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Does Financial Liberalisation Improve Access to Investment Finance in Developing Countries?

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Abstract

This paper considers the effect of financial liberalisation on access to investment finance using firm level data covering 57 developing and transition countries. An index is presented which measures financial market liberalisation along the following policy dimensions: directed lending, credit controls and reserve requirements, state control of banking, openness of international financial flows, banking market entry, prudential regulation and supervision, and securities market development. Categorising firms as financially constrained across four measures, the results indicate that financial liberalisation reduces the probability of being credit constrained, with the effect strongest for young, domestic private small and medium sized enterprises. Increases in the degree of liberalisation, decrease the probability of being constrained by between 5 and 20 percent depending on the constraint definition. However, for Sub-Saharan Africa, the results indicate that financial liberalisation actually increases financing constraints for firms. This may help explain the stylised fact that despite a commitment to financial reform, the predicted growth benefits have not been realised in this region.

Keywords: Financial liberalisation, access to credit, firm level investment

JEL classification: G00, F32, G32

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1   Introduction

In recent decades, there has been a particular focus in developing countries on achieving financial development through liberalising capital markets. This process is supported and promoted by research highlighting the causal role of finance in delivering economic growth (King and Levine, 1993; Levine, 1997, 2005; Levine et al., 2000). The core theme in this literature posits that financial liberalisation (FL) leads to financial development which in turn gives rise to economic growth. One channel through which financial reform is beneficial is through improved access to finance, leading to higher and more efficient investment. By facilitating better credit access, FL allows constrained firms to obtain vital funds with which capital investment plans can be undertaken (Haramillo et al., 1996; Gelos and Werner, 2002; Love, 2003; Galindo et al., 2007; Beck et al., 2004).

This paper builds on the existing literature by evaluating the effect of FL on access to finance in developing countries. An index of FL is estimated using the World Bank financial regulation and supervision database complied by Barth et al. (2008).[1] The index is then mapped to firm level data from the World Bank Enterprise Surveys (WBES). The final sample covers more than 29,000 firms across 57 developing and transition economies. Importantly, the new index improves the coverage across Sub-Saharan Africa (SSA) with 23 countries included. Access to finance is measured by defining four groups of credit constrained firms: "General Constrained", "New Entrants", "Active Investors" and "Deterred Investors". The categories are developed using direct survey questions on loan applications denied, the use of internal funds and informal finance to cover investment expenditure, the presence of existing credit lines and the reasons for not making loan applications. The analysis also focuses on the differential effect of liberalisation on constraints by firm size, age, ownership and legal status as well as focusing on the effect in SSA.

The specific contribution of the paper is as follows: First, using data from the WBES, an extensive dataset is collated covering 29,000 firms across 57 developing and transition economies including 23 economies in SSA. This improves the country coverage as compared to existing research (Haramillo et al., 1996; Barajas et al., 2000; Gelos and Werner, 2002; Koo and Shin, 2004; Koo and Maeng, 2005; Abiad et al., 2008; Galindo et al., 2007). Second,

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[1] It closely mirrors the index presented by Abiad et al. (2010) which is the most extensive database of financial reform information available at present.

with a view to both capturing the multifaceted nature of FL as well as maximising the country coverage, a FL index is developed using data on financial market structure and financial regulation from Barth et al. (2008). The index covers, in as much depth as possible, the financial reform dimensions outlined in Abiad et al. (2010). Using a broad based index improves upon the work that evaluates liberalisation using a single or limited number of policy dimensions. Thirdly, following Byiers et al. (2010), Rand (2007) and Hansen and Rand (2011), four different measures of credit constraints are developed. They use the responses to survey questions on the use of internal funds or formal finance for investment, loan applications denied, the reasons for not making a loan application and whether or not the firm currently has loan finance or a line of credit from a financial institution. Our indicators move away from existing studies which identify credit constraints using investment-cash flow sensitivities or perception measures of finance as an obstacle to growth (Haramillo et al., 1996; Barajas et al., 2000; Gelos and Werner, 2002; Koo and Shin, 2004; Koo and Maeng, 2005; Beck et al., 2004; Clarke et al., 2006). The estimation strategy uses an instrumental variables probit model with legal origin dummies as instruments.

For the whole sample, the results indicate that FL reduces the probability of being credit constrained across all four constraint definitions. The estimated coefficients on FL are negative and statistically significant using both standard probit and IV probit techniques. These results show that improvements in the overall level of capital market liberalisation do improve the real position of firms by bettering their access to credit facilities.

To understand the magnitude of the effects, we estimate probit marginal effects to capture the impact on the probability of being credit constrained of a one unit increase in the liberalisation index. For firms classified as "General Constrained" (applied for and were denied finance or did not apply due to capital market imperfections), an increase in FL decreases the probability of being constrained by 19 percent. For firms classified as "New Entrants" (constrained as per "General Constrained" but also did not have formal financial services), FL decreases the probability of being constrained by circa 18 percent. For "Active Investors" (constrained as per "General Constrained" but undertook some investment financed using internal funds or informal finance), the reduction in constraints due to FL is less at 4 percent. As these firms managed to finance some investment, it is no surprise that the reduction is more muted. For the final group "Deterred Investors" (constrained as in "General Constrained"

but did not undertake any investment), an increase in FL decreases the probability of being constrained by 8.7 percent.

From a policy perspective, understanding the magnitude of these changes is difficult due to the nature of the index.[2] A stylised example may provide some clarification. If we consider firms classified as "General Constrained", a one unit increase in the index reduces constraints by 19 percent. If a country with a low index score of 2.5 (such as Ivory Coast or Guinea Bissau) were to introduce financial reform measures to boost the index by 5 units (to the level of Hungary or Lithuania), this would reduce the probability of being constrained by nearly 95 percent.

We test the distributional impacts of FL by interacting the index with the following firm characteristics: size, age, ownership and whether or not it is publicly listed. The reduction in constraints from FL is greatest for young, private domestic small and medium sized enterprises. The reduction is less for foreign and publicly listed firms. That SME financing constraints are more sensitive to financing liberalisation is important from a development perspective. International research points to the most constrained firms being SMEs (Beck et al., 2006). Most foreign firms and domestic publicly listed firms have ample access to international and national financing sources. If SMEs are the beneficiaries of FL, this is a positive story for the ability of finance to facilitate growth through the investment channel.

While the results are suggestive of an improvement in access to credit being associated with higher levels of FL, focusing on SSA, there is evidence that the benefits of FL do not materialise at all. The findings indicate firms in SSA are more constrained than those in other regions and constraints appear to increase with FL for all categories except "Active Investors". Recent research by Andersen et al. (2012) highlights the fact that African economies have been reformist in liberalising credit markets but have lagged in terms of growth performance, especially in comparison with the Asian countries. That liberalisation has not delivered improved access to finance may go some way to explaining the disconnect between the pro-reform policies and the poor growth performance.

The remainder of the paper is structured as follows: section 2 presents a brief review of existing research. Section 3 outlines the measures of credit constraints, FL and the data used. Section 4 outlines the empirical model and econometric issues. Section 5 presents the results

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[2]The index runs from 1 (complete financial repression) to 11 (completely liberalised).

and section 6 concludes.

2 Background and motivation

While the literature in this area is voluminous, there are a number of reasons why further research can provide new insight. The main issues relate to the country coverage, measurement of FL and measurement of financing constraints. Firstly, a number of studies (Haramillo et al., 1996; Koo and Shin, 2004; Koo and Maeng, 2005; Barajas et al., 2000; Gelos and Werner, 2002) are based on one country's experience of FL. This is beneficial as it draws on rich case study experience. It does not, however, produce the cross-country evidence required to make conclusions about the global effect on firms of capital market liberalisation. Further studies exploit cross country variation (Abiad et al., 2008; Galindo et al., 2007) in FL. However, these are still limited to a small number of successful developing countries and do not include many of the poorest LDCs or any African economies. Clarke et al. (2006) and Beck et al. (2004) do consider a more extensive set of countries but their focus is not on FL in general. Instead, they concentrate on more specific elements of banking market structure (bank concentration and foreign bank participation, respectively). Their samples are also limited in the coverage of many of the least developed countries, in particular nations in SSA.

The second contribution relates to the definition and measurement of FL. Financial reform is multifaceted and covers a range of issues from capital controls, to banking market structure, financial regulation and investment legislation. Many studies to date focus on specific areas of financial market policy. Haramillo et al. (1996) and Gelos and Werner (2002) determine the effect of FL by assessing a structural break pre and post liberalisation (usually relating to a specific aspect of financial market reform such as interest rate controls as in Haramillo et al., 1996). More comprehensive data measuring FL across seven policy dimensions are developed by Abiad and Mody (2005) and Abiad et al. (2010). Despite the availability of these data, they have not been used to link financial reform to access to finance in developing countries.

