ESSAYS ON INTERNATIONAL CAPITAL MOBILITY

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Abstract

Unequal quality of fundamental institutions induces different patterns of international capital flows in terms of both direction and magnitude. This dissertation examines, theoretically and empirically, the link between the financial intermediation sector and capital flows by highlighting the role of institutions and the technological level that financial intermediaries have access to. The theoretical section employs a model with endogenous labour input in monitoring loans by the financial intermediary. Numerical exercises reveal that this modification improves the traditional exogenous model by replicating the stylized facts, in particular, the model is able to replicate and explain the non-monotonic relationship between institutional quality and international net bank flows. Furthermore, contrary to the exogenous model, the model with endogenous labour input is able to reproduce a loan interest rate profile which decreases as institutional quality improves. The empirical section uses a panel of 56 rich and middle-income countries and cross-border bank flows and reveals that, firstly, institutional quality matters slightly more for the mid-income countries in explaining the net bank flows, while for high-income countries it is the market fundamentals which are significant explanatory forces. Secondly, while for both income groups the *rule of law* and *voice & accountability* indices are significant, for mid-income countries *government effectiveness* is also of significance.

To my parents for their never-ending support, and my loving and patient wife...

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Chapter One: Introduction

International capital flows come in forms of debt, portfolio investments or foreign direct investments. Debt flows are generally volatile and short-term compared to some other types of flows such as foreign direct investments. Determinants of debt flows, and in particular bank flows, have not been studied in depth within the literature despite being comparable in size to flows of foreign direct investments. As with any type of capital flow, it is important to understand the forces behind the direction and magnitude of flows across borders. The study may yield an understanding of differences in economic foundations of countries while at the same time shedding light on the mechanisms through which the flows can be managed from a policy perspective.

Fundamental institutions are the economic and political constraints that shape economic interaction. Unequal quality of fundamental institutions induce different patterns of international bank flows in terms of both direction and magnitude. Throughout this dissertation, references to institutional measures are references to the *perceptions* of how well-functioning these institutions are (in practice or *de facto*) as opposed to *de jure*. This is an important distinction since as what is in the regulatory framework or the constitution is not the same as what happens in practice.

Bank flows, despite being generally short-term in nature, like all other types of flows are driven by deep institutional fundamentals such as the degree of corruption, quality of regulations, and political stability to name a few. Therefore, understanding the long-term and deep drivers of flows of bank loans can help with prediction, prevention and response to reversals and sudden stops which are often harmful to economies with fragile financial markets. Good functioning general institutions are the foundations of any well-functioning economy. Contract enforcements for example are shown to spur innovation, while quality of the regulatory framework impacts the level of competitiveness of an economy.

A study of cross-border movement of bank loans, as a major component of debt flows, is tantamount to examining the functioning of the financial intermediation sector and the quality of the general institutions governing the economy. In particular, the financial intermediaries engage in credit creation by raising funds through deposits and issuing loans to entrepreneurs. Monitoring and consolidating loans in light of information asymmetry are costly to the financial intermediary and the costs may be exacerbated due to poor general institutions supporting the financial intermediation sector. Some of such institutional qualities of interest are governance quality, political stability, quality of the regulatory framework, strength of the rule of law, and the ability to control corruption.

This dissertation aims to explore the link between institutional quality and capital flows both theoretically and empirically. The theoretical study presented in Chapter 2 extends the costly-state verification model of Williamson (1986) by allowing for endogenous labour input into the monitoring technology within a small open economy setting. The resulting model better reproduces the stylized facts: the non-monotonic relationship between bank outflows and institutional quality measures and the reduction in the interest rate spread caused by improvements in the quality of institutions. The introduction of labour input into the monitoring technology allows the financial intermediaries to better manage the cost of intermediation. Due to the decreasing returns to scale in the production process of the risky projects, when the increase in the number of risky projects being funded (adjustment in the extensive margin) dominates the decrease in the loan size per project (adjustment in the intensive margin), the economy experiences a greater distributional efficiency. Bank loans then flow out more for countries with good institutions and less for countries with poor institutions. Without the modifications in the model, bank loans would be flowing out more for countries with poor institutions which is contrary to what the data shows.

In the theoretical study I take one parameter to represent all forms of institutional quality as an aggregate. A natural extension would be to try and discover empirically which institutions matter specifically; the magnitude and direction of the association between types of institutions and bank flows. The empirical approach relies on a panel data constituted of International Monetary Funds *International Financial Statistics* bank flow data and the World Bank's governance indicator data to establish the nexus between institutional quality and bank flows. The theoretical model in Chapter 2 studies the net outflow of capital as it measures the difference between domestic deposits and domestic loans, where the excess funds will be lent abroad.

The institutional variables may include measures such as governance quality, degree of control of corruption, enforcement of the rule of law, political stability, citizen participation and government accountability, and finally, policy quality and government credibility. No institutional quality measure is perfect and measurement issues would exacerbate when one focuses on *de facto* measures as opposed to *de jure*. As such, Chapter 3 uses the World Bank governance indicators which are intended to capture the "perceptions" of institutional qualities as opposed to the *de factor* qualities.

Two key features in the theoretical model separate this work from existing work in the literature. First, labour input is endogenized in the monitoring technology, allowing the financial intermediary to choose not only the optimum level of monitoring but also the unit monitoring costs in response to changes in the underlying parameters of the model. Second, as the project size is determined endogenously, the intermediary rations credit on the intensive margin and all entrepreneurs qualify for a loan but may not receive the loan size they desire.

The closest work to this research is Greenwood et al. (2010)'s attempt to link financial intermediation with economic development and total factor productivity gains. Greenwood et al. (2010) endogenize the labour input into the monitoring technology within an imperfect information framework and not in a costly state verification setting. As a result, the more the intermediary spends on intermediation the higher the probability of success in monitoring and so the authors can draw a link to higher economic development and higher spending on intermediation. Furthermore, the loan size is determinate in their model and the environment is a closed-economy setting. My model however focuses on how the presence of information asymmetry is dealt with, given the possible variations in institutional quality and banking technologies, and what the net effect is on cross-border flows of bank loans.

Capital flows in general may depend on the stage of development and GDP growth rates as Aharonovitz and Miller (2010) explain. Higher output is associated with financial outflows in later stages of development since "the local savings are increasing by more than the local demand for capital". Prasad, Rajan and Subramanian (2006) also show that among the poor countries, capital tends to flow more to low-growth economies. Less developed economies tend to suffer from poor regulations, high level of corruption, dysfunctional governments and political risks.

Imrohoroglu and Kumar (2003) study intermediation and physical capital flows in a model in which entrepreneurs can choose between a safe and a risky project. They modify a neoclassical model to include intermediation costs and show that an opposing income effect (from higher total intermediation costs) and substitution effect (from substituting capital into safe projects) result in returns to capital exhibiting non-monotonicity and thus generating significant variations in returns across countries. However, they take monitoring intensity to be fully exogenous unlike this paper. Furthermore, with the focus of their paper being on flows of physical capital, there is little lessons which can be drawn in terms of capital account liberalization and determinants of short-term capital flows.

Alessandria and Qian (2005) also study financial intermediation and capital account liberalization. They show that efficiency of the intermediary sector is not a necessary nor a sufficient condition for a successful capital account liberalization. Conversely, liberalization has an ambiguous effect on financial sector efficiency and may either improve or worsen it. Their paper however differs in project types and monitoring set-up with the intermediary committing resources to monitoring ex ante[1]. While they look at the impacts of liberalization on the financial sector efficiency, we look at the impact of institutions on the efficiency of the financial sector and thus

[1] In Stiglitz and Weiss (1992) entrepreneurs have same choices as in this paper however they are assumed to be risk-averse and monitoring cost is exogenous. In Diamond (1984) and Williamson (1986) monitoring costs are exogenous as well.

the capital flows.

The empirical study in Chapter 3 examines the net inflow of bank loans by taking the difference between the inflows of bank loans and outflows of banks loans in the data. The Feasible Generalized Linear regression estimation of the random effects model reveals that depending on income, different institutions matter differently when it comes to bank flows.

As with the theoretical literature, the empirical literature on this subject is thin. Papaioannou (2004) emphasizes the importance of directly modelling institutional quality effects. Using a sample of 55 recipient countries between 1984 and 2002, the author shows that well-functioning institutions are the single most important driving force for international capital flows: a 5% decline in political risk in the recipient country is associated with a 2% increase in bilateral bank flows. Likewise, Papaioannou (2009) use bank flows from 19 *source* to 49 *recipient* countries and find that GDP per capita is a significant correlate. In other words, bank flows are attracted to richer economies. At the same time, institutional quality is a more significant correlate for bank flows than both income and human capital. Unfortunately, the model lacks any interaction or quadratic terms and fails to capture any possible non-linearities.

In another somewhat related work, Chinn and Ito (2006) use a panel of 108 countries to study the effect of capital account liberalization on equity markets. They further underline the importance of institutional quality by concluding that financial systems with a higher degree of legal/institutional development on average benefit more from financial liberalization. Similarly, Alfaro, Ozcan and Volosovych (2005) use a sample of 81 countries and find low institutional quality to be the leading explanation for the Lucas Paradox. Finally, as famously documented by La Porta et al. (1997), countries with poor institutions and a French civil law system suffer from "smaller and narrower" capital markets. Hence, it is of interest to study theoretically the links between institutional quality, income level, and international capital flows. The finding will help rationalize the empirical findings in the literature.

While financial flows can be growth enhancing and welfare augmenting (Bailliu, 2000; Hagen and Zhang, 2011), they may also be vehicles for crisis transmission when general institutions are weak (Faria and Mauro, 2009; Herrmann and Mihaljek, 2010). Bank loans have been shown to be just as reversible as portfolio investments (Sula and Willett, 2009) and, given the high exposure of banks to emerging markets, the understanding of the underlying determinants and fundamentals is essential for better macro policy design and better decision making by the agents in the banking sector. From a theoretical point of view, this linkage of institutional quality with bank flows has generally received less attention in comparison to other types of capital such as foreign direct investments and portfolio investments. Ju and Wei (2010, 2011) show that financial capital generally flows from countries with low quality of institutions to countries with high quality of institutions. Furthermore, the inefficiency of the financial market results in an inflow of foreign direct investment and an outflow of financial capital (the so-called Bypass Effect). Mutsuyama (2008) similarly demonstrates that in the presence of financial market insecurity, mirrored by poor contract enforcements, capital flows out of poor countries to finance investments in richer countries. In addition, von Hagen and Zhang (2011) show that under free mobility of FDI and financial capital, flows are welfare improving. This relationship is best understood when the financial sector of a country is viewed as an endowment.

Mendoza, Quadrini, and Rios-Rull (2009) introduce financial friction to a neo-classical model and report that capital flows from poor to rich countries mostly in form of investments in less risky and less profitable assets. This is because higher growth rate of developing economies results in lower domestic savings, while at the same time "lower development of financial markets" in these countries induce higher savings. The authors claim that the heterogeneity in financial market development between the poor and rich countries is the primary reason behind some of the puzzles in capital mobility patterns. Finally, Pol Antras and Ricardo Caballero (2009) extend a Heckscher-Ohlin-Mundell model to a dynamic setting by allowing for heterogeneity in the financial sector across countries. In summary, they find that capital flows to countries with underdeveloped financial markets. The theoretical predictions are equivocal at best and often depend on the deep institutional parameters. In all these aforementioned studies, financial intermediaries are taken to be a single exogenous force and are not differentiated. For example, while poor contractual enforcement is reminiscent of the strength of *rule of law*, one would expect that poor *regulatory quality* and lack of *political stability* make investment opportunities less appealing to investors.

The first interesting finding of the empirical chapter is that, ignoring income levels, political stability tends to be the most significant type of institutional quality affecting bank flows. However, when income levels are taken into account, rule of law and voice & accountability matter for rich countries, and political stability is no longer significant. Furthermore, for mid-income countries, government effectiveness, rule of law, and voice & accountability matter most, though not the same as they would for rich economies. For example, while bank inflows are increasing in quality of rule of law for mid-income countries, they are decreasing in quality of rule of law for richer countries.

Rule of law in particular measure the perception of of the extend to which agents have confidence in and abide by the rules of the society. These rules include quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. It may well be that the returns to improvements in rule of law are yet to be fully exhausted for mid-income countries and hence their tendency to absorb bank flows. Furthermore, while flows to richer countries may be in search of risk diversification, the flows to mid-income countries may be the outcome of return differentials and mostly profit-seeking. More detailed analysis and scrutiny may be needed to systematically explain the underlying reasons.

There are measurement issues with such institutional indices in the sense that there is an element of objectivity in how these measures are constructed. Furthermore, focusing on perceptions as opposed to actual institutional quality as measured by provisions in the law or regulatory framework may also have implications for policy implementation.

The remainder of the dissertation is organized as follows. Chapter 2 presents the theoretical model along with numerical simulations. Chapter 3 reports the results of the empirical investigation by describing the data and the modelling approach followed by exploration of the results and robustness analysis. The conclusion is presented in Chapter 4.

Chapter Two: Financial Intermediation and Capital Mobility

1 Introduction

Financial intermediaries are significant players in allocating investment funds within and across countries. Past attempts to understand the forces behind international capital movements have largely ignored the role of the financial intermediation sector. These financial intermediaries operate within carefully regulated environments and their operational efficiency heavily depends on the technological improvements in the financial sector as well as the quality of the general institutions (such as the strength of rule of law or control of corruption). Short-term flows such as cross-border flow of bank loans are generally the first stage of the capital account liberalization sequence (Bayoumi and Ohnsorge, 2013), and as such, understanding the forces behind such flows is necessary to ensure a smooth and successful liberalization process. Identifying these factors may help in controlling and avoiding sudden reversals, minimizing the potential harms, and ensuring that the flows are beneficial to the domestic economy. Another less obvious benefit of such study has to do with understanding the lack of capital flows from rich to poor and mid-income countries as pointed out by Lucas (1990). In particular, in the data we observe that after accounting for the quality of institutions, bank loans tend to flow to the mid-income countries and out of the rich and poor economies. As such, by modelling the financial intermediary sector more meticulously we will be able to give an alternative and partial explanation of the Lucas puzzle.

This paper focuses on bank loans to capture funds mobilized by the financial intermediaries. Figure 1 of the Appendix A section plots the net outflows of bank loans as percentages of GDP and illustrates how different measures of institutional quality correlate with net bank outflows. The figures are produced using World Bank Governance Indicators while the bank flow data are compiled using IMF's 2010 International Financial Statistics Yearbook[2]. The scatter plots are overlaid with quadratic prediction plot which was a better fit than a linear fit (estimated using ordinary least squares). The non-monotonic relationship is most evident for rule of law, control of corruption, regulatory quality and government effectiveness. The plots make evident that specifically countries with very poor and very good institutions are exporters of financial capital. These two groups of countries are exporters for different reasons: poor countries do not have the institutional capacity to absorb capital and use it productively while the richer economies look to diversify their foreign portfolios and seek higher returns from high growth mid-income economies.

A significant amount of research has been devoted to understanding the forces behind other types of international capital flows, however, very little has been done for flows of bank loans. This paper employs, within a small open economy setting, a costly state verification model based on Williamson (1986) with three modifications: (1) allowing for endogenous labour input in the monitoring technology, (2) endogenous investment choice between safe and risky projects, and (3) endogenous

[2]Lines 78bqd (assets) and 78bud (liabilities) are added to form the net bank loan flows, converted into domestic currency from US dollars using IFS' National Currency per U.S. Dollar (period average) and divided by the nominal GDP (in domestic currency) extracted from IMF's World Economic Outlook database. The plotted values are averages for each country for years 1998-2009. The quadratic fit is estimated using ordinary least squares with the quadratic terms being statistically significant.

production scale of risky projects. Monitoring refers to the act of verifying and enforcing a contract in a costly state verification (asymmetry of information between a lender and a borrower). Numerical simulations demonstrate that improvements in the quality of institutions improve the distributional efficiency of loanable funds and result in a larger net outflow of capital as a ratio of output in a non-linear fashion, with the outflow being largest for countries with very poor and very good institutions. Furthermore, a model that lacks the labour input component in the monitoring technology predicts somewhat counter intuitively a lower loan interest rate in a riskier environment. Once labour input is introduced into the monitoring technology however, the model is then able to generate a loan interest rate profile which is more in line with the data.

The intuition behind this outcome has to do with the way the financial intermediary responds to higher unit costs due to worsening of the institutional quality. Because of the diminishing returns to monitoring, the financial intermediary issues larger loans and less number of loans overall to economize on monitoring costs. With fewer loans the intermediary increases the cut-off productivity level at which point loans are declared bankrupt. The contracted loan interest rate, defined in equilibrium by the ratio of the cut-off output to loan size, increases as the rise in the cut-off output level is larger than the increase in the loan size.

During the 20th century, capital mobility levels have been documented to have a significant upward trend only to be disrupted briefly by the Great Depression and the Second World War (Taylor, 1996)[3]. According to Ohanian (2007) gross capital flows

[3]In fact, during the first half of the 20^{th} century there have been two major incidences of lack of capital mobility: both World War I (followed by the great depression) and World War II were

constituted 25% of the world GDP per year between 2000 and 2005 compared to only 9% in 1980. Furthermore, according to the World Bank Development Report, as of 2009, gross private capital flows stood at roughly 33%. More recent history (since the early 70's) has witnessed a reborn surge in mobility following the breakdown of the Bretton Woods system[4]. However, the distribution of the flows has defied theoretical predictions in the sense that most of the observed mobility takes place among the richer countries, while the emerging economies are merely providers of capital to the mature markets[5]. In more recent years, gross bank flows (as a % of GDP) have been the more dominant form of capital mobility (Appendix *A* Figure 2). Gross bank flows have equalled or surpassed gross flows of Foreign Direct Investments (both as a percentage of GDP) in the past decade for the most part. The gross bank loans as percentage of GDP was indeed quite high at 10%, and it surged to 20% in 2002-2003 and 2007.

One way to exploit the relationship between institutional quality and capital flows in a model is to introduce a financial intermediation sector that depends on quality of general institutions. Financial intermediaries accept deposits and issue loans in order to finance investment while offering a relatively safe return to the depositors[6]. Inefficiencies in intermediation, due to poor general institutions (rule of law, control of corruption etc.), could change the composition of capital flows. Wei and Wu (2002)

superseded by sharp declines in capital mobility, with "WW I" being preceded by an unprecedented surge in capital movements which may be partly attributed to government policies of the time

[4]Since the accord's dissolution in 1973, private foreign capital flows became the principal sources of development finance [OECD, 1998]

[5]IMF Finance and Development, March 2007, Volume 44, Number 1, "Global Capital Flows: Defying Gravity"

[6]Financial intermediation is not a modern concept. Temin (2004) documents the existence and effectiveness of intermediation during the Roman Empire era

for example find a positive association between corruption and loan-to-FDI ratio. Ju and Wei (2006) also show theoretically that investors would engage in FDI and bypass financial intermediaries if the general institutional framework is good but the financial intermediaries are weak. The relationship between net bank outflows and institutional quality indicators tend to be non-monotonic as presented in Figure 1 of the Appendix A section. While not all institutional measures are equally important in relation to net flows, the curvatures in general do imply a higher outflow being associated with extreme values of the institutional quality. The pattern is most visible particularly with the rule of law, control of corruption, regulatory quality and government effectiveness indices. The model in this paper is able to fully rationalize this pattern.

Countries differ in quality of institutions and in legal and regulatory frameworks. Figure 3 of the Appendix A section clearly shows that more developed economies tend to have better quality of institutions. It would be of interest to investigate the rationale behind the positive relationship between a country's quality of institutions and its output level, and to explore the effects of improvement in quality of institutions on a country's net capital outflows.

Treating the financial intermediary as a decision maker helps with the disaggregation of the forces behind capital mobility. In order to ease informational asymmetries (and reap the benefits of risk-pooling and diversification) intermediaries must alleviate the traditional adverse-selection and moral-hazard problems through monitoring and state verification. Traditionally, starting with the early papers of Diamond (1984), Boyd and Prescott (1986) and Williamson (1986), the monitoring technology has been assumed fixed and void of any labour input. In contrast, utilizing a monitoring technology with endogenous labour input is based on the notion that the intermediary can reduce unit monitoring costs by employing labour. The justification is intuitive: in face of higher operating costs of financial intermediary associated with poor institutions, the intermediary must hire more labour to verify project returns and bankruptcy claims. On the other hand, better institutions help reduce these costs partially. Adding labour input in fact increases the operating costs of the financial intermediary, and so labour is added up to a point where the marginal benefit of adding labour outweighs its marginal cost. In practice, financial intermediaries operating in environments with poor institutions cannot rely on the costless enforcement of contracts and the accuracy of reported project outcomes. Loan officers act as information verification vehicles and alleviate the information assymetry to some extend.

Figure 4 of the Appendix *A* section underlines this fact as it shows the association between the rule of law and the average loss given default for the financial sector of each country[7]. The improvement in intermediation costs as a result of better institutions is also reflected in the observed lower interest spreads for countries with better institutions. As can be seen in Figure 5 in the Appendix *A* section, lower interest rate spreads (the wedge between the loan and deposit interest rate) are associated with better enforcement of the rule of law[8].

[7]Strength of rule of law index comes from World Bank's *The Worldwide Governance Indicators* and is defined as "perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence" (Kaufmann et. al., 2010) The index ranges from 0 to 5, with higher scores indicating better institutions.

[8]Interest rate spread data are taken from Beck et al. (2009)

Figure 2 of the Appendix A section plots the indexes of institutions by level of income. As the figure shows, richer economies enjoy better institutions. Lucas (1990) points to the capital return differentials across countries as the culprit in the puzzle of limited capital mobility. He then argues that the force of political risk which deters investments can help explain partly the lack of capital mobility.

To the best of my knowledge this paper is the first of its kind in the capital mobility literature that attempts to endogenize the labour input for the monitoring technology while accounting for the quality of general institutions and the level of technology the intermediary has access to. This is a significant departure from the literature of the costly-state verification models where the monitoring technology is fully exogenous. Without the endogenized labour input, as institutional quality worsens, the unit monitoring cost increases. The financial intermediary issues more loans but of smaller size in response to a rising unit monitoring cost. The total monitoring cost drops with the effect of loan size dominating, and the financial intermediary has to charge a lower loan interest rate to give the borrowers incentives to report the truth. Thus, the exogenous model predicts that higher unit monitoring costs are associated with lower loan interest rates which is contrary to the real world evidence. Endogenizing the labour input in this setting then allows the financial intermediary to respond to the change in the unit monitoring cost by hiring more labour for monitoring. The result is a loan interest rate profile that is in line with the observed pattern in data.

