This paper discusses the concept of the financial possibilities frontier as a constrained optimum to

categorize different problems of shallow financial markets or unsustainable expansion. The paper offers three examples of how to use different data sources to apply the frontier concept to assess the state of financial systems.

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Benchmarking Financial Systems: Introducing the Financial Possibility Frontier

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1. Introduction

Households, enterprises and governments demand financial services to reallocate consumption and investment across different time periods and different states of the world. The fact that the financial sector is one of the oldest service sectors in human history suggests that the demand for (i) payment, (ii) savings, (iii) credit, and (iv) risk management services is a fundamental characteristic of exchange-based economies.¹

Micro-evidence in the form of financial diaries (Collins et al., 2009) has shown that even the poorest of the poor have demand for financial services, even though this demand is satisfied mostly by informal arrangements.

In spite of widespread demand for financial services, there is a high variation in the range and depth of financial service provision across countries. This paper introduces the concept of the possibility frontier, which is the constrained optimum of financial development in an economy, as diagnostic tool to assess the gap between actual provision of financial services and demand from the real sector and identify bottlenecks that prevent further financial deepening of financial institutions and markets, on the one hand, and mitigate risks of overheating in banking or capital markets, on the other hand. We will use a cross-country benchmarking exercise to illustrate the application of the frontier concept. We will then suggest several specific applications of the frontier concept. Specifically, we will assess the performance of i) the transition economies in the 1990s and 2000s, ii) illustrate the assessment of SME finance with firm-level data and iii) use the example of Egypt to document the use of different data sources to gauge the development of its financial system.

¹ For just one example of historic financial arrangements and their development during the Roman empire see Malmendier (2009).

It is important to distinguish between the different services provided by financial institutions and markets. While the need for payment services is basic across all exchange-based economies, though increasing with specialization and division of labor, the demand for credit, savings, and risk management services is partly a function of the economic environment in which households, enterprises and governments work. The high volatility facing many low-income countries, related to volatile export prices – particularly for commodity-based exporters – and natural calamities increases the demand for risk management services. Given the high degree of informality and consequent volatility of income flows for many households, there is need for financial products to mitigate the impact of this income volatility and allow for smooth consumption patterns. Similarly, extensive research has shown that the availability of long-term financing sources enables firms to innovate more and invest in fixed assets (e.g. Aghion et al., 2009). Investment in infrastructure, be it private or public, requires access to long-term financing sources. Finally, effective monetary policy, adequate exchange rate management and fiscal policy space rely on deep and liquid financial markets (IMF, 2012).

While the basic demand for financial services therefore does not systematically vary with the level of income, different financial products and services are being demanded in countries with different levels of income, by different educational and occupational groups, and in different socio-economic circumstances. More importantly, however, the supply of financial services varies systematically across countries of different sizes and income levels, not just in depth and outreach, but also in the breadth and diversity of institutions and markets, products and services. And low-income countries, often with the highest need for financial markets to mitigate risks stemming

from volatility and shocks, suffer most from the dearth of the necessary financial instruments and products. In addition, shallow financial systems in many low- and middle-income countries drive a wedge between inherent and bankable, i.e. commercially viable, demand, effectively excluding a large share of the population.

The literature has related an array of country characteristics to the level of financial sector development, ranging from market structure and competition over broad institutional characteristics and specific policies to historic factors.² The observed aggregate volume of financial service provision and individual or enterprise use of specific financial services, however, reflect as much supply as demand, and shallow financial markets can be the result of demand-side as much as of supply-side constraints.

In this paper, we will abstract from historic factors and focus on policies, incentives, and government interventions that can explain cross-country variation in financial sector development. To better understand this variation, we will next introduce the concept of a possibility frontier, which can be based on aggregate as on micro-level considerations. This frontier denotes the constrained optimum of financial depth or the share of population that can be commercially served in a sustainable manner, given structural country characteristics, technological constraints, and long-term policy choices. The frontier concept allows distinguishing between demand- and supply-side constraints and a classification of policies according to whether they aim at shifting the frontier outwards, moving closer to the frontier or at preventing the financial system from moving beyond the frontier to an unsustainable point, which ultimately will end in fragility.

² See Beck (2013) for a detailed discussion.

We will illustrate the use of the frontier concepts with several examples. First, we will discuss a benchmarking exercise that relates aggregate indicators of financial sector development to country characteristics to predict a structural depth line, i.e. the level of financial depth predicted by socio-economic characteristics of the economy. While such a structural depth line is not identical to the frontier concept, as it does not take into account long-term policy variables, it is an important first approximation and can serve as basis for cross-country and over-time comparisons of financial system development. We will also use this benchmarking exercise to compare the development of different segments of the financial system with country characteristics. Second, we will use the benchmarking exercise and the example of the former transition economies to illustrate the relative development of both structural depth line and actual levels of financial sector development over the past twenty years. We will document the rapid deepening process across the transition economies as well as the overheating after the mid-2000s. Third, we will illustrate the application of the frontier concept to the SME market, using firm-level data from the World Bank's Enterprise Survey data. Such micro-data allow closer insights into specific demand and supply-side constraints. Finally, we will use the example of a specific country – Egypt – to illustrate how the combination of aggregate and micro-data allows an assessment of underlying constraints to financial sector development. The conclusion from these three specific examples is that a combination of macro and micro data is necessary to determine not only the situation of a financial system or a specific segment of the financial system relative to its frontier, but also to identify the specific constraints.

While this paper relates directly to a small literature on the policies and institutions underpinning sustainable financial development, it also relates to a much larger literature on the relationship between financial deepening and economic development. While extensive empirical work has shown a positive relationship between financial depth and economic growth (see Levine, 2005, for an overview), recent work has pointed to important non-linearities in this relationship or even a range of financial depth where this relationship turns negative (Aghion et al., 2005; Arcand et al., 2012). This is in addition to an extensive literature that has shown that rapid increases in credit are associated with a higher likelihood of systemic banking distress (Demirguc-Kunt and Detragiache, 2005).³

The remainder of this paper is structured as follows. The next section introduces the concept of the financial possibility frontier. Section 3 uses the concept to discuss different policy options for sustainable financial deepening. Section 4 introduces the benchmarking exercise and section 5 uses the example of the transition economies to illustrate its application. Section 6 discusses the access possibilities frontier for SMEs and the use of Enterprise Surveys. Section 7 uses the example of Egypt to demonstrate the need to use both aggregate and micro data. Section 8 concludes.

2. The financial possibility frontier

The section introduces the financial possibility frontier, a concept that builds on previous work by Beck and de la Torre (2007) and Barajas et al. (2012).

³ For a discussion on how banking fragility has affected households in Eastern Europe, see Brown (2013).

2.1. Market frictions

In a world without market frictions, i.e. without transaction costs and information asymmetries, and without uncertainty, direct financial transactions between savers and borrowers would be feasible and there would be no need for financial institutions or markets. Uncertain outcomes in a world with risk-averse agents put a premium on risk diversification and create demand for risk management services. Information asymmetries and limited enforceability of contracts give rise to agency problem. These agency problems and transaction costs introduce additional market frictions, which ultimately give rise to financial institutions and markets that can help overcome these frictions and economize on costs. In addition to these “bilateral frictions”, collective frictions related to network externalities and first-mover disadvantages can prevent the development of financial markets that rely on depth and liquidity and cost-effective payment systems (De la Torre and Ize, 2010, 2011).

While financial institutions and markets help overcome these market frictions, their efficient operation is restricted by these same market frictions. The typical market frictions that interact to affect the process of financial deepening are associated either with information, enforcement, or transactions costs (Levine, 2005; Merton and Bodie, 2005; De la Torre, Feyen and Ize, 2013).⁴ Fixed transaction costs in financial service provision result in decreasing unit costs as the number or size of transactions increases.⁵ The

⁴ For the following, see a similar discussion in Beck and de la Torre (2007).

⁵ These fixed costs exist at the level of the transaction, client, institution, and even the financial system as a whole. Processing an individual payment or savings transaction entails costs that, at least in part, are independent of the value of the transaction. Similarly, maintaining an account for an individual client also implies costs that are largely independent of the number and size of the transactions the client makes. At the level of a financial institution, fixed costs span a wide range—from the brick-and-mortar branch network to computer systems, legal and accounting services, and security arrangements—and are independent of the number of clients served. Fixed costs also arise at the level of the financial system (e.g., regulatory costs

resulting economies of scale at all levels explain why financial intermediation costs are typically higher in smaller financial systems and why smaller economies can typically only sustain small financial systems (even in relation to economic activity). They also explain the limited capacity of small financial systems to broaden their financial systems towards clients with need for smaller transactions. In summary, fixed transaction costs can explain the high level of formal financial exclusion in many developing countries. Fixed costs can also explain the lack of capital markets in many small developing economies.

In addition to costs, the depth and outreach of financial systems, especially in credit and insurance services, is constrained by risks, particularly default risk. These risks can be either contract specific or systemic in nature. While idiosyncratic risks are specific to individual borrowers, projects or policy holders, their management is influenced by the systemic risk environment. High macroeconomic uncertainty and deficient contract enforcement institutions exacerbate agency problems, while the lack of diversification possibilities can hinder the ability of financial institutions to diversify non-agency risks. As systemic risk increases, it enlarges the set of borrowers and projects that are effectively priced out of credit and capital markets. Similarly, it makes insurance policies unaffordable for larger segments of the population. At the same time, the easing of agency frictions in the absence of adequate oversight can create incentives for excessive risk-taking by market participants (by failing to internalize externalities), fueling financial instability.

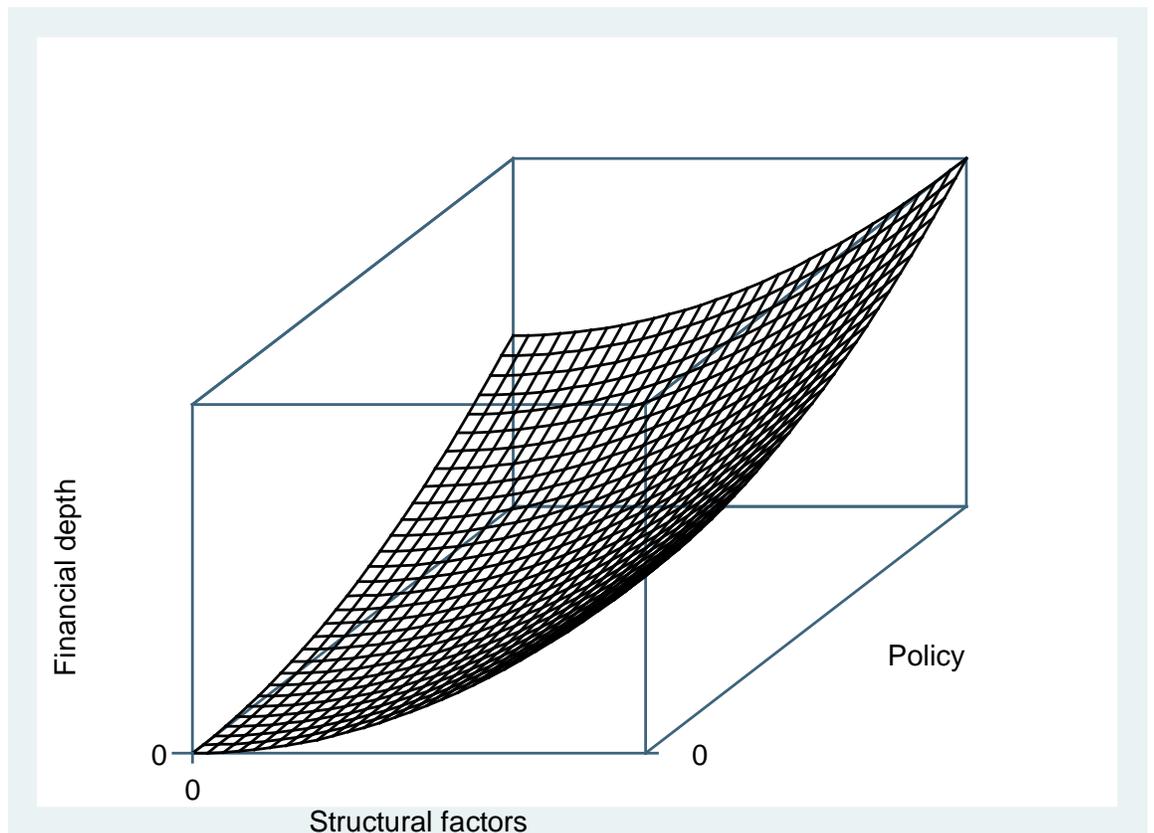
and the costs of payment, clearing, and settlement infrastructure) which are, up to a point, independent of the number of institutions regulated or participating in the payment system.