The final contribution relates to the measurement of financing constraints. Existing studies either model and define credit constraints by measuring the sensitivity of investment to internal funds within the context of the neoclassical investment Euler equation or the Q model of finance (Haramillo et al., 1996; Koo and Shin, 2004; Koo and Maeng, 2005; Barajas et al., 2000; Gelos and Werner, 2002) or use survey data on the firms' view of finance as an obstacle

to growth and development (Clarke et al., 2006; Beck et al., 2004). Both of these methodologies have their limitations. The sensitivity of investment to internal funds has been criticised as an identification strategy (Kaplan and Zingales, 1997) while a further difficulty arises due to the requirement in the neoclassical models to parameterise the unobservable shadow cost of capital (Whited and Wu, 2006). Moreover, measuring access to finance using a categorical variable from survey data may be subject to perception bias.[3]

In addition to the specific reasons to reconsider the FL debate, work by Andersen and Tarp (2003) and more recent evidence by Andersen et al. (2012), asks fundamental questions about the finance-growth thesis and suggests the literature promoting FL as a cornerstone of economic development policy is questionable. They argue that, while finance no doubt plays some role in economic growth, recent moves towards FL have not delivered either development of domestic financial systems or improved economic outcomes. Pointing to SSA and other developing countries, they highlight the extensive financial reforms undertaken and point to the lack of improvements in economic outcomes following reform. Additionally, Andersen et al. (2012) point to the fact that East Asia and the Pacific, the fastest growing region during the last two decades, has recorded the lowest level of financial reform as measured by Abiad et al. (2010). The importance of investment in the East Asian success story would also question the requirement of FL for increased capital formation. The lack of improvement in economic outcomes despite reform is SSA is also noted by Reinhart and Tokatlidis (2003). However, while focusing on whether financial reform has led to financial deepening and in turn economic outcomes, Andersen et al. (2012) do not isolate and focus on all the potential channels through which FL can drive economic outcomes. In particular, they do not evaluate the role of FL in improving firms' access to investment finance.

3   Variable measurement and data

Assessing the effect of liberalisation on access to finance requires a combination of country level estimates of financial reform and firm level estimates of credit constraints. In this paper a number of sources are combined. The firm level data to measure access to finance are taken from the WBES while the data measuring FL are extracted from the World Bank survey of

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[3]See the discussion in Reinikka and Svensson (2006) regarding micro studies based on subjective questions in survey data.

financial regulation and supervision (Barth et al., 2008). This section describes the measures of credit constraints, FL and provides some summary statistics covering the main variables of interest.

3.1 Measuring access to finance

In section 1, some of the limitations of traditional methodologies for identifying credit constraints using balance sheet data are discussed. Recently, the availability of survey data containing questions on access to formal finance has facilitated the estimation of direct measures of credit constraints for firms in developing countries. This paper follows this tradition. Drawing on Byiers et al. (2010) and Hansen and Rand (2011), we use firm level data from the WBES to estimate four binary indicators of whether a firm faces credit constraints. Byiers et al. (2010) and Bigsten et al. (2003) focus on identifying only firms who are constrained due to failures/imperfections in capital markets as opposed to firms whose investments do not have a positive net present value at the economy wide market cost of capital. This definition is carried forward into the development of constraint indicators in this paper.

To identify credit constrained firms, we draw on a number of different questions from the WBES concerning access to financial markets. The first question to identify relative constrainedness is whether or not the firms applied for and were denied loan facilities. This is a very direct measure of excess demand for credit i.e. the firms that attempted to access credit facilities but were unsuccessful. The question does not capture the reason for the refusal. Some of the applying firms may have had poor quality investment proposals and so in identifying these firms as credit constrained, we implicitly assume that the typical entrepreneurs' application had an internal rate of return at least equal to the market cost of capital. This question is used in Byiers et al. (2010) and Hansen and Rand (2011).

The second question asks firms who did not apply for loans, the reason they did not do so. Firms are classified as constrained if they state one of the following reasons for not applying: i) the size of loan and maturity are insufficient, ii) application procedures for loans or line of credit are too complex, or iii) collateral requirements for loans or line of credit are unattainable. In line with Hansen and Rand (2011), we do not classify firms as constrained if they answered that the interest rate offer was prohibitive or they did not think they would be successful. The third question asks whether or not the firm has access to a formal line of

credit (either a loan facility of a line of credit to smooth working capital). Finally, information on the financing of investment is included. Firms are asked whether or not they purchased fixed assets and if so, how did they structure their investment finance. This research focuses on the percentage of capital expenditure financed from internal funds or informal sources (moneylenders, family, friends etc). Both informal finance or internal funds may be either a substitute or complement to external finance (from either banks, equity markets or other financial providers), however, an overreliance on the firms' own resources or informal sources to fund investment is a well established indicator of credit constraints (See Chirinko (1993) and Hubbard and Kashyap (1992) for discussion), despite the aforementioned Kaplan-Zingales critique. Internal or informal finance carry a differential cost of capital to external formal credit. As this may have implications for the efficient allocation of capital, it is of interest to this research question.[4]

Table 1: Measures of credit constraints

	Constraint Definitions			
Indicator	General Constrained	New Entrants	Active Investors	Deterred Investors
	(C1)	(C2)	(C3)	(C4)
Applied and denied credit1	√	√	√	√
No loan application	√	√	√	√
No formal finance		√		
Invested using internal funds or informal sources			√	
No investment				√

Note: 1 >50% of loans denied.

Source: Author's calculations.

To capture the heterogeneous nature of firms' interactions with capital markets and the non-uniform impact of FL on the population of firms in the economy, we develop four categories of credit constrained firms using combinations of the aforementioned questions. The

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[4]The frequently used measure in this literature is a catergorical variable where firms are asked to rank access to finance as a relative obstacle to the firms' growth and development. The ranking scale runs from 0 (no constraint) to 4 (severe constraint). This measure has been used as the main dependent variable in research into access to finance (Clarke et al., 2006; Beck et al., 2004). There are drawbacks to using this variable as it is influenced by the managers perception of credit access. For example, a firm may view the credit conditions in the economy as restrictive to its growth prospects, however, when offered finance at the market opportunity cost, their investments may no longer be viable. Due to these considerations, we do not use this indicator in our main analysis.

categories are: "General Constrained", "New Entrants", "Active investors" and "Deterred Investors". Their links to the questions in the WBES survey are presented in table 1. Credit constraint one (C1), "General Constrained" takes the value of one if the firm applied for loan finance but was rejected or did not apply for loans due to capital market imperfections and is similar to constraint one in Hansen and Rand (2011). This constraint is used as a base case in this analysis.

Having identified firms facing a general constraint in access financing markets, three further categories tighten this definition by using additional criteria. As financial markets are liberalised, one of the expected benefits is a widening of the use of formal financial services. In a development context, this equates to new firms using formal finance for the first time. For constraint two (C2), "New Entrants", firms are classified as constrained using C1 but then reclassified as unconstrained if they currently have access to formal banking services (a loan or line of credit from a financial institution). This categorisation identifies firms who do not have formal finance, but attempted to apply for lending facilities or are put off by the current market structure. If FL facilitates financial widening, it is expected that these firms should also be beneficiaries.

The third constraint (C3) uses C1 as a base, but for this category, we identify those firms who are constrained but went ahead and undertook investment financed using either internal funds or finance from informal sources (moneylenders, friends or relatives). We classify this category as "Active Investors". These firms are actively investing using internal funds or informal credit which indicates that they have positive net present value investment opportunities and are willing to commit to these in the current economic environment. As internal funds are limited and informal sources can be unreliable and attract an above market cost of capital, both can be seen as imperfect substitutes for formal external finance. These firms may have undertaken additional investment, paid a lower cost of capital on committed capital expenditure, or freed internal funds for use in operational activities if formal external finance had been made available.

The final constraint (C4) classifies firms as "Deterred Investors". These firms are identified as constrained using C1 but re-classified as unconstrained if they did not invest. This group represents firms who have foregone investment opportunities due to the capital market imperfections they faced when seeking credit lines. Following a period of FL, if financial

8

development occurs, we would expect this group to benefit as, in the post-reform environment, credit should be available to facilitate investing in positive net present value investment opportunities.

Identifying four categories of credit constrained firms should cater for the heterogeneous nature of firms' interaction with financial markets and both intra-country variation in the degree of credit constraints. It should also provide a platform to adequately assess the multifaceted and multidimensional aspects of financial reform and how it affects businesses on the ground.

3.2 Financial liberalisation in developing countries

The main challenge facing researchers working in the area of FL and capital market reform has been the absence of a comparable cross-country database that captures the multifaceted nature and complex policy dimensions of financial liberlisation. Recent work by Abiad et al. (2010) addresses this issue and presents a comprehensive database covering 91 advanced, transition and developing economies over the period 1973-2005. Building on the work of Abiad and Mody (2005), the database presents an index of FL built around seven aspects of financial policy: credit controls and reserve requirements, interest rate controls, entry barriers, state ownership of the banking sector, financial account restrictions, prudential regulations and supervision and securities market policies. Various sub-indicators are used to collate liberalisation scores in each of these areas and combined into an overall score. The overall index is increasing in the degree of liberalisation i.e. the larger the value, the greater the degree of liberalisation.

While the database provides a very valuable resource for researchers, from a development perspective, it does not contain information for many developing economies. This is especially the case for African countries, many of whom have undertaken considerable measures towards liberalising capital markets but continue to under-perform in growth terms. The database covers 14 countries in SSA but linking these estimates to firm level micro data which provide estimates of credit constraints provides further challenges. Matching these financial reform estimates with firm level data from the WBES survey rounds for developing countries provides only coverage for 36 countries, 9 of whom are from SSA. This is a limitation for empirical research on this topic as using data on only 9 countries in SSA masks considerable cross-

country variation in the region and potentially raises issues of sample selection.