The loan interest rate profile observed in the data is decreasing in institutional quality (better institutions result in lower interest rates). The model is able to replicate this since the lower institutional quality increases unit monitoring costs and results in for smaller loans but more number of loans in order for the intermediary to economize on monitoring costs. The cut-off productivity level for bankruptcy would be higher as a result, and so will be the equilibrium loan interest rate.

The chapter also contributes to the capital mobility literature and speaks to the Lucas puzzle. It is shown in the existing literature that weak institutions in poor economies partly explain the lack of flows to these countries. In the context of bank flows, this model predicts that countries with very poor and very good institutions export more capital as a ratio of GDP in comparison to countries with institutional qualities in-between the two. This non-monotonicity is also confirmed by Imrohoroglu and Kumar (2003) where they predict higher returns for mid-income countries and lower returns for very poor and very rich economies and thus a subsequent flow from rich and poor countries to mid-income. While capital flows from rich countries in search of higher returns, the same story is not true for poor countries. The authors show using a calibrated model that because the quality of investment projects in poor countries is lower, due perhaps to lower levels of financial development, capital tends to flow out from the very poor economies also.

The rest of this chapter is structured as follows: Section 2 provides a detailed literature survey, Section 3 presents the set-up of both the exogenous model and the model with endogenous labour input, Section 4 solves for an equilibrium for each of the models, Section 5 is devoted to comparative static exercises and discussion of the results, and finally Section 6 concludes.

2 Model Set up:

Consider a small open economy with three sectors: households, financial intermediaries and entrepreneurs. The economy can trade in the world markets and takes the world interest rate as given. I will describe the economic environment, and obtain predictions on the dynamics of the international flow of funds and the interest rate spread in response to changes in the quality of general institutions and the level of technology in the financial sector. For simplicity, the model abstracts away from money and thus exchange rates. This is not to undermine the relative importance and role of money within the capital mobility literature. The households live for two periods: supplying labour while young in the first period of life and consuming their savings in the second period of life while old. The lifespan of a typical investment project taken up by an entrepreneur is one period and so is the duration of the loan issued to the entrepreneur by the financial intermediary. In order to keep the model simple and do not alter the risk-aversion behaviour of the households we make the assumption that households cannot choose to be entrepreneurs.

The economy's time-line is illustrated in Appendix A Figure 6. At the beginning of period t the households make deposits and the entrepreneurs choose their projects. The intermediary then allocates the loans. Production occurs, output is realized, the entrepreneur either pays back the loan or declares bankruptcy, and monitoring takes place. The intermediary then pays back its liability to the households. The households consume/save their earnings at the end of period t. The sequence then repeats itself in $t+1$ with now the older generation consuming and the new younger generation working and making deposits.

2.1 Households:

The economy has an infinite sequence of two-period-lived overlapping generations of households. All households are identical with the number of households normalized to one. A new generation of households is born in each period. At time $t = 1$, the old agents are endowed with d_0 units of funds. Young agents supply labour to the labour market in period t but do not work when old in period *t+1*. Households consume $c_{1,t}$ in period t and $c_{2,t+1}$ in the subsequent period $t+1$. Young agents in period t make deposits d_t with the financial intermediary and withdraw their deposits, plus accrued interest $(1+r^d_{t+1})d_t$ earned in at period *t+1*. For a representative household born in period t, the preferences are given by the following time-separable utility function:

$$U(c_{1,t}, c_{2,t+1}, L_t) = \frac{c_{1,t}^{1-\xi} - 1}{1-\xi} + \rho \frac{c_{2,t+1}^{1-\xi} - 1}{1-\xi} + \eta \frac{(1-L_t)^{1-\xi}}{1-\xi},$$
$$\text{where, } 0 < \xi < \infty,\ 0 < \rho < 1, \text{ and } 0 < \eta < \infty.$$

In the equation above, $c_{1,t}$ is the agent's consumption when she is young and $c_{2,t+1}$ is consumption for when she is old. L_t is the agent's work effort supplied to the labour market when young. The subjective rate of time preference is denoted by ρ, the intertemporal elasticity of substitution by $\frac{1}{\xi}$, and η is the weight of leisure in utility. Households are risk averse as $\xi \neq 0$. Taking the real wage rate w_t and the risk-free interest rate r^d_{t+1} as given, the representative household of generation t solves the following optimization problem:

$$\begin{aligned} \max_{\{c_{1,t}, c_{2,t+1}, L_t\}} \; & U_t(c_{1,t}, c_{2,t+1}, L_t) \\ \text{subject to: } c_{1,t} + \frac{c_{2,t+1}}{1 + r_{t+1}^d} &= w_t L_t \end{aligned}$$

where the lifetime budget constraint states that the household's lifetime consumption expenditure is equal to its lifetime income.

The first order conditions yield the following equation for the supply of labour:

$$L_t = \frac{1}{1 + \frac{w_t^{\frac{\xi-1}{\xi}} \frac{\eta}{\rho}^{\frac{1}{\xi}}}{(\frac{1}{\rho})^{\frac{1}{\xi}} + (1+r_{t+1}^d)^{\frac{1-\xi}{\xi}}}}, \tag{1}$$

and the saving decision of the young agent at the end of the period t depends on the market wage rate and the deposit interest rate,

$$d_t = \frac{w_t L_t}{1 + \rho^{\frac{-1}{\xi}} (1 + r_{t+1}^d)^{\frac{\xi-1}{\xi}}}. \tag{2}$$

Wage elasticity of labour supply is negative ($\partial L_t / \partial w_t < 0$) for $\xi > 1$ and is zero when $\xi = 1$. This indicates that the income effect dominates the substitution effect and households supply less labour. For $\xi > 1$, the deposit interest rate elasticity of labour supply is also negative ($\partial L_t / \partial r_{t+1}^d < 0$), which indicates that the interest rate elasticity of deposit supply is positive ($\partial d_t / \partial r_{t+1}^d > 0$); higher deposit interest rate induces higher supply of deposits by households.

2.2 Entrepreneur

In each period, a continuum (equal to 1) of entrepreneurs is born and they live for one period only. The entrepreneurs are assumed to be risk neutral and are exogenously endowed with 1 unit of funds which are not consumable. Each entrepreneur is endowed with a safe project and a risky project, and can operate only one project at a time[9] but are not identical in terms of the quality of their safe projects.

All projects have a lifetime of one period only; entrepreneurs invest their 1 unit of funds at the beginning of the period and receive profits at the end of the period. At the beginning of each period t, each entrepreneur knows the return from the safe project but faces uncertainty in productivity level of the risky project, and must choose her project type prior to observing the realization of the productivity level of the risky project, $\theta_t \in (0, \bar{\theta})$.

2.2.1 Safe Project

The safe projects are heterogeneous in terms of quality and the quality is publicly observable. Each of the safe projects has the certain return x (where $x \in [\underline{x}, \bar{x}]$ is known before the project choice is made). The distribution of x, $G(x)$, is uniform and is public knowledge. Each safe project requires 1 unit of fund invested by an entrepreneur. Since the project is self-financed, the entrepreneur's profit is the return of the project $\pi^s(x) = x$. If an entrepreneur chooses the safe project, she invests her 1 unit of endowed funds at the beginning of the period and consumes the certain

[9] As per Imrohoroglu and Kumar (2003), a safe project could be one with an older (proven) technology while a risky project is one which employs newer technology. Although newer technology may yield higher profits, it is also more likely to fail.

profit return $\pi^s(x)$ at the end of the period, $c_t^s = \pi^s(x)$. In summary, all safe projects are fixed in size and are self-financed.

2.2.2 Risky Project

The risky projects are identical ex ante, while their productivity levels are heterogeneous ex post depending on the realization of θ_t. Risky projects require more than just the entrepreneur's 1 unit of funds endowment and if the entrepreneur chooses the risky project she will need to finance the project using her endowment and borrow b_t units from the financial intermediary. The total initial investment of $1 + b_t$ is then used to employ labour $l_{e,t}$ and physical capital k_t. Physical capital is owned by the entrepreneurs and depreciates fully at the end of the project's lifetime. The entrepreneur therefore faces the following budget constraint:

$$b_t + 1 = k_t + w_t l_{e,t}. \tag{3}$$

Output is observable at no cost by the entrepreneur at the end of the period and production takes the following form as such:

$$f(k_t, l_{e,t}; \theta_t) = \theta_t A_t k_t^{a_k} l_{e,t}^{a_l} \quad A_t > 0,\ \{a_k\,,\ a_l\}\ \in [0, 1] \tag{4}$$

where A_t is the economy's total factor productivity and $0 < a_k + a_l < 1$ for diminishing returns. The productivity level of a project is denoted by θ_t; the entrepreneur who draws a higher productivity at the beginning of the period is more likely to have a high enough output to not declare bankruptcy. The return for the risky project is therefore stochastic. It is assumed that capital fully depreciates after the production process.

Productivity θ_t is randomly drawn from an invariant distribution $F(\theta_t)$, $\theta_t \in (0, \bar{\theta})$, and is independent of x (safe project's return). The realization of θ_t is unknown to everyone before the project choice is made and is only *costlessly* observable by the entrepreneur privately after she chooses her project and inputs are made. The output of the risky project is also private information. Everything else is common knowledge, and the project choice of every entrepreneur is irreversible.

Let $\hat{\theta}_t$ be the cut-off productivity level where projects' output is just enough to repay the loans:

$$\begin{cases} Declare\ bankruptcy & if\ \ \theta_t \in [0, \hat{\theta}_t) \\ Non-bankruptcy & if\ \ \theta_t \in [\hat{\theta}_t, \bar{\theta}] \end{cases}$$

In other words, for θ_t lower than $\hat{\theta}_t$, output realization is not high enough to pay back the loan and the entrepreneur must declare bankruptcy to the financial intermediary. For simplicity, the value of $\bar{\theta}$ is normalized to 1 so that $\hat{\theta}_t$ can be interpreted as the rate of bankruptcy of the risky projects. All of the risky projects with $\theta_t < \hat{\theta}_t$ will declare bankruptcy.

In Williamson (1986), there is only one type of project, project size is fixed, and project returns are stochastic. Therefore, entrepreneurs have no choice over the type of project they undertake. In this paper however, I have employed a production function similar to that in Ho (2000) for the risky project as well as a safe project type to give the entrepreneur a choice. It is noted that all the risky projects are identical ex-ante (and the same as in the formulation in Williamson (1986)). With the endogenous choice between safe and risky projects, the number of risky projects undertaken therefore varies. With the endogenous project sizes, and even though all risky projects are funded by the financial intermediary, credit rationing could still occur in term of the loan amount; entrepreneurs may receive a loan size smaller than they would like. If an entrepreneur chooses to operate a risky project then the problem facing the entrepreneur would be:

$$\mathbf{E}[\pi^e] = \max_{k_t, l_{e,t}} \int_{\hat{\theta}_t}^{1} \left[\theta_t A_t k_t^{a_k} l_{e,t}^{a_l} - b_t(1 + r_t^e)\right] d\theta_t$$

$$\begin{aligned} \text{Subject to: } 1 + b_t &= w_t l_{e,t} + k_t \\ \text{and } \hat{\theta}_t A_t k_t^{a_k} l_{e,t}^{a_l} &= b_t(1 + r_t^e). \end{aligned}$$

Given the loan size b_t and interest rate r_t^e, the entrepreneur chooses inputs k_t and $l_{e,t}$ to maximize the expected profits $\mathbf{E}[\pi^e]$. Evaluating the integral and using the second constraint the expected pay-off from a risky project becomes:

$$\mathbf{E}[\pi^e] = \frac{1}{2}[1 - \hat{\theta}_t]^2 A_t k_t^{a_k} l_{e,t}^{a_l} \tag{5}$$

where $\hat{\theta}_t$ is defined by

$$\hat{\theta}_t A_t k_t^{a_k} l_{e,t}^{a_l} \quad = \quad b_t(1 + r_t^e). \tag{6}$$

The expected profit of the risky project given by Equation 5 is decreasing in $\hat{\theta}_t$ and note that $E[\pi^e|\hat{\theta}_t = 1] = 0$. In other words, the higher is the cut-off productivity level, the lower is the expected profit of a risky project. In equation (6), r_t^e is the loan interest rate the entrepreneur must repay the financial intermediary. The right-hand side of the equation is the output of the risky project with productivity level $\hat{\theta}_t$ that is just enough to repay the loan.

2.2.3 Project Choice

The safe project return is characterized by a known x while the risky project is characterized by the unknown θ_t and the distributions of each are independent. The entrepreneur optimally decides which type of project to undertake after the observation of its x but before the realization of θ_t. In particular, the entrepreneur will choose the risky project if the following inequality holds:

$$\mathbf{E}[\pi^e] \geq x \tag{7}$$

which states that should the expected profit of the risky project not be high enough the entrepreneur will prefer the safe project. In the extreme case that $\mathbf{E}[\pi^e] > \bar{x}$ then all entrepreneurs will take on the risky projects. In contrast, when $\mathbf{E}[\pi^e] < \underline{x}$, in a climate with very high business risks, entrepreneurs unanimously choose safer projects to pursue. The entrepreneur's problem is therefore to maximize her expected return (prior to observing the realization of θ_t) by choosing a safe or a risky project: $H_e \equiv \max\{x, \mathbf{E}[\pi^e]\}$ given the constraints (5) and (6) and taking the loan size and interest rate $\{b_t, r_t^e\}$ as well as w_t the wage rate as given.

As illustrated in Appendix *A* Figure 7, given that the safe project return is uniformly distributed over the interval $[\underline{x}, \bar{x}]$, the fraction of entrepreneurs who take on the risky projects (those with $x < \mathbf{E}[\pi^e]$) is equal to $\phi_t = \frac{\mathbf{E}[\pi^e] - \underline{x}}{\bar{x} - \underline{x}}$ $(0 < \phi_t \leq 1)$.

The larger is the wedge between the expected profit $\mathbf{E}[\pi^e]$ and the lower bound return on safe projects $\underline{x}$, the higher will be the number of entrepreneurs who take on risky projects.

2.3 Financial Intermediary

The financial intermediary is an economic agent who maximizes the expected return to the entrepreneur within a perfect competition setting and whose primary role is to allocate savings towards more productive investments. It does so by accepting deposits from households and making loans to entrepreneurs. They also have access to international credit market, channelling funds from the international credit market to finance domestic investment, or the excess funds from the domestic credit market to lending abroad.

It has been shown in the literature that intermediaries reduce socially unnecessary capital liquidation and shift composition of savings towards more productive capital (Bencivenga and Smith, 1991). However in this model, time frames of investments are homogeneous that there is no differentiation between liquid and illiquid investments. Therefore, the primary channel for enhancing investments is through improved risk diversification which induces entrepreneurs to choose risky projects over the safe projects with low returns.

In this paper, all financial intermediaries are identical and behave competitively. In general however, countries vastly differ in quality of institutions, depth and structure of financial markets, and in their finance-specific legal and regulatory framework. For our purposes, the exogenous components are disaggregated into quality of general institutions and level of finance-related technologies. This distinction is integral to the analysis. The working mechanism of intermediaries is intuitive: in face of higher costs due to more uncertainty or poorer institutional environment, intermediaries' hire more loan officers to verify project returns and bankruptcy claims. Improvement in the intermediaries' monitoring technology allows them to reduce the number of loan officers.

Following Diamond (1984) and Williamson (1986), intermediation endogenously dominates direct lending in equilibrium[10]. Because there are idiosyncratic risks, risk-pooling is necessary and the financial intermediary collects information in order to maximize entrepreneur's profits by minimizing losses from lending to risky investments. Financial intermediaries allocate deposits amongst a large number of entrepreneurs, diversifying the risk. As a result, they can provide depositors with a non-contingent interest payment of r_t^d at each period t which is paid only after collecting loan repayments from the entrepreneurs.

The financial intermediary makes loans of size b_t to entrepreneurs at date t with the interest rate r_t^e, which is collected only when project returns are realized at the end of the period and only if the project return is higher than the cut-off expressed in equation (6). The optimal loan contract is therefore characterized by $\{b_t, r_t^e\}$. Rationing happens only on the intensive margin and all entrepreneurs who choose to operate a risky project receive the same rationed loan size, b_t.

In the model with endogenous labour input to monitoring, given that the intermediary's labour input $l_{f,t}$ has been in place, should the project realization be lower

[10] While Diamond (1984) simply assumes the existence of financial intermediaries, Williamson (1986) shows they arise endogenously.

than the cut-off level, the amount of resources the intermediary will dedicate to monitoring will partly depend on the level of labour input, $l_{f,t}$, and partly on exogenous institutional quality and technological level of the financial intermediation sector. An improvement in regulatory framework or institutional quality will be captured by a decrease in z. It is noted that the labour cost $w_t l_{f,t}$ is like an upfront cost in the set up with endogenous labour input to financial intermediation. As such, the monitoring technology, $M(l_{f,t}; z, \mu)$, can take on two functional forms in this paper: one exogenous and one with endogenized labour input. In the exogenous case, the cost z governed by the quality of general institutions is taken as given by the intermediary and there is nothing it can do to reduce or influence it. In the endogenized labour input case however, the financial intermediary will take as given the costs associated with the quality of institutions (captured by z) as well as the monitoring technology it has access to (captured by μ) and chooses the optimum level of labour input to affect the unit monitoring cost.

In the case of the entrepreneur declaring bankruptcy, the financial intermediary engages in monitoring the project and incurs a monitoring cost while liquidating the output. In other words, monitoring decision is made ex-post as in Williamson (1987) rather than ex-ante. As a result there are no adverse selection problems given that there are no ex-ante information asymmetries. Because productivity draws are exogenous and project returns cannot be influenced by the entrepreneur, there are no moral hazard problems in this type of setup either. The zero-profit condition for the financial intermediary in period t is given by:

$$\int_0^{\hat{\theta}_t} \left[\theta_t A_t k_t^{a_k} l_{e,t}^{a_l} - M(l_{f,t}; z, \mu) b_t\right] d\theta_t + \int_{\hat{\theta}_t}^1 b_t(1 + r_t^e) d\theta_t - w_t l_{f,t} = b_t(1 + r_{t+1}^d) \quad (8)$$

Using (3) and (6), it can be simplified to:

$$(\hat{\theta}_t - \frac{\hat{\theta}_t^2}{2}) A_t k_t^{a_k} l_t^{a_l} - (k_t + w_t l_{e,t} - 1) \left[\hat{\theta}_t M(l_{f,t}; z, \mu) + (1 + r_t^d)\right] - w_t l_{f,t} = 0 \quad (9)$$

where,

$M(l_{f,t}; z, \mu) = z$ and, $l_{f,t} = 0$, for the exogenous model, and

$M(l_{f,t}; z, \mu) = z - \mu l_{f,t}^{\sigma}$ and, $l_{f,t} > 0$, for the endogenous model.

The first term on the left-hand side of equation (8) is total liquidated output the financial intermediary collects from bankruptcy-declared projects net of the monitoring cost $M(l_{f,t}, z) \times b_t$. The intermediary hires labour $l_{f,t}$ for monitoring and collecting interest revenue and its monitoring cost efficiency is subject to exogenous factors such as institutional quality and regulations which are captured by the parameter z. The second term in equation (8) is the revenues collected from non-bankrupt loans and the third term is the labour costs $w_t l_{f,t}$ incurred. Finally, the term on the right-hand side is the financial intermediary's liability; the promised risk-free return on deposits made by households. Equation (9) is a simpler representation of the zero-profit condition: collected revenues are equal to the sum of the cost of funds and the costs associated with monitoring. In the next section, after setting up the model using an exogenous version of $M(l_{f,t}; z, \mu)$ followed by an endogenized version, some numerical exercises are presented. Given the non-linearity of the equilibrium equations, analytical solutions cannot be derived.

2.3.1 Exogenous Monitoring Technology

As mentioned before, efficiency of the financial intermediaries is assumed to be a function of country-specific characteristics such as the legal system and institutions (Levine, 1997). That is why monitoring cost has always been assumed to be exogenous in most models of financial intermediation (Williamson (1986), Imrohoroglu and Kumar (2003), Alessandria and Qian (2005)). The monitoring costs are decreasing in quality of institutions as shown empirically by Kunt et al. (2003). The authors use data from 72 countries and find a negative relationship between intermediation costs and improving financial intermediation regulations and national institutions. Therefore, in this model I let z captures the unit monitoring costs and in essence represents the regulatory effects (financial intermediary entry restrictions, reserve requirements, restrictions on financial intermediary's activities, financial intermediation freedom etc.) as well as the institutional effects (property rights, political stability, government effectiveness etc.). It is noted that in the literature most studies assume a fixed project size and a fixed monitoring cost. In this paper, the monitoring cost of a risky project with loan size b_t is zb_t.