2.2. State variables

The efficiency with which financial institutions and markets can overcome market frictions is critically influenced by a number of state variables—factors that are invariant in the short-term (often lying outside the purview of policy makers)—that affect provision of financial services on the supply-side and can constrain participation on the demand-side. In broad terms, we can distinguish between two types of state variables: (i) structural characteristics of the socio-economic environment in which financial institutions and markets operate and which impose a limit on their development and (ii) long-term policy variables that either foster or limit financial deepening. While structural variables relate to the broader socio-political and structural environment in which the financial system operates, including market size, population distribution, demographic structure, policy variables are often directly related to the financial sector, as, e.g., macroeconomic fundamentals, the available technology, contractual and information frameworks underpinning the financial system, and regulatory and supervisory frameworks. Among the structural variables is the size of the market, as already discussed, which reduces the possibilities to diversify and hedge risks, while at the same time increasing concentration risks. Similarly, the demographic structure of the population can be important, as it influences both savings behavior and demand for financial services. The geographic structure of a country and population distribution can influence the costs of distributing financial services. Finally, the income level itself, while certainly endogenous to the development of the financial sector, as documented by an extensive literature, positively affects the commercially viable demand and reduces the cost of financial service provision. Higher levels of average income typically also come with higher levels of

institutional development and sophistication and higher levels of formal economic activity, thus increasing the share of commercially viable clients.

Figure 1: Stylized Financial Possibility Frontier



2.3. The frontier

Using the concept of state variables allows us to define the financial possibility frontier as a rationed equilibrium of optimal supply and demand, variously affected by market frictions. In other words, this is the maximum sustainable depth (e.g., credit or deposit volumes), outreach (e.g., share of population reached) or breadth of a financial system (e.g., diversity of domestic sources of long-term finance, including banks, long-term debt and equity markets, private equity companies, and different contractual savings

institutions) that can be realistically achieved at a given point in time. As we will discuss below, the actual depth, outreach or breadth can vary from the frontier, for various reasons. While they can stay below the frontier for longer time periods, it is unlikely that a financial system can move beyond the frontier for a sustained period, especially in the area of credit, without systemic bank fragility as this would suggest that risks are not being properly priced or that the borrower population has been expanded beyond its commercially viable maximum. In non-risk taking services, such as payment or saving services, movements beyond the frontier can only be achieved through subsidies or financial repression forcing the population into the banking system, though even here, risks loom large as these resources might eventually find their way into risk taking, through a shadow banking system.

Figure 1 illustrates the financial possibility frontier and the difference between structural and policy variables among the state variables. We graph the frontier in a three-dimensional space, where the x- and z-axes denote structural and policy state variables, respectively, while the y-axis denotes financial development. All three axes are one-dimensional representation of an array of variables. A movement outwards on the x-axis indicates improvement in the structural state variables –e.g., size, demographic structure, socio-political situation – conducive to financial deepening. Similarly, movements outwards on the z-axis indicate improvements in long-term policies and institutions – e.g., macroeconomic stability, contractual framework – that are conducive for financial deepening.

The plane indicates the financial possibility frontier, i.e. the level of financial development sustainable in the long-term for a given combination of structural and policy

state variables. If the financial system is below the plane, this suggests that it has not achieved the optimal level feasible under current demand- and supply-side constraints. A financial system above the plane suggests an unsustainable level of financial deepening, most likely to result in fragility. The split of state variables into structural and policy variables also underlines the importance of taking into account structural constraints when evaluating the potential for financial sector development. Put differently, policies and institutions supporting sustainable financial development are even more important in countries with very adverse structural characteristics.

2.4. Product specific frontiers

Conceptually, the frontier can vary for different types of financial services, depending on the sources of market frictions. For instance, the frontier for payment and savings services, where transaction costs are the decisive constraint, can be different from that for credit and insurance services, where risk is an additional important component. The financial possibility frontier can also move over time, as income levels change, the international environment adjusts, new technologies arise, and the overall socio-political environment in which financial institutions operate changes.

Depending on which dimension of financial development and on which segment of the financial system one focuses, different relationships between state variables and the frontier are predicted by theory. Scale is especially important for capital markets that rely on liquidity and thus active trader bases, but also a sufficient supply of “marketable” enterprises, i.e. enterprises at a scale and transparency to issue public securities. The importance of monetary stability for defining the frontier increases in the maturity of the

financial service. The dependence on the contractual framework is more important for arms-length than relationship based financing contracting and thus more important for corporate bond markets than for banks. Geographic dispersion of the population and the quality of the infrastructure is especially important for the outreach of the financial system. Different segments of the financial system, however, also depend on each other. Insurance companies and pension funds depend on long-term investment opportunities, such as traded and non-traded equity and debt securities. Banks rely on capital markets to hedge risks and securitize assets. Mortgage finance relies on the availability of long-term investors, such as pension funds and insurance companies.

In the context of developing countries, it is important to distinguish between savings or resource constraints and intermediation constraints.⁶ While demographic or income constraints might limit the amount of resources available for financial intermediation in the economy, most financial systems in low-income countries seem rather intermediation constrained, i.e. banks are characterized by a large share of investment in liquid and government securities. Relating to the discussion above, this suggest that the liability side of banking (mobilization of savings and resources more generally) might face lower constraints relating to state variables than the assets side, especially private sector lending, which is often constrained by agency frictions exacerbated by deficient contractual and information frameworks. Relaxing constraints on the liability side might also involve different policies than relaxing constraints on the asset side.

⁶ See similar arguments on a broader level by Hausman, Rodrik and Velasco (2005) in their discussion on growth constraints.

2.5. The challenges for sustainable financial sector deepening

Generalizing from the above discussion, we can identify three broad challenges facing countries. First, the financial possibility frontier may be low relative to countries at similar levels of economic development due to deficiencies in state variables. Here we can distinguish between the role played by structural and policy state variables. While policy variables can be addressed with long-term institutional reforms, a low structural depth frontier might require additional institutional reforms. Small scale might require countries to tap the possibilities offered by globalization in terms of risk diversification and scale economies. Countries with disperse population might have to rely more on technology and non-branch delivery channels than other countries

Second, there is the possibility that a financial system lies below the frontier, i.e. below the constrained maximum defined by state variables, due to demand and/or supply-side constraints. Demand-side constraints can arise if, for instance, the number of loan applicants is too low due to self-exclusion (e.g., due to lack of financial literacy) or on account of a lack of viable investment projects in the economy (e.g., as a result of short-term macroeconomic uncertainty). Supply-constraints influencing idiosyncratic risks or those artificially pushing up costs of financial service provision might also serve to hold the financial system below the frontier.⁷ For instance, lack of competition or regulatory restrictions might prevent financial institutions and market players from reaching out to new clientele or introducing new products and services. Similarly, regulatory barriers can

⁷ It should be noted that lack of private sector participation could also result from other frictions in the economy. For instance, barriers to doing business, tax distortions that discourage firm growth, directed subsidies to industries and sectors, among others, are examples of distortions complementary to credit market frictions which serve to constrain participation.

prevent deepening of certain market segments as can weak systems of credit information sharing or opacity of financial information about firms.

Finally, the financial system can move beyond the frontier, indicating an unsustainable expansion of the financial system beyond its fundamentals, i.e. an expansion that is likely to end in systemic banking distress. For instance, “boom-bust” cycles in economies can occur in the wake of excessive investment and risk taking (often facilitated by loose monetary policy) by market participants. Experience from past banking crises suggests that credit booms and subsequent busts typically occur in environments characterized by poorly defined regulatory and supervisory frameworks. As underscored by the global financial crisis, financial innovation and regulatory ease can foster rapid deepening, but also pose challenges for financial stability.⁸ Finally, fragility in many developing countries is often linked to governance problems, so that an overshooting of the financial possibility frontier may also be related to limited supervisory and market discipline.⁹

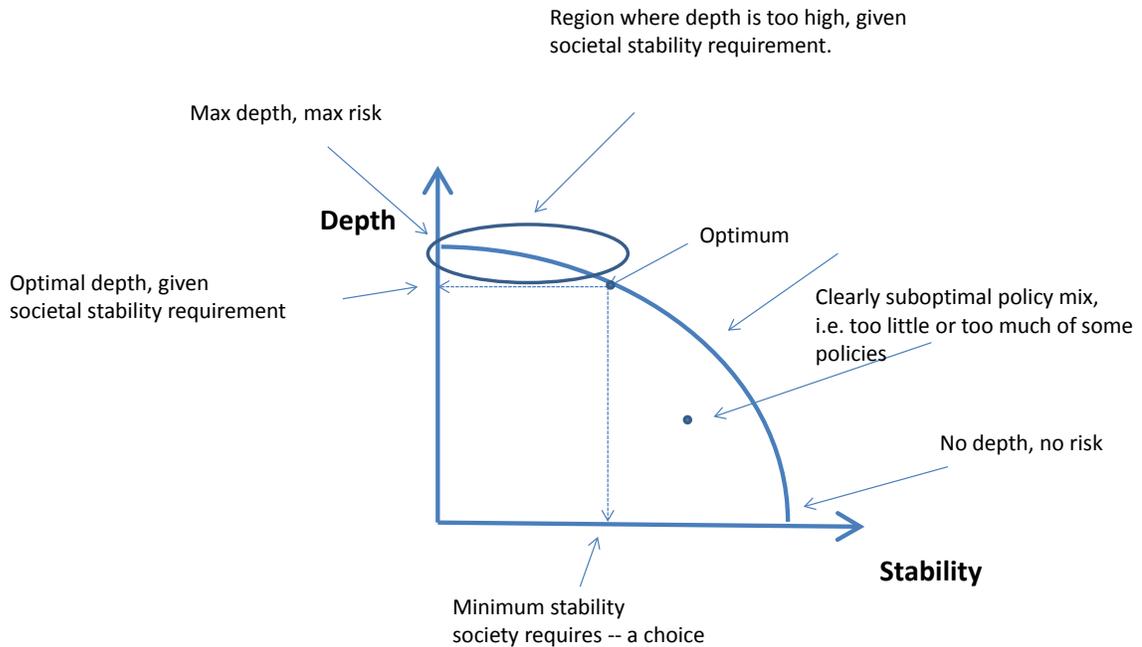
While the frontier concept implies a specific level of financial development for a given combination of structural and policy state variables that is sustainable in the long-run, risk-return preferences might vary across countries, as illustrated in Figure 2. Societies might choose different points along the trade-off line between financial deepening and stability, with more risk-loving societies choosing higher risk of fragility to achieve a deeper financial system while other societies might prefer a more constrained

⁸ See Beck et al. (2012) for evidence on the bright and dark sides of financial innovation.

⁹ There might also be important interactions between the outreach of the financial system and its stability as shown by Han and Melecky (2013) who show that countries with broader access to deposit services faced lower probabilities of deposit withdrawals during the crisis.

financial system to benefit from higher stability. As in Figure 1, combinations of stability and depth below the frontier are sub-optimal, while combinations above the frontier are not feasible in this graph and trade-off.

Figure 2: Depth-Stability trade-off



It is important to understand that some of the policies can both help the financial system move closer to the frontier and have the potential of pushing it beyond the frontier. Competition is a very good example. Competition and contestability can facilitate the entry of new players, the introduction of new products and new delivery channels and thus push a financial system towards the frontier. In effect, competitive pressure and the search for profits are key factors behind such examples of outreach as offering of services that are tailor-made for low-income clients (e.g., simple debit accounts at lower costs than regular checking accounts) or the use of mobile branches or cell phone banking to reach populations in remote areas at low costs. At the same time, indiscriminate free entry for

new deposit-taking credit institutions or the intensification of competition among existing institutions can lead to lending binges and fragility. A regulatory framework that allows innovation, while at the same time avoiding excessive risk-taking, is therefore called for. As shown by Beck, de Jonghe and Schepens (2013), the regulatory framework is critical for the effect of bank competition on banks' risk taking and fragility.