To increase the coverage of estimates of financial reform for developing economies as well as attempting to maximise the number of countries for which matched reform and firm level data are available, this paper develops an additional cross-country measure of FL. This is complementary to that of Abiad et al. (2010) and uses data from the World Bank financial regulation and supervision database collected and compiled by Barth et al. (2008). The data are available from three rounds of the survey in 2001, 2003 and 2007 and cover various aspects of financial sector policy such as banking sector entry requirements, bank activities, supervision and regulatory issues as well as bank ownership, capital and liquidity data. The building blocks for the index presented in this paper are the seven financial reform dimensions used by Abiad et al. (2010), however, data are not available for all. Our index covers the following issues: credit controls, directed lending and excessive reserve requirements, barriers to entry, restrictions on international financial flows, state control of financial institutions, prudential regulatory and supervisory policy and securities market policies. The index ranges from 0 in a completely repressed system to 11 in a fully liberalised financial market. The Barth et al. (2008) database does not contain data on interest rate controls so this dimension is not covered. While the index is not as rich in coverage of the policy dimensions of financial reform as Abiad et al. (2010), the goal is to extend the number of developing countries included. Full details of the specific variables included in the index are presented in Annex 6. The lack of data on interest rate controls is a disadvantage of our measure as this is one of the issues that has been highlighted from early on in the financial reform literature (McKinnon, 1973; Shaw, 1973). However, given the wide range of policy issues across the other dimensions as well as the improved country coverage, we believe the construction and use of this index provides an important tool for answering the research question under consideration.

3.3 Sample and summary statistics

Combining the WBES firm level data and the index of FL leaves a cross sectional dataset of over 29,500 firms across 57 countries. We include data from the 2005 to 2009 years of the survey and map these to the 2007 database on financial regulation and supervision. We exclude 2010 data due to the potential changes in financial reform that were undertaken following the international financial crisis and the changes to regulatory standards following

Table 2: Summary statistics for main variables

Variable	Obs	Mean	St. Dev,	Min	Max
C1: General Constraint	29,603	0.24	0.43	0	1
C2: New Entrants	29,603	0.21	0.40	0	1
C3: Active Investors	29,603	0.07	0.26	0	1
C4: Deterred Investors	29,603	0.14	0.35	0	1
Manufacturing and industry	29,587	0.65	0.36	0	1
Services	29,587	0.35	0.48	0	1
Direct trade	29,603	0.26	0.44	0	1
Age	29,603	17.02	15.93	1	310
Small	29,603	0.72	0.44	0	1
Medium	29,603	0.19	0.39	0	1
Foreign	29,603	0.09	0.29	0	1
Publically listed	29,603	0.05	0.22	0	1
FL index	29,603	5.08	1.45	1.5	8

Source: Author's calculations using WBES data.

the BASEL III accord. The coverage across countries is presented in table 11 in Annex 6. There are 23 countries from SSA. This is substantially more than the 9 countries from SSA if the Abiad et al. (2010) financial reform index is used and merged with the WBES firm data.

Table 2 presents summary statistics for the credit constraint measures, FL index and other firm and country level characteristics. Only private domestic and foreign firms are included in the sample with state firms removed. Given implicit or explicit state guarantees, these firms face soft budget constraints and are not the focus of our research interest. The majority of the firms in the sample are privately owned domestic companies (91 percent) with the remaining 9 percent foreign owned. On the distribution of firm size, 72 percent are small (less than 50 employees) and 19 percent are medium sized (between 50 and 250 employees). In total, 27 percent of firms are engaged in direct trade (either importing or exporting). In terms of a sectoral breakdown, 35 percent are active in the services sector with the remaining 65 percent engaged in manufacturing or industrial activity. Publicly listed firms make up 5 percent of the sample.

C1-C4 correspond to the estimates of credit constraints outlined in section 3.1. The main observation is that there is a large variance between the measures. Across the sample, 24 percent of firms are defined as constrained by C1 "General Constrained". C2 "New Entrants" classifies 21 percent of firms are constrained. This suggests that the majority of firms who are constrained using our general measure, C1, also do not have formal financial services. These

firms should be some of the biggest beneficiaries of FL if reform leads to a widening of the financial sector.

For C3 "Active Investors", the data show that 7 percent of constrained firms did undertake some investment and they financed this using either internal funds or informal sources of finance such as money lenders, friends or relatives. It is expected that this group may react less to FL as at least some of their investment demand has been satiated. Firms categorised as C4 "Deterred Investors" are an interesting and important group. These are the firms for which capital market imperfections have led to a foregoing of profitable investment opportunities and could potentially represent a large increase in potential investment following successful financial reform. In total, nearly 15 percent of firms are classified as constrained using this measure.

The summary statistics for the index of FL are also presented in table 2. As the index hypothetically runs from 0 in a completely repressive financial system to 11 in a fully open system, it can be seen that the sample average is just below the mid-point. There is a large variance with least financially liberalised countries (Niger and Burkina Faso) having a value of 1.5 while the most open score 8 (Nicaragua and Slovenia).[5]

Figure 1: Indices of FL by region
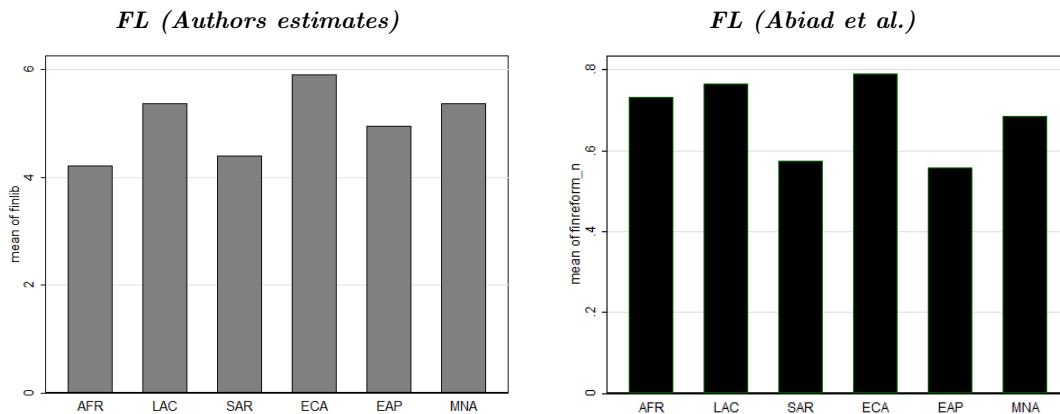
Source: Adiad et al. (2010) and author's estimates using Barth et al. (2008).

To provide a high level comparison and robustness check on our index of financial reform, figure 1 presents the regional average values for the FL measures from Abiad et al. (2010) as well as the estimates derived from the raw World Bank regulation and supervision data.[6]

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[5]See table 11 in Annex 6 for all countries and corresponding FL index value.

[6]The country coverage is the same for both indices and provides an indication of the degree of similarity.

The correlation coefficient between the two indices is 0.4. By both measures, Europe and Central Asia as well as Latin America and the Caribbean report the most liberalised financial markets. The lowest levels of liberalisation are recorded in South Asia as well as East Asia and the Pacific in the Abiad et al. (2010) index while SSA is lower by the measure presented in this analysis.

While an identical set of countries is used in these charts for comparison purposes, this does not represent the group of countries included in our estimation sample. This is due to the loss of data in the process of matching country level indicators with the firm level data. The average value per region for the FL index in the estimation sample is included in figure 2. The values in this regional comparison are skewed for South and East Asia as only 5 countries are available accoss these regions. Comparing SSA with Europe and Central Asia as well as Latin and Central America, it can be seen that liberalisation is not as progressed with scope for future reform.

Figure 2: Index of FL - final sample

FL by region (Author's estimates)
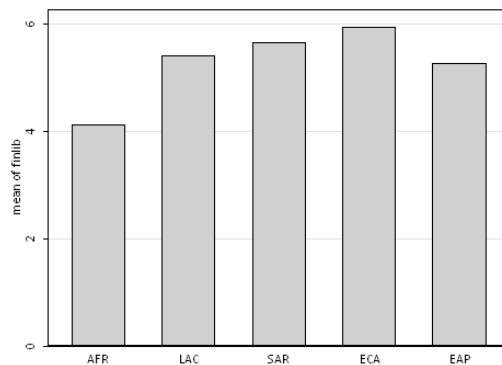
Source: Author's estimates using Barth et al. (2008).

Before undertaking a detailed econometric evaluation of the effect of financial reform on credit constraints, it is informative to consider some simple scatter plots of the liberalisation index and indicators of investment and financing arrangements for the countries in the sample. These are presented in figure 3.