Following with that line of the literature and taking a constant monitoring unit cost, $M(l_{f,t}; z, \mu) = z$, the distinction between the financial intermediary's technology level (μ) and the general institutional framework (z) vanishes and only to be reintroduced in the next section under an endogenous monitoring function. The problem faced by the intermediary is to maximize the expected return to the entrepreneur by choosing capital k_t, labour $l_{e,t}$, and $\hat{\theta}_t$[11]:

$$\max_{\{k_t, l_{e,t}, \hat{\theta}_t\}} \frac{1}{2}(1-\hat{\theta})^2 A_t k_t^{a_k} l_{e,t}^{a_l} \quad (10)$$

$$\textit{subject to}$$

$$(\hat{\theta}_t - \frac{\hat{\theta}_t^2}{2}) A_t k_t^{a_k} l_t^{a_l} = (k_t + w_t l_{e,t} - 1)\left[\hat{\theta}_t z + (1 + r_t^d)\right] \quad (11)$$

where the cutoff productivity level $\hat{\theta}_t$ determines the number of project being monitored and liquidated, and the intermediary's revenue is just enough to cover the monitoring cost and repayment to depositors. The first-order conditions for k_t, $l_{e,t}$, and $\hat{\theta}_t$ are respectively given by:

$$\frac{a_k}{2}(1-\hat{\theta}_t)^2 A_t k_t^{a_k-1} l_{e,t}^{a_l} + \lambda_t \left[a_k(\hat{\theta}_t - \frac{\hat{\theta}_t^2}{2}) A_t k_t^{a_k-1} l_{e,t}^{a_l} - [\hat{\theta}_t z + (1+r_t^d)] \right] = 0 \quad (12)$$

$$\frac{a_l}{2}(1-\hat{\theta}_t)^2 A_t k_t^{a_k} l_{e,t}^{a_l-1} + \lambda_t \left[a_l(\hat{\theta}_t - \frac{\hat{\theta}_t^2}{2}) A_t k_t^{a_k} l_{e,t}^{a_l-1} - w_t[\hat{\theta}_t z + (1+r_t^d)] \right] = 0 \quad (13)$$

$$-(1-\hat{\theta}_t) A_t k_t^{a_k} l_{e,t}^{a_l} + \lambda_t \left[(1-\hat{\theta}) A_t k_t^{a_k} l_{e,t}^{a_l} - (k_t + w_t l_{e,t} - 1) z \right] = 0 \quad (14)$$

where λ_t is the Lagrange multiplier associated with the zero-profit condition (11). Combining equations (12) and (14) yields:

$$\frac{a_k}{2} A_t k_t^{a_k} l_t^{a_l} = \left[\hat{\theta}_t k_t + \frac{a_k}{2}(1-\hat{\theta}_t)(k_t + w_t l_{e,t} - 1) \right] z + (1+r_t^d) k_t \quad (15)$$

[11]As per Diamond (1984), perfect competition in the loan market implies that financial intermediaries have to maximize the expected return their borrowers while making zero profit. Therefore, the intermediary maximizes the expected profit of the entrepreneur with respect to its own zero-profit condition

and similarly, using (13) and (14):

$$\frac{a_l}{2}A_t k_t^{a_k} l_t^{a_l} = \left[\hat{\theta}_t w_t l_{e,t} + \frac{a_l}{2}(1-\hat{\theta}_t)(k_t + w_t l_{e,t} - 1)\right] z + (1+r_t^d) w_t l_{e,t} \tag{16}$$

The left-hand side of equation (15) is the output share of capital which is the benefit of employing k_t units of capital. The right-hand side is the cost of monitoring and employing capital with the first term being the cost of informational asymmetries and the second term being the cost of fund facing the intermediary. We could also interpret the right-hand side of equation (15) as the expected monitoring cost for the loan to finance k_t, $\hat{\theta}_t k_t z$, plus the cost of funds of borrowing k_t facing the intermediary, $(1+r_t^d)k_t$, and the wedge to the entrepreneur to induce truth-telling and avoid unnecessary liquidation, $\frac{a_k}{2}(1-\hat{\theta}_t)(k_t + w_t l_{e,t} - 1)z$. Equation (16) is interpreted similarly with $w_t l_{e,t}$ replacing k_t and a_l replacing a_k. Subsequently, the relationship between the marginal rate of technical substitution and the unit input costs comes from equations (12) and (13):

$$\frac{a_l}{a_k}\frac{k_t}{l_{e,t}} = w_t \tag{17}$$

In this setting, the ex ante interest-rate spread is defined as the difference between the lending interest rate and the deposit interest rate:

$$r_t^e - r_t^d = \frac{\hat{\theta}_t A_t k_t^{a_k} l_t^{a_l}}{k_t + w_t l_{e,t} - 1} - (1+r_t^d). \tag{18}$$

It is evident from equation (18) above that as r_t^e falls, the ratio of cut-off output to loan size must fall at the same (higher) rate for the spread to not change (narrow down). Furthermore, the international net outflow of funds is captured by the residual term $d_t - \phi_t b_t$ which is the difference between the total available deposits in the economy, d_t, and the total amount of funds loaned out to fund the risky projects, $\phi_t b_t$. Equations (15)–(17) define the optimal debt contract and characterize k_t, $l_{e,t}$ and $\hat{\theta}_t$ and govern the loan interest rate r_t^e profile as well as the loan size b_t.

2.3.2 Endogenous Monitoring Technology

In contrast to the section above, the per unit monitoring cost denoted as $M(l_{f,t}; z, \mu)$ is taken to be a function of labour hired for monitoring (which the intermediary can choose optimally) and two parameters capturing the exogenous forces (such as institutional, legal or government regulations as well as the financial sector's information technology level):

$$M(l_{f,t}, ; z, \mu) = z - \mu l_{f,t}^{\sigma} \tag{19}$$

where σ is a proxy for labour-elasticity of information production and $l_{f,t}$ is the endogenized labour input. The information production $\mu l_{f,t}^{\sigma}$ counters the amount of resources required (z) for monitoring and it does so by combining labour $l_{f,t}$ with intermediation sector's level of technology μ. The unit monitoring cost, $M(l_{f,t}; z, \mu)$, is therefore decreasing in this production function at a diminishing rate since we assume $\sigma < 1$ as in Greenwood et al. (2010).

This form of the monitoring technology allows for disaggregation of the general institutional quality[12], z, from the level of information technology available to the financial intermediary, μ. Higher values of z indicate less developed general institutional levels, resulting in a higher unit cost for the financial intermediary as mentioned before. However, the intermediary also benefits from some level of monitoring technology which is assumed to be exogenously given and is captured by μ and works in the opposite direction of z in reducing the unit monitoring cost.

Numerous papers have shown that evolution of the information technology sector as well as the advancements in statistical analysis and risk management have resulted in higher efficiency of the financial intermediation sector. Furlong (2001) finds that banks generally invest more heavily in information technology before other industries do. Hitt et al. (1998) show that investment in employees that specialize in information technology is in fact efficiency augmenting. Finally, Berger (2002) concludes that the general consensus of the literature is that there are improvements in costs from technological advancements.

As financial intermediaries engage in more monitoring, more labour is demanded, and per unit cost of monitoring falls due to the higher degree of specialization: $\frac{\partial M(l_{f,t};z,\mu)}{\partial l_{f,t}} < 0$ and $\frac{\partial M(l_{f,t};z,\mu)^2}{\partial^2 l_{f,t}} > 0$ (diminishing returns). The upfront labour cost $w_t l_{f,t}$ is independent of whether the project fails (bankruptcy case) or not. The intermediary will hire labour up to the point where the marginal cost of labour is equal to the marginal benefit from monitoring. As such, monitoring can be adjusted in two dimensions. First, through adjustments in the cut-off productivity level for

[12]Kunt et al. (2003) also find empirically that "bank regulations reflect broader national institutions associated with the protection of private property rights and the freedom to compete in the economy" and so bank-specific regulations become insignificant in explaining intermediation costs once accounting for general institutions

bankruptcy and monitoring, $\hat{\theta}_t$, which is the common approach within the literature. Secondly, through adjusting the unit cost of monitoring by changing the labour input $l_{f,t}$ which is unique to this model and has not been explored in the existing literature.

The financial intermediary, taking r^d_{t+1} (world interest rate) and w_t (market wage) as given, faces the following optimization problem:

$$\max_{\{k_t, l_{e,t}, l_{f,t}, \hat{\theta}\}} \frac{1}{2}(1-\hat{\theta})^2 A_t k_t^{a_k} l_{e,t}^{a_l} \tag{20}$$

subject to

$$(\hat{\theta}_t - \frac{\hat{\theta}_t^2}{2}) A_t k_t^{a_k} l_t^{a_l} = (k_t + w_t l_{e,t} - 1)\left[(z - \mu l_{f,t}^{\sigma})\hat{\theta}_t + (1 + r_t^d)\right] + w_t l_{f,t} \tag{21}$$

Let $\hat{\lambda}_t$ be the Lagrange multiplier associated with the financial intermediary's zero profit condition. The first-order conditions are similar to before with one extra equation for $l_{f,t}$ since it is determined endogenously now:

$$\frac{a_k}{2}(1-\hat{\theta}_t)^2 A_t k_t^{a_k-1} l_{e,t}^{a_l} + \hat{\lambda}_t\left[a_k(\hat{\theta}_t - \frac{\hat{\theta}_t^2}{2})A_t k_t^{a_k-1} l_{e,t}^{a_l} - [(z - \mu l_{f,t}^{\sigma})\hat{\theta}_t + (1 + r_t^d)]\right] = 0 \tag{22}$$

$$\frac{a_l}{2}(1-\hat{\theta}_t)^2 A_t k_t^{a_k} l_{e,t}^{a_l-1} + \hat{\lambda}_t\left[a_l(\hat{\theta}_t - \frac{\hat{\theta}_t^2}{2})A_t k_t^{a_k} l_{e,t}^{a_l-1} - w_t[(z - \mu l_{f,t}^{\sigma})\hat{\theta}_t + (1 + r_t^d)]\right] = 0 \tag{23}$$

$$-(1-\hat{\theta}_t) k_t^{a_k} l_{e,t}^{a_l} + \hat{\lambda}_t\left[(1-\hat{\theta}_t)A_t k_t^{a_k} l_{e,t}^{a_l} - (k_t + w_t l_{e,t} - 1)(z - \mu l_{f,t}^{\sigma})\right] = 0 \tag{24}$$

$$(k_t + w_t l_{e,t} - 1)\sigma\mu l_{f,t}^{\sigma-1}\hat{\theta}_t = w_t \tag{25}$$

The left-hand side of equation (25) is the marginal product of labour hired to monitor projects (the reduction in the marginal cost of monitoring multiplied by the loan size and the measure of projects declaring bankruptcy). As in the previous model, the first two first-order conditions, equations (22) and (23), yield:

$$a_k w_t l_{e,t} = a_l k_t \tag{26}$$

while (22) and (24) simplify to:

$$\frac{a_k}{2} A_t k_t^{a_k} l_{e,t}^{a_l} = \left[\hat{\theta}_t k_t + \frac{a_k}{2}(1-\hat{\theta}_t)(k_t + w_t l_{e,t} - 1)\right](z - \mu l_{f,t}^{\sigma}) + (1 + r_t^d) k_t \tag{27}$$

and using (23) and (24):

$$\frac{a_l}{2} A_t k_t^{a_k} l_t^{a_l} = \left[\hat{\theta}_t w_t l_{e,t} + \frac{a_l}{2}(1-\hat{\theta}_t)(k_t + w_t l_{e,t} - 1)\right](z - \mu l_{f,t}^{\sigma}) + (1 + r_t^d) w_t l_{e,t} \tag{28}$$

The first terms on the right-hand side of both equations (27) and (28) are again costs of imperfect information to capital and labour subsequently. Equations (25)–(28) define the optimal debt contract which characterizes k_t, $l_{e,t}$, $l_{f,t}$ and $\hat{\theta}$ and governs the interest rate $r_{e,t}$ and the loan size b_t.

3 Equilibrium

In closing the model I resort to using the endogenous form of the unit monitoring cost, $M(l_{f,t}; z, \mu) = z - \mu l_{f,t}^{\sigma}$. The arguments here hold for both models if the reader keeps in mind that in the exogenous cost model, there is no labour input for the financial intermediary: $l_{f,t} = 0$. Labour market must clear in equilibrium. The sum of labour demanded by the financial intermediary sector and by the entrepreneurs, weighted by the total number of risky projects, must equal the total labour supplied by the households. The weighting is necessary as the labour hired ($l_{e,t}$ or $l_{f,t}$) is in fact per unit of loan and needs to be aggregated.

$$\phi_t(l_{e,t} + l_{f,t}) = L_t \tag{29}$$

The loan market should also be closed in the closed economy case: $d_t = \phi_t b_t$. Using equations (1) and (3), the loan market clearing condition for the closed economy is:

$$\left(\frac{\frac{1}{2}(1-\hat{\theta}_t)^2 A_t k_t^{a_k} l_{e,t}^{a_l} - \underline{\mathrm{x}}}{\bar{x} - \underline{\mathrm{x}}} \right) (k_t + w_t l_{e,t} - 1) = d_t = \frac{w_t L_t}{1 + \rho^{\frac{-1}{\xi}} (1 + r_{t+1}^d)^{\frac{\xi-1}{\xi}}}. \tag{30}$$

where the fraction of entrepreneurs choosing the risky investments is rewritten as:

$$\phi_t = \frac{\mathbf{E}[\pi^e] - \underline{x}}{\bar{x} - \underline{x}} = \frac{\frac{1}{2}(1-\hat{\theta}_t)^2 A_t k_t^{a_k} l_{e,t}^{a_l} - \underline{x}}{\bar{x} - \underline{x}}. \tag{31}$$

However, given that the interest of this paper lies in the case of a small open-economy, the equality will not hold and the gap would be filled by inflows or outflows of capital. The small open economy takes r_t^d as given and determines the international capital inflows, $\phi_t b_t - d_t$, endogenously. Finally, the total output of this small economy is given by the sum of the output of the safe and risky projects, less the resources spent on monitoring:

$$\begin{aligned} Y_t &= \{Y_t^{safe}\} + \{Y_t^{risky}\} \\ &= \{\frac{1}{2}(\bar{x}^2 - \mathbf{E}[\pi^e]^2)\} + \{\phi_t A_t k_t^{a_k} l_{e,t}^{a_l} - \phi_t(\hat{\theta}_t M_t b_t + w_t l_{f,t})\} \end{aligned}$$

Given the parameters of the model, an equilibrium is the set of variables w_t, $l_{f,t}$, $l_{e,t}$, k_t, ϕ_t, $\hat{\theta}_t$, L_t, and d_t, which satisfy the following system of equations:

$$(\hat{\theta}_t - \frac{\hat{\theta}_t^2}{2})A_t k_t^{a_k} l_{e,t}^{a_l} = (k_t + w_t l_{e,t} - 1)\left[(z - \mu l_{f,t}^{\sigma})\hat{\theta}_t + (1 + r_t^d)\right] + w_t l_{f,t} \qquad (32)$$

$$\frac{a_k}{2} A_t k_t^{a_k} l_{e,t}^{a_l} = \left[\hat{\theta}_t k_t + \frac{a_k}{2}(1 - \hat{\theta}_t)(k_t + w_t l_{e,t} - 1)\right](z - \mu l_{f,t}^{\sigma}) + (1 + r_t^d) k_t \qquad (33)$$

$$(k_t + w_t l_{e,t} - 1)\sigma\mu l_{f,t}^{\sigma-1}\hat{\theta}_t = w_t \qquad (34)$$

$$\phi_t = \frac{\frac{1}{2}(1 - \hat{\theta}_t)^2 A_t k_t^{a_k} l_{e,t}^{a_l} - \underline{x}}{\bar{x} - \underline{x}} \qquad (35)$$

$$\phi_t(l_{e,t} + l_{f,t}) = L_t \qquad (36)$$

$$a_k w_t l_{e,t} = a_l k_t \qquad (37)$$

$$d_t = \frac{w_t L_t}{1 + \rho^{\frac{-1}{\xi}}(1 + r_{t+1}^d)^{\frac{\xi-1}{\xi}}} \qquad (38)$$

$$L_t = \frac{1}{1 + \frac{w_t^{\frac{\xi-1}{\xi}} \frac{\eta}{\rho}^{\frac{1}{\xi}}}{(\frac{1}{\rho})^{\frac{1}{\xi}} + (1 + r_{t+1}^d)^{\frac{1-\xi}{\xi}}}} \qquad (39)$$

The entrepreneur's expected return can be rewritten using equations (27), (28) and (32):

$$\begin{aligned}\mathbf{E}[\pi^e] = &\frac{1}{2} A_t k_t^{a_k} l_{e,t}^{a_l}(1 - a_k - a_l) + [M(l_{f,t}; z, \mu)\hat{\theta}_t + 1 + r_t^d] \\ &+ [\frac{a_k + a_l}{2}(1 - \hat{\theta}_t)(k_t + w_t l_{e,t} - 1)M(l_{f,t}; z, \mu) - w_t l_{f,t}]\end{aligned} \qquad (40)$$

where the first term is the fair share of output allocated to the entrepreneur, the second term is the return to the entrepreneur's internal fund and the last term is the extra payment to the entrepreneur as an incentive to tell the truth.

4 Comparative Statics

As mentioned before, in order to better understand the role of institutions and establish a link between the institutional framework and financial intermediation sector, the monitoring cost function must be endogenized. Taking the deposit interest rate (r_t^d) as exogenously given, a comparison between the model with endogenized labour input to monitoring against the model with exogenous monitoring is of interest to realize the gains from this modification. In general, the results indicate that the endogenized labour input to monitoring technology matters and has serious implications. Once the validity of this approach is verified, using the endogenized model, certain comparative statics are derived numerically with respect to the changing quality of institutions as well as the elasticity of labour input for the financial intermediary (to verify robustness).

4.1 Parameter Values

I have used three different values for the financial intermediary's monitoring technology level (μ) and have also let the institutional parameter (z) to vary in order to focus the results on the response of the endogenous variables to the changing technology level and the changing quality of institutions, holding all parameters of other sectors of the economy constant. The μ parameter takes on values 12, 14, and 16 (a higher value reflects access to better bank-specific technology) in order to produce loan interest rate values which are reasonable. However, these values are arbitrary and do not seem to affect the qualitative results. Given the shape of the monitoring technology function, $M(l_{f,t}; z, \mu) = z - \mu l_{f,t}^{\sigma}$, higher values of μ imply access to better technology level as they reduce the monitoring cost: $\frac{\partial M}{\partial \mu} = -l_{f,t}^{\sigma} < 0$. The monitoring technology is linear and directly proportional in parameter z representing the quality of institutions in the monitoring technology, $\frac{\partial M}{\partial z} = 1$. Consequently, unlike the technology parameter, the higher the value of z is, the higher are the associated monitoring costs. Again, the 2.5 to 4.5 range for the z values is not calibrated and is arbitrarily set to produce reasonable loan interest rate values. While different values of μ change the curvature of the unit monitoring cost, the z values will only result in level effects.

Finally, to assess the sensitivity of the results with respect to the proxy for the elasticity of labour (σ) in the monitoring technology function, I use arbitrary values of 0.3 and 0.7. Some results are responsive to these values and in particular the direction of net international capital flows as a percentage of total output changes (with details discussed in section 5.2). Capital outflows within the setting of the model are defined as the residuals of available funds (deposits) after projects are funded. In this model d_t and $\phi_t b_t$ are chosen by different agents so that the intertemporal aspects of saving and investment are not the same as other standard models with agents making savings and investment decisions contemporaneously. Flows as percentage of total output are calculated using the sum of the safe and risky project outputs as the measure for total domestic output.

The discussion of the results starts with a look at the loan interest rate profile and how the model predictions fare against real world data. Table 1 of the Appendix B section summarizes the parameter values employed for performing the numerical exercises. The elasticity of capital (a_k) and labour (a_l) are set to 0.3 and 0.65 which are within the range of values suggested within the literature and the total factor productivity (A_t) is set to 1 for simplicity. The intertemporal elasticity of substitution ($1/\epsilon$) is accepted in the literature to be larger than one and so we set it equal to 1.04 in order to ensure the model predicts reasonable values for the loan interest rate profile. The subjective discount rate ρ is set to 0.96 to be in line with accepted range of discount rate values for a 1-year time period (see Frederick et al., 2002 for details). The deposit interest rate is equal to 2% which is roughly the historical return of the U.S. Treasury Bill rate. As such, the lower bound for the safe project is set slightly higher at 5% and the upper bound is set to 15% (in order to produce reasonable loan interest rate values).

Table 2 of the Appendix B section summarizes the simulation results for the exogenous model while Tables 3 and 4 summarize the simulations for the endogenous models with $\sigma = 0.3$ and $\sigma = 0.7$ respectively.

4.2 The Loan Interest Rate Profile

This section is in essence a comparison of the exogenous and the endogenous models in their predictions of the interest rate spread. The generated loan interest rate profile is essentially what sets the two models apart. Unlike the conventional exogenous model, the model with endogenous labour input to the monitoring technology is able to produce a loan interest profile consistent with real world observed data. As is evident in Figure 5 of the Appendix A section which is produced using the World Bank Governance Indicators and the interest rate spread data compiled by Beck et al. (2009), one can observe an expected negative relationship between the two variables. The better the quality of institutions the higher the index of rule of law (which equates to a lower value of "z" in the model), the lower is the interest rate margin. Better institutions are one of the driving forces behind the lower monitoring costs in cases of declared bankruptcy. Resources are better allocated and therefore the financial intermediaries require less labour input and face lower monitoring costs overall. Given the decreasing returns in the production function of the risky project, it will be beneficial to the intermediary to fund more projects with smaller loan sizes. Should more projects default however, then the monitoring cost will be higher.

Using the parameter values shown in Table 1 (Appendix B), the numerical exercises show that under the endogenous model, the loan interest rate is increasing as quality of institutions deteriorate (increase in z). The financial intermediary can respond to a deteriorating institutional condition through loan rationing as well as through adjusting the monitoring intensity endogenously. As the unit cost of monitoring rises due to an increase in z, the financial intermediary is induced to hire more labour ($l_{f,t}$) to reduce the unit cost to some degree (Figure 8 of the Appendix A). Due to the diminishing returns to monitoring, the financial intermediary also has to adjust by issuing larger loans (higher b_t), loosening the rationing on the intensive margin while tightening the rationing on the extensive margin (lower ϕ_t) as seen on Figure 9 of the Appendix A section. With few loans (lower ϕ_t) the intermediary can increase the cut-off productivity level $\hat{\theta}_t$ (Figure 10 of the Appendix A section). The contracted loan interest rate, $1 + r_t^e = (\hat{\theta}_t A_t k_t^{a_k} l_{e,t}^{a_l})/b_t$, increases as the rise in the cut-off output level is larger than the increase in the loan size.

On the contrary, the loan interest rate profile generated using the exogenous model is decreasing in the quality of institutions: intermediaries with access to poorer institutions (higher z) offer loans at a lower interest rate (Appendix A: Figure 11). This prediction is contrary to the data. Recall that the exogenous monitoring technology is simply $M(l_{f,t}; z, \mu, \sigma) = z$, and so the intermediary is not able to adjust the unit cost by injecting labour ($l_{f,t} = 0$). The financial intermediary hence funds more projects but with a smaller loan size. To economize on the monitoring costs, the productivity cut-off level for bankruptcy, $\hat{\theta}_t$, is lower and hence the loan interest rate has to be set lower. This however, as mentioned before, is counter-intuitive since under conditions of poor institutions, the data show a higher interest rate spread (Appendix A Figure 5). The monitoring technology with endogenous input therefore significantly improves the prediction of the model and brings it more in line with the pattern observed in the real world. Since the risk-free interest rate, r_t^d, is fixed in a small open economy framework, the loan interest rate spread, $r_t^e - r_t^d$ also exhibits the same pattern as the lending interest rate r_t^e. Furthermore, combining Figures 4 and 5 of Appendix A, both loss given default (monitoring cost) and the interest rate spread are decreasing in quality of institutions; in other words, higher monitoring costs are associated with higher interest rate spreads. Figures 12(a) and 12(b) of Appendix A replicate this association while 12(c) does not as it pertains to the exogenous model.

Since the endogenous model conforms better to real world data, I will focus on this model in the following discussions. It is of interest to see how the model performs in environments where monitoring technology improves or where the quality of institutions changes. In the following section these two forces are investigated in order to study their implications on the direction of capital flows.

4.3 International Capital Flows

As stated before, net international capital outflows are defined as a residual of funds; left over of domestic deposits (savings) once all domestic projects are funded and loans are issued (investment). It is noted that the supply and demand of funds do not include the entrepreneurs' internal funds. There are three variations[13] of this measure which can be of interest: net difference, $d_t - \phi_t b_t$, net difference as a percentage of output,$\frac{d_t - \phi_t b_t}{Y_t}$, and the savings-investment ratio, $\frac{d_t}{\phi_t b_t}$. The savings-investment ratio (also known as the Aizenman's self-financing ratio)[14] is constructed as the ratio of total deposits to total loans issued to finance risky projects: $\frac{d_t}{\phi_t b_t}$, and it is often used to capture "the intertemporal aspects of savings and investments" which however are not the focus of this paper. As such, in this paper the net international flows, and in particular, the net international flows as a ratio of GDP ($\frac{d_t - \phi_t b_t}{Y_t}$) are used to gauge the performance of the financial sector.