3. Using the frontier to define policy options for financial sector deepening

Identifying a country's position relative to the financial possibility frontier is a first step towards defining an adequate policy mix to achieve an optimum, long-term sustainable level of financial sector development. In this section, we discuss three sets of policies that: (i) push the frontier outwards (market-developing policies); (ii) push the system towards the frontier (market-enabling policies); and (iii) prevent the financial system from moving beyond the frontier (market-harnessing policies). It is important to stress that all these policy areas focus on overcoming market frictions and market failures and aim at better functioning markets. They stand in contrast to market-replacing policies that aim to substitute market with government mechanisms. In the overwhelming majority of cases, such mechanisms have not worked (Fry, 1988, La Porta et al., 2002).

Market-developing policies aim at pushing out the financial possibility frontier. Such reforms include, for instance, legal (even constitutional) changes and substantial upgrading of macroeconomic (particularly fiscal) performance. Cross-country comparisons suggest that macroeconomic stability is critical for financial deepening (Boyd, Levine and Smith, 2001), while country experiences suggest that macroeconomic

stability is a necessary condition for unlocking the financial deepening process.¹⁰ Smaller countries are less likely to be hosts to thriving financial systems as they lack the necessary scale for a diversified, competitive landscape of institutions and markets (need reference). Accessing the vast risk-pooling and diversification opportunities offered by international capital markets, while adopting appropriate macro-prudential policies to dampen the impact of potentially disruptive volatile international capital flows, can be important for such economies. Constraints imposed by market size can be partly overcome through regional integration and foreign bank entry, although risks have to be carefully managed, as evidenced by the global financial crisis. An extensive literature has shown that strengthening informational and contractual frameworks (e.g., building or upgrading of credit registries, collateral, risk insurance) and providing supporting market infrastructure can help to push out the frontier (Djankov, McLiesh and Shleifer, 2007, among others). It is important to note that these market-developing policies are long-term in nature, as they do not only involve deep and often drawn-out political processes, but their benefits also materialize over a longer horizon.

Market-enabling policies help push a financial system closer to the frontier, and include more short- to medium-term policy and regulatory reforms. For instance, policies aimed at fostering greater competition can result in efficiency gains, as illustrated, by the recent vigorous expansion of profitable micro- and consumer lending across many developing countries. Such policies can also include removing regulatory impediments

¹⁰ For instance, deposit mobilization and credit expansion in transition economies only took off when disinflation became entrenched (IMF, 2012).

and reforming tax policies.¹¹ Enabling policies are not just limited to allowing new entry and facilitating greater contestability, but also include “activist” competition policies, such as opening up infrastructures (e.g., payment systems and credit registries) to a broader set of institutions, or forcing institutions to share platforms and infrastructure. Beyond targeting competition, market-enabling policies can address hindrances such as coordination failures, first mover disincentives, and obstacles to risk distribution and sharing in financial markets. While these government interventions can be diverse, they tend to share a common feature in terms of creating incentives for private lenders and investors to step in, without unduly shifting risks and costs to the government (e.g., providing partial credit guarantee schemes and establishing joint platforms).

A final set of policies aim at preventing the financial system from moving beyond the frontier (i.e. the sustainable long-term equilibrium.) This set of *market-harnessing or market-stabilizing* policies encompass risk oversight and management, and include the regulatory and supervisory framework, macro-economic and macro-prudential management. These include upgrading regulatory frameworks to mitigate risks stemming from increased competition from new non-bank providers of financial services, carefully calibrating the pace of financial liberalization to the prudential oversight capacity, and establishing cross-border regulatory frameworks to mitigate risks stemming from increased international financial integration. Such policies are also important on the user

¹¹ Examples from country experiences abound (IMF, 2012). For instance, the development of the government bond market in Mexico was spurred by the elimination of compulsory lending to the government by banks. Similarly, in Turkey, tax reform (e.g., the elimination of withholding tax on income from bonds with maturities of over five years and reducing the tax rate on those with maturities of less than five years) and greater transparency served to increase investor appetite for corporate bonds. Similarly, reducing restrictions on the asset composition of insurance companies in Barbados allowed the industry to fill an important role as a major supplier of mortgage finance until banks became more active in the market.

side (e.g., minimizing the risk of household over-indebtedness, through financial literacy programs and consumer protection frameworks).

4. Benchmarking – A macro-quantitative approach to identifying the financial possibility frontier

In this section, we will discuss how the concept of a financial depth frontier can be partly operationalized using the benchmarking exercise developed by Beck et al. (2008) and De la Torre, Feyen and Ize (2013). Specifically, using a large cross-country panel, a time-variant benchmark for different financial sector indicators can be constructed by using the predicted value of regressions of financial sector indicators on an array of country characteristics proxying for the different frictions discussed above (e.g., income, size, population density, and demographic structure). As discussed by Barajas et al. (2013), this benchmark is not the equivalent to the frontier as it does not take into account long-term and deep-rooted institutional characteristics of countries. Including specific institutional measures raises (i) concerns of endogeneity of such measures to the specific financial system outcome variable and (ii) measurement concerns about the institutional indicators.¹² Rather, we can see this benchmark as representing a structural depth line, i.e. the level of financial development predicted by structural country characteristics that are not directly related to policies and/or the financial sector. The gap between the actual and predicted level of financial development can then be related to different policies.

The benchmarking exercise estimates the following regression

¹² One can also interpret GDP per capita, one of the explanatory variables, as capturing institutional quality on a very general level, as it is empirically highly correlated with general institutional quality indicators, as those by Kaufman, Kraay and Mastruzzi (2011).

$$FD_{i,t} = \beta X_{i,t} + \varepsilon_{i,t} \quad (1)$$

where FD is the log of an indicator of financial development, X is an array of structural country-specific factors, and the subscripts i and t relate to countries and years, respectively. The regression includes several country characteristics that theory predicts to be associated with the level of financial development in a country. First, the log of GDP per capita and its square (to account for possible non-linearities) proxy for general demand and supply-side constraints related to low income, Second, the log of population proxies for market size, in line with the above discussion on scale economies. Third, the log of population density proxies for geographic barriers and thus the ease of financial service provision. Fourth, the log of the age dependency ratio is included to capture demographic trends and corresponding savings behavior. Finally, dummy variables for off-shore centers, transition countries and oil-exporting countries are included to control for specific country circumstances, as these countries face specific challenges and development experiences that impact their financial systems.¹³

Barajas et al. (2013) and De la Torre, Feyen and Ize (2013) use this regression model to predict a large number of financial sector indicators capturing the depth, efficiency, stability and outreach of different segment of the financial system, including banking, capital markets and contractual savings institutions. While results vary and significance levels are influenced by the number of data points available, the regression models confirm the importance of the socio-economic indicators included as explanatory variables. The benchmarking exercise also confirms the predictions of the frontier concept, as the gap can be explained by an array of macroeconomic, regulatory,

¹³ In related work, Buncic and Melecky (2013) show substantial cross-country heterogeneity in the estimated level of equilibrium credit, due to differences in financial structure and regulatory frameworks.

institutional and market structure variables. Specifically, Barajas et al. (2013) relate the gap between predicted and actual financial development, as measured by Private Credit to GDP to an array of policies and institutions. Their results suggest that lower inflation, higher remittance share, and higher previous rates of growth all are associated with lower gaps between predicted and actual levels of Private Credit to GDP, as are a lower share of government ownership, better banking supervision, and stronger creditor rights.

Restrictions on foreign bank entry, greater exchange rate flexibility, and gross capital inflows are associated with higher gaps, while greater competition and overall financial reform are related to lower gaps between predicted and actual levels of Private Credit to GDP. Barajas et al. (2013) also show that rapid changes in Private Credit to GDP, relative to its predicted benchmark, are related to boom-and-bust cycles and thus ultimately bank fragility.

How can comparisons of the actual level of financial development with the predicted level help in the assessment of a financial system, in assessing whether a financial sector is “too hot, too cold or just right”? If the actual level of financial development is below the predicted level (thus a positive Gap), several additional empirical analyses can give insights into the reasons. First, what are the macroeconomic and institutional conditions for financial deepening in the country? High and volatile inflation and a deficient institutional framework (limited creditor rights that are not being enforced, lack of credit information sharing) can depress the sustainable constrained equilibrium (i.e. frontier) below the structural depth line. Second, there might also be demand-side constraints, related to a previous boom-bust cycle and the consequent burden of over-indebtedness for both enterprises and households. Third, there might be barriers

related to market entry or regulatory constraints that prevent the financial system from deepening. Analysis of the market structure and degree of competition in the financial system might be useful in that context.

If the actual level of financial development is above the predicted level, this can also be due to several reasons, which can be gauged with different data sources. First, a sound and flexible institutional framework might allow the financial system to move beyond its structural depth line. If this movement beyond the predicted level has been a gradual one and in line with improvements in policy and institutional indicators, it might be indeed sustainable. If on the other hand, there is a rapid increase in financial depth indicators such as Private Credit to GDP, concentrated in specific sectors, such as household or mortgage credit or in foreign currency rather than local currency, this might indicate an unsustainable expansion. Finally, bailout expectations as gauged from banks' credit ratings and funding cost differences between systemically important banks and non-systemic institutions might give additional indications of overheating.

The benchmarking exercise can also be used to gauge the differential development of different segments of the financial system, as done by De la Torre, Feyen, and Ize (2013) who apply a quantile regression framework to a global panel database to explain the variation in a large set of financial indicators. The model's independent variables consist of structural country factors including demographic factors (population size and density) and dummy variables for specific country circumstances (fuel exporter status, transition country indicator, and an offshore center indicator) and a set of year indicators. In addition, the model includes economic factors that are decomposed into an initial income effect, a contemporaneous economic growth effect, and the interaction between

these two factors. This approach allows for the association of economic development with financial indicators to be dependent on the economic development path of the country.

More formally, the specification of the benchmark model is:

$$FD_t^{i,j} = \alpha_0^j + \alpha_1^j y_0^i + (\alpha_2^j + \alpha_3^j y_0^i)(y_t^i - y_0^i) + \alpha_4^j s_t^i + \Omega_0^j X_t^i + \Omega_1^j Z_t^i + \varepsilon_t^j \quad (2)$$

where $FD_t^{i,j}$ is the (log of) the financial development indicator j for country i at time t , s_t^i is the (log of) the country's population size, X_t^i is a vector of the remaining country-specific structural characteristics, and Z_t^i is a vector of policy variables.

A large α_1 coefficient implies that the financial indicator is more strongly associated with a country's initial level of income (measured by log GDP per capita in 1980), suggesting that the associated financial activities develop when a country is economically more sophisticated. Similarly, the $\alpha_2 + \alpha_3 y_0$ term captures the sensitivity of the financial indicator to economic growth. The larger this term, the more strongly associated financial activities will increase as a country grows faster. Finally, the α_4 coefficient measures the return to scale of the financial indicator.

Table 1 presents the regression results and shows that the benchmark model is able to explain a significant portion of the variation for many financial indicators. In particular, a key finding is that population scale effects are significant for most financial indicators. The regressions also show that fuel exporters and transition countries typically lag behind while offshore centers tend to be ahead. As regards their association with economic development, all financial indicators are significantly and positively associated with initial income. In addition, financial indicators also show significant variation in their sensitivity to economic growth. In particular, the impact of initial income on the magnitude of the

economic growth effect varies across indicators and, combined with the secular growth effect, gives rise to financial development paths of various shapes. For example, the economic growth effect is strong for bank credit whereas initial income does not play a large role since the interaction term is insignificant. In contrast, for some indicators such as mutual fund assets, initial income has a very large, positive impact on the economic growth effect (i.e. the interaction term is positive and significant) whereas the secular economic growth effect is negative. This implies that countries at a low level of economic growth and initial income will typically exhibit weakly developed mutual funds.

Table 2 presents benchmark regressions which add four contractual and informational policy factors to the basic model (strength of legal rights, quality of credit information, strength of investor protection index, and contract enforcement costs). To proxy for the quality of the macro-prudential management, a credit crash dummy is included which captures severe drops in private credit to GDP levels. The explanatory power of the model increases noticeably for most financial indicators, confirming that policy matters. As such, the expanded benchmark model produces a closer proxy to the financial possibility frontier. The regressions show that the policy factors are significantly associated with most financial indicators. As expected, some policy factors matter more for some dimensions of financial sector development than for others. For example, better creditor rights appear to promote bank credit, capital market development, and life insurance. Similarly, lower enforcement costs facilitate bank lending and lower net-interest margins. Weak macro-prudential management not only affects bank credit, but also other financial indicators such as pension fund assets and life insurance premiums.