The charts plot FL against the country average of investment, whether finance is an obstacle for firm expansion and the share of investment financed using internal funds and bank loans. For FL, the plots suggest a positive relationship with investment, a negative relation-

Figure 3: Scatter plots - FL and firm financing

FL - Investment

FL - Finance as obstacle

FL - Internal funds

FL - Bank finance
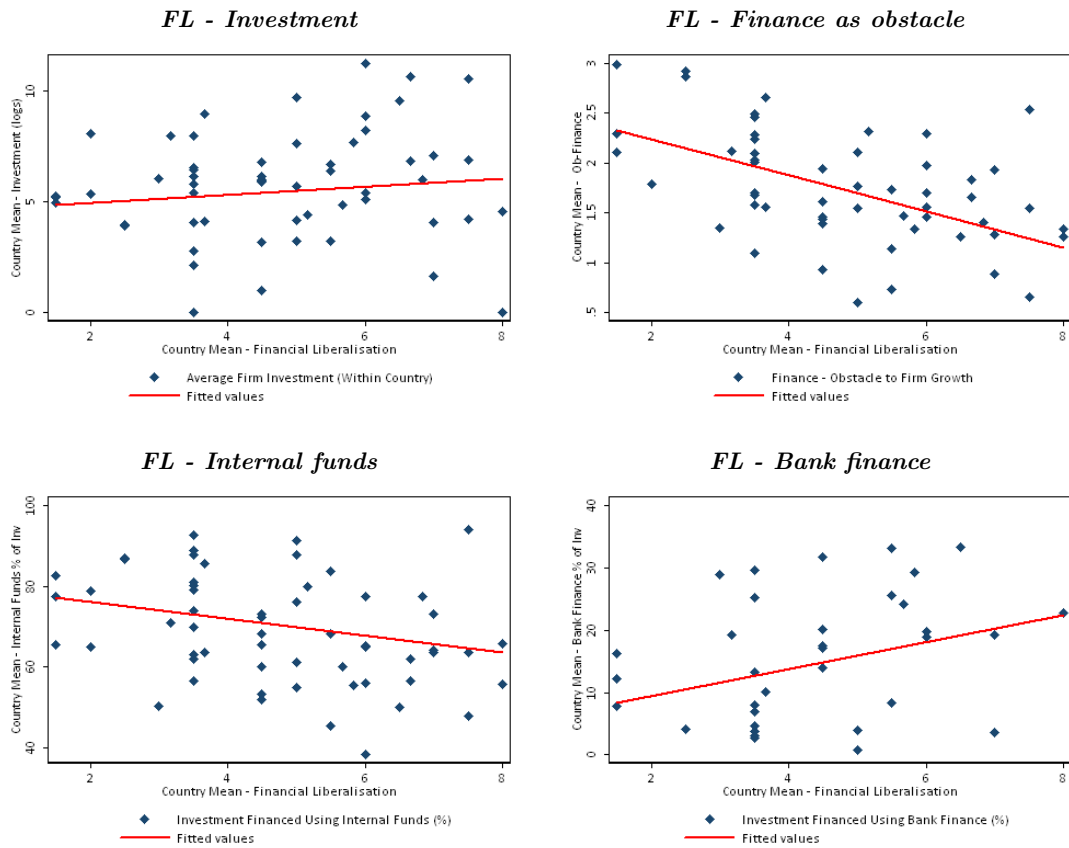
Source: Adiad et al. (2010) and author's estimates using Barth et al. (2008) data.

ship between firms' perceptions of finance as an obstacle for growth, a negative relationship with the share of investment financed using internal funds and a positive relationship with the share of investment financed using bank lending facilities. More liberalised financial systems are associated with higher levels of investment, lower use of internal funds and more bank financing as well as a lower perception among managers that finance is an obstacle to growth.

4 Empirical model and econometric methodology

To estimate the effect of FL on our binary indicators of credit constraints, a standard probit model is employed on the cross sectional data. The probability of being credit constrained is modelled as:

$$Pr\left[C(n)_{ij} = 1/\, FL_j, X_{ij}, Z_j\right] = \Phi\left(FL_j \beta_{FL} + X_{ij}\theta + Z_j\lambda\right) \tag{1}$$

where n = 1,...,4 represent the credit constraint categories. FL is the index level per country as defined above. The coefficient β_{FL} provides the test of the main hypothesis of this paper. If $\beta_{FL} < 0$ then credit constraints are reduced by FL, if $\beta_{FL} = 0$ there is no impact of FL on access to finance. An unlikely scenario is that FL actually increases credit constraints but this would be represented by $\beta_{FL} > 0$.

To capture other aspects of the operating environment that influence the level of credit constraints, firm level control variables are included in the vector X_{ij}. These include firm size, firm age and binary indicators for foreign ownership and whether or not the firm is publicly listed. An indicator is also included for whether the firm is a direct exporter or importer. The data used is cross sectional which prevents the use of a technique to explicitly remove firm level heterogeneity, such as random or fixed effects. Including these firm level controls should capture a considerable portion of the firm specific effect. Sector dummies are also included.

As our data contains both within-country and cross-country variation, we also include a number of country controls in the vector Z_j to capture heterogeneity in the level of credit constraints that is common across firms within a specific country and also captures cross-country differences in economic structures and economic activity. We include GDP growth to capture the overall investment opportunities in the economy and trade as a percentage of GDP to capture market opportunities, international linkages and openness. In addition, we include credit provided by the banking sector as a percent of GDP to capture the country level availability of finance. As our main indicator of FL varies by country, it is important that country specific differences are controlled for in as much depth as possible in a cross-sectional context. To aid this control process, an indicator of corruption perception from transparency international as well as the level of ethnic fractionalisation (Alesina et al., 2003) are included in regressions as controls. The former captures cross-country differences in institutional quality while ethnic fractionalisation controls for differences in the use of informal networks and other cultural factors. A heteroscedasticity robust estimator is employed and the errors are clustered at the country level. This allows correlation across the error terms of firms within a specific country and captures uncontrolled elements that are common across firms within a specific country. The model is estimated using maximum likelihood estimation.

While the level of FL is assumed to be a driver of credit availability at the country level, there is an argument that both FL and the overall level of credit availability are jointly determined. If this is the case, FL is endogenous. There are also scenarios in which very large firms have strong political linkages or where business lobby groups are powerful in which cases reverse causality is a possibility. Furthermore, there are potentially common factors which co-determine credit availability and financial reform which may lead to a spurious regression if not controlled for.

To allay these concerns as well as to establish a causal link, we employ an instrumental variables probit model to deal with potential endogeneity. This poses another challenge; finding a suitable instrument. The variable must be orthogonal to the error term in the main variable i.e. it must have no influence on credit availability except through FL, yet be highly correlated with the endogenous variable. Finding a variable with these characteristics can be difficult. In the literature, one instrument that is suggested is the legal origin of the country. Legal origin is used to instrument the effect of governance on financial development and financial outcomes by La Porta et al. (1997) and La Porta et al. (1998) and entry regulations on enterprise start ups by Djankov et al. (2002). The reasons for the exogeneity of legal origin to economic outcomes is articulated in La Porta et al. (2008). They argue that legal origin was imposed on colonies by occupying powers which in turn influenced and shaped the development of the legal structures and institutions of governance in the post-colonial independent states. This in turn shaped economic outcomes. Legal origin should therefore be exogenous to the current economic conditions including the credit environment except through its impact on the design and functioning of institutions and the inherited policy design. Given the precedent in the literature, we use legal origin as our instrument for FL. To test the robustness of legal origin, the probit model is estimated using the two-step procedure of Newey (1987) and the Almeya-Lee-Newey test of overidentifying restrictions is calculated.

5   Results

This section presents the results of the empirical analysis. We first test the effect of firm characteristics on the probability of begin credit constrained before introducing the FL index. Dummies for German and socialist legal origin are used in the IV probit regressions. When the country controls are included with the instrumental variables, a number of countries fall

out of the sample and the final number is reduced to 52. Following our investigation into the overall effect of FL on financing constraints, we explore the distributional impacts by interacting the index with firm characteristics.

One of the contributions of this paper is to extend the country coverage for developing economies, especially African countries. The sample contains 23 countries from SSA. To provide deeper insight into the effects of FL in SSA (SSA), the differential effect of FL on credit constraints in SSA is investigated in detail.

5.1 Firm level determinants of constraints

To begin, we test the determinants of the proposed credit constraints including firm controls. Beck et al. (2006) indicate the firm size, ownership, age and legal status are some of the most important indicators of whether or not a firm faces financing constraints. Firm size and ownership are noted as salient by Rand (2007). We therefore test our constraint categories using these determinants. The estimates using a standard probit model are presented in table 3.

Table 3: Firm level determinants of constraints - Probit estimates

C(n)	General Constrained	New Entrants	Active Investors	Deterred Investors
Direct trade	-0.234***	-0.362***	-0.110*	-0.321***
	(0.057)	(0.060)	(0.056)	(0.063)
Age	-0.121***	-0.144***	-0.121***	-0.071**
	(0.038)	(0.039)	(0.035)	(0.036)
Small	0.658***	0.781***	0.348**	0.797***
	(0.158)	(0.153)	(0.170)	(0.123)
Medium	0.130	0.179	0.058	0.199*
	(0.120)	(0.112)	(0.119)	(0.115)
Foreign	0.045	0.108	0.080	0.061
	(0.089)	(0.087)	(0.085)	(0.075)
Publicly listed	-0.291**	-0.278**	-0.352**	-0.263**
	(0.119)	(0.140)	(0.147)	(0.114)
n	29,587	29,587	29,587	29,587
Sector controls	Yes	Yes	Yes	Yes
Year controls	Yes	Yes	Yes	Yes

Notes: (1) * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

(2) All estimates are robust to heteroscedasticity and clustered at the country level.