Figures 13 and 14 of the Appendix A section summarize the results and are comparable to Figure 1 of the Appendix A Section.

4.3.1 Changes in the Technology Level (μ)

The exercise here focuses on holding the quality of institutions z fixed while allowing for the technology level μ to differ. In general, changes in the technology level the

[13]In the empirical literature these measures are used interchangeably.
[14]Aizenman, Pinto and Radziwill (2004)

financial intermediary has access to will result in level effects mostly. The better the monitoring technology is, the lesser is the need for labour input by the intermediary (Appendix A: Figure 8). To best see the underlying reasons, consider a micro-finance institution in a poor country with poor monitoring technology. With micro-finance loans, loan officers have to travel to villages and meet with each entrepreneur declaring bankruptcy in person to verify project returns. If however the financial intermediary can monitor these entrepreneurs remotely, it will reduce its labour force. The financial intermediary then can issue more loans, taking advantage of the economies of scale the monitoring technology offers.

Thus, as the monitoring technology μ improves, more loans are issued, ϕ_t increases (Appendix A Figure 9), while rationing is intensified on the intensive margin, b_t decreases (Appendix A Figure 15), and the total loan supply, $\phi_t b_t$, decreases as a result. Alternatively, domestic deposit d_t decreases by a smaller proportion than the decrease in $\phi_t b_t$, resulting in an increase in capital outflows. Overall, holding z fixed while increasing μ, the model predicts a larger outflow of capital, both "net" and as a percentage of output (Appendix A: Figures 13 and 14). The total amount of intermediated loans drops, which implies that the rationing on the intensive margin dominates the increase in the total number of loans funded (the extensive margin). However, total output increases, which is an indication that higher quality projects are funded, which in turn is a result of the financial intermediary having access to better monitoring technologies. Consider a poor country where intermediaries have access to poor technologies. Net international capital outflows would be lower for this type of economy compared to the one with better technologies. Naturally, this by no means is the complete picture as these countries also suffer from lower managerial abilities and TFP levels (Silva, 2010).

4.3.2 Changes in the Institutional Quality Level (z)

While holding the technology level μ fixed, I allow z to vary in order to be able to study the changes in capital flows in response to different institutional quality levels. This is one dimension in particular where the two models diverge in prediction as Figures 13 and 14 in the Appendix A section make clear. For higher values of z, the intermediary employs more labour per unit of loan in order to reduce the monitoring costs (Appendix A Figure 8). To cut costs, the intermediary will issue fewer loans, increase the loan size, and increase the cut-off productivity level for bankruptcy. Recall that the model is a small open economy and thus subject to the world interest rate, $r_t^d = r_t^w$. Rewriting equation (32):

$$(\hat{\theta}_t - \frac{\hat{\theta}_t^2}{2}) A_t k_t^{a_k} l_{e,t}^{a_l} = b_t M_t \hat{\theta}_t + b_t(1 + r_t^d) + w_t l_{f,t} \tag{41}$$

$$\text{where, } M_t = z - \mu l_{f,t}^{\sigma}$$

$$\text{and, } \hat{\theta}_t A_t k_t^{a_k} l_{e,t}^{a_l} = b_t(1 + r_t^e).$$

Equation (41) is the zero-profit condition for the financial intermediary and it determines the cut-off productivity level $\hat{\theta}_t$. The term on the left-hand side is the sum of the repayments from projects with $\theta_t \geq \hat{\theta}_t$ and the liquidated output collected from the projects with $\theta_t < \hat{\theta}_t$ declaring bankruptcy. The right-hand side constitutes the monitoring cost, the cost of funds and the cost of labour of the financial intermediary.

As the cut-off productivity level for bankruptcy $\hat{\theta}_t$ rises, the expected profit of the risky projects fall. At the same time, because of a larger loan size, the entrepreneur employs more capital and labour which in turn drives up the expected profit. Overall between the two opposing forces, the effect of the cut-off productivity dominates and expected profit falls. With lower expected profit from taking up the risky projects, some entrepreneurs prefer to operate their safe projects, total output will be lower.

Focusing first on the model with endogenous labour input into the monitoring technology, net international capital outflow, $d_t - \phi_t b_t$, drops as a result of weaker institutions (Figures 13(a) and (b) of Appendix A). That is partly because of the drop in deposits, d_t. In particular, while the labour input per unit of loan ($l_{f,t}$) and per project ($l_{e,t}$) both increase, the overall labour demand falls because of lower number of risky projects operated (lower ϕ_t), and the wage rate (w_t) falls. The lower labour demand and lower wage rate together result in a lower supply of deposits (d_t).

The other channel through which the capital outflows are affected are through the total loans issued, $\phi_t b_t$. For lower values of σ, total loans increase as z increases (poorer institutions) while for higher values of σ, total loans drop. In the former case where $\phi_t b_t$ increases, the effect of loan size dominates: fewer risky loans are issued (lower ϕ_t) but the loan size is larger (larger b_t). For higher values of σ the situation is reversed with the decrease in number of loans (lower ϕ_t) dominating the increase in loan size (larger b_t).

The explanation of the observed opposing forces above (between ϕ_t and b_t) has to do with the effectiveness of labour input into the monitoring technology. As the unit monitoring cost increases (higher M_t) due to an increase in z, the financial intermediary hires more labour (higher $l_{f,t}$) to counter the increase in unit monitoring cost (Figures 8(a) and (b) of Appendix A). The financial intermediary hires more labour as the marginal benefit of monitoring outweighs the marginal costs of monitoring. The additional labour enables the intermediary to overcome the institutional deficiencies such as poor contract enforcements for example.

For larger values of σ, labour input does not increase much and unit monitoring cost still increases. As such, the financial intermediary issues fewer but larger loans since the increase in labour input in monitoring is not as effective as it would have been when σ is low. For either values of σ the residual of funds ($d_t - \phi_t b_t$) is falling even though the adjustments are slightly different due to the differences in the effectiveness of labour input into the monitoring technology.

In contrast to the models with endogenous labour input, the exogenous model predicts an increase in capital outflow as institutions worsen (higher z). With higher unit monitoring costs (higher M_t where $M_t = z$), the financial intermediary issues more loans (higher ϕ_t) but with a smaller loan size (lower b_t). The effect of the decrease in loan size dominates the increase in the number of loans, resulting in a lower level of total loans issued (lower $\phi_t b_t$). Domestic deposits, d_t, are lower since with smaller loan sizes (b_t), less labour is hired (lower $l_{e,t}$) and the wage rate, w_t, is lower. While both deposits and total loans fall, the drop in total loans dominates, and the surplus of deposits flowing out of the economy, $d_t - \phi_t b_t$, increases.

The exogenous model and the models with endogenous labour each provide contrasting predictions in terms of net outflows. In order to see which model is better able to replicate the stylized facts presented in Figure 1 of Appendix A, the model predictions in terms of net capital outflow as percentage of output ($\frac{d_t - \phi_t b_t}{Y_t}$) are presented (Appendix A, Figure 14). Since the numerator (net outflows) was discussed in detail above, we can turn our attention to the denominator (total output) first before we can evaluate the whole ratio.

Figures 16(a, b and c) of Appendix A reveal the models' prediction in terms of total output (sum of safe and risky projects' outputs). Across all models and for all parameter values output increases as institutional quality improves (z drops). This is consistent with the stylized facts presented in Figure 3 (Appendix A) where higher income is associated with higher scores for institutional quality. There are two channels through which output increases with improvements in institutions (fall in z). Firstly, there is a compositional effect where as z falls (institutions improve), more of risky projects are undertaken and fewer safe projects are operated. Secondly, the risky projects' output, which is the project output net of resources spent on monitoring, also increases as z falls as less resources are needed to be spent on monitoring.

Returning to net outflows as a percentage of output (Appendix A Figures 14(a) and 14(b)), the non-monotonicity of the outflows in institutional quality is seen with the higher value of σ only ($\sigma = 0.7$). the model is able to replicate the stylized facts presented in Figure 1 of Appendix A: all indices seem to have a non-linear relationship with net bank flows except for *voice & accountability* and the relationship is somewhat U-shaped. The non-monotonicity in Figure 14(b) is the result of the relative magnitude of decrease in capital outflows and output when institutions are poor (higher z). For extreme values of z the model with endogenous labour and

$\sigma = 0.7$ predicts a higher ratio of outflow to output. In summary, even though the results are robust when it comes to net capital outflows, they are confounding for net capital outflows as a percentage of output. The results indicate that a thorough empirical study is needed to shed more light on the issue.

Recall that in an exogenous monitoring setting the intermediary can only adjust the total amount of intermediated funds $\phi_t b_t$ and the cut-off productivity level $\hat{\theta}_t$, but not the unit monitoring cost by adjusting $l_{f,t}$. Recall also that the model is a small open economy and thus subject to the world interest rate. To better understand the rationale, we rewrite equation (32) again for the exogenous monitoring cost setting:

$$(\hat{\theta}_t - \frac{\hat{\theta}_t^2}{2}) A_t k_t^{a_k} l_{e,t}^{a_l} = b_t M_t \hat{\theta}_t + b_t(1 + r_t^d) \tag{42}$$

$$\text{where, } M_t = z$$

$$\text{and, } \hat{\theta}_t A_t k_t^{a_k} l_{t,e}^{a_l} = b_t(1 + r_t^e).$$

Equation (42) is similar to the zero-profit condition for the financial intermediary under the endogenous case (Equation 41) and implies that the sum of the repayment collected from non-bankrupt projects and the liquidated output collected from bankrupt projects equals the resources spent on monitoring the liquidated projects, as well as the interest rate paid to depositors. However, unlike equation (41) for the endogenous case, here the intermediary cannot adjust the unit monitoring cost M_t. As a result, when z increases, smaller loans are issued (b_t falls), more projects are funded (ϕ_t increases), while the cut-off productivity level $\hat{\theta}_t$ falls. The fall in $\hat{\theta}_t$ results in an increase in the expected profits from risky projects for the entrepreneurs[15]. The

[15]The lenders have to give the entrepreneurs a higher return (incentive) so that they will not lie,

fall in b_t dominates the increase in ϕ_t, total loan $\phi_t b_t$ falls. In addition, the fall in the domestic deposit d_t is smaller than the fall in $\phi_t b_t$. Net capital outflow $d_t - \phi_t b_t$ increases, in contrast to the endogenous case.

It is worth mentioning that in the closed economy case, $d_t = \phi_t b_t$, changes to z are offset by changes to the deposit interest rate r_t^d as the wedge between the supply and demand for loans cannot be filled with international flows. Our numerical exercises for this particular case resulted in very high loan interest rates. In a closed economy, the higher monitoring costs can result in a shortage of loanable funds (see Alessandria and Qian, 2005) and higher interest rates. The endogenous labour supply for the monitoring technology, when the economy is closed, allows the financial intermediary to respond to the exogenous changes in the institutional quality by adjusting the labour input and the monitoring unit cost in turn. Once the economy opens to the world however the supply can adjust through inflows of international loans.

I will close this section with a few important comments. Firstly, the model with endogenous labour input to monitoring provides richer comparative statics results which once exploited can reveal a more complete working mechanism of the financial intermediary. The benefits of disaggregating the effects of monitoring technology of financial intermediaries and the general institutional qualities emerge when the model is applied to studying capital mobility. Secondly, not only does this model produce results consistent with observations of loan interest rate patterns, it also provides a simple theoretical framework which can be used to explain empirical findings on the links between institutions and financial intermediaries.

allowing the lenders to economize on the monitoring cost.

5 Conclusion

I have modified a costly state verification model to allow for the financial intermediary to adjust its monitoring intensity optimally in two dimensions: through the productivity cut-off level for bankruptcy ($\hat{\theta}_t$), and labour input into the monitoring technology ($l_{f,t}$). It is important to endogenize the labour input into the monitoring cost if the model is to explain the interaction between the quality of institutions and finance-related technologies and the net effect on international capital mobility. The exogenous model's primary handicap is in the loan interest rate predictions, where the interest rate spread is decreasing in quality of institutions; a prediction which cannot be backed by the empirical literature.

Numerical exercises show that including labour input to monitoring technology in fact matters as it yields a loan interest rate profile which is increasing as quality of institutions worsen (compared to a decreasing one predicted by the exogenous model). Furthermore, in response to improvements in monitoring technologies and quality of general institutions, the models predict significantly different outcomes in terms of the direction of the international capital flows. The endogenous model predicts a lowering outflow of capital as the quality of the institutions worsens, while the exogenous model produces an increasing outflow. The explanation lies in the added dimension in which the intermediary can economize on monitoring: adjusting marginal monitoring cost. Traditionally within the literature the marginal monitoring cost is assumed exogenous and so the financial intermediary can only adjust through lowering or raising the monitoring intensity.

Since projects last for one period and there is no dynamic decision making by the entrepreneur, the results here do not display any long-term dynamics. Short versus long term flows distinctions is thus an important future extension of the model. Addition of a sensitivity analysis and calibration of the numerical results are also indispensable in order to be able to make predictions with more confidence and validate the current theoretical findings using real world data. Finally, the assumption of a perfectly competitive market within the financial intermediation sector and devoid of any government control will not be in line with the reality of many developing and less-developed countries. It is of importance to verify the robustness of these results against an alternative market structure.

Chapter Three: An Empirical Investigation of Bank Flows

1 Introduction

General institutions in a country play a significant role in economic development and efficient resource allocation. Factors such as *regulatory quality*, *degree of accountability*, *political stability*, *control of corruption*, and confidence in the *rule of law* that characterize a country's institutions, are of importance in everyday economic activities. This fact has been well established within the growth literature (see for example Glaeser et al. 2004 and Klein 2005), within trade (Levchenko 2004) and in the context of bank flows (Ju and Wei, 2006; Papaioannou, 2009). The differences between the characteristics of institutions in various countries are still ignored in a large body of growth literature (and in almost all other fields of economic research where institutions are taken to be a single exogenous force and the models do not differentiate amongst the types of institutions), leading to partial accounts of forces behind capital flow patterns and magnitudes.

This paper aims to bring attention to the importance of the institutional quality for bank flows while underlining the differences between the quality of institutions and their impacts on bank flows across countries. The methodology is as follows.

The quality of the financial sector is assessed in terms of the following institutional variables: voice & accountability, political stability, rule of law, government effectiveness, control of corruption, and regulatory quality. Net bank flows are defined as the inflows net of outflows and expressed as a percentage of GDP. The empirical results are obtained from the data covering the period 1998-2008 and using a panel of 56 rich and middle-income countries. We use the random effects model that represents the net bank flows as a function of institution variables and select lagged control variables. The results of the estimation on the full sample reveal that only the level of political stability in the economy is of importance amongst all institutional variables. However, when income levels are taken into account, rule of law and voice & accountability matter for rich countries, and political stability is no longer significant. Furthermore, for mid-income countries, government effectiveness, rule of law, and voice & accountability matter most, though not the same as they would for rich economies. Improvement in rule of law is negatively associated with inflows for rich countries while it is positively associated with inflows for mid-income countries. Finally, improvements in quality of governance reduces net inflows of bank loans for mid-income countries and improvements in control of corruption increase inflows for rich economies.

A typical mechanism which links institutions to capital flows is the financial intermediation. Financial intermediaries, trusted with the task of taking deposits from consumers and issuing loans to entrepreneurs, monitor loans and enforce financial contracts. The intermediation process will use up resources such as labour, capital, public institutions (*rule of law*, *regulatory quality*, etc.), which results in a wedge between the safe saving interest rate paid to the depositors and the risky loan interest rate collected from the entrepreneurs. This wedge, or the interest rate spread, is often viewed as a measure of the financial sector's efficiency. As an example, in institutions of poor quality one expects to see deficient contract enforcements and more corruption, which hinders lending conditions. As a result, lending interest rate rises to compensate for default risks, increasing the interest rate spread in turn. Then, loan makers look abroad for investment opportunities as the domestic conditions are now inferior, and the outcome is a net bank loan outflow. The dilemma is then whether political *in*stability has the same effect on the market as the weakness of the *rule of law*. One would expect not and that is what this paper aims to address.

Another mechanism that links institutional quality to capital flows originates from the substitutability nature of foreign direct investments and financial capital investments, accounts of which are discussed in Wei and Wu's (2001) study of sources of currency crisis, Ju and Wei's (2006) resolve of the Lucas paradox, and in Wei and Ju's (2011) study of a variation of the classical dichotomy. Their conclusion is that countries with poor and inefficient financial systems will experience inflows of FDI and outflows of financial capital (bank loans, portfolio, etc.). Countries with high levels of corruption receive less FDI, since this form of investment is heavily dependent on contract enforcement and absence of expropriation, and instead are net recipients of financial capital. Financial capital flows from countries with poor institutions to countries with good institutions. Though very important, this paper does not explore this issue and focuses on bank flows solely.

In related work, Papaioannou (2009) uses a gravity model applied to quarterly bank flow data between 1977 and 2002 for 140 countries and finds that, despite popular sentiment, institutional quality is a more important determinant for bank flows than income. In other words, banks invest more in countries with less corruption: a one percent increase in the quality of institutions is associated with a two percent increase in bank lending. This chapter finds that political stability is a significant explanatory force when looking at the full sample of all countries simultaneously, yet when the sample is broken down by income groups, different patterns emerge and other institutional quality measures come out as significant as the *control of corruption.* For example, while the degree of *rule of law* is equally important for both rich and mid-income countries, improvements in this respect attract more inflows in rich countries while causing more outflows in mid-income countries. The estimation results show that improvements in *government effectiveness* only matter for mid-income countries and do not seem to affect the flows to and from rich countries.

In other work, Hausmann and Fernandez-Arias (2000) find a positive and significant relationship between the perceived risk of a country and the total FDI inflows into that country using an averaged (1996-98) cross-section data. Wei and Wu (2001) also links institutional quality with financial flows, indirectly, by demonstrating that countries with corrupt institutions favour less FDI and experience a portfolio shift to loans instead. As far as other covariates are concerned, Berkel (2004) investigates the home equity bias and finds capital control measures to be insignificant when controlling for the degree of financial market developments, strength of the legal system and other information asymmetries. Furthermore, bank structure (concentration) and regulation have been shown to be unimportant when controlling for broader institutional measures (Demirguc-Kunt, Levine and Laeven; 2004). Herrmann and Mihaljek (2010) use a gravity model as well and find that in general bank flows are downhill, from rich to poor countries. Faria and Mauro (2009) explore the association between finance and quality of institutions from a risk-sharing point of view. Using a cross-section of 55 countries the authors find that weak institutions encourage a shift in portfolio to more crisis-prone forms of capital flows. In general, countries with more developed general institutions can better reap the benefits of financial liberalization (Chinn and Ito; 2006). Sustaining sound institutions is also a condition for a well-developed financial market (La Porta et al.; 1998). A well-developed financial market in turn increases a country's absorptive capacity (Prasad, Rajan and Subramanian; 2006) of foreign finance and enhances growth.

The chapter is organized as follows. Section 2 presents a set of stylized facts and summary of patterns in flows and institutional quality indices across countries. Section 3 presents a description of the data. In Section 4, the empirical model is discussed. The results are presented in Section 5, followed by the conclusions in Section 6.

2 Stylized Facts

Changes in net bank flows over time (calculated as the outflows subtracted from inflows[16], and expressed as a percentage of the GDP) and gross bank flows (sum of absolute values of inflows and outflows, also expressed as a percentage of the GDP) are presented in Figure 17 of Appendix *A*. Net and gross FDI are also plotted for comparison (defined, just as described above for bank flows, as a percentage of the GDP). While net FDI expressed as a percentage of GDP is on average larger than net bank flows, gross bank flows on average exceed gross FDI flows. In the top panel

[16] A positive net bank flow is an indication of inflow of loans

of Figure 17 of Appendix A, we observe that the net bank flows are exceptionally high in 2009. That year is an anomaly given the events surrounding the financial meltdown in late 2008 and is thus excluded from the final estimation using net bank flows. The sudden changes observed in 2008 and 2009 net bank flow values are explained in Herrmann and Mihaljek (2010) who find that the increase in global risk aversion and expected financial market volatility both reduce the flow of bank flows. Interesting patterns emerge when looking at the cross-section of flows by country income group and by region. Breaking down the flows by country income group[17] (Appendix A Figure 18) reveals that while low income and lower mid-income countries are net borrowers, high-income OECD, upper mid-income and high income countries are net exporters of bank loans. High-income countries (both OECD and non-OECD) stand out in terms of gross bank flows, perhaps due to the existence of better developed financial markets in these economies. As expected, OECD member countries are net importers of direct investment as FDI flows to countries with sound institutions and less corruption.

From the classification by geographical regions in Figure 19 of Appendix A, it becomes clear that European and Middle Eastern countries are the primary suppliers of bank loans[18]. The former's large outflow is most likely driven by the EU coun-

[17]World Bank Classification: low income, \$1,025 or less; lower middle income, \$1,026 - \$4,035; upper middle income, \$4,036 - \$12,475; and high income, \$12,476 or more.

[18]Central America gross bank flow data are hugely inflated because of the Bahamas.

tries' significant exposure to high growth emerging economies[19]. Middle Eastern and Northern African regions are dominated by oil producing economies. These countries direct their excess oil revenues to investment banks or regular deposit taking institutions, while these institutions in turn invest the proceedings in emerging markets or in other specific external projects (Wiegand, 2008).

The institutional variables broken down by country income group are depicted in Figure 20 of Appendix *A*. The richer countries score higher on all six institutional quality indices. We observe that interesting patterns emerge when the indices are divided with respect to geographic region (Appendix *A*: Figure 21). North America and Europe enjoy the highest institutional quality, while Sub-Saharan Africa as well as the Middle East and North Africa regions have the poorest institutions in place. The Middle East and North Africa are comprised of economies dominated by political instability and lack of accountability (particularly in the Middle East). South America and East Central Asia are very similar in this respect. South America scores higher on accountability perhaps because of the higher number of democracies compared to the East and Central Asia region. However, South America scores lower in *rule of law* which could be due to high income inequality prevalent in the region.

[19] See Herrmann and Mihaljek (2010)

3 Data

This section presents the data set used in the empirical study. The entire data set covers 177 countries between 1998 and 2009. However, the estimation is only performed on 56 of the countries (26 rich and 30 mid-income countries)[20]. The countries excluded from the sample are the low-income countries due to a high number of missing observations. The data consists of observations on the bank flow variables, the institutional variables, and selected macroeconomic fundamentals. Each of the three sets of variables is defined in the following subsections and the summary statistics are presented in Table 5 in the Appendix *B* section.