TABLE 1. Basic Benchmark Regressions

Panel A								
	<i>Bank Private Credit</i>	<i>Net Interest Margin</i>	<i>Bank Claims On Dom. Fin. Sector</i>	<i>Bank Credit To Government</i>	<i>Bank Domestic Deposits</i>	<i>Bank Non- Deposit Funding</i>	<i>Insurance Premiums (Life)</i>	<i>Insurance Premiums (Non-Life)</i>
	1	2	3	4	5	6	7	8
Log Initial GDPPC	0.372***	-0.261***	0.822***	0.285***	0.288***	0.380***	0.619***	0.267***
Log GDPPC minus Log Initial GDPPC	0.840***	0.120	-0.286	1.634***	1.535***	-0.271	0.745**	-0.155
Interaction	7.95 ^{e-05}	-0.0837***	0.223***	-0.183***	-0.0964***	0.146***	0.133***	0.0686***
Log Population	0.0721***	-0.0660***	0.243***	0.0940***	0.0367***	0.0717***	0.0424**	-0.0496***
Log Population density	0.0193***	-0.0293***	0.339***	0.200***	0.0870***	0.0452***	0.0999***	-0.0403***
Fuel dummy	-0.272***	0.00729	-0.256***	-0.262***	-0.163***	-0.0551	-0.687***	-0.202***
Offshore dummy	0.331***	0.105**	-0.634***	0.166***	0.333***	0.428***	-0.130	0.107**
Transition dummy	-0.0350	0.187***	-0.102	-0.0864	-0.170***	0.220***	-0.779***	-0.0863*
Constant	0.285***	3.709***	-8.413***	-1.285***	0.815***	-0.441***	-6.126***	-1.708***
Observations	4,075	1,785	1,643	4,003	4,097	3,983	2,138	2,308
Pseudo R ²	0.388	0.294	0.247	0.141	0.401	0.285	0.384	0.357
Panel B								
	<i>Pension Fund Assets</i>	<i>Mutual Fund Assets</i>	<i>Stock Market Turnover</i>	<i>Stock Market Capitalizatio n</i>	<i>Domestic Private Debt Securities</i>	<i>Domestic Public Debt Securities</i>	<i>Foreign Private Debt Securities</i>	<i>Foreign Public Debt Securities</i>
	1	2	3	4	5	6	7	8
Log initial GDPPC	0.317***	0.734***	0.672***	0.415***	1.010***	0.159***	1.030***	-0.134***
Log GDPPC minus Log initial GDPPC	-3.501**	-1.423***	1.853***	0.253	2.332***	0.0639	-0.426	-2.144***
Interaction	0.566***	0.472***	-0.0452	0.0900	-0.0578	-0.0207	0.239***	0.167**
Log population	-0.0994	0.135***	0.462***	0.118***	0.112***	0.0973***	0.122***	-0.243***
Log population density	-0.152***	0.00934	0.0661***	0.0756***	-0.131***	0.0571***	-0.0115	-0.253***
Fuel dummy	0.360**	-0.224**	-0.0575	0.0716	-0.785***	-0.357***	0.0507	-0.00290
Offshore dummy	-0.278	0.960***	-0.592***	0.391***	-0.0158	-0.345***	0.150	-0.0280
Transition dummy	-1.834***	-1.421***	0.722***	-0.669***	-0.504**	-0.118	-0.499***	-0.474***
Constant	0.247	-5.554***	-4.359***	-0.975***	-6.488***	1.579***	-7.983***	4.601***
Observations	568	613	1,682	1,818	889	978	985	1,198
Pseudo R ²	0.169	0.383	0.375	0.274	0.353	0.0808	0.382	0.138

Note: This table displays the median regression results of equation (1) using a panel of country-year data for the 1980–2010 period.

GDPPC stands for gross domestic product per capita.

Source: De la Torre, A., E. Feyen, and A. Ize (2013).

TABLE 2. Extended Benchmark Regressions

Panel A

	<i>Bank Private Credit</i>	<i>Net Interest Margin</i>	<i>Bank Claims On Dom. Fin. Sector</i>	<i>Bank Credit To Government</i>	<i>Bank Domestic Deposits</i>	<i>Bank Non- Deposit Funding</i>	<i>Insurance Premiums (Life)</i>	<i>Insurance Premiums (Non-Life)</i>
	1	2	3	4	5	6	7	8
Log initial GDPPC	0.266***	-0.260***	0.664***	0.415***	0.269***	0.411***	0.508***	0.199***
Log GDPPC minus Log initial GDPPC	0.456***	0.524***	-0.817	2.065***	1.049***	-0.378*	0.391	-1.114***
Interaction	-0.00235	-0.134***	0.283***	-0.253***	-0.0817***	0.115***	0.0998**	0.187***
Log population	0.0406***	-0.112***	0.294***	0.204***	0.0576***	0.0754***	0.0626***	-0.0520***
Log population density	0.0465***	-0.0167	0.348***	0.175***	0.0623***	0.0152	0.139***	-0.0284***
Fuel dummy	-0.233***	-0.0135	0.289*	-0.464***	-0.227***	-0.145***	-0.519***	-0.183***
Offshore dummy	0.271***	0.00753	-0.767***	0.157*	0.362***	0.675***	-0.195*	0.0437
Transition dummy	-0.373***	0.152**	-1.572***	-0.146	-0.319***	-0.118	-1.645***	-0.272***
Private credit crash	-5.963***	2.945***	-3.188**	-1.724***	-3.329***	-5.281***	-1.782***	-0.409
Strength of legal rights index	0.0288***	-0.00336	0.242***	-0.0454***	0.00687	0.0178*	0.277***	0.0561***
Credit information index	0.0425***	0.0857***	-0.0264	-0.210***	-0.0449***	-0.0560***	0.0546***	0.0180**
Strength of investor protection index	0.0167 -0.00326**	0.0103	-0.0933*	0.155***	0.0570*** -0.00238**	-0.0390** -0.00378**	-0.0250 0.00668**	-0.0414***
Enforcement costs	*	0.00178**	-0.00486*	-0.00268**	*	*	*	0.000972
Observations	2,148	1,731	1,056	2,140	2,160	2,094	1,805	1,857
Pseudo R ²	0.710	0.479	0.395	0.317	0.662	0.604	0.633	0.537

Panel B

	<i>Pension Fund Assets</i>	<i>Mutual Fund Assets</i>	<i>Stock Market Turnover</i>	<i>Stock Market Capitaliza tion</i>	<i>Domestic Private Debt Securities</i>	<i>Domestic Public Debt Securities</i>	<i>Foreign Private Debt Securities</i>	<i>Foreign Public Debt Securities</i>
	1	2	3	4	5	6	7	8
Log initial GDPPC	-0.0629	0.713***	0.593***	0.481***	1.173***	0.346***	1.006***	-0.224***
Log GDPPC minus Log initial GDPPC	-2.166	-2.300***	1.268***	0.644*	5.861***	1.311**	-0.894	-1.431**
Interaction	0.285	0.476***	-0.0795	-0.000579	-0.487***	-0.224***	0.327***	0.133
Log population	-0.0525	0.287***	0.619***	0.155***	-0.0301	0.154***	0.123***	-0.467***
Log population density	-0.142***	-0.119***	0.00520	0.0397**	-0.0740*	0.129***	-0.0179	-0.184***
Fuel dummy	0.182	-0.335**	-0.183**	0.0137	-0.380***	-0.00603	0.0845	-0.0817
Offshore dummy	0.121	1.230***	-0.334***	0.0959	-0.567***	-0.509***	-0.243*	-0.478***
Transition dummy	-3.052***	-1.387***	0.635***	-0.926***	-0.744**	0.359*	-0.673***	-0.460***
Private credit crash	-5.985***	-7.414***	-6.495***	-4.187***	4.262**	-2.988**	-0.742	8.200***
Strength of legal rights index	0.189***	0.000925	0.00960	0.0372**	0.176***	-0.0530**	0.0421*	-0.0906***
Credit information index	0.275***	-0.324***	-0.0881***	-0.132***	0.181***	0.108***	-0.111***	0.115***
Strength of investor protection index	0.0476	0.0617	0.157***	0.121***	0.0480	0.0952***	-0.0470	-0.0532
Enforcement costs	-0.00971	-0.00576	-0.0127***	0.00268	0.00390	-0.00294	0.00623**	-0.00164
Observations	565	567	1,292	1,344	645	707	883	1,073
Pseudo R ²	0.378	0.669	0.598	0.490	0.567	0.277	0.617	0.330

Note: This table extends table 1 by adding the following additional policy variables: *Private credit crash* (which assumes a value of 1 if private credit to GDP drops by over 20 percent for a particular country-year) and a set of variables taken from the World Bank Doing Business Database, including the *Strength of legal rights index* (the extent to which creditors are legally protected), the *Credit information index* (the quality of credit information), the *Investor protection index* (the extent to which investors are protected by law), and *Enforcement costs* (the cost to enforce a contract). The contract enforcement index is the first principal component of the following indicators (also from Doing Business): contract enforcement costs, number of days to enforce a contract (in logs), and number of procedures to enforce a contract. GDPPC stands for gross domestic product per capita.

***, **, and * indicate $p < 0.01$, $p < 0.05$, and $p < 0.1$

Source: De la Torre, A., E. Feyen, and A. Ize (2013).

The sequential development of different segments illustrated with these benchmarking regressions is also confirmed by the financial structure literature that shows that economically and financially more developed countries tend to have more market-based financial systems, i.e. financial systems where capital markets have a more prominent role in enterprise financing (Demirguc-Kunt and Levine, 2001). Similarly, Beck et al. (2012) show that economically and financially more developed countries channel a larger share of its bank lending to households rather than enterprises.

While the concept of the financial possibility frontier and the taxonomy of financial sector policies that it helps define can be an important guiding principle for financial sector policy reforms, two caveats should be borne in mind. First, given the uniqueness of macroeconomic, institutional, and structural conditions and the incidence of leapfrogging and financial crises, financial deepening paths may not necessarily be replicable across countries. The focus here is on identifying policies that have played a role in pushing financial systems towards the financial possibility frontier or shifting the frontier outwards. Second, the considerable heterogeneity within developing countries implies that while the reforms discussed are relevant across a broad range of countries, their relative importance and cost-benefit tradeoffs can differ widely across countries and even the same country over time, pointing to the need to account for country-specific circumstances and institutions.

5. From shallow markets to overheating – Applying the frontier concept to transition economies

This section applies the frontier concept to one specific region – the former transition economies of Eastern Europe and Central Asia - and illustrates how the concept can be used to both identify positions below the frontier and above the frontier.

5.1. The challenges at transition

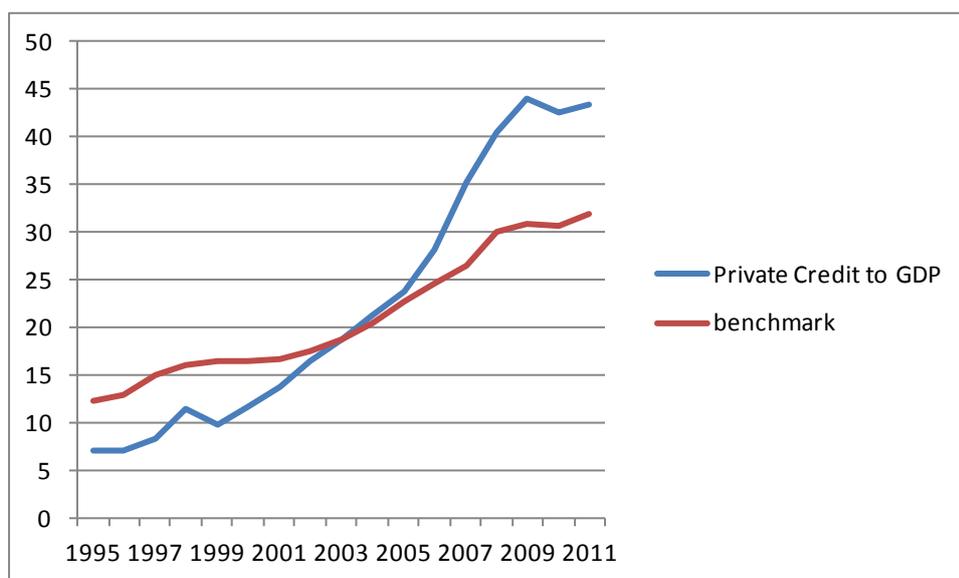
While we can observe many different patterns of financial sector development across countries and over time, the process of financial deepening over the last 20 years of transition in Central and Eastern Europe and Central Asia has shown some striking differences to financial system development in other parts of the world. First, the transition economies had to start almost from zero in developing market-based financial service provision, but with a legacy of non-performing loans to state-owned enterprises. In the context of the frontier, concept, transition economies thus faced adverse structural state variables at the outset of the transition process. Second, financial sector development was part of a larger structural transformation of countries from centrally planned towards market-based economies. Third, even more than in other countries, financial sector policies were closely linked to macroeconomic, institutional and political choices governments had to make in the early days of transition. The result of these interlinkages was that rather than an agent of transformation and development, financial institutions and markets were as much affected by the path and speed of reform as the real sector, most prominently their borrowers. While financial sector development was not simply the result of the transformation process and economic growth either, the paths of economic, institutional and financial development were co-determined by a choice of reform policies during the first years of transition.