Source: Author's calculations using estimation sample.

Across all of the constraint categories, we find that small size firms face greater difficulties

in accessing financing for investment. For small firms, the coefficient is positive and significant at the 1 percent level in all estimations while for medium size firms, the coefficient is positive and significant for "Deterred Investors". Across all categories, constraints decrease with firm age. This finding is in line with Beck et al. (2006). In the main, older firms have well developed relations with finance providers and/or greater internal resources available so can face lower credit constraints. In all cases, publicly listed firms face lower financing constraints relative to other legal structures. These firms usually have good access to domestic and international capital markets. Stock market listings also require a greater degree of information disclosure and transparency on business operations which helps reduce information asymmetries between borrowers and lenders, a major factor in the degree of financing constraints.

We find a negative relationship between firms who trade directly and financing constraints. This is in line with the literature which highlights the productivity advantages of trading firms (Bernard and Jensen, 1999, 2004). It posits that trading firms, exporters in particular, have higher productivity than non-exporters/traders, due to either international spillovers or competition induced efficiency. These firms may also have more profitable investment opportunities or at least are able to demonstrate to finance providers that they are worthy borrowers. There does not seem to be any difference between foreign and private domestic firms in the sample across all four constraint categories.

To test magnitude of the estimated effects, table 4 presents the probit marginal effects. Focusing on firms classified as "General Constrained", the marginal effects suggest that trading firms are 6 percent less likely to be financially constrained. Small firms are 17 percent more likely to face a financing constraint than large firms. Publicly listed firms are 7 percent less likely to face a financing constraint. An additional year in the age of the firm also reduces the probability of facing a financing constrained by 4 percent.[7] The magnitudes of the coefficients are similar for firms classified as "New Entrants" and "Deterred Investors" while the effects are lower for "Active Investors".

In summary, financing constraints are decreasing in firm size and age. This finding is in line with Rand (2007) and Byiers et al. (2010). Byiers et al. (2010) state that older firms are easier to monitor while small firms face higher credit constraints due to a higher risk of failure and greater opacity which increases monitoring and enforcement costs. Trading firms are less

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[7]Age values are included in log terms so the coefficient effect is exp(coef).

Table 4: Firm level determinants of constraints - Marginal effects

C(n)	General Constrained	New Entrants	Active Investors	Deterred Investors
Direct trade	-0.064***	-0.084***	-0.012**	-0.057***
	(0.017)	(0.016)	(0.006)	(0.013)
Age	-0.035***	-0.036***	-0.014***	-0.014**
	(0.010)	(0.009)	(0.004)	(0.006)
Small	0.165***	0.165***	0.035**	0.125***
	(0.030)	(0.025)	(0.014)	(0.017)
Medium	0.039	0.048	0.007	0.041
	(0.035)	(0.030)	(0.014)	(0.025)
Foreign	0.013	0.028	0.010	0.012
	(0.026)	(0.024)	(0.011)	(0.015)
Publicly listed	-0.074**	-0.062**	-0.031***	-0.044**
	(0.030)	(0.029)	(0.011)	(0.019)
n	29,587	29,587	29,587	29,587
Sector controls	Yes	Yes	Yes	Yes
Year controls	Yes	Yes	Yes	Yes

Notes: (1) * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

(2) All estimates are robust to heteroscedasticity and clustered at the country level.

Source: Author's calculations using estimation sample.

likely to face credit constraints as are publicly listed firms who potentially benefit from the increased transparency and information disclosure that comes with a stock market listing.

5.2 Financial liberalisation and access to finance

The analysis of the effect of FL on the financing constraints faced by firms in developing countries is now evaluated. The overall effect of FL on financial constraints is tested before providing greater insight by considering the differential effect of age, firm size, ownership and legal status on the effect of FL on constraints.

5.2.1 Overall effect

Table 5 presents the estimates of the standard probit model as well as the maximum likelihood IV probit including firm level and country controls with legal origin as instruments. The four categories of constraint measures are placed along the columns. Controls included are sectoral dummies, firm age, size and ownership controls as well as whether or not the firm either imports or exports directly. Country level economic controls are trade as a percent of GDP, credit provided by the banking sector as a percent of GDP, GDP growth. Controls for

Table 5: Probit/IV Probit model - FL and access to finance

Dep Var	General Constrained		New Entrants		Active Investors		Deterred Investors	
	(Probit)	(IV MLE)	(Probit)	(IV MLE)	(Probit)	(IV MLE)	(Probit)	(IV MLE)
FL index	-0.201***	-0.646***	-0.187**	-0.672***	-0.105	-0.384***	-0.174***	-0.445***
	(0.076)	(0.167)	(0.076)	(0.162)	(0.073)	(0.129)	(0.060)	(0.108)
Direct trade	-0.211***	-0.172**	-0.329***	-0.263***	-0.069	-0.059	-0.301***	-0.256***
	(0.059)	(0.070)	(0.063)	(0.076)	(0.055)	(0.062)	(0.057)	(0.052)
Age	-0.081***	-0.045	-0.093***	-0.049	-0.089***	-0.069**	-0.029	-0.017
	(0.024)	(0.041)	(0.024)	(0.042)	(0.027)	(0.032)	(0.022)	(0.028)
Small	0.472***	0.381***	0.583***	0.453***	0.154	0.132	0.664***	0.625***
	(0.066)	(0.098)	(0.076)	(0.112)	(0.110)	(0.110)	(0.066)	(0.085)
Medium	-0.003	-0.048	0.043	-0.017	-0.052	-0.079	0.087	0.072
	(0.062)	(0.071)	(0.055)	(0.064)	(0.082)	(0.085)	(0.069)	(0.075)
Foreign	-0.044	-0.152*	0.019	-0.110	0.010	-0.058	-0.003	-0.074
	(0.093)	(0.089)	(0.097)	(0.093)	(0.085)	(0.082)	(0.085)	(0.087)
Publicly listed	-0.175	-0.265**	-0.147	-0.249**	-0.276*	-0.340**	-0.127	-0.178
	(0.112)	(0.108)	(0.130)	(0.121)	(0.145)	(0.143)	(0.103)	(0.111)
Wald Test χ^2 (p-value)	-	0.030	-	0.031	-	0.016	-	0.018
OIR A-L-N χ^2 (p-value)	-	0.62	-	0.29	-	0.19	-	0.33
n	28,367	28,367	28,367	28,367	28,367	28,367	28,367	28,367
Sector controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: (1) * p<0.10, ** p<0.05, *** p<0.01.

(2) All estimates are robust to heteroscedasticity and clustered at the country level.

(3) Instrumental variables for IV probit are German and socialist legal origin dummies.

(4) Country controls include GDP growth, corruption, fractionalisation, credit to private sector and trade.

(5) OIR test: model estimated using Newey (1987) two step method to test for instrument validity.

Source: Author's calculations using estimation sample.

wider country level common influences, cultural aspects and institutional functioning are the transparency international corruption perception index and the level of ethnic fractionalisation.

With respect to econometric diagnostic tests, two important checks are reported: 1) the Wald test of the exogeneity of the FL index and 2) the validity of the instruments using over-identifying restrictions. The p-values for the Wald test reject the null of exogeneity at the 5 percent level in all regressions, supporting the use of an instrumental variables strategy. The over-identifying restrictions tests of instrument validity, estimated using the Newey (1987) two-step method, suggests the instrument matrix is orthogonal to the errors in the second stage in all regressions.

Table 6: Marginal effects - FL and access to finance

Dep Var	General Constrained		New Entrants		Active Investors		Deterred Investors	
	(Probit)	(IV Probit)	(Probit)	(IV Probit)	(Probit)	(IV Probit)	(Probit)	(IV Probit)
FL index	-0.055***	-0.195***	-0.043**	-0.186***	-0.011	-0.046**	-0.031***	-0.089***
	(0.020)	(0.067)	(0.017)	(0.067)	(0.007)	(0.020)	(0.010)	(0.033)
Direct trade	-0.055***	-0.050***	-0.070***	-0.069***	-0.007	-0.007	-0.048***	-0.047***
	(0.015)	(0.019)	(0.013)	(0.017)	(0.005)	(0.007)	(0.009)	(0.011)
Age	-0.022***	-0.014	-0.021***	-0.014	-0.009***	-0.008**	-0.005	-0.003
	(0.007)	(0.012)	(0.006)	(0.011)	(0.003)	(0.004)	(0.004)	(0.005)
Small	0.117***	0.108***	0.118***	0.114***	0.015	0.015	0.097***	0.106***
	(0.016)	(0.021)	(0.017)	(0.021)	(0.010)	(0.012)	(0.013)	(0.015)
Medium	-0.001	-0.014	0.010	-0.005	-0.005	-0.009	0.016	0.015
	(0.017)	(0.022)	(0.013)	(0.018)	(0.008)	(0.010)	(0.013)	(0.015)
Foreign	-0.012	-0.044*	0.004	-0.029	0.001	-0.007	-0.000	-0.014
	(0.024)	(0.025)	(0.023)	(0.025)	(0.009)	(0.009)	(0.015)	(0.016)
Publicly owned	-0.044	-0.073**	-0.032	-0.062*	-0.023**	-0.032**	-0.021	-0.032
	(0.027)	(0.033)	(0.026)	(0.034)	(0.010)	(0.013)	(0.016)	(0.022)
n	28,367	28,367	28,367	28,367	28,367	28,367	28,367	28,367
Sector controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: (1) * p<0.10, ** p<0.05, *** p<0.01.