3.1 Capital Flow Data

Bank loan data in line 1 of Table 5 of Appendix *B* are extracted from IMF's 2010 International Financial Statistics Yearbook. Lines 78bqd (assets) and 78bud (liabilities) are added in absolute value to form the gross bank loan flows variable. To get the net flows, assets and liabilities are added since debits are marked with a minus sign. The reported values correspond to transactions involving trade credits, deposits, bonds and currency that are facilitated by the banking system. These values are converted into domestic currency by using the *International Financial*

[20]Country lists can be found in Table 14 of Appendix *B* section

Statistics' National Currency per U.S. Dollar exchange rate data averaged over the sampling period and divided by the nominal GDP (in domestic currency), extracted from *International Monetary Fund*'s World Economic Outlook database. Net Foreign Direct Investment data are constructed by adding lines 78bdd and 78bed of the same data source. Table 5, Appendix B reports the overall, between and within variations for each variable of interest. The overall variation of each variable is decomposed into a between $\bar{x}_i$ (across countries) and within $\bar{x}_t$ (within each country) variation[21]. In Table 5, Appendix B, n is the number of panels for each variable, T is the average number of years observations are available for within each panel, and the total number of observations for each variable is $T \times n = N$. In the final estimation of each model the total number of observations will vary since the panels need to be balanced for the estimation to be viable. While the variation over time and the variation across countries are the same for net FDI flows, the net bank inflows exhibit a different pattern. Variations over time in net bank inflows are more than twice the variations across countries. As shown by Albuquerque (2003) FDI flows are less volatile compared to other forms of capital flows since they are less likely to be expropriated and hence can serve as a risk-sharing instrument. Finally, net bank inflows seem to be more volatile over time, as is generally understood in the literature (Wei and Wu, 2001), given that the standard deviation over time is 15%

[21] Within variation refers to the deviation from each country's average.

higher than the standard deviation of the FDI flows across countries.

It is noteworthy that *gross* capital flows are used in the literature instead of *net* in order to study the risk associated with such flows to the economy, such as domestic credit booms and sudden capital reversals[22]. Gross flows do not reveal the underlying patterns of inflows and outflows and leave out the credit needs of an economy. Therefore, it is unclear if the economy is a net exporter of funds or not, and if so, what are the underlying factors. We are interested in finding out what contributing factors can make an economy a net lender or a net borrower of bank loans.

3.2 Institutional Quality Indices

The data on a total of 6 institutional quality indices are compiled by the World Bank and documented by Kaufmann et al. (2010), titled as *The Worldwide Governance Indicators (1996-2010)* and summarized in rows 3-8 of Table 5 in Appendix *B*. There are six aggregate indicators which are compiled using over 30 underlying data sources "reporting the perceptions of governance of a large number of survey respondents and expert assessments worldwide". The values of these variables range from 0 to 5, with the value being close to 5 when institutions are deemed well-functioning[23]. Rows

[22]see Shin (2012) for an example

[23]In the original data set, the values range between -2.5 to 2.5, but to simplify the interpretation of the estimation results, the values are transformed to a range between 0 and 5.

3-8 of Table 5 in Appendix *B* Section reveal that the variations across countries are greater than the variations across time. One possible explanation is that institutional changes within a country and their effects take years to be realized, while institutional quality indices vary greatly across countries. The definitions of the institutional quality indices are presented as follows.

- *Voice and Accountability* [24] Reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.

- *political stability*: Reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.

- *government effectiveness*: Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

- *regulatory quality*: Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

[24] All variable definitions are directly from Kaufmann et al. (2010)

- *rule of law*: Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

- *control of corruption*: Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

The only other source of institutional quality data is the Political Risk Services Group's International Country Risk Guide (ICRG) dataset. The World Bank data is used in this study due to ease of access.

3.3 Control Variables

The stocks traded, Treasury bill rate, exchange rate, and degree of openness to trade are extracted from the World Bank's database and their summary statistics are given in rows 9-12 of Table 5 of Appendix *B*. Exchange rate volatility is the growth rate of local currency per US dollar, computed as an annual average. *Stocks traded* is the total value of stocks traded, calculated as a ratio of GDP, and measures the degree of market liquidity. The data on the Treasury rate, and the economy's degree of openness are extracted from the IMF's IFS 2010 Yearbook. The Treasury bill interest rate is the government bond yield (line 61) per annum which is the yield to maturity of government bonds (or other bonds that would indicate longer term rates). The degree of openness is the ratio of sum of exports (line 78aad) and imports (line 78abd in absolute value) as a ratio of GDP. This is the standard measure in the literature to assess how open a country is to the rest of the world economically.

4 Empirical Model

The standard model used in the empirical literature of international trade flows is the gravity model (see Bergstrand's (1985) seminal paper). Portes and Rey (2005) show that the same gravity model also fits the gross international equity flow data almost as well as the international trade data. There is a caveat in using the gravity model for bank loan flow data however. In general, there is a lack of a supporting theoretical foundation for applying the gravity model to financial capital flows (see Siregar et al. (2010) for a detailed discussion). While attempts have been made by Helpman (1987) and Anderson et al. (2004) to alleviate this problem within the trade literature, the same cannot be said about the bank loan flow literature. In addition, a core component of the gravity model is the population size. However, while population is deemed to be an important factor in trade data (larger population inducing a larger consumption market for example), it is not very clear why it should be significant for the bank loan flow data. The ambiguity in using population as a gravitational force is underlined by the inconsistency in sign and statistical significance often observed in the trade empirical literature.

Bank loans are different in nature to goods and services since loans generally are diverted to countries where higher returns are guaranteed while goods and services are traded, depending on comparative advantage. Higher loan interest rates however need not be a result of competitive advantage and may only be reflective of the structure of the banking sector, regulations, higher inflation or soaring growth rates. Of course, one could look at the financial intermediaries themselves as a source of comparative advantage (Ju and Wei, 2011) given that financial development across countries is found to be highly asymmetrical. With goods and services, market size is often leveraged on the demand side, while productivity and comparative advantage are pertinent to the supply side. The second sharp difference between trade flows and bank loan flows has to do with distance and country size. While distance is understandably a significant parameter[25] capturing primarily transportation costs in a model of trade, for financial capital there are no transportation costs to be captured. In a world with decreasing transaction costs and information technology advancement, it may prove difficult to justify the role of distance in flow of financial capital.

[25]Distance in gravity models should have a diminishing effect over time and this is a major criticism of such models. See Brun, Carrere, Guillaumont, and de Melo (2005) for potential remedies.

It has been shown that distance is a much more important factor for determining FDI, for example, than for portfolio investments. Instead, country size is an issue that must be looked at more closely. Countries like Luxembourg, the Bahamas and Iceland are not particularly large, yet when it comes to international bank flows, they are among some of the major participants in the world markets.

Therefore, instead of the gravity model, used by Portes and Rey (2005) for example, our empirical model is based on the theoretical work of Ju and Wei (2010, 2011) and Mutsuyama (2008) presented in Chapter 2, where capital is shown to flow out of the countries with poor institutions. In general, countries with poor institutions fail to properly enforce contracts, i.e. the *rule of law*, and often tend to impose regulations detrimental to productive financial intermediation. The counter-productive nature of these institutions causes less funding for domestic projects and encourages a surge in capital outflows in search of better returns. Bank flows are, however, very sensitive to changes to level of development of the stock market, trends in the exchange rate market, or changes to the treasury bill rates. As such, to accurately estimate the effect of institutions, the model must also account for such economic fundamentals.

We use the one-way country-specific random effect model in order to model the inflows and outflows simultaneously and to account for the unobserved heterogeneity

(Greene, 2011):

$$y_{it} = \alpha + \phi' X_{it} + \gamma' Z_{it-1} + u_{it} \tag{43}$$

$$u_{it} = \lambda_i + \epsilon_{it}$$

$$t = 1 \ldots T, \ i = 1 \ldots N.$$

In the above specification, y_{it} is the net bank loan inflows expressed as a percentage of the GDP for country i in year t, X_{it} is the matrix containing the six institutional quality variables, ϕ is the vector of coefficients associated with the institutional quality variables, Z_{it-1} is the matrix containing the four lagged control variables, α is the intercept term, γ is the vector of coefficients associated with the control variables, and u_{it} is error structure. Finally, the two-part error structure consists of λ_i, which is the unobserved heterogeneity (individual-specific effect), and ϵ_{it}, which is the idiosyncratic error term, where $\mathbf{E}[\epsilon_{it}|X_{it}, Z_{it}] = \mathbf{E}[\lambda_i|X_{it}, Z_{it-1}] = 0$. The individual-specific effect is a random variable uncorrelated with the explanatory variables at all lags/leads and has a finite variance ($\sigma^2_{\lambda,i}$). The model is identifiable since $rank(\Psi_{i,t}) < n \times T$, where $n = 56$, T=10, and $\Psi_{i,t} = [1 \ X_{it} \ Z_{it}]$. The cross-section units (countries) are denoted by $i = 1 \ldots n = 56$ while $t = 1 \ldots T = 10$ denotes the years from 1998 to 2008. We use specification tests to confirm the choice of the random effect model in Section 4 and use the lags of the control variables in order to avoid the potential endogeneity problems.

In the literature, the institutional variables are generally expected to have a simultaneous and negative effect on capital flows since better institutions are expected to result in more efficient allocation of resources domestically and thus cause a net outflow of financial capital. At the same time, one can argue that poor countries may struggle with finding investment and lending opportunities domestically and will export the excess capital abroad. By including different types of institutional measures one can examine to see of the associations between bank flows and institutional measures, which are consistent across different income groups, and that which effects matter the most. The control variables are lagged in light of a causal identification problem. Changes in institutions may affect the control variables simultaneously and thus replacing $Z_{i,t}$ with $Z_{i,t-1}$ solves the problem of $Z_{i,t}$ being endogenous to $Y_{i,t}$. Furthermore, changes in the exchange rate, Treasury bill rate, or degree of openness to trade may all impact bank flows with some lag. As such, I estimated model (43) without lagged control variables first and then with lagged control variables to find only the lagged variables to be statistically significant.

The first control variable is the value of stocks traded as a percentage of GDP, a proxy for the level of development of the financial markets in an economy. The better developed the stock market, the more likely it is for financial intermediaries to raise equity from the market as opposed to look abroad for funds. Stulz et al. (2013) for example show that capital flows into countries where there is improvement in local market liquidity. Finally, a liquidity shock may result in sudden reversals of foreign flows (Kirabaeva and Razin, 2010) as foreign investors recalibrate their portfolios and move funds to less-risky investment projects. Treasury bill interest rates are higher during poor economic conditions as a result of the governments' efforts to stabilize the financial climate and to improve domestic lending conditions. If the domestic economy is destabilized, domestic lending decreases and capital is expected to flow out.

The lagged rate of change in exchange rate per US dollar (lagged one period) captures the volatility and sudden shifts in the exchange rate. Temporary exchange rate depreciation makes domestic returns more appealing to incoming investors as the funds cost less now taking into consideration the exchange rate. Capital inflows are documented to induce exchange rate appreciation[26] (see Combes, Kinda and Plane, 2011), however the short-term positive correlation cannot be interpreted as a causal

[26]It must be noted that FDI type of flows are exempt from this pattern (Brooks et al., 2001, and Kamar et al., 2010)

relationship. Factors such as high inflation, speculation and large current account surpluses may also cause exchange rate appreciation. Investors looking to lend their funds abroad will take into account these factors and will likely avoid investing in countries with expected exchange rate appreciation.

The last covariate in model (43) is a lagged measure of economic openness. The standard measure in the literature is the sum of absolute values of imports and exports calculated as a percentage of the GDP. Flows of different capital types depend on a country's willingness to engage in economic activity with the rest of the world. The general convention is that richer countries are exporters of financial capital and these are countries which are more open to interaction with the rest of the world. We can estimate this association to see whether this control variable is significant for the mid-income countries as well and whether the sign is indeed negative (indicating that these countries are net exporters of bank loans). More open economies will enjoy a larger ratio of flows and the GDP perhaps, but whether more openness results in net inflows or outflows remains to be confirmed by the regression results.

5 Estimation

We use the FGLS estimator and estimate Equation (43) for samples of middle-income ($N_1 = 30$), rich ($N_2 = 26$), and all countries ($N = 56$), which are reported in separate columns of Table 9 of Appendix B. This approach is based on a two-step estimation in which a pooled model is first estimated and the resulting residuals are next used to construct an unrestricted error covariance matrix for the second step. The FGLS estimator is consistent and asymptotically normally distributed when $N \rightarrow \infty$ even if T is fixed. Furthermore, the data are transformed using the PraisWinsten transformation so that the resulting estimates are robust to serial correlation as well as to any intra panel heteroskedasticity[27] (provided that there is no group-wise heteroskedasticity present).

We also estimate using the FGLS estimator an extended version of model 43 that captures the non-linearity in the institutional variables (Table 10 in the Appendix B section). That is, the quadratic terms which are statistically significant in each of the 3 samples, such as the *rule of law*, *political stability*, *accountability* and *control of corruption*. Squaring the institutional indices also alleviates any collinearity problems as correlation is a linear association and including the quadratic terms breaks that linear relationship. An important problem in panel data modelling is endogeneity. In order to determine whether model (43) is well-specified we perform the specification test by Hausman (1978) for endogeneity. Given that the estimate of the fixed-effect model is consistent in the presence of endogeneity, the test for endogeneity is equivalent to testing for random-effects against fixed-effects. Accordingly, the Hausman

[27] Greene (2003, p.322), Wooldridge (2002, p.263)

test statistic is the squared value of the difference measure between the fixed effects and the random effects estimates divided by the difference of the covariance matrices of the two models. Under the null $H_0 : cov(\Psi_{it}, \lambda_i) = 0$, $\forall i, t$, the test is chi-square distributed with degrees of freedom equal to the rank of the matrix of the difference between the two estimated covariance matrices. The results of this test are reported in Table 6 of Appendix B. The test does not reject H_0 in the three samples. We take this as evidence in favour of the random effects model.

The second specification test is the Breusch-Pagan (1980) Lagrange multiplier (LM) test for heterogeneity, which is used to test for the presence of random effects against the pooled regression with equal error variances. Under the null hypothesis of a pooled regression model, the test statistic is chi-square distributed with 1 degree of freedom. Table 7 of Appendix B displays the results of the LM test for the each of the three samples. The null is rejected across all three samples which provide evidence in favour of the random effects model.

6 Goodness of Fit Tests

The overall R^2 for each estimation is reported in the corresponding tables in Appendix B. While the R^2 values are not directly comparable due to different degrees of freedom, the choice of running separate regressions for each income group is justified by looking at the R^2 values of each estimated model where the regressions for *All Countries* all have lower R^2 values. At the same time, comparing the values within the *Rich* and *Mid-income* samples across Table 10 of Appendix B, we observe a marked improvement in the R^2 values. We observe even a bigger improvement in the *Overall* R^2 with the quadratic model (Table 10 of Appendix B). Finally, the separate inflow/outflow regression estimates reported in Tables 12 and 13 of Appendix B have lower R^2 values compared to the ones reported in Table 10 indicating that joint modelling of *net* flows is advantageous over modelling of inflows and outflows separately.

We test the joint significance of the quadratic terms using the residual sum of squares for the model estimates reported in Table 10 as the unrestricted model and the model estimates reported in Table 9 as the restricted model. The null hypothesis is therefore $H_0: \ inst_1^2 = \cdots = inst_6^2 = 0$ where $inst_1$ to $inst_6$ are the 6 institutional variables of *regulatory quality, government effectiveness, rule of law, voice & accountability, political stability*, and *control of corruption*. The chi-square test statistic is equal to 14.548 with 6 degrees of freedom. The reported p-value is 0.0241 which is an indication that we can safely reject the null and claim that the quadratic terms are jointly statistically significant.

To test for the presence of autocorrelation in the residuals, we employ the Lagrange Multiplier (LM) test developed by Breusch (1978) and Godfrey (1978). We apply this test to the quadratic model given in Table 10 and report the results in Table 8 of Appendix *B*. We fail to reject the null hypothesis of zero serial-correlation for the model estimated on the *middle-income* sample only. It would be interesting to conduct further tests to see if the outcomes of the LM test applied to the *middle-income* sample is due to non-stationarity in the data using the proposed method by Im-Pesaran-Shin (2003). The Im-Pesaran-Shin (2003) test is generally preferred over the Maddala-Wu test (1999) (Baltagi and Kao, 2000) since it accounts for cross-section independence, i.e. the correlation across countries. However, these tests are known to suffer from size distortion for small time series ($T = 10$ in this case) as shown by Karlsson and Lothgren(2000) and Hlouskova and Wagner (2006). In particular, the Im-Pesaran-Shin test will be oversized for small T. Lastly, all these tests have computational issues when applied to an unbalanced sample.

7 The Results

Model (43) with quadratic terms is estimated using three samples of *all countries*, *rich countries*, and *mid-income* countries. There are $N_1 = 26$, $N_2 = 30$, and $N = 56$ countries respectively in each sample. The estimation results for the quadratic model presented in Table 10 of Appendix B reveal that in the sample of the mid-income and the rich countries, the only institutional variable which is significant is the *political stability* index. This finding is in line with the findings in Papaioannou (2009) where political stability is highly significant. When the sample is divided into the rich and mid-income countries however, political stability is no longer significant. Both *rule of law* and *voice & accountability* are the only institutional variables which are highly significant across the rich and mid-income samples. Neither however is significant in the whole sample. For mid-income countries, *government effectiveness* is also a significant explanatory variable, while for rich countries *control of corruption* is also statistically significant.

Improvements in the *rule of law* seem to result in an increase of outflows of loans for rich countries and an inflow of loans for the mid-income countries. To understand this finding better, we look at *contract enforcement* as one component of the *rule of law* for example. It is widely accepted that contracts are better enforced in developed countries. As such, loan contracts are either fulfilled or in case of default the lender is able to recover a higher percentage of the loan. The security in contract enforcement encourages lending and allows for a more efficient allocation of funds. This makes a mid-income country a safer lending target: for developing countries with *relatively* lower quality of contract enforcement lending out to these developed economies is a safer investment.

In order to assess the impact of each significant variable on net bank flows, we calculate the effect of one standard deviation deviations from the means of each of the significant institutional variables on net bank flows (see Table 11 of the Appendix *B* section). For a richer economy, a one standard deviation improvement in the quality of *rule of law* decreases imports of bank loans by 2.89 percentage points, while for mid-income countries it will result in an increase of 0.804 percentage points increase in exports of bank loans. *Voice & accountability* seems to have a similar effect on bank flows, decreasing outflows by 0.717 and 1.323 percentage points for the mid-income and rich countries respectively. For the mid-income countries, a one standard deviation improvement in *government effectiveness* results in an increase of outflows by 0.864 percentage points. Better *control of corruption* for the richer economies seems to decrease exports of bank loans by 1.409 percentage points. For the whole sample however, the improvements in *political stability* measures do not seem to have much impact (-0.008 percentage point decrease).

Figures 22-25 of Appendix *A* display the marginal effects calculated as change in net bank flows (%) and plotted against the institutional quality measures. The marginal effects for the full sample of all countries is presented in Figure 22 of Appendix *A* where better political stability is associated with higher inflows of bank loans. The marginal effects for the *rule of law* (Figure 23 of Appendix *A*), show the difference of the impact of this index on bank flows amongst the rich and mid-income countries. Mid-income countries can expect higher levels of net inflows as a result of improvements to the rule of law, while the rich will most likely experience increases in net outflows. *Voice & accountability* tend to behave the same for both income groups (Figure 24 of Appendix *A*), though, for the mid-income countries there seems to be less sensitivity of bank flows to improvements in this index relative to the rich countries. Figure 25a of Appendix *A* documents the association between better institutions and the decreasing bank inflows for mid-income countries. Finally, Figure 25b of Appendix *A* shows how richer countries tend to experience higher levels of inflows with better institutional quality.

The reasons behind the differences in directions of flows in bank loans resulting from improvements in these institutional variables at first glance could be understood within the context of differences in growth stages between economies. Aisen and Veiga (2011) find a negative association between political stability and economic growth for example. *Political stability* has for long been achieved in most advanced economies and so one expects less variation in the index for developed economies compared to developing and least-developed economies[28]. Hence, there is a possibility that the effect of the less-developed countries is dominating here in the sense that

[28]The standard deviation for rich countries is 0.6971 compared to 0.7332 for the mid-income countries

these countries are in early phases of growth and require capital to fund domestic investments. Once a politically stable government is in place, its effectiveness and ability to enforce the *rule of law* start to improve and these attributes become relevant to investors.

As presented in Table 10 of Appendix *B*, the four control variables all have the same sign across all models though all are not necessarily significant consistently across models. For rich countries, a one percent increase in the exchange rate is followed by a 0.01% decrease in net inflows. Higher exchange rate make domestic investment returns less appealing to foreign investors. Similarly, a 1% increase in stocks traded (total value, % of GDP) results in a net inflow decrease of 0.005%. The more liquidity available and the better-functioning the stock market in a country, the greater is the wealth effect for the financial intermediaries, and the more the banks look outward to lend out. Furthermore, inflows to these countries may be decreasing because of the crowding out effect that a well-functioning stock market has for the financial intermediary lending market. For mid-income countries, the Treasury bill rate increase results in a decrease in net inflows by 0.011 percentage points. Higher treasury rates induce banks to lend to the government mostly and this limit funding to domestic investment opportunities.

7.1 Alternative Model

Tables 12 and 13 of Appendix *B* present the results from estimating two separate regressions of inflows and outflows in order to see if the institutional variables have different effects on each of the flow variables separately. Model (43) without unobserved heterogeneity reduces to a SUR (seemingly unrelated) model when the same set of covariates is used. As such, we can estimate the two equations individually using the FGLS to give a clearer picture on the relationship between the institutional quality measures and the bank flows. The interpretation of these results is complicated since both equations have the same set of covariates, and since we are not able to differentiate between source and host country characteristics. In the entire sample, institutional indices are significant explanatory variables for inflows mostly and not so much for the outflows. In other words, host countries characteristics tend to matter more for flows as opposed to the source countries. Furthermore, the inflows series and the outflows series are highly negatively correlated ($\rho = -0.9779$) overall. On a year to year basis, the correlation values range from $\rho = 0.9967$ to $\rho = 0.9490$, with all correlation values statistically significant at the 99% level.

Nevertheless, interesting patterns emerge from the estimation results which may shed more light on the earlier results. While institutional factors are only relevant for inflows of mid-income countries, they seem to matter for outflows of both the rich and the mid-income countries. *Political stability* which was the only significant variable for net inflows in the full sample is not seen to be highly significant for outflows of the three samples (all countries, rich and mid-income countries). Outflows are increasing with more political stability in the rich countries, while it decreases as political stability improves for the mid-income economies.