5.2. Moving towards the frontier

Twenty years after the start of transition, financial systems in the transition economies have developed from mono-bank systems into market-based financial systems. However, there is a wide variation in financial sector development across different countries within the region. The financial deepening process across the region and over time can be best appreciated comparing the actual level of financial development with the predicted one, using

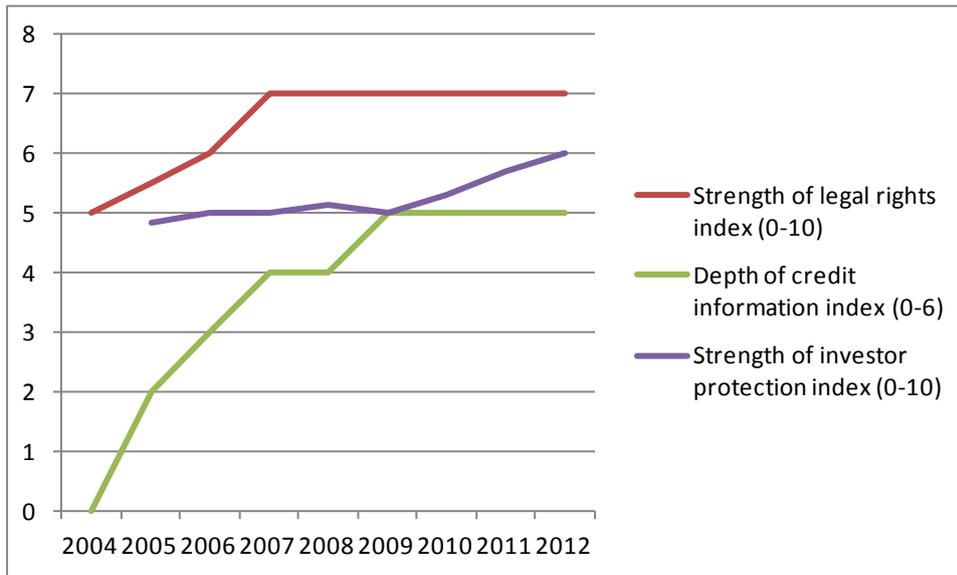
the benchmarking model discussed above. Figure 3 plots the predicted and actual value of Private Credit of the median transition economy for the period 1995 to 2011. While in the early part of the sample period the actual value was below the predicted value, the actual value pulled ahead of the predicted value in the 2000s. In 2003, the two lines crossed, with subsequent rapid increase in Private Credit to GDP.

Figure 3: Private Credit to GDP relative to a benchmark across transition economies

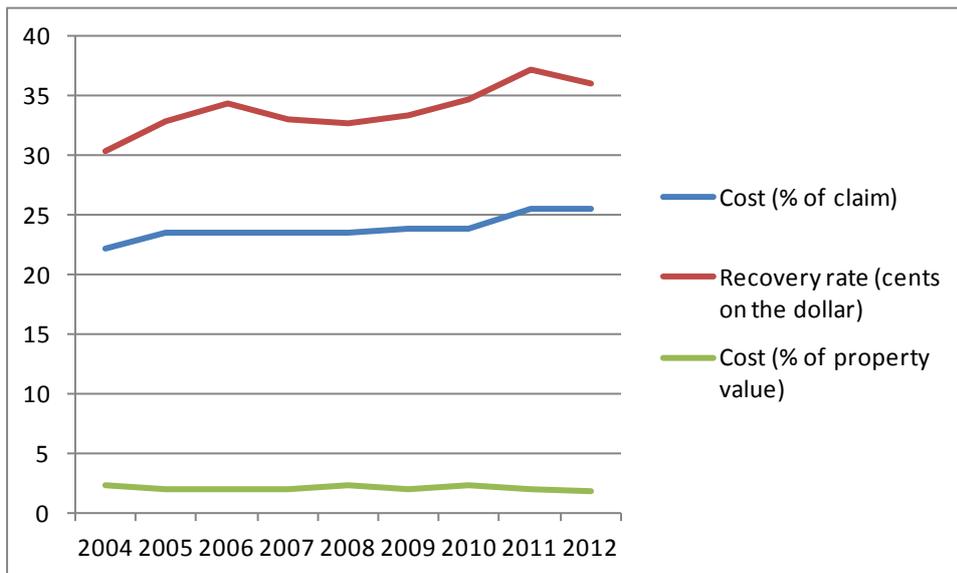


Source: Global Financial Development Indicators, own calculations

The deepening process went hand in hand with an institutional upgrade, as illustrated in Figure 4, gauged by Doing Business Indicators. Specifically, the rights of creditors and investors increased, while the largest increase can be observed in the credit registry index. Most countries introduced credit registries or upgraded them significantly in the 2000s, with significant effects on firms' access to credit (Brown, Jappelli and Pagano, 2009). However, other dimensions of the institutional framework only improved little or not at all, at least in the median transition economy. Specifically, Figure 5 shows that the bankruptcy recovery rate improved only slightly, while the cost of property registration dropped slightly and the cost of contract enforcement actually increased in the median country.

Figure 4: Development of institutional infrastructure across transition economies

Source: Doing Business, own calculations

Figure 5: Development of institutional costs across transition economies

Source: Doing Business, own calculations

In addition, the financial possibility frontier has also been pushed by improvements in macroeconomic stability, socio-political stability in many though not all transition economies and by foreign bank entry. While often controversial, the evidence on the effect of foreign bank entry on the efficiency, breadth, and stability of banking systems in transition economies has been overwhelmingly positive. Perhaps the most important impact of foreign

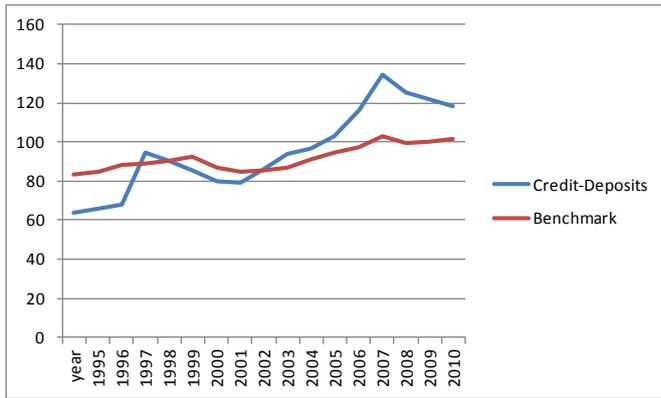
bank entry was on cutting entrenched relationships between politically connected enterprises and the banking system (Gianetti and Ongena, 2009). Foreign bank entry was a critical element of the disciplining framework that countries in Central Europe put in place in the mid to late 1990s and set them on a path to financial deepening.

The increase in financial depth, including Private Credit to GDP was accompanied by increase in the share of enterprises that finance their investment with bank credit, as gauged by the World Bank Group's Enterprise Surveys. Specifically, this share increased from 14 percent in 2002 to 28 percent in 2005 to 36 percent in 2008/9. This increase in access to financial services has been confirmed by in-depth studies and has also been linked to specific institutional upgrades (Brown, Jappelli and Pagano, 2009, Gianetti and Ongena, 2009).

5.3. Moving beyond the frontier

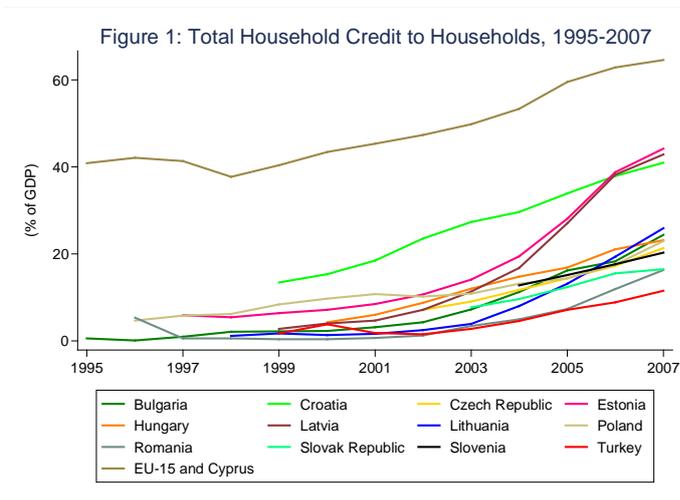
However, the benchmarking exercise might have also given first indications of an overheating in the mid-2000s. Specifically, while both actual credit and deposit to GDP ratios moved beyond the predicted levels, the credit increase was faster than the deposit increase, ultimately resulting in an "intermediation efficiency" ratio of credit to deposit above one. The ratio of credit to deposits moved beyond its predicted level after 2003 (Figure 6). Much of this additional credit was allocated to households rather than enterprises, especially in the form of mortgage credit for longer maturities in some cases in foreign currency (Figures 7 and 8).

Figure 6: Credit-deposit ratio across transition economies over time



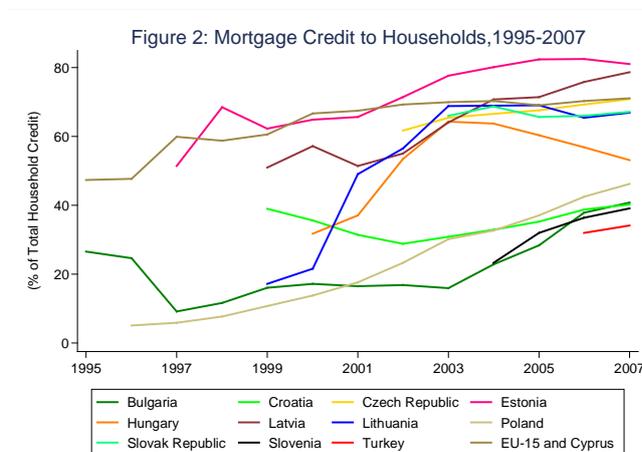
Source: Global Financial Development Indicators, own calculations

Figure 7: Household credit across transition economies over time



Source: Allen et al. (2011)

Figure 8: Mortgage credit across transition economies over time

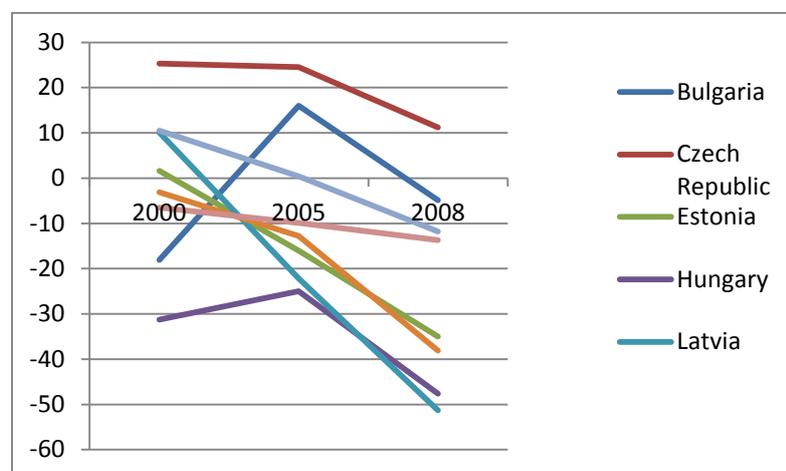


Source: Allen et al. (2011)

While aggregate indicators pointed to a boom, there were also more detailed bank-level data that pointed to a movement beyond the frontier, i.e. towards an unsustainable level, including a shift towards foreign currency lending. In 2008, the share of foreign currency debt in total debt ranged from less than 20% in the Czech Republic to over 47% in Lithuania (Allen et al., 2011). Obvious (at least ex-ante) arbitrage possibilities were exploited by banks and households, taking out Swiss Franc or Euro mortgages as lower interest rates than local currency mortgages, betting on the seemingly unavoidable long-term appreciation of local currencies, following the Balassa-Samuelson hypothesis. This trend towards both foreign-currency loans in many countries thus took the character of carry trades for consumers and producers of non-tradables. While the offer of mortgages in Euros and Swiss Francs was for a long time seen as innovation, allowing households to directly benefit from these seemingly riskless arbitrage possibilities, this also exposed them to currency shocks.