(2) All estimates are robust to heteroscedasticity and clustered at the country level.

(3) Instrumental variables for IV probit are German and socialist legal origin dummies.

(4) Country controls include GDP growth, corruption, fractionalisation, credit to private sector and trade.

(5) OIR test: model estimated using Newey (1987) two step method to test for instrument validity.

Source: Author's calculations using estimation sample.

The co-efficient on FL is negative and significant across three of the measures of credit constraints using the standard probit model and all four of the measures using the IV probit. In the case of the IV estimates, the effect is significant at the 1 percent level in all regressions. This indicates that firms in countries with higher levels of FL face lower credit constraints. On the comparison between the standard and IV probit models, the coefficient on the FL variable decreases considerably across all four categories using the IV probit model. This would suggest that the standard probit estimates are biased due to potential endogeneity or common factors driving the level of financial liberalsation and credit availability. Due to this finding, our main focus is on the IV regressions.

To establish the magnitude of the effect of FL on financing constraints, table 6 presents the probit marginal effects for both the standard and IV models. The marginal effects presented consider a change in the regressors on the predicted probability of a positive outcome i.e. the

effect of a unit change in the regressors on the probability of being financially constrained.

On the magnitude of the effects (using the IV model), for firms classified as "General Constrained", a one unit increase in the index of FL reduces the probability of facing a binding credit constraint by 19 percent. For "New Entrants", the magnitude of the effect is an 18 percent reduction in the probability of being constrained given a one unit increase in the index. These two categories of firms are particular sensitive to developments in financial markets, especially in the case of "New Entrants" who do not have access to formal financial services.

Considering "Deterred Investors" a one unit increase in the degree of liberalisation decreases the probability of being constrained by 8.9 percent. These firms missed investment opportunities due to a lack of available finance and the results indicate that they are significant beneficiaries of financial reform. For "Active Investors", who despite being constrained, managed to invest using internal funds or informal sources of finance, the effect of FL is more muted, but an increase in the index still accounts for a 5 percent reduction in the probability of being constrained.

Given the nature of the FL index, it is difficult from a policy perspective to understand the real world impact of a one unit change in the index on the marginal effect. As the index is a composite measure covering various dimensions of capital markets, changes across a broad spectrum of policies could initiate a one unit change to the index as captured by the marginal effect. However, the aim of this paper is not to consider the specific policy changes but to capture the overall degree of financial market openness and its effect on the credit environment. A simple stylised example can help to clarify. For firms classified as "General Constrained", the marginal effects indicate a one unit increase in the index reduces constraints by 19 percent. In this case, if a country with a low index score of 2.5 (such as Ivory Coast or Guinea Bissau) were to introduce financial reform measures (across any of the dimensions of financial policy considered) to boost the index by 5 units (to the level of Hungary or Lithuania), this would reduce the probability of being constrained by circa 95 percent.

In conclusion, these results suggest that financial liberalsation reduces the probability of being financially constrained, identifying a key channel through which finance can affect economic growth. The effect is strong for firms classified as "New Entrants" and do not currently

Table 7: IV Probit marginal effects - Results by age and size

Dep Var	General Constrained	New Entrants	Active Investors	Deterred Investors
		Liberalisation and Firm Age		
FL index	-0.239***	-0.212***	-0.059***	-.157***
	(0.076)	(0.065)	(0.020)	(0.044)
Age	-0.052	(-0.026)	-0.037*	0.018
	(0.043)	(0.035)	(0.020)	(0.021)
FL index · Age	0.013*	0.012*	0.012**	-0.000
	(0.009)	(0.008)	(0.005)	(0.006)
		Liberalisation and Firm Size		
FL index	-0.182***	-0.170***	-0.011	-0.173***
	(0.070)	(0.058)	(0.021)	(0.044)
SME	0.194***	0.166***	0.069	0.038
	(0.053)	(0.033)	(0.013)	(0.047)
FL index · SME	-0.072***	-0.081***	-0.046**	-0.058***
	(0.035)	(0.035)	(0.022)	(0.027)
n	28,367	28,367	28,367	28,367

Notes: (1) * p<0.10, ** p<0.05, *** p<0.01.

(2) ME for interaction estimated using Ai and Norton (2003).

Source: Author's calculations using estimation sample.

have access to formal finance. These results indicate that capital market liberalisation not only leads to financial deepening but also financial widening. FL can facilitate additional investment as the probability of being constrained decreases with increased liberalisation for firms classified as "Deterred Investors".

5.2.2 Effect by age, size and ownership

While financial reform policies are introduced at the country level, their effect on firms is potentially non-linear and heterogeneous depending on the characteristics of the firms, their interaction with capital markets and individual financing strategies. To explore the differential effect of FL on access to finance across the population of firms, we interact the liberalisation index with the firm characteristics noted in section 5.1. We focus on firm age, size, ownership and legal status. Table 7 presents the marginal effects IV probit with interactions between FL with firm age and separately with binary variables for small and medium sized firms. Due to the non-linearities in the model, the marginal effects for the interaction terms are estimated following the procedure outlined in Ai and Norton (2003).

The interaction of firm age and FL is significant for "General Constrained" and "New

Entrants" at the 10 percent level and for "Active Investors" at the 5 percent level. These results indicate that as firm age increases, reduction in constraints due to FL is lessened. This finding is intuitive as younger firms are usually the most constrained. Older firms have well established relationships with financial institutions and, on this evidence, are not the main beneficiaries of FL.

The results of the interactions between firm size and FL are interesting. The own effect of FL is negative and significant for all groups except "Active Investors". The interaction of FL and a dummy variable for SMEs is negative and significant for all four constraint categories. This indicates that while FL leads to a reduction in credit constraints for all firms, there is a further reduction for small and medium sized firms compared to large firms. This is a very positive finding as the literature suggests SMEs face particularly difficult challenges in accessing credit. These firms in many cases do not have access to international finance and are reliant solely on domestic capital markets. That SMEs are the beneficiaries of FL is a positive finding. Considering the magnitude of the effect, SMEs face a further 8 percent, 7 percent, 5 percent and 6 percent reduction in the probability of being credit constrained for categories "General Constrained", "New Entrants", "Active Investors" and "Deterred Investors".

Having considered size and age effects, table 8 interacts FL with indicator variables for foreign firms as well as public listed firms. In terms of initial expectations, it is unclear whether or not foreign firms would be the main beneficiaries of domestic financial reform. Foreign companies are, in the main, well supplied with credit from international markets and foreign direct investors usually bring capital to invest. However, there is some evidence that foreign firms do compete for capital with domestic firms (Harrison and Mcmillan, 2003). For publicly listed firms, as they already have access to stock market finance and our earlier results indicate they are less constrained, we expect that they benefit less from FL.

Focusing on foreign versus private domestic ownership, while the overall level of FL is negative and significant across all categories, the interaction of foreign and FL is also positive and significant at the 10 percent level in all cases. This suggests that private domestic firms benefit more from domestic financial reform than foreign firms. As is noted, foreign firms are more likely to bring their own capital or source finance on international markets so developments in domestic capital markets are less likely to influence these companies.

On the effect of FL on publicly listed firms, the interaction is positive and significant in all

Table 8: IV Probit marginal effects - Effects by ownership and legal structure

Dep Var	General	Constrained New Entrants	Active Investors	Deterred Investors
		Liberalisation and Foreign Ownership		
FL index	-0.221***	-0.204***	-0.047***	-0.159***
	(0.071)	(0.061)	(0.017)	(0.042)
Foreign	-0.150***	-0.133***	-0.053***	-0.059*
	(0.052)	(0.036)	(0.013)	(0.035)
FL index · Foreign	0.049*	0.048*	0.024*	0.043*
	(0.028)	(0.026)	(0.012)	(0.024)
		Liberalisation and Publicly Listed		
FL index	-0.219***	-0.202***	-0.046***	-0.159***
	(0.071)	(0.067)	(0.017)	(0.042)
Publicly listed	-0.177***	-0.143***	-0.058***	-0.082***
	(0.048)	(0.040)	(0.009)	(0.033)
FL index · Publicly listed	0.080*	0.079*	0.042***	0.076**
	(0.047)	(0.046)	(0.017)	(0.039)
n	28,367	28,367	28,367	28,367

Notes: (1) * p<0.10, ** p<0.05, *** p<0.01.

(2) ME for interaction estimated using Ai and Norton (2003).

Source: Author's calculations using estimation sample.

cases. This indicates that listed firms benefit less than non-listed firms from capital market openness. This is in line with a priori expectations.