While *voice & accountability* is significant for net bank flows of both the rich and mid-income economies, it only seems to affect the outflow of mid-income countries and not the rich. Lower levels of outflow are associated with improvements in the *voice & accountability* measure. Similarly, *rule of law* was significant for net bank inflows of rich and mid-income economies, while being an important explanatory for inflow of mid-income economies, it is highly significant for outflows of both rich and mid-income economies. Surprisingly both inflows and outflows are decreasing in the *rule of law*. Countries with better contract enforcements tend to experience less in- and outflow of bank loans. This could be due to a better risk assessment and management capacity of the financial intermediaries in these countries which results in a more efficient allocation of loans and thus a lesser need for external funds or external borrowing.

A variable of interest which is often cited in theoretical literature on financial intermediation and financial capital flows as the exogenous institutional quality is the *regulatory quality* index. While the index is not significant for net flows, it does seem to be significant for outflow of rich countries. Recall that the index used in this paper measures how favourable the regulatory conditions are to doing business in a country. As the estimates in this section show, the more favourable the regulatory conditions are, the lower is the level of outflow of bank loans. Capital tends to generally run away from a poor regulatory environment. As such, it is fully expected to see a lower outflow from a country with a favourable regulatory environment.

7.2 Further Discussion

In the literature, there exist some papers which investigate the determinants of cross-border bank flows. Papaioannou (2009), for example, uses one aggregate political risk measure and finds that it is highly significant and that improvements in this measure do attract bank flows for recipient countries. Using quarterly data however introduces additional variability which may not be due to institutional improvements (which usually have small variation over years) and furthermore, the chapter focuses on one type of institutional quality. Herrmann and Mihaljek (2010) also look at the determinant of bank flows but ignore institutional quality factors and are thus only able to verify that the gravity model explanatory variables are significant in explaining cross-border bank flows. Furthermore, as is the case with all gravity model approaches, their estimation is based on outflows from a group of few rich source countries to some recipient developing countries only. Jeanneau and Micu (2002) focus on Asia and Latin America and find that both *push* and *pull* factors (macro conditions in both the source and recipient countries) are significant in explaining cross-border bank flows. Similarly, Muellera and Uhdeb (2010) find macroeconomic effects to be significant in explaining bank flows as well as institutional arrangements such as exchange rate agreements. Their study however also fails to incorporate differences in institutional quality across countries.

8 Concluding Remarks

This paper uses annual series of institutional quality variables and bank flow data (expressed as percentage of the GDP) to reveal the impact of different kinds of institutions across countries. Our results at different income levels indicate that while improvements in *political stability* augment bank inflows in the entire sample of all countries, once the sample is broken down by income group, *political stability* is no longer a significant explanatory. Instead, improvements in *government effectiveness*, enforcement of the *rule of law*, *voice & accountability* and *control of corruption* become significant depending on the income group of the country. The impacts however are not always the same. Improvements in the *rule of law* in richer countries result in greater outflows, while in mid-income countries, they result in greater inflows. One possible explanation for this contradictory outcome may be the nature of these institutions. Further research is needed to understand the peculiar links between these institutions and flows in general and why capital flows often do not confirm the theoretical predictions.

Our empirical model also contains macro control covariates to account for cross-country differences. These explanatory variables are not all statistically significant across different income groups. In mid-income countries, the Treasury bill rate seems to be the only significant explanatory factor, while exchange rate appreciation, the degree of openness to the world and development of the stock market are significant explanatory factors for the rich countries. When looking at the whole sample, however, we find that all macro controls are relevant except for the exchange rate.

The chapter makes a contribution to the institutional quality and capital flow literature by exposing different types of institutional quality measures and their effects on international capital flows. A larger sample would greatly improve the results, as well as strong instruments to account for any potential endogeneity and any confounding effects. Furthermore, controlling for macro characteristics can improve the robustness and consistency of the estimates. Lastly, controls for specific financial regulations, such as capital requirements or the Basel Accord requirements, as well as the market structure of the financial sector can give better insight on the forces behind the magnitude and direction of international bank flows.

Chapter Four: Conclusion

The thesis aims to contribute to the theoretical and empirical literature of cross-border capital mobility. In particular, focusing on movement of bank loans, a model of costly-state verification is used to build a theoretical foundation for understanding the link between the quality of general institutions in the economy and the magnitude and direction of bank flows between countries. The link is established using the financial intermediation sector which raises deposits in order to be able to fund investments domestically. Doing so, I also introduce the new and novel idea of allowing for endogenous labour input into the monitoring technology of the financial intermediary as opposed assuming a fixed unit monitoring cost as is common within the literature.

The introduction of the endogenous labour input produces a loan interest rate profile in line with what is observed in the data; higher loan rates associated with poorer institutional quality. Furthermore, the numerical analysis of the theoretical model show that bank flows are non-monotonic in institutional quality where the countries with the best and worst institutions tend to have a higher capital outflow as a ratio of GDP. The model with the endogenous labour input is able to better match the patterns of bank flows observed in the data.

An empirical investigation accompanies the theoretical work to shed light on the types of institutions that matter for magnitude and direction of bank flows. Using a panel of 56 rich and mid-income countries and 12 years of data (1997-2008) a quadratic random-effects model is estimated first using a full sample, and then using sub-samples based on income category. The estimation reveals the following results. Firstly, rich and mid-income countries show different patterns in terms of which institutions matter for bank flows and how they matter. While political stability seems to be the most significant institutional measure for the full sample of 56 countries of rich and mid-income countries, it no longer is significant when controlling for income levels. In particular, for rich economies, voice & accountability, rule of law and control of corruption seem to matter. For mid-income countries, voice & accountability, and rule of law also matter but also the government effectiveness. Secondly, while improvements in the rule of law for rich economies seems to encourage more outflow, for mid-income economies it encourages more inflows of bank loans.

These results are interesting for two reasons. Firstly, they justify distinguishing between types of institutional quality within the theoretical literature. Secondly, the same institutions types tend to have different impacts on flows for rich versus mid-income economies. Further work will be needed to fully explain and understand these underlying forces and differences.

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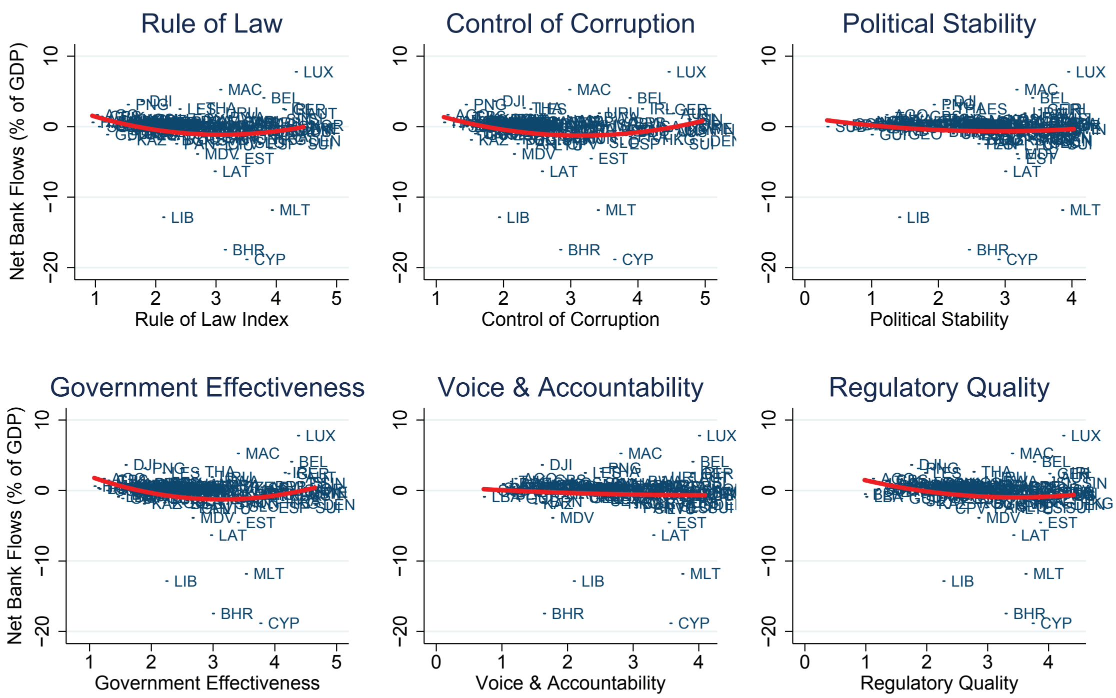
Appendix: Figures and Tables

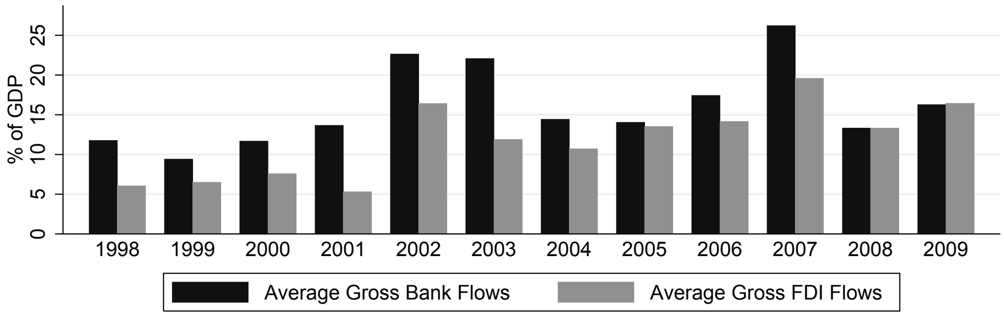
1 Appendix A - Figures

Figure 1: Net Bank Outflows vs. Institutional Quality



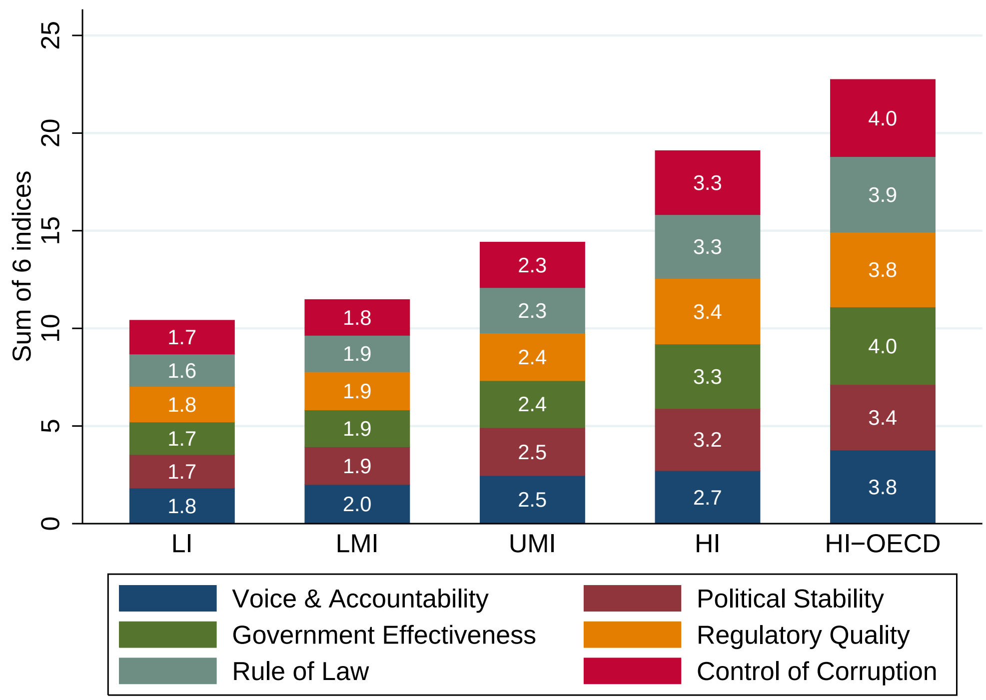
Note 1: Quadratic fit using ordinary least squares.
Note 2: Bank outflows and institutional indices are averages for 1998-2009 (average of n=65 countries).
Source: World Bank Governance Indicators, and International Monetary Fund's *International Financial Statistics*

Figure 2: Gross FDI & Bank Flows



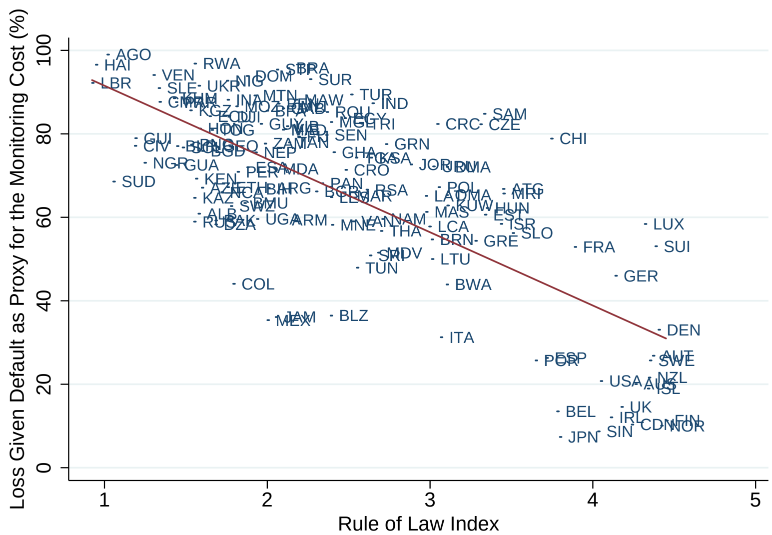
Note: Average (per year) gross flow of bank loans and gross FDI as percentage of output (average of n=65 countries).
Source: International Monetary Fund's *International Financial Statistics*

Figure 3: Institutional Quality by Income



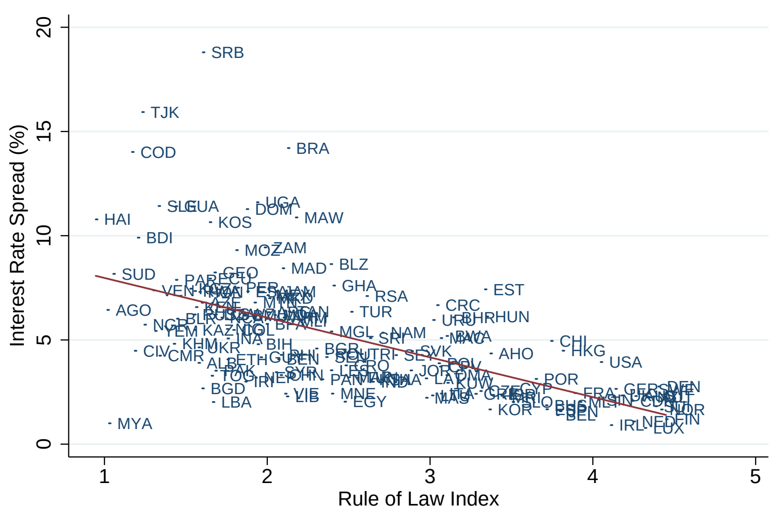
Note 1: LI = Low Income, LMI = Lower Mid-Income, UMI = Upper Mid-Income, HI = High Income (non-OECD), HI-OECD = High Income OECD
Note 2: Each index ranges between 0 to 5. Average per index per income group for all countries (1998-2009, n = 168).
Source: Kaufmann et. al. (2010)

Figure 4: Monitoring Cost & Rule of Law



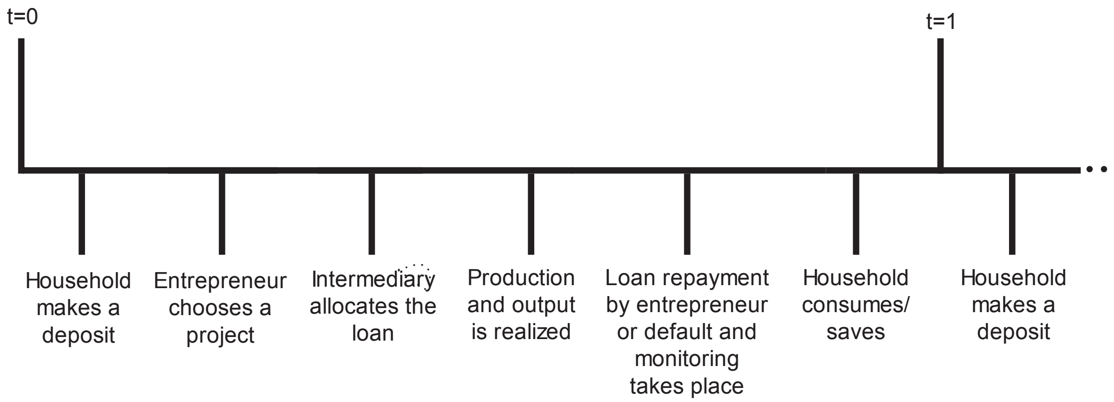
Note: Values are averages between 1998−2009
Source: World Bank Database

Figure 5: Interest Rate Spread & Rule of Law



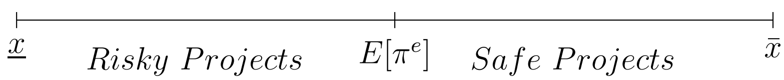
Note: Values are averages between 1998−2009
Source: World Bank Database

Figure 6: Economy's Time-line



Note: Sequence of events in the model. Household agents live for two periods while projects last one period.

Figure 7: The Return Spectrum of the Safe Projects



Note 1: $\underline{x}$ and $\bar{x}$ are lower and upper limits of return for safe projects. $x < E[pi^e]$ is the expected profit of the risky project.
Note 2: Each entrepreneur with $x < E[pi^e]$ will choose to operate a risky project instead of the safe project, and each entrepreneur with $x > E[pi^e]$ will operate the safe project.

Figure 8: Labour Input for Monitoring, $l_{f,t}$

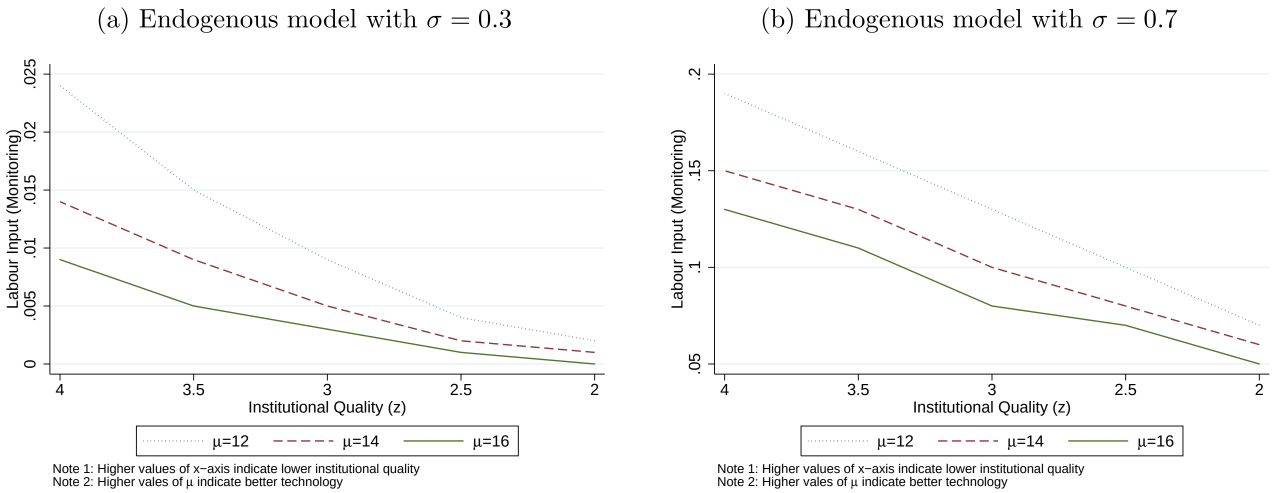
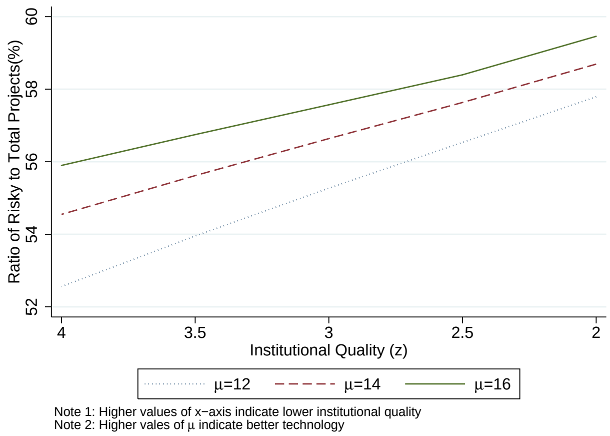
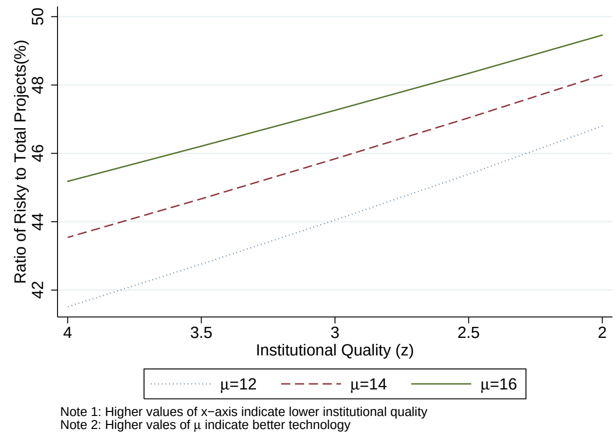