In addition, there were also macroeconomic warning signs, pointing to aggregate imbalances that had been observed earlier in the lead-up to banking and currency crises (Berglöf et al., 2009, Sirtaine and Skamnelos, 2007). This included a private sector deficit and lack of savings, which could be interpreted as an overshooting in dis-savings after the transition, ultimately resulting in negative net asset positions (Figure 9).

Figure 9: Net foreign currency asset as share of GDP



Source: Mihaljek (2009)

While warning signs were increasingly obvious in 2007/2008, it was ultimately the exogenous shock of the Global Financial Crisis that pushed the financial systems of many transition economies into reversal exposing the buildup of financial sector vulnerabilities suggesting that several countries in the region were unequivocally operating beyond the financial frontier.

This section showed how the benchmarking exercise building on the frontier concept plus an analysis of the institutional framework underpinning financial sector development can be used to gauge financial sector development. It clearly shows that there can be too much of a good thing, i.e. a movement of financial sector deepening beyond the frontier, captured by aggressive expansion trends in the banking system as well as funding and asset structure of banks.

6. Application of the frontier concept using micro-data – Benchmarking SMEs’ financing constraints

The frontier concept can be also applied to specific markets and client groups, such as the SME credit market. Across the globe, SMEs suffer from higher financing obstacles than large corporate and have more limited access to external sources of finance. As discussed in detail by Beck and de la Torre (2007), the frontier concept can be used to derive an access possibilities frontier for SMEs. We will summarize their arguments briefly in the following and discuss an empirical application.

6.1. Deriving the access possibilities frontier

Transaction costs and information asymmetries drive the variation in access to finance across firms of different sizes. Fixed transaction costs in credit assessment, processing, and monitoring result in a decrease of unit costs as the size of the loan increases, which makes

lending to SMEs more costly. In addition to transaction costs, SME lending, more than other lending products, is affected by challenges in managing risks. Compared with large firms, SMEs are commonly less likely to be able to post collateral, have less formal governance structures, and often do not have audited financial statements that allow a better picture of the enterprise and its projected profits. Compared to retail clients, financial institutions can rely less on the law of large numbers to exploit scale economies and diversification benefits in the case of SMEs as there are fewer of them in a given sector and their characteristics are harder to capture in a few quantitative indicators.¹⁴

Lending techniques, government policies and structural characteristics of financial systems and economies affect the extent to which transactions costs and risk reduce SMEs' access to external funding. We define as the *access possibilities frontier* the maximum share of SMEs applying for loans that can be served by financial institutions in a commercially viable way (see Figure 10, Point I, A).¹⁵ This concept implies that, in many economies, a large share of micro-enterprises and even small formal firms might not be bankable from a commercial viewpoint. This frontier—and thus the share of bankable SME loan applicants — is determined by the state variables we have discussed above, including available lending technologies, risk management facilities (such as availability of hedging and securitization instruments), credit registries and the contractual framework.¹⁶ Please note that the shape of this frontier is somewhat different from the previous, more general and aggregate, analysis, as

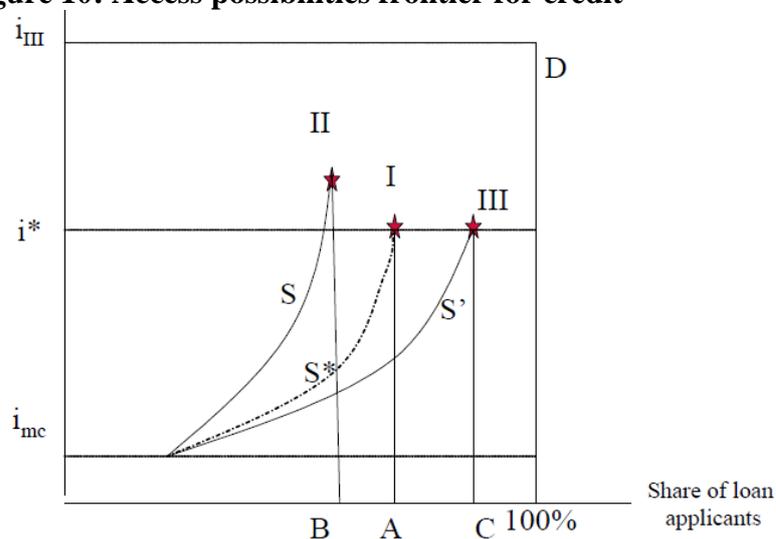
¹⁴ See Beck and de la Torre (2007) and de la Torre, Martinez Peria and Schmukler (2010) for a more in-depth discussion and references.

¹⁵ As discussed in more depth in Beck and de la Torre, (2007), the fact that there is no unique combination of costs, expected return, and risk that maps one-to-one to the interest rate limits our graphical analysis to loan applicants as opposed to all potential borrowers.

¹⁶ The supply curve underlying this concept is non-linear and can bend backward. i^* denotes the marginal interest rate at the rationed equilibrium rather than the market-clearing equilibrium. For a detailed technical discussion on the derivation of these curves, we would like to refer the reader to Beck and de la Torre (2007).

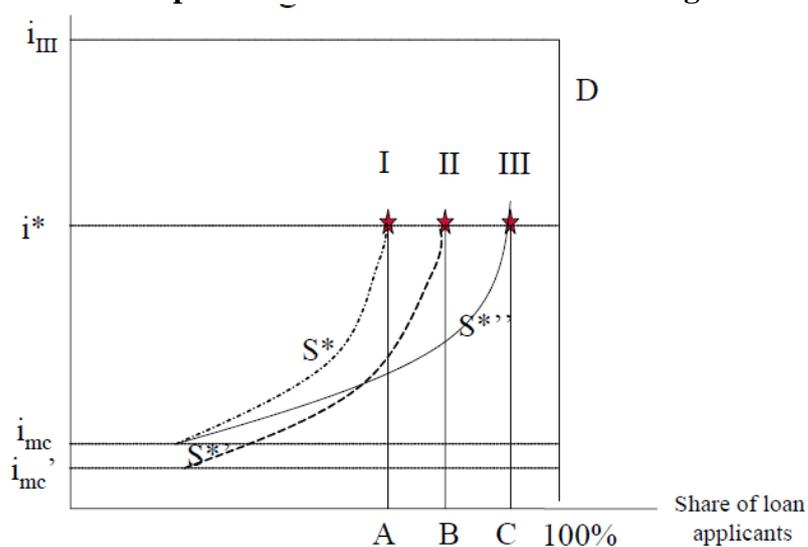
we plot the frontier here in the outreach-price space, where the state variables –both structural and policy – are incorporated in location and shape of the frontier curve.

Figure 10: Access possibilities frontier for credit



Source: Beck and de la Torre (2007)

Figure 11: Access possibilities frontier for credit – changes in state variables



Source: Beck and de la Torre (2007)

Similar to the discussion on the financial possibility frontier, we can use the access possibilities frontier to identify several types of access to credit problems. A first type of access problem is demand-originated. This problem may be evident in too low a number of loan applicants simply because of self-exclusion resulting from cultural barriers or financial

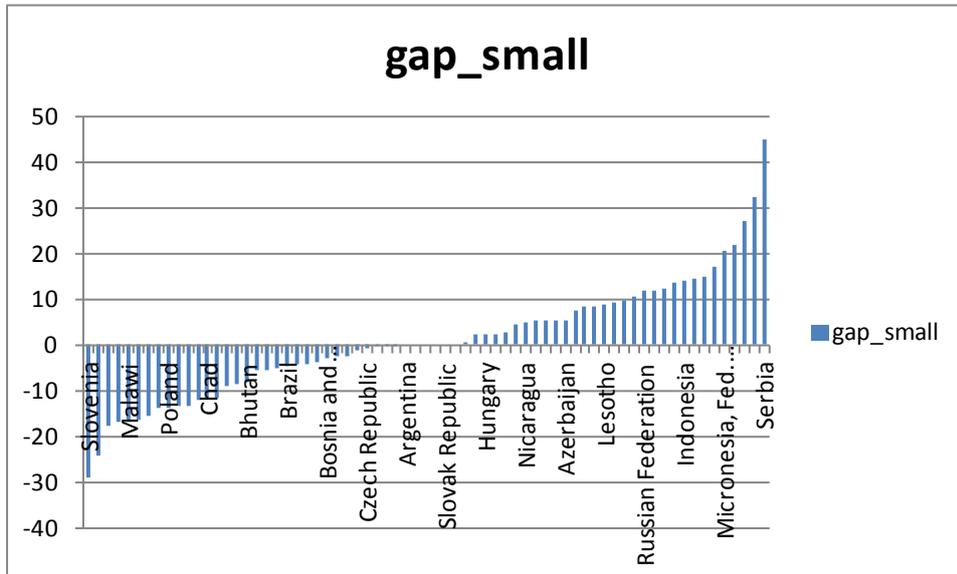
illiteracy. Alternatively, there may be a lack of profitable investment projects in the economy that deserve financing based on their expected return. This problem can actually not be illustrated in our figure as it focuses on loan applicants. A second type of access problem can arise from regulatory distortions or insufficient contestability that cause lenders not to fully exploit all the outreach opportunities and thus settle at a point below the access possibilities frontier with a higher marginal interest rate (Figure 10, Point II, B). A third and very different access problem is associated with “excess access,” that is, an equilibrium above the access possibilities frontier with loans being granted to a larger share of loan applicants than is prudently warranted or SMEs achieve too high a leverage, given the lending interest rate and the institutional framework (Figure 10, Point III, C). A final access problem consists of too low a prudent access possibilities frontier, caused by deficiencies in an economy’s institutional framework compared with that of countries with similar levels of economic development. An improvement along these lines would lead to an expansion of the frontier from S^* to S^{**} in Figure 11. Similarly, lower opportunity costs of funding (i_{mc}), e.g. due to better macroeconomic conditions, will increase the universe of potential loan applicants receiving finance (Figure 11, Point II, B).

6.2. Matching the concept with data

As in the case of aggregate indicators, the frontier concept can be matched with empirical data. First, using the benchmarking model described above, one can predict the share of (small) firms with access to a credit line or loan by a formal financial institution and compare them to the actual share, as gauged by the Enterprise Surveys, undertaken by the World Bank/IFC. Figure 12 graphs the gap between the predicted and the actual share of small enterprises that use a credit line or loan from a formal financial institution. There is a large variation, ranging from Serbia, where the predicted is 44 percentage points above the

actual share of small enterprises with a formal loan, to Slovenia, where the actual level is 29 percentage points below the predicted level.