5.3 Focus on Africa

One of the most interesting but challenging comparisons over the last 20 years from a development perspective is the contrasting growth performance of Africa and the rest of the developing world, most notably East Asia. The relative success of Asia and the continued underperformance of SSA is of particular concern to policy makers and of interest to academic researchers working in this area. As noted in Andersen et al. (2012), despite their strong growth performance, Asia has undertaken less financial reforms as compared with other developing regions. In particular, compared to Asia, Africa has embraced financial reform but has not seen improvements in real economic growth or industrialisation (Andersen et al., 2012; Reinhart and Tokatlidis, 2003). The important role played by investment and industrialisation in the East Asian growth story also adds to this puzzle. If FL eases credit constraints, why has higher and more efficient investment not occurred in Africa despite the continents' commitment to FL?

Table 9: FL and SSA - IV Probit marginal effects

C(n)	General Constrained	New Entrants	Active Investors	Deterred Investors
FL index	-0.105*	-0.099**	-0.012	-0.107***
	(0.059)	(0.051)	(0.154)	(0.036)
SS Africa	-0.450***	-0.451**	-0.542	-0.372***
	(0.141)	(0.125)	(0.556)	(0.106)
FL index · SS Africa	0.178**	0.184**	0.079	0.113**
	(0.085)	(0.087)	(0.064)	(0.056)
n	29,183	29,183	29,183	29,183
Sector controls	Yes	Yes	Yes	Yes
Year controls	Yes	Yes	Yes	Yes

Notes: (1) * p<0.10, ** p<0.05, *** p<0.01.

(2) All estimates are robust to heteroscedasticity and clustered at the country level.

(3) Instrumental variables for IV probit are German and socialist legal origin dummies.

(4) Country controls: GDP growth, corruption, fractionalisation, credit to private sector and trade.

(5) Firm controls include firm age, size, ownership, publicly listed and direct trade.

(6) ME for interaction estimated using Ai and Norton (2003).

Source: Author's calculations using estimation sample.

With a view to informing these issues, the effect of FL on access to finance is tested by interacting a dummy for the African countries with our index of FL. The marginal effects from the IV probit model are presented in table 9.

The estimates in table 9 show that the interaction of SSA and FL Index is positive and significant in all cases except for "Active Investors". The probability of being credit constrained increases with the degree of capital market liberalisation in SSA for firms in these groups. While a deeper and more thorough analysis is surely warranted on the role of finance and the effects of financial reform in SSA, the lack of improvements of financial access despite a commitment to FL may go some way towards explaining why growth has been stunted despite the reform agenda in capital markets.

These estimates facilitate anwering another important question: are credit constraints higher in SSA? To answer the first, we need to evaluate what the effect of the regional dummy is on the probability of being constrained. As the dummy is interacted with FL, its effect must be evaluated with recourse to this interaction as well as the own effect in a non-linear framework.[8] The effects are calculated using the sample mean of FL and are presented in table 10. The results indicate that credit constraints are higher in SSA relative

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[8]The marginal effect for SSA is calculated as $\frac{\delta P(C(n)==1)|\mathbf{X}}{\delta SSA} = \phi(\cdot) \cdot (\beta_A + \beta_{AFL} \cdot FL)$.

	Table 10: Focus on SSA - Are credit constraints higher?			
C(n)	General constrained	New Entrants	Active Investors	Deterred Investors
	Are credit constraints higher in SSA?			
ME	0.18	0.15	0.11	0.02

Source: Author's calculations using estimation sample.

to the overall sample. The magnitude differs across the constraint categories. In categories "General Constraint" or "New Entrants", firms in SSA are 18 percent and 15 percent more likely to face financing constraints relative to the sample average. "Active investors" are 11 percent more likely to be constrained in SSA while "Deterred Investors" are nearly 2 percent more likely to face a binding financing constraint in SSA. This results indicate that firms in Africa face greater financing constraints than in other regions.

This section has potentially identified one of the explanatory factors to reconcile how, despite committing to financial reform, SSA has not achieved the supposed benefits of capital market liberalisation. The findings here indicate that FL in Africa has not led to a reduction in financing constraints faced by firms. While there are many other reasons why growth in Africa may have been stunted[9], a lack of progress in providing access to investment finance for domestic firms is one potential explanation for the lack of progress on industrialisation. Improving credit transmission mechanisms to domestic firms in Africa, on this evidence, can be growth positive.

6 Concluding remarks

This paper considers the effect of FL on access to finance using firm level data covering 57 developing and transition countries. An index of FL is presented which measures the degree to which capital markets are liberalised in the following policy areas: directed lending, credit controls and reserve requirements, state control of banking, openness of international financial flows, banking market entry, prudential regulation and supervision and securities market development. It covers a larger number of developing countries, including 23 SSA countries. The measurement of access to finance follows Byiers et al. (2010) and presents

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[9]Other explanations include a lack of infrastructure, institutional quality and conflict. See Page (2011) for an overview.

four variant indicators of whether firms face difficulties in accessing financial markets. The measures are built around survey questions covering loan applications denied, the use of internal or informal resources for investment, the reasons for not making loan applications and whether the firm has formal finance facilities.

A number of conclusions emerge. First, FL reduces the probability of being credit constrained by between 5 and 20 percent depending on the firms initial position. For firms with no formal finance, classified as "New Entrants", an increase in FL decreases the probability of being constrained by 19 percent. As these firms did not have formal finance prior to reform, this is evidence of a widening of the financial sector. As firms with existing finance also benefit, our results indicate both a widening and a deepening of the financial sector with increased liberalisation. On this evidence, FL can lead to improvements in the financing position of firms which in turn can impact growth through the investment channel. The effect of financial reform on access to finance is strongest for young firms and domestic private small and medium sized enterprises. The effect is not as strong for older, foreign and publicly listed firms.

While for the whole sample, the results point to a positive benefit of FL in reducing financing constraints, the findings for SSA provide mixed evidence regarding the effect of financial reform on firms facing financing constraints. In SSA, increased FL is actually associated with an increase in credit constraints in two of the categories examined ("General Constrained" and "New Entrants"). This may be explained by the finding that foreign firms seem to be the beneficiaries of financial reform in this region. Research by Andersen et al. (2012) highlights the fact that Africa has been particularly reformist in capital markets, but yet growth continues to be stunted. While our research does not provide direct evidence on the formal role of finance in unlocking economic growth, the result that FL has not led to a reduction in financing constraints in SSA may be one of the explanations for why, despite extensive reforms, SSA has not seen the benefits of FL. Improving credit allocation mechanisms and the targeting of financial assistance to private domestic SME's in SSA should therefore remain a key policy focus on the development agenda.

References

Abiad, A., Detragiache, E. and Tressel, T. (2010). A new database of financial reforms. *IMF Staff Papers* 57: 281–302.

Abiad, A. and Mody, A. (2005). Financial reform: What shakes it? what shapes it? *American Economic Review* 95: 66–88.

Abiad, A., Oomes, N. and Ueda, K. (2008). The quality effect: Does financial liberalization improve the allocation of capital? *Journal of Development Economics* 87: 270–282.

Ai, C. and Norton, E. C. (2003). Interaction terms in logit and probit models. *Economics Letters* 80: 123–129.

Alesina, A., Wacziarg, R., Devleeschauwer, A., Easterly, W. and Kurlat, S. (2003). Fractionalization. *Journal of Economic Growth* 8: 155–94.

Andersen, T. B., Jones, S. and Tarp, F. (2012). The finance growth thesis: A sceptical assessment. *Journal of African Economies* 21.

Andersen, T. B. and Tarp, F. (2003). Financial liberalization, financial development and economic growth in LDCs. *Journal of International Development* 15: 189–209.

Barajas, A., Steiner, R. and Salazar, N. (2000). The impact of liberalization and foreign investment in Colombia's financial sector. *Journal of Development Economics* 63: 157–196.

Barth, J. R., Caprio, G. and Levine, R. (2008). *Rethinking Bank Regulation*. Cambridge University Press.

Beck, T., Demirguc-Kunt, A., Laeven, L. and Maksimovic, V. (2006). The determinants of financing obstacles. *Journal of International Money and Finance* 25: 932–952.

Beck, T., Demirguc-Kunt, A. and Maksimovic, V. (2004). Bank competition and access to finance: International evidence. *Journal of Money, Credit and Banking* 36: 627–48.

Bernard, A. B. and Jensen, J. B. (1999). Exceptional exporter performance: cause, effect, or both? *Journal of International Economics* 47: 1–25.

Bernard, A. B. and Jensen, J. B. (2004). Why some firms export. *The Review of Economics and Statistics* 86: 561–569.

Bigsten, A., Collier, P., Dercon, S., Fafchamps, M., Gauthier, B., Gunning, J. W., Oduro, A., Oostendorp, R., Patillo, C., Sderbom, M., Teal, F. J. and Zeufack, A. (2003). Credit constraints in manufacturing enterprises in Africa. *Journal of African Economies* 12: 104–125.

Byiers, B., Rand, J., Tarp, F. and Bentzen, J. S. (2010). Credit demand in Mozambican manufacturing. *Journal of International Development* 22: 37–55.

Chirinko, R. (1993). Business fixed investment spending: Modelling strategies, empirical results and policy implications. *Journal of Economic Literature* Vol. 31: pp. 1875–1911.

Clarke, G., Cull, R. and Peria, M. S. M. (2006). Foreign bank participation and access to credit across firms in developing countries. *Journal of Comparative Economics* 34: 774–795.

Djankov, S., Porta, R. L., Silanes, F. Lopez-de and Shleifer, A. (2002). The regulation of entry. *The Quarterly Journal of Economics* 117: 1–37.