Figure 9: Ratio of Risky Projects to Total Projects, ϕ_t

(a) Endogenous model with $\sigma = 0.3$



(b) Endogenous model with $\sigma = 0.7$



(c) Exogenous model

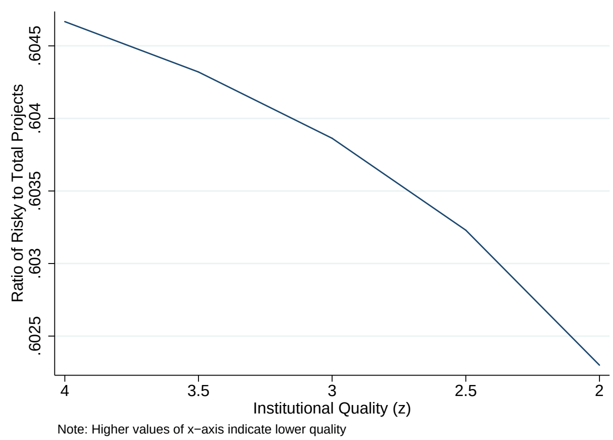
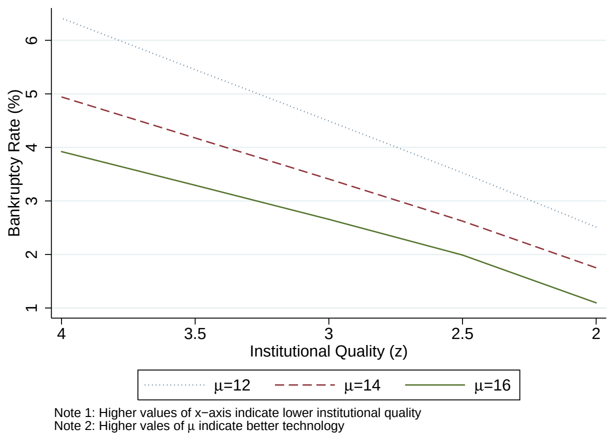
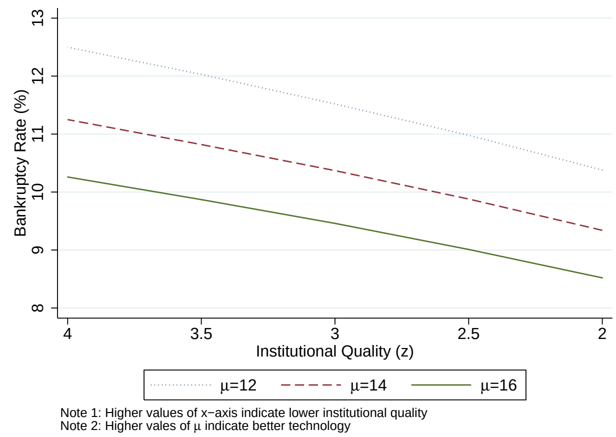


Figure 10: The Rate of Bankruptcy of the Risky Projects, $\hat{\theta}_t$

(a) Endogenous model with $\sigma = 0.3$



(b) Endogenous model with $\sigma = 0.7$



(c) Exogenous model

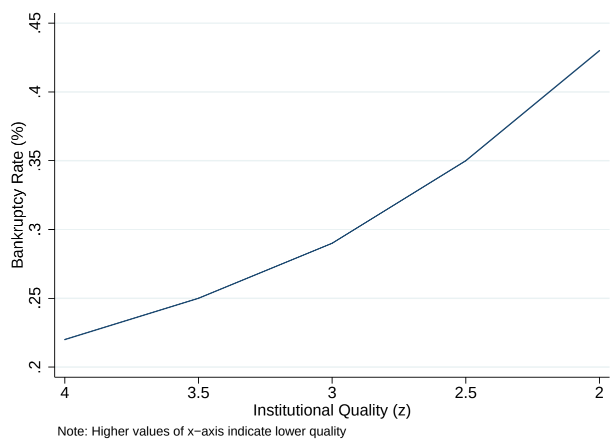
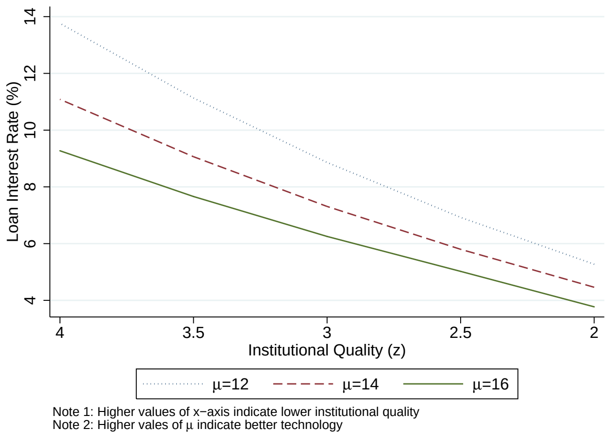
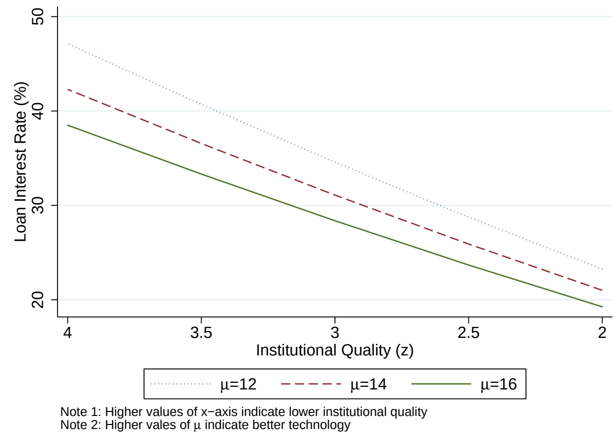


Figure 11: Lending Interest Rate, r_t^e

(a) Endogenous model with $\sigma = 0.3$



(b) Endogenous model with $\sigma = 0.7$



(c) Exogenous model

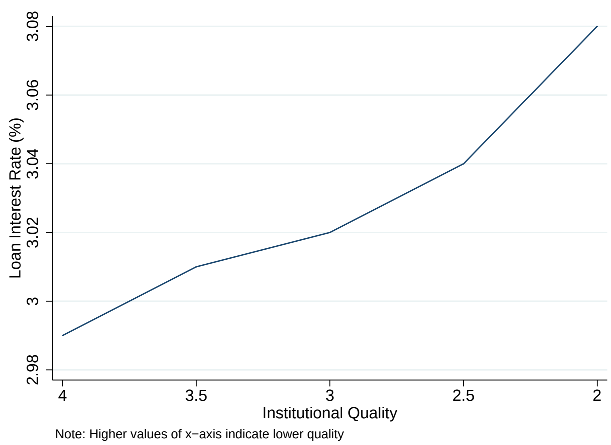
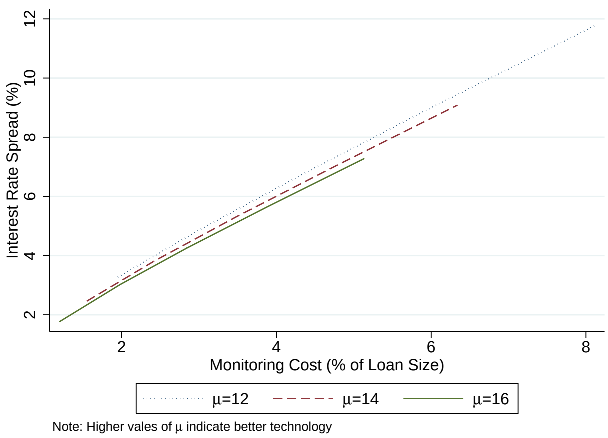
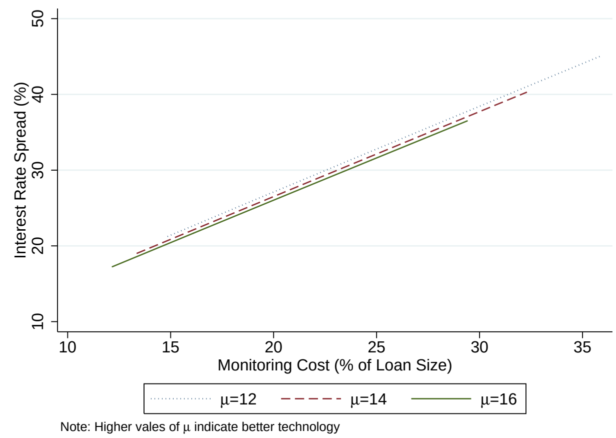


Figure 12: Interest Rate Spread & Monitoring Cost

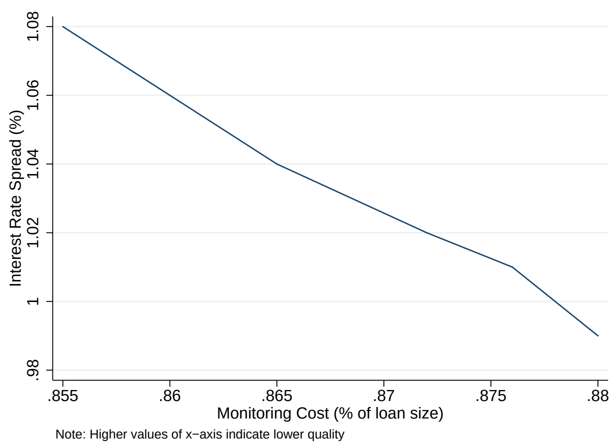
(a) Endogenous model with $\sigma = 0.3$



(b) Endogenous model with $\sigma = 0.7$



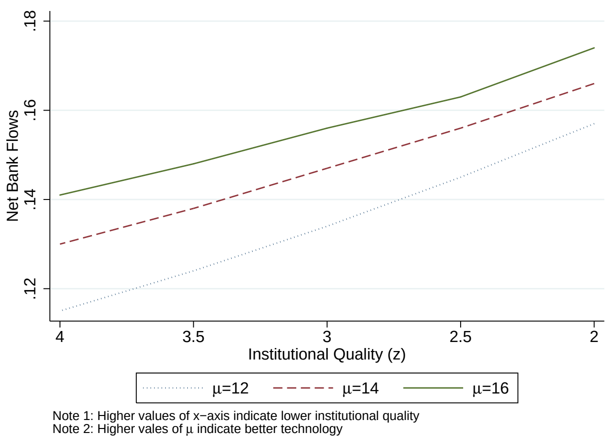
(c) Exogenous model



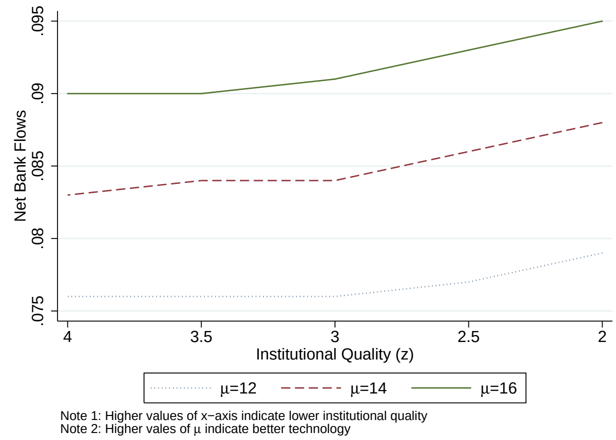
Note: Interest Rate Spread $= r_t^e - d_t$, and
Monitoring Cost $= \phi_t[\hat{\theta}_t M_t b_t + w_t l_{f,t}]$.

Figure 13: Net Capital Outflow, $d_t - \phi_t b_t$

(a) Endogenous model with $\sigma = 0.3$



(b) Endogenous model with $\sigma = 0.7$



(c) Exogenous model

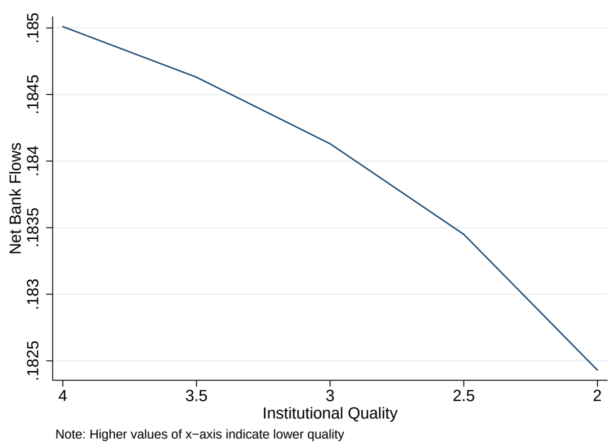
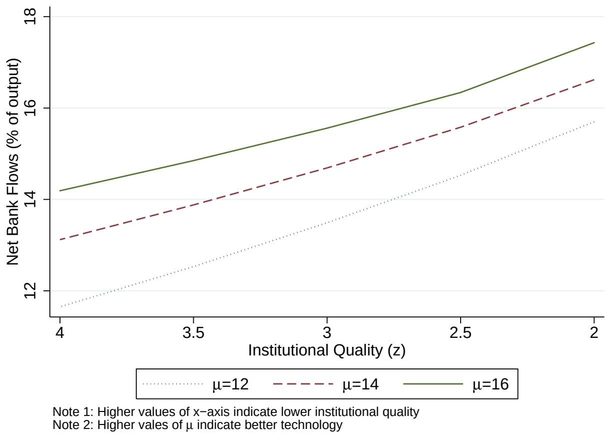
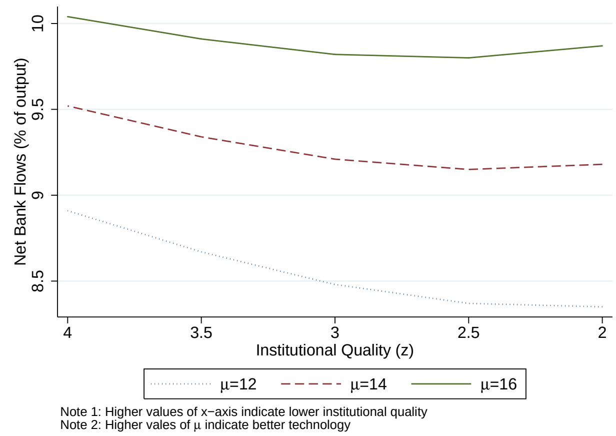


Figure 14: Net Capital Outflow as a Percentage of Output

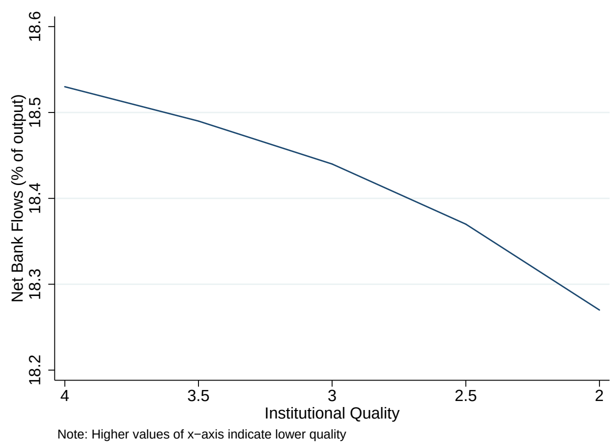
(a) Endogenous model with $\sigma = 0.3$



(b) Endogenous model with $\sigma = 0.7$



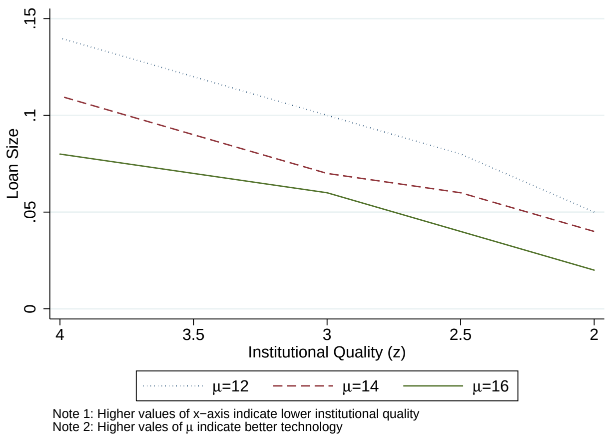
(c) Exogenous model



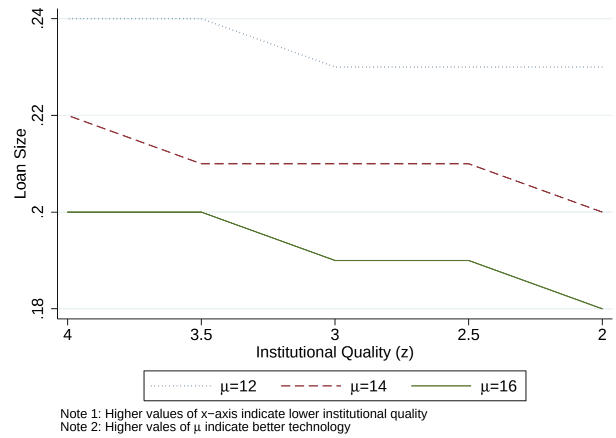
Note: Net capital outflow as percentage of output $= \frac{d_t - \phi_t b_t}{Y_t}$ where Y_t is the sum of both risky and safe project outputs.

Figure 15: Loan size, b_t

(a) Endogenous model with $\sigma = 0.3$



(b) Endogenous model with $\sigma = 0.7$



(c) Exogenous model

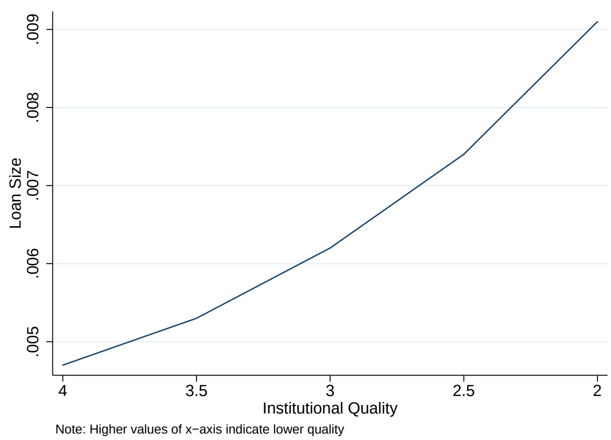
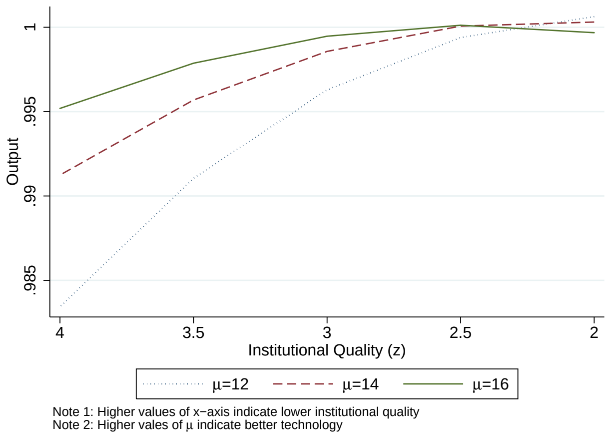
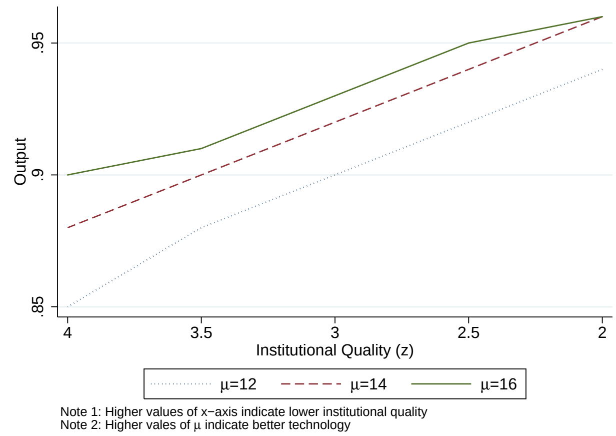


Figure 16: Total Output, Y_t

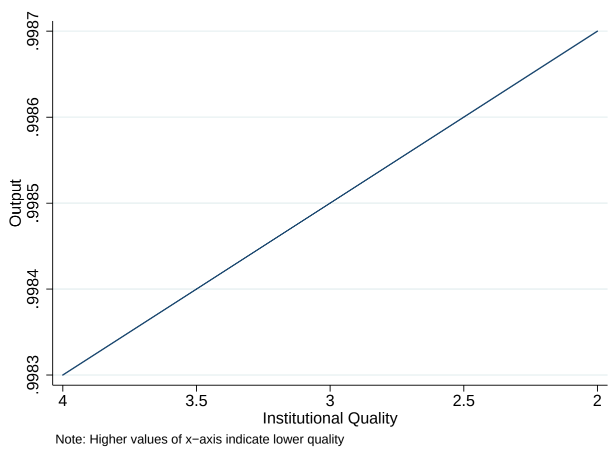
(a) Endogenous model with $\sigma = 0.3$



(b) Endogenous model with $\sigma = 0.7$

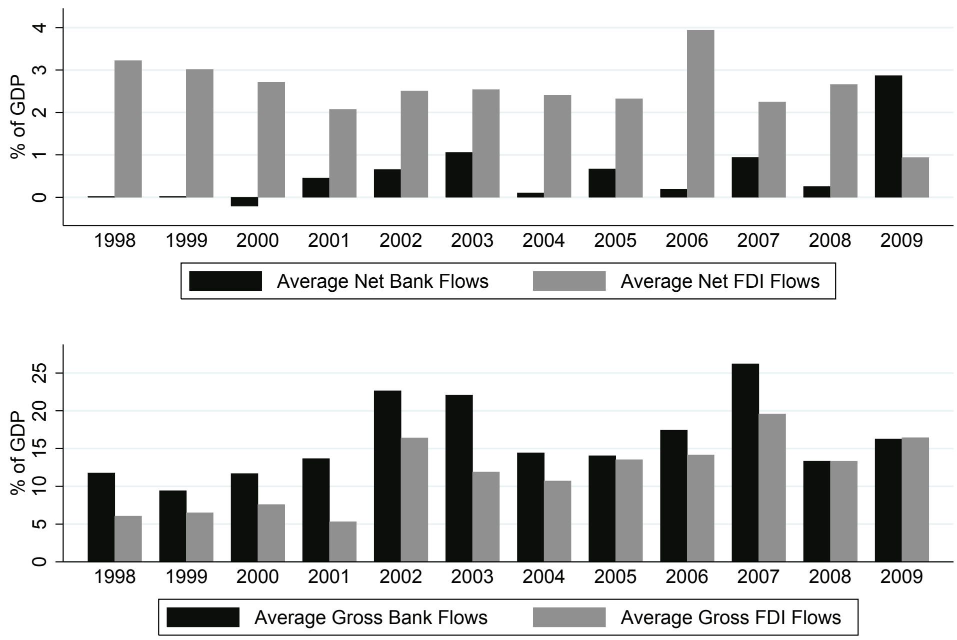


(c) Exogenous model



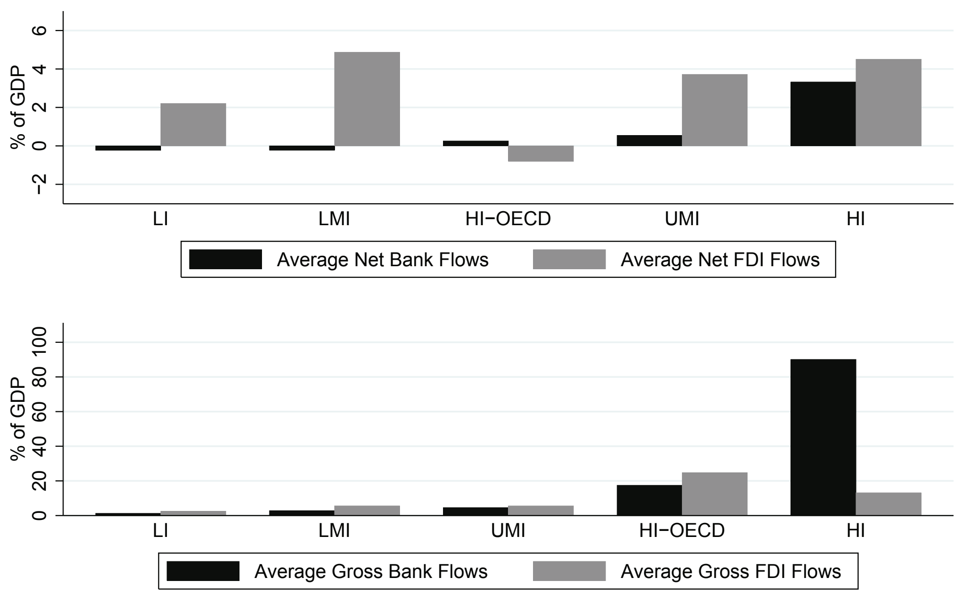
Note: Total output Y_t is the sum of both risky and safe project outputs.