Figure 12: Gap in share of small firms with formal credit across countries



Source: Enterprise Surveys, own calculations

The Enterprise Surveys, however, also allow a deeper look into the reasons of why firms do not use formal financial services, i.e. whether there are demand-side or supply-side constraints. Table 3 provides an example, comparing low and lower-middle income countries in and outside Sub-Saharan Africa (Beck and Cull, 2014). There is not only a smaller share of firms that have a loan in Africa than outside Africa, but among those firms without a loan, a smaller share of firms applied for a loan in Africa than outside Africa. Considering the reasons for not applying for a loan sheds lights into the bottlenecks that prevent the SME financing frontier from moving outwards in Africa. First, complex application procedures and high collateral requirements point to supply-side constraints, caused either by institutional deficiencies (such as non-existing or ineffective collateral and credit registries) or inefficiencies within the banking system. A higher share of enterprises in Africa points to

complex application procedures and high collateral requirements than in non-African countries. The share of non-applying firms pointing to complex application procedures is especially high (above 30%) in several West and Central African countries, including Benin, Burkina Faso, Central African Republic, Cameroon, Cape Verde, Mali, and Niger, but also Lesotho and Rwanda. The high share of non-applicants pointing to complex application procedures as constraint might be associated with high documentation requirements of regulators, but also a more formalistic approach by banks. Similarly, high collateral requirements are quoted as reasons for not applying especially in Burkina Faso, Cameroon, and Ethiopia, which might be related to the limited enforceability of collateral in case of loan default. Fourteen percent of firms in Africa point to high interest rates as reason for not applying, compared to only 10 percent outside Africa. Second, high interest rates as reason for not applying can be due to macroeconomic instability, such as in Zimbabwe (several years of rampant inflation) or high risk premia (DRC). Third, the size of loan or too short a maturity are rarely given as reason for not applying, while the need to pay bribes is mentioned by four percent of non-applicants in Africa and is especially high in Cote d'Ivoire, Ethiopia, Sierra Leone, and Zimbabwe. Matching these constraints as expressed by non-applicants across countries with supply-side constraints in the policy framework (e.g., contractual and collateral frameworks, existence and efficiency of credit registries and macroeconomic stability) and market structure and competition in the banking system allows a clear identification of state variables that keep the access frontier too low but also more short-term policy bottlenecks that prevent the financial system to move towards the frontier.

Finally, there might be demand-side reasons for not applying related to the lack to investment projects or expansion possibilities, as already discussed above. Notably, a smaller share of non-applicants points to no need as reason for not applying in Africa compared to non-African developing countries, pointing to a smaller role for demand-side constraints.

undertaken on the household side, using similar information from the Global Findex database (Demirguc-Kunt and Klapper, 2013).

7. Egypt – Applying macro and micro data to identify a financial system’s position¹⁷

Macro and micro data can give different and sometimes contradictory insights, as we will highlight in the following for the case of Egypt.

7.1. Background

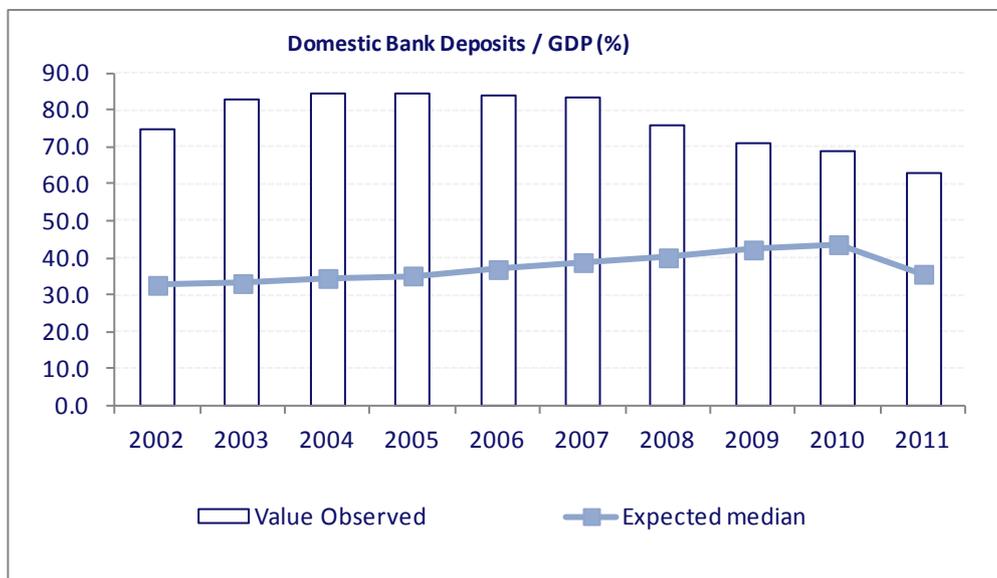
Egypt has undergone significant financial sector reform in the mid-2000s that aimed at making the financial system not only more stable but also more efficient. The reforms included privatization of one of the four commercial state-owned banks and financial, operational and institutional restructuring of the remaining three government-owned banks. The banking sector experienced a consolidation process driven by higher minimum capital requirement and by the exit of several weak banks, with the number of banks dropping from 57 banks in 2004 to 29 in 2010. Bank supervision has undergone significant changes, moving from a compliance-based toward a risk-based system. As a result of the reform program, Egypt’s financial system transformed itself over the past seven years, becoming more stable, mostly due to addressing loan losses in state-owned banks, increase in provisioning and capital and the aforementioned increase in minimum capital. There has also been progress in the financial infrastructure, most notably through the establishment of the credit bureau I-Score as well as improvements in the payment system. In 2007, a second-tier market – Nilex - was established by the government to offer funding to SMEs by offering relaxed listing rules.

¹⁷ This section relates to early work by the two authors for an internal World Bank report on Egypt’s post-revolution challenges in the financial sector.

7.2. Gauging Egypt's financial system with aggregate data

Today, Egypt's financial system is relatively large, in comparison to most peer countries. The benchmarking exercise discussed above shows a financial system corresponding to its level of income per capita and other country characteristics including size, population density and demographic structure. Specifically, Figures 13 and 14 show the actual and predicted values of two aggregate financial depth indicators, corresponding to the two sides of banks' balance sheets – Bank Deposits to GDP and Private Credit to GDP.

Figure 13: Deposit collection in Egypt over time

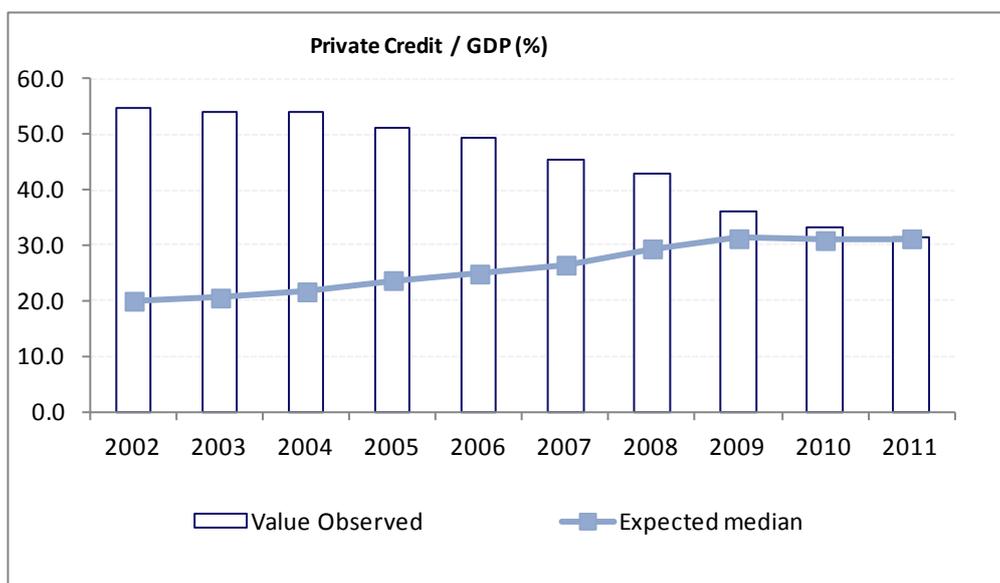


Source: Global Financial Development Indicators, own calculations

Figure 13 shows that the level of saving mobilization by the banking system has been higher than predicted by country characteristics, although the gap has been recently closing. We also note that the level of Bank Deposits to GDP has actually decreased over the past years. Figure 14 shows that the actual value of Private Credit to GDP has also been above the predicted value for many years, but has moved below it for 2009, both due to the drop in the actual level of private sector lending as to the increase in the expected value. The progress made in financial sector reform has thus not been reflected yet in aggregate financial sector indicators. While savings mobilization as captured by Bank Deposits to GDP has stagnated,

private sector lending actually declined. This can be explained by the fact that banks started building provisions and tightening their procedures and controls in response to regulatory pressures. Notwithstanding this caveat and while quantity is certainly not be equated with quality, the lack of a medium-term increase in Private Credit to GDP following the financial sector reform programs is somewhat disappointing and matches the development of demand-side indicators, as we will discuss below.

Figure 14: Private Credit to GD in Egypt over time



Source: Global Financial Development Indicators, own calculations

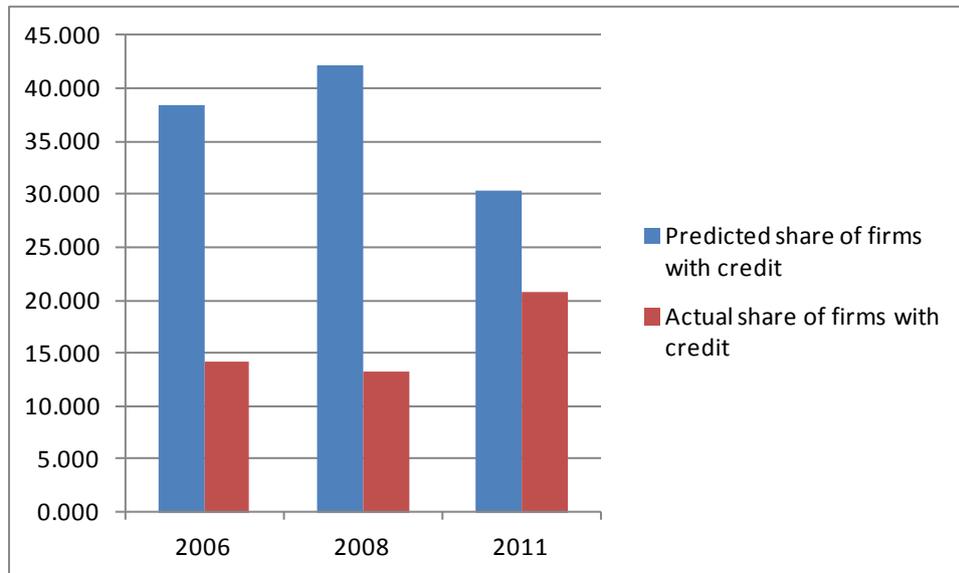
7.3. Gauging Egypt's financial system with micro-data

While aggregate data and following the benchmarking model described above paint a favorable picture of Egypt's financial system, with actual levels well above predicted levels, micro-level indicators paint a different picture. Figure 15 shows that the share of firms with a credit from a formal institution has been consistently below the predicted level across three survey waves (2006, 2008 and 2011).¹⁸ In addition, Figure 16 shows a positive, though non-linear relationship between the level of Bank Credit to GDP and the share of enterprises that

¹⁸ While the gap seemingly closes in 2011, this last survey has to be treated with caution as it relies on a smaller sample than the two previous surveys.

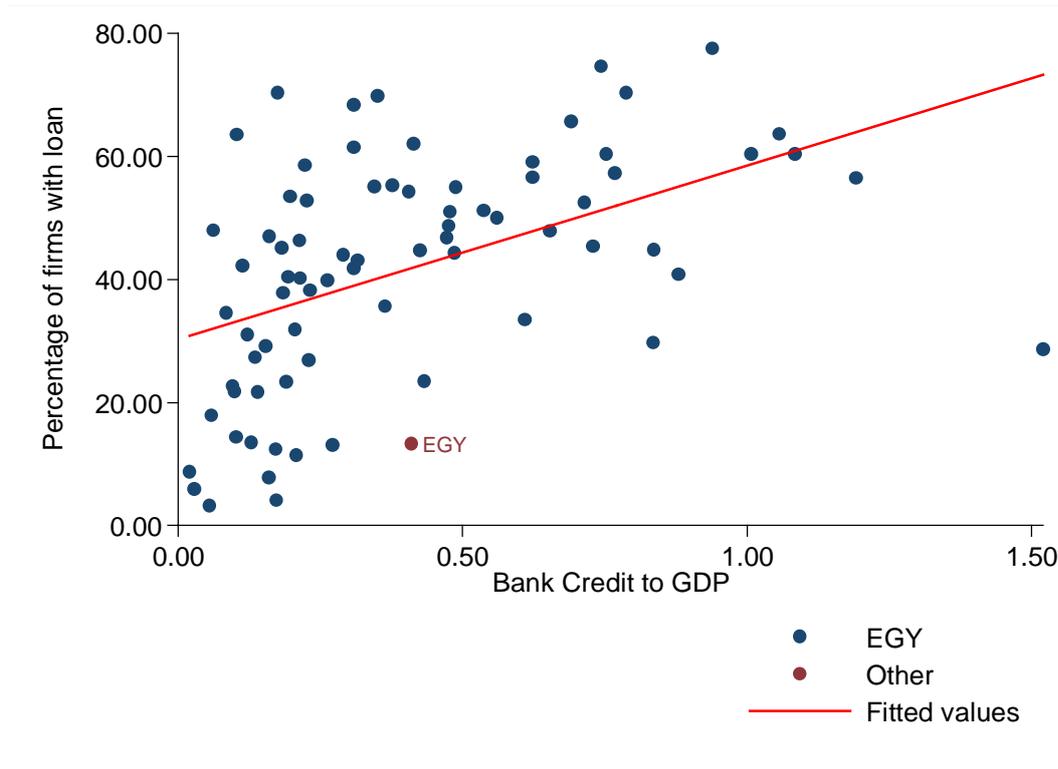
use credit, with Egypt being a significant outlier. Specifically, corresponding to its level of Bank Credit to GDP, more than twice as many enterprises should have access to bank credit, as for example in Cape Verde, which has a similar level of Bank Credit to GDP (42.5%).