Galindo, A. J., Schiantarelli, F. and Weiss, A. (2007). Does financial liberalization improve the allocation of investment?: Micro-evidence from developing countries. *Journal of Development Economics* 83: 562–587.

Gelos, R. G. and Werner, A. M. (2002). Financial liberalization, credit constraints, and collateral: investment in the Mexican manufacturing sector. *Journal of Development Economics* 67: 1–27.

Hansen, H. and Rand, J. (2011). Another Perspective on Gender Specific Access to Credit in Africa. FOI Working Paper 2011/14, University of Copenhagen, Institute of Food and Resource Economics.

Haramillo, F., Schiantarelli, F. and Weiss, A. (1996). Capital market imperfections before and after financial liberalization: An Euler equation approach to panel data for Ecuadorian firms. *Journal of Development Economics* 51: 367–386.

Harrison, A. E. and Mcmillan, M. (2003). Does direct foreign investment affect domestic credit constraints? *Journal of International Economics* 61: 73–100.

Hubbard, R. G. and Kashyap, A. (1992). Internal net worth and the investment process: An application to U.S. agriculture. *Journal of Political Economy* 100: 506–34.

Kaplan, S. N. and Zingales, L. (1997). Do investment-cash flow sensitivities provide useful measures of financing constraints. *The Quarterly Journal of Economics* 112: 169–215.

King, R. and Levine, R. (1993). Finance and growth: Schumpeter might be right. *The Quarterly Journal of Economics* 108: 717–37.

Koo, J. and Maeng, K. (2005). The effect of financial liberalization on firms' investments in Korea. *Journal of Asian Economics* 16: 281–297.

Koo, J. and Shin, S. (2004). Financial liberalization and corporate investments: Evidence from Korean firm data *. *Asian Economic Journal* 18: 277–292.

La Porta, R., Lopez-De-Silanes, F. and Schleifer, A. (2008). The economic consequences of legal origins. *Journal of Economic Literature* 46: 285–332.

La Porta, R., Silanes, F. Lopez-de, Shleifer, A. and Vishny, R. W. (1997). Legal determinants of external finance. *Journal of Finance* 52: 1131–50.

La Porta, R., Silanes, F. Lopez-de, Shleifer, A. and Vishny, R. W. (1998). Law and finance. *Journal of Political Economy* 106: 1113–1155.

Levine, R. (1997). Financial development and economic growth: Views and agenda. *Journal of Economic Literature* 35: 688–726.

Levine, R. (2005). Finance and growth: Theory and evidence. In Aghion, P. and Durlauf, S. (eds), *Handbook of Economic Growth*. Elsevier, *1, Part A*, chap. 12, 1st ed., 865–934.

Levine, R., Loayza, N. V. and Beck, T. (2000). Financial intermediation and growth: Causality and causes. *Journal of Monetary Economics* 46: 31–77.

Love, I. (2003). Financial development and financing constraints: International evidence from the structural investment model. *Review of Financial Studies* 16: 765–791.

McKinnon, R. I. (1973). *Money and Capital in Economic Development*. Washington: The Brookings Institute.

Newey, W. (1987). Efficient estimation of limited dependent variable models with endogenous explanatory variables. *Journal of Econometrics* 36: 231–250.

Page, J. (2011). Should Africa Industrialize? Working Papers UNU-WIDER Research Paper WP2011/47, World Institute for Development Economic Research (UNU-WIDER).

Rand, J. (2007). Credit constraints and determinants of the cost of capital in Vietnamese manufacturing. *Small Business Economics* 29: 1–13.

Reinhart, C. M. and Tokatlidis, I. (2003). Financial liberalisation: The African experience. *Journal of African Economies* 12: 53–88.

Reinikka, R. and Svensson, J. (2006). Using micro-surveys to measure and explain corruption. *World Development* 34: 359–370.

Shaw, E. (1973). *Financial Deepening in Economic Development*. New York: Oxford University Press.

Whited, T. and Wu, G. (2006). Financial constraints risk. *Review of Financial Studies* 19: 531–559.

Annex 1: Financial liberalisation index

The index used in this paper covers the following issues: credit controls, directed lending and excessive reserve requirements, barriers to entry, restrictions on international financial flows, state control of banking, prudential regulatory and supervisory policy and securities market policies. The Barth et al. (2008) database does not contain data on interest rate controls so this dimension is not covered. We take the 2007 wave of the Barth et al. (2008) data to build the index which, like Abiad et al. (2010), is increasing in FL. The selection of variables and the scores assigned to each variable is outlined in Abiad et al. (2010). Readers are encouraged to consult this work, as well as Abiad and Mody (2005), for a full discussion of the reasons for selecting the seven dimensions and scoring.

The variables used for each aspect of the index are:

- **_Credit controls and excessive reserve requirements_** is the simple average of:

  - Restrictive reserves

    * 0 if reserves are more than 20 percent

    * 1 if reserves are between 20 percent and 10 percent

    * 2 if reserves are less than 10 percent

  - Activities restrictions

    * The ability of banks to engage in insurance activities, real estate activities and own non-financial corporations is rated on a scale of 1 to 4 increasing in prohibition. These three variables are summed and assigned the following scores:

    * Sum is > 7, at least two are prohibited so system is restricted - score 0

    * Sum is 7 > 3, partially liberalised - score 1

    * Sum is < 3, Liberalised - score 2

- **_Entry barriers_** is the simple average of:

  - Fraction of all entries denied

    * 0 if denials are more than 50 percent

    * 1 if reserves are between 20 percent and 50 percent

* 2 if reserves are less than 20 percent

– Fraction of foreign entries denied

  * 0 if denials are more than 50 percent

  * 1 if reserves are between 20 percent and 50 percent

  * 2 if reserves are less than 20 percent

– Prevention of foreign entry through subsidiaries, acquisitions, branches and joint ventures

  * 0 if at least three are prevented - restricted system

  * 1 if one or two are prevented - partially liberalised

  * 2 if non of the above are prevented - liberalised

- **State control**:

  – Percentage ownership of banking assets by the state:

  * 0 if ownership is more than 50 percent

  * 1 if ownership is between 20 percent and 50 percent

  * 2 if ownership is less than 20 percent

- **International financial activities**:

  – Lending activities by domestic banks overseas:

  * 0 if no

  * 1 if yes

- **Prudential supervision and regulatory policy** (All definitions as in Barth et al. (2008)):

  – Independence of official supervisor

  – Power of official supervisor

- **Securities market development**

  – 0 if financial institutions are restricted or prohibited from engaging in securities market activities

- 1 if financial institutions are permitted to engage in securities market activities

- 2 if financial institutions are unrestricted in their engagement in securities market activities

The overall index is the sum of the above categories.

Annex 2 - Data

Table 11 presents a detailed outline of the number of observations per country as well as the country values of the FL index and "General Constrained" measure.

Table 11: Country details: Observations, C1 and FL index

Sub-Saharan Africa				South and Central America				Europe and Central Asia			
	Obs	C1	FL		Obs	C1	FL		Obs	C1	FL
Benin	149	0.15	3.5	Argentina	1061	0.15	6	Azerbaijan	341	0.21	3.66
Botswana	341	0.14	3.5	Bolivia	611	0.14	4.5	Belarus	229	0.07	2
Burkina Faso	520	0.22	1.5	Chile	1011	0.06	5.83	Bosnia	346	0.03	6
Burundi	267	0.35	6	Colombia	997	0.11	5.5	Bulgaria	1284	0.12	7
Cameroon	531	0.27	3.5	El Salvador	692	0.11	4.5	Croatia	618	0.15	6.5
Chad	147	0.36	3.5	Guatemala	521	0.07	4.5	Czech Republic	239	0.03	6.66
Congo	140	0.29	3.5	Honduras	431	0.11	5.67	Estonia	272	0.03	5
Gabon	178	0.24	3.5	Mexico	1385	0.13	4.5	Hungary	284	0.04	7.5
Gambia	170	0.35	2	Nicaragua	475	0.10	8	Kosovo	263	0.03	6.83
Ghana	491	0.87	3.67	Panama	600	0.05	7	Latvia	268	0.06	6
Guinea	219	0.65	7.5	Uruguay	619	0.14	4.5	Lithuania	271	0.05	7.5
Guinea Bissau	157	0.75	2.5	**Southern Asia**				Moldova	356	0.05	6.67
Ivory Coast	524	0.57	2.5	Bangladesh	1496	0.00	6	Romania	522	0.08	5
Kenya	651	0.17	4.5	Bhutan	248	0.21	3.5	Russia	979	0.09	3.5
Malawi	145	0.17	3.17	**East Asia and Pacific**				Slovenia	274	0.03	8
Mali	489	0.93	3.5	Fiji	151	0.04	4.5	Ukraine	818	0.09	7
Mozambique	477	0.91	5	Indonesia	1404	0.30	5.5				
Namibia	328	0.13	3.5	Samoa	103	0.08	3				
Niger	179	0.16	1.5								
Nigeria	1887	0.45	5								
Senegal	506	0.89	3.5								
South Africa	937	0.81	5.5								
Swaziland	297	0.18	5								
Uganda	552	0.22	5.17								
Togo	152	0.34	1.5								