Figure 15: Actual and predicted share of firms with credit in Egypt



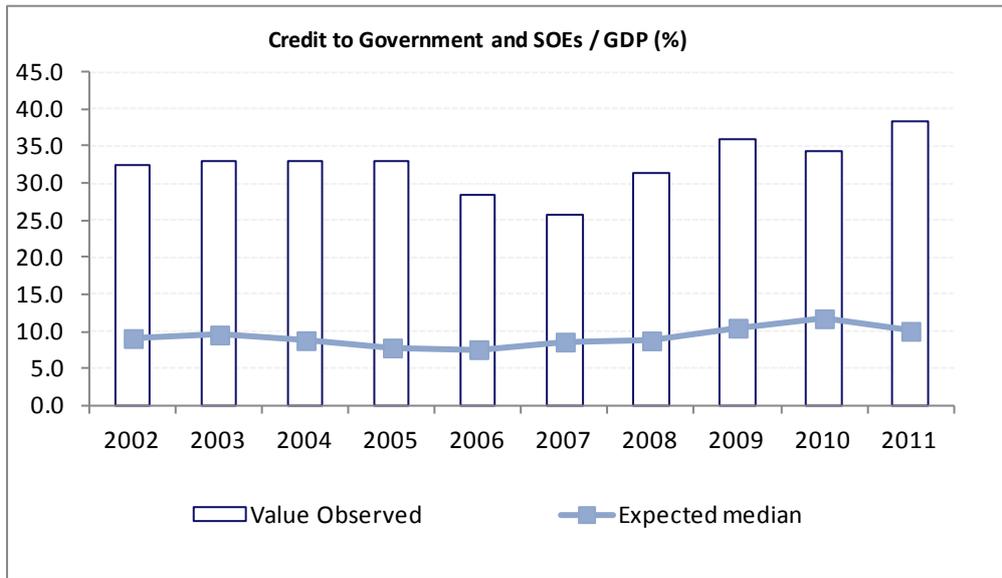
Source: Global Financial Development Indicators, own calculations

Figure 16: Cross-country variation in aggregate credit and share of firms with credit



Source: Global Financial Development Indicators, own calculations

There are several reasons to explain this discrepancy between aggregate and micro-data. One reason for Egypt being such a big outlier lies in the banking sector focusing historically on mostly connected lending, based on names or connections, with the large majority of enterprises being excluded from the formal banking sector and thus puts in perspective the high value of Private Credit to GDP documented above. This is also confirmed by considering the share of lending that goes to governments and state-owned enterprises, which is substantially above its predicted value (Figure 17).

Figure 17: Credit to Government and SOEs in Egypt over time

Source: Global Financial Development Indicators, own calculations

The example of Egypt shows the importance of considering an array of different data sources to gauge the efficiency and depth of financial systems. Benchmarking based purely on aggregate data can be mis-leading if not accompanied by more detailed analysis with micro-level data.

8. Conclusions

This paper discusses the concept of the possibility frontier as assessment tool for financial sector development across countries. The financial possibility frontier indicates the constrained optimum of depth, outreach or breadth of a country's financial system given certain state variables that cannot be changed in the short term. We show how the benchmarking exercise can be used to operationalize the frontier concept on the aggregate level. We also discuss three examples of how to apply the frontier concept in analytical work. These three examples are intended to give a flavor of the possibilities that the frontier concept

offers when combined with different data sources. The main conclusions from these three examples are that only a combination of different data sources – aggregate, demand- and supply-side – can help to properly identify the frontier, the location of the financial system relative to the frontier, and the policy constraints that have to be overcome to either help move a financial system towards the frontier or prevent it from moving beyond to an unsustainable position.

We see this paper as a first attempt at combining the benchmarking exercise with the frontier concept and use it as diagnostic tool. The examples we offered were illustrative rather than conclusive. Future applications could try to derive a frontier for a specific market segment across countries using a combination of different data sources or try to derive a frontier for a specific country across different segments using cross-country and country-specific data and information.

References

- Aghion, Philippe, Peter Howitt, and David Mayer-Foulkes. 2005. “The Effect of Financial Development on Convergence: Theory and Evidence.” *Quarterly Journal of Economics* 120, 173–222.
- Aghion, Philippe, Philippe Bacchetta, Romain Rancière, and Kenneth Rogoff. 2009. “Exchange Rate Volatility and Productivity Growth: The Role of Financial Development.” *Journal of Monetary Economics* 56, 494–513.
- Allen, Franklin, Thorsten Beck, Wolf Wagner, Philip Lane, Dirk Schoenmaker, and Elena Carletti (2011), .Cross-Border Banking in Europe: Implications for Financial Stability and Macroeconomic Policies., CEPR Policy Report.
- Arcand, Jean Louis, Enrico Berkes, and Ugo Panizza. 2012 “Too Much Finance?” IMF Working Paper 12/161.
- Barajas, Adolfo, Thorsten Beck, Era Dabla-Norris, and Seyed Reza Yousefi. 2013. “Too Cold, Too Hot, Or Just Right? Assessing Financial Sector Development Across the Globe.” IMF Working Paper 13/81
- Beck, Thorsten, 2013. Finance, Growth and Fragility: The Role of Government, Maxwell Fry Lecture on Global Finance, CEPR Discussion Paper.
- Beck, Thorsten, Berrak Büyükkarabacak, Felix K. Rioja, and Neven T. Valev. 2012 “Who Gets the Credit? And Does it Matter? Household vs. Firm Lending across Countries.” *B.E. Journal of Macroeconomics: Contributions* 12
- Beck, Thorsten, Tao Chen, Chen Lin and Frank Song. 2012 “Financial Innovation: The Bright and the Dark Sides.” HKIMR Working Paper 05/2012.
- Beck, Thorsten and Robert Cull. 2014. Banking in Africa. In: Berger, Allen, John Wilson and Philip Molyneux (Eds.): Oxford Handbook of Banking, 2nd edition.
- Beck, Thorsten, Olivier De Jonghe, and Glenn Schepens, 2013, Bank competition and stability: Cross-country heterogeneity, *Journal of Financial Intermediation* 22, 218-244.
- Beck, Thorsten and Augusto de la Torre. 2007. The Basic Analytics of Access to Financial Service. *Financial Markets, Institution and Instruments* 17, 79-117.

- Beck, Thorsten, Erik H. B. Feyen, Alain Ize, and Florencia Moizeszowicz. 2008. "Benchmarking Financial Development." Policy Research Working Paper 4638, World Bank, Washington, DC.
- Berglöf, E, Korniyenko, Y, Plekhanov, A and Zettelmeyer J (2009), 'Understanding the Crisis in Emerging Europe', EBRD Working Paper 109.
- Boyd, John H., Ross E. Levine, and Bruce D. Smith. 2001. "The Impact of Inflation on Financial Sector Performance." *Journal of Monetary Economics* 47 (2): 221–48.
- Brown, Martin, 2013. The Transmission of Banking Crises to Households: Lessons from the 2008–2011 Crises in the ECA Region. Policy Research Working Paper Series 6528, The World Bank.
- Brown, Martin, Tullio Jappelli, and Marco Pagano, 2009, Information sharing and credit: Firm-level evidence from transition countries, *Journal of Financial Intermediation* 18, 151-172.
- Buncic, Daniel and Martin Melecky 2013. "Equilibrium credit : the reference point for macroprudential supervisors," Policy Research Working Paper Series 6358, The World Bank.
- Collins, Daryl, Jonathan Morduch, Stuart Rutherford, and Orlanda Ruthven. 2009. *Portfolios of the Poor: How the World's Poor Live on \$2 a Day*. Princeton, NJ: Princeton University Press.
- De la Torre, A. and A. Ize. 2010. "Regulatory Reform: Integrating Paradigms", *International Finance* 13, 109-39.
- De la Torre, A. and A. Ize. 2011. "Containing Systemic Risk: Paradigm-Based Perspectives on Regulatory Reform" *Economia* 11, 25-64
- De la Torre, Augusto, Erik Feyen, and Alain Ize. 2013. Financial Development: Structure and Dynamics, *World Bank Economic Review*, forthcoming.
- De la Torre, Augusto, Maria Soledad Martinez Peria, and Sergio Schmukler, 2010. Bank Involvement with SMEs: Beyond Relationship Lending. *Journal of Banking and Finance* 34, 2280-93.

Demirgüç-Kunt, Asli, and Enrica Detragiache. 2005. "Cross-Country Empirical Studies of Systemic Banking Distress: A Survey." *National Institute Economic Review* 192, 68–83

Demirgüç-Kunt, Asli and Leora Klapper. 2012. "Measuring Financial Inclusion: The Global Financial Inclusion Index," Washington, DC: World Bank.

<http://siteresources.worldbank.org/DEC/Resources/FinInclusionBrochureFINALWEB.pdf>.

Demirgüç-Kunt, A., Levine, R., 2001. Bank-based and market-based financial systems: a cross-country comparison. In: Demirgüç-Kunt, A., Levine, R. (Eds.), *Financial Structure and Economic Growth: Cross-Country Comparisons of Banks, Markets, and Development*. MIT Press, Cambridge, MA

Djankov, Simeon, Caralee McLiesh, and Andrei Shleifer. 2007. "Private Credit in 129 Countries." *Journal of Financial Economics* 84, 299–329.

Fry, Maxwell. 1988. *Money, Interest, and Banking in Economic Development*. Baltimore, Md.: Johns Hopkins University Press.

Giannetti, Mariassunta and Steven Ongena. 2009. Financial Integration and Entrepreneurial Activity: Evidence from Foreign Bank Entry in Emerging Markets. *Review of Finance*

Han, Rui and Martin Melecky 2013. "Financial inclusion for financial stability: access to bank deposits and the growth of deposits in the Global Financial Crisis," Policy Research Working Paper Series 6577, The World Bank.

Hausmann, Ricardo; Rodrik, Dani ; Velasco, Andrés 2005. "Growth Diagnostics". In: *The Washington Consensus Reconsidered: Towards a New Global Governance*. Oxford, UK: Oxford University Press, 324-355.

International Monetary Fund. 2012. *Enhancing Financial Sector Surveillance in Low-Income Countries—Financial Deepening and Macro-Stability*. Washington, D.C

La Porta, Rafael, Florencio Lopez-de-Silanes, and Andrei Shleifer. 2002 "Government Ownership of Commercial Banks." *Journal of Finance* 57, 265–301.

Levine, Ross. 2005. "Finance and Growth: Theory and Evidence." In *Handbook of Economic Growth*, ed. Philippe Aghion and Steven N. Durlauf, 865–934. Amsterdam: Elsevier.

Malmendier, Ulrike. 2009. "Law and Finance 'at the Origin.'" *Journal of Economic Literature* 47, 1076–1108.

Merton, Robert C., and Zvi Bodie. "The Design of Financial Systems: Towards a Synthesis of Function and Structure." *Journal of Investment Management* 3, no. 1 (First Quarter 2005): 1-23.

Mihaljek, Dubravko (2009): The Spread of the Financial Crisis to Central and Eastern Europe: Evidence from the BIS Data.

Sirtaine, S and Skamnelos, I (2007), 'Credit Growth in Emerging Europe: A Cause for Stability Concerns?' World Bank Policy Research Working Paper 4281.