Figure 17: Net/Gross Bank & FDI Flows (% of GDP)



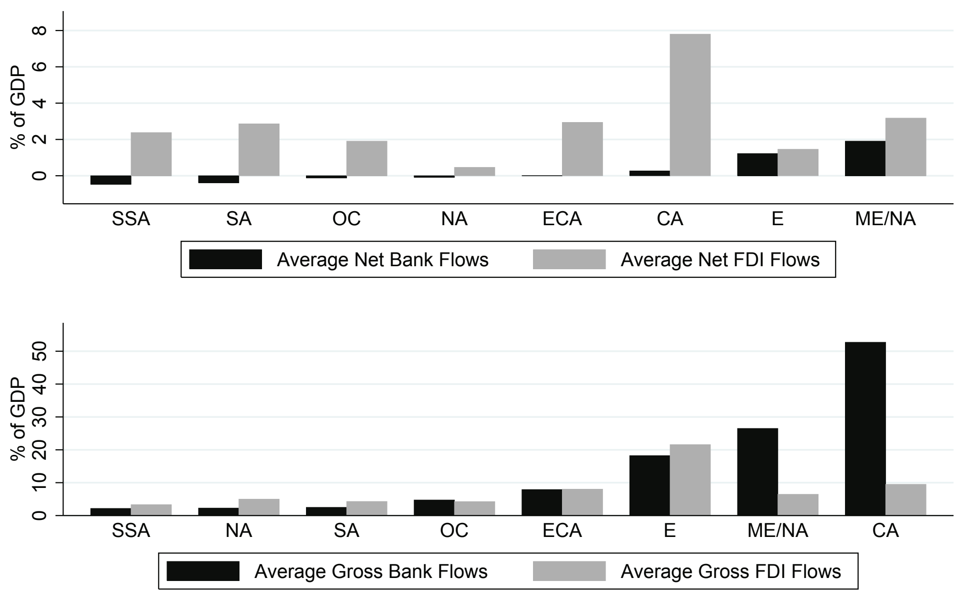
Note: Average (per year) gross/net flow of bank loans and gross/net FDI as percentage of output (n = 65).
Source: International Monetary Fund's *International Financial Statistics*.

Figure 18: Net/Gross Bank & FDI Flows (% of GDP) by Income Group



Note 1: LI = Low Income, LMI = Lower Mid-Income, UMI = Upper Mid-Income, HI = High Income (non-OECD), HI-OECD = High Income OECD
Note 2: Average (per year) gross/net flow of bank loans and gross/net FDI as percentage of output (n = 65).
Source: International Monetary Fund's *International Financial Statistics*.

Figure 19: Net/Gross Bank & FDI Flows (% of GDP) by Region

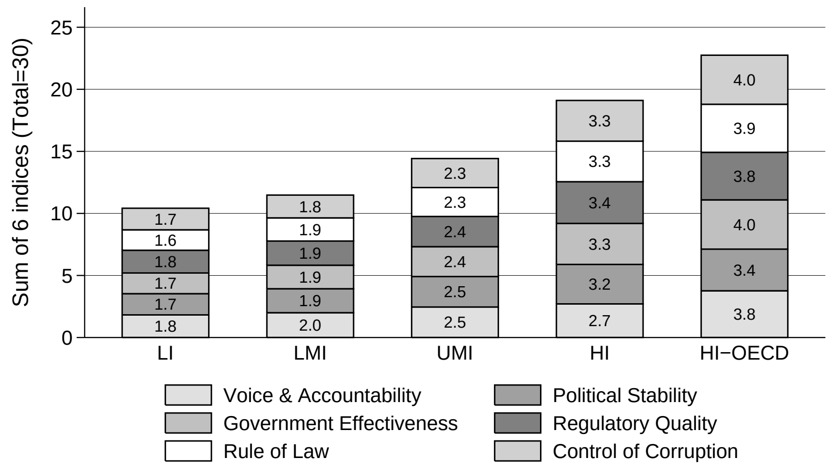


Note 1: ECA = East Central Asia, ME/NA = Middle East/North Africa, E = Europe, NA =North America, CA = Central America, SA = South America, SSA = SubSaharan Africa, OC = Oceania

Note 2: Gross/net bank loan flows, average per region (n = 65).

Source: International Monetary Fund's *International Financial Statistics*

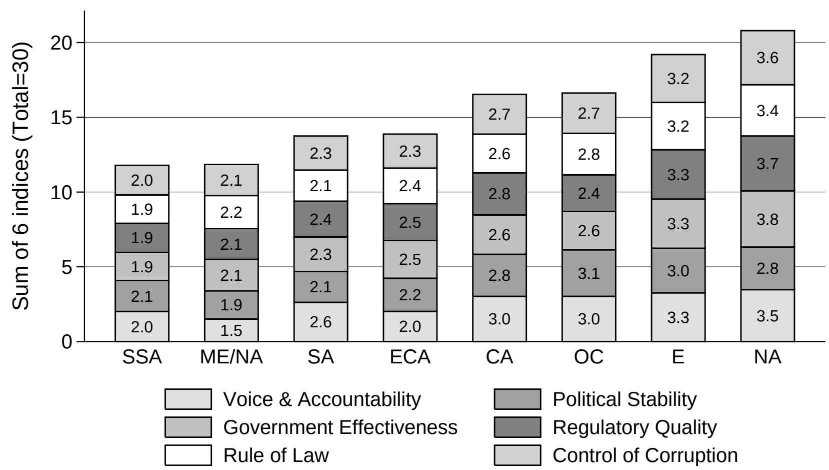
Figure 20: Institutional Quality by Income Group



Note: LI = Low Income, LMI = Lower Mid−Income, UMI = Upper Mid−Income, HI = High Income (non−OECD), HI−OECD = High Income OECD

Source: Kaufmann et. al. (2010)

Figure 21: Institutional Quality by Region



Note: ECA = East Central Asia, ME/NA = Middle East/North Africa, E = Europe, NA =North America, CA = Central America, SA = South America, SSA = Sub−Saharan Africa, OC = Oceania

Source: Kaufmann et. al. (2010)

Figure 22: Marginal Effects: Political Stability

(a) *political stability* (All Countries)

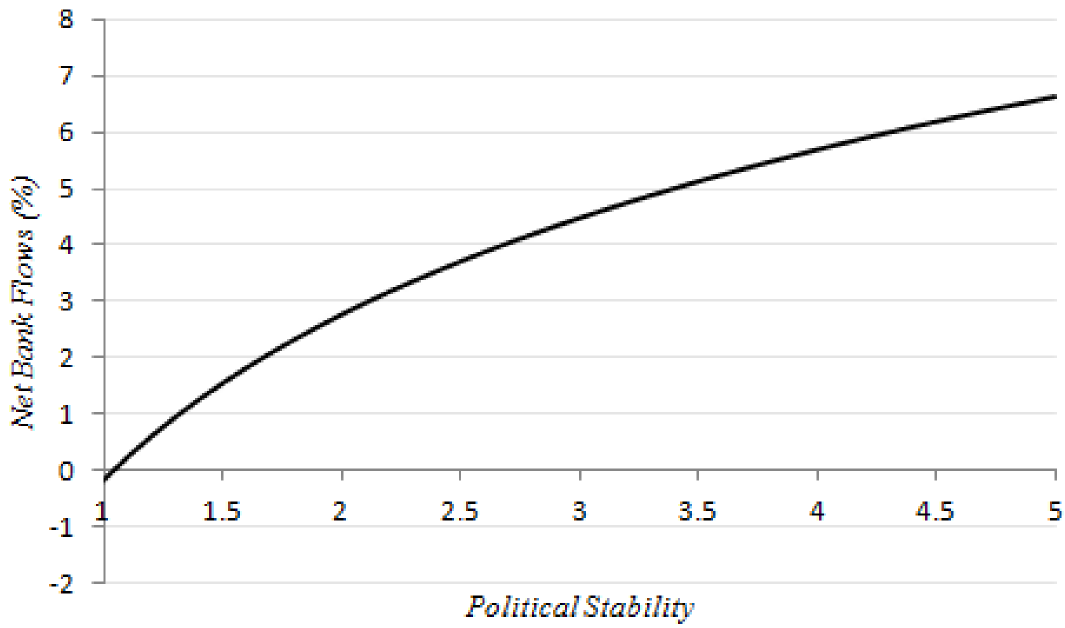
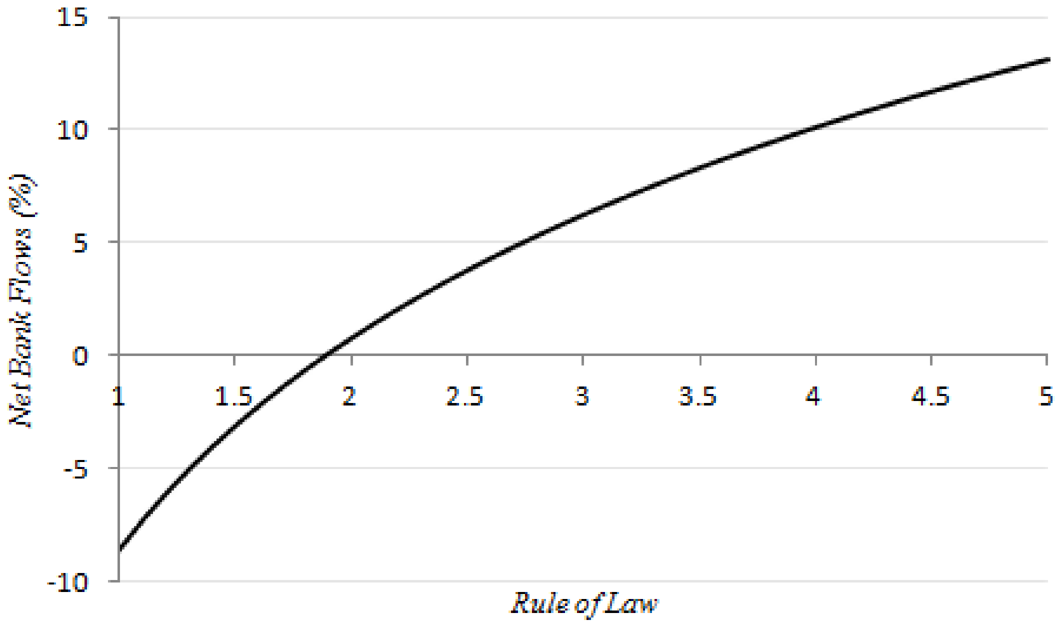


Figure 23: Marginal Effects: Rule of Law

(a) *rule of law* (Mid-income Countries)



(b) *rule of law* (Rich Countries)

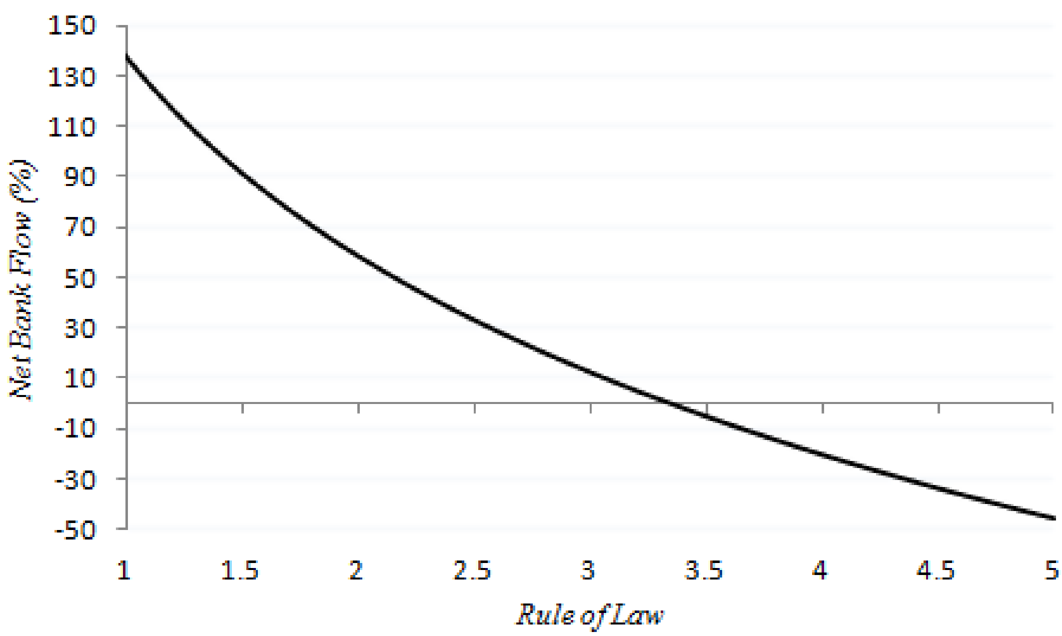
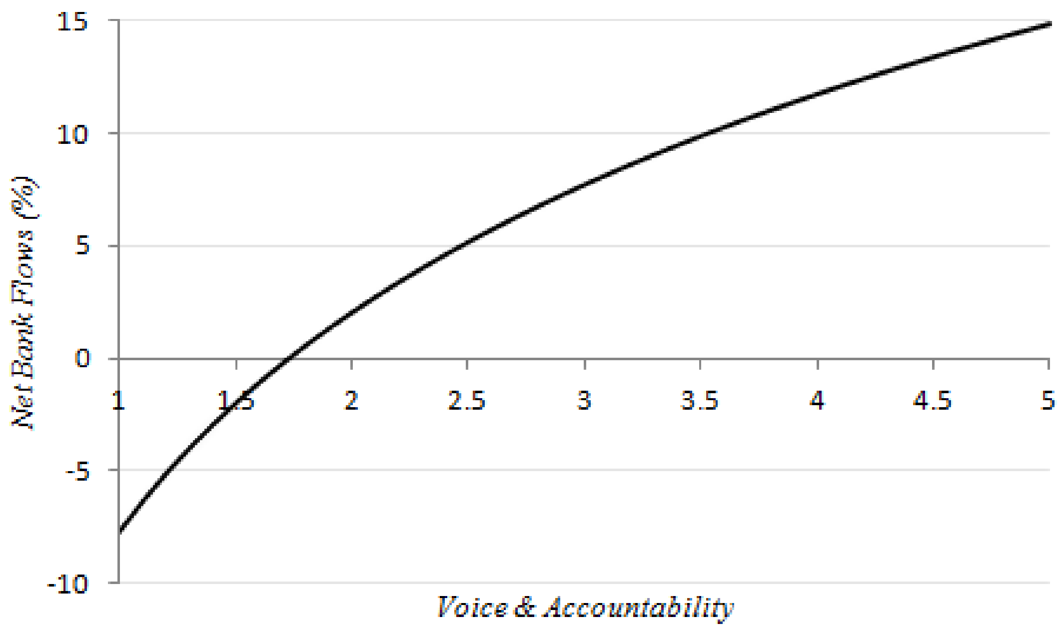


Figure 24: Marginal Effects: Voice & Accountability

(a) *voice & accountability* (Mid-income Countries)



(b) *voice & accountability* (Rich Countries)

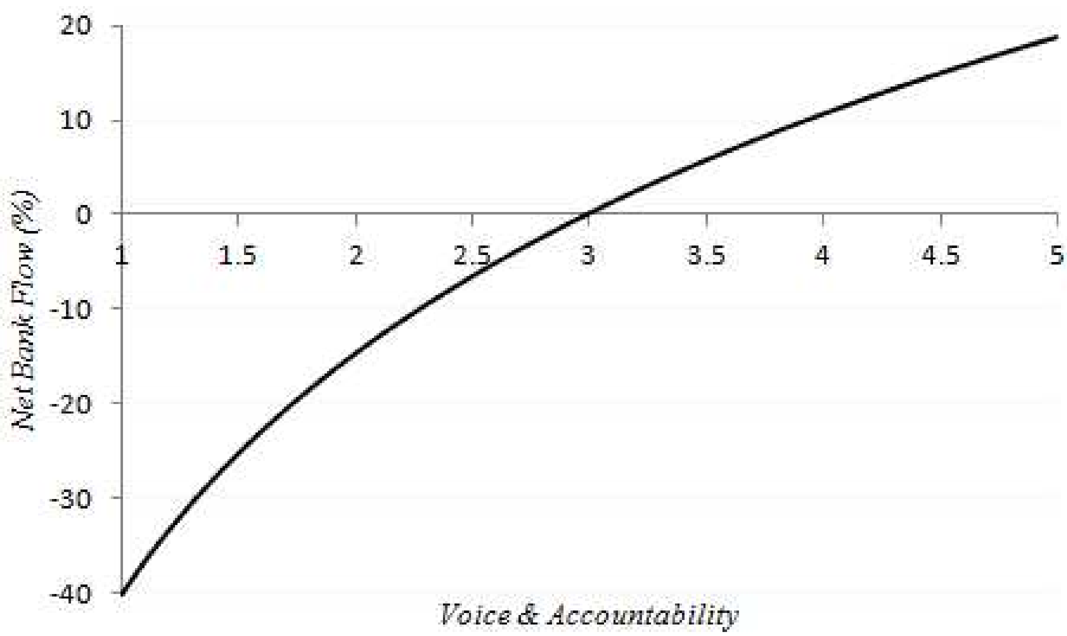
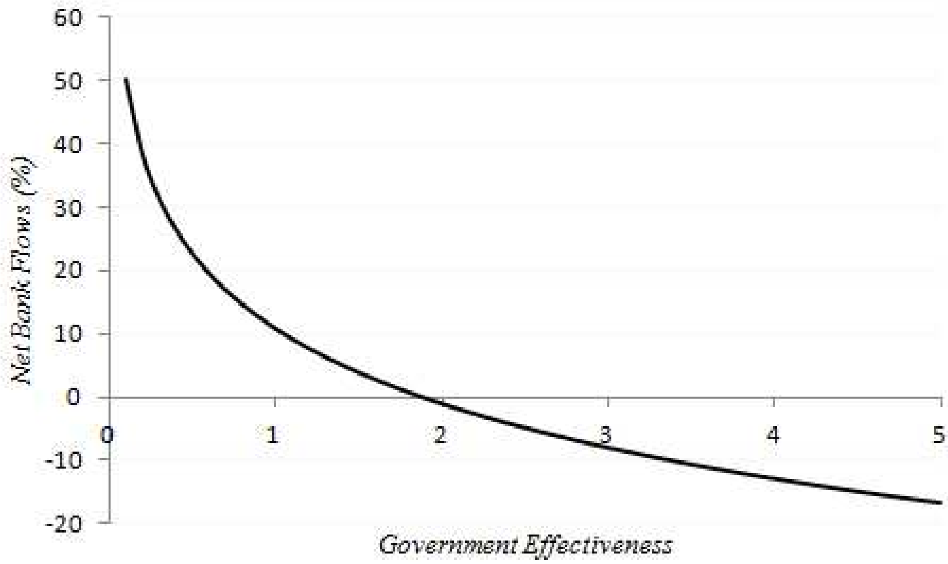
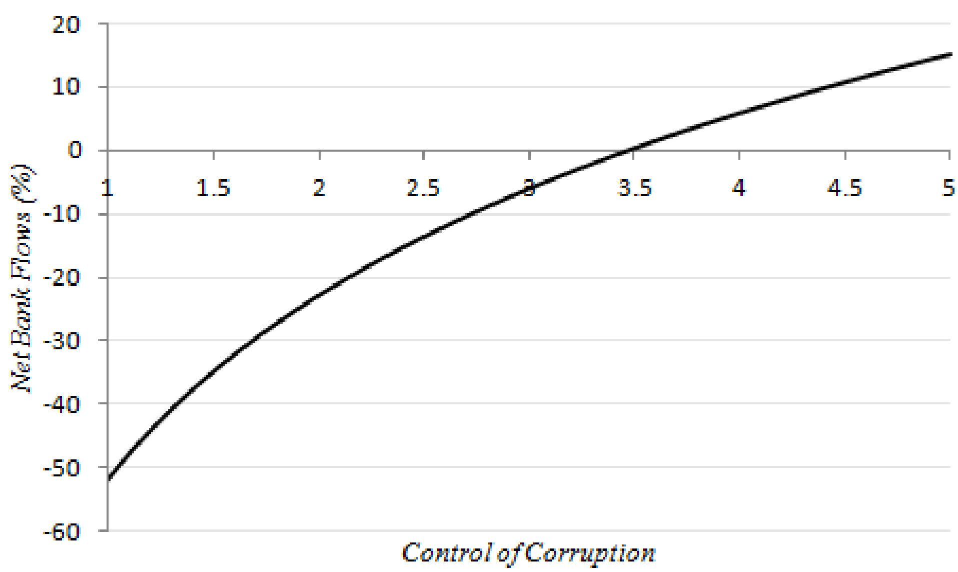


Figure 25: Marginal Effects: Others

(a) *Quality of Governance* (Mid-income Countries)



(b) *Control of Corruption* (Rich Countries)



2 Appendix B - Tables

Table 1: Parameter Values

Parameter	**Value**	**Description**
a_k	0.3	Risky project's output elasticity of capital
a_l	0.65	Risky project's output elasticity of labour
A_t	1	Risky project's total factor productivity
$\underline{x}$	1.05	Lower bound for safe projects' return
$\bar{x}$	1.15	Upper bound for safe projects' return
ξ	0.96	$\frac{1}{\xi}$ is the intertemporal elasticity of substitution
ρ	0.96	Subjective discount rate
η	0.3	Weight of labour in utility
r_t^d	0.02	Risk-free deposit interest rate

Table 2: Exogenous Model: Changes in quality of institutions (varying z)

z	L_t	b_t	d_t	k_t	l_t	ϕ_t	π_t	θ_t	w_t	r_t^e
2.0	0.8690527	0.0091	0.18794	0.3718	1.443	60.23%	1.092276	0.4275%	0.44172	3.0752%
2.5	0.8690518	0.0074	0.18790	0.3711	1.441	60.32%	1.092388	0.3459%	0.44163	3.0431%
3.0	0.8690512	0.0062	0.18788	0.3707	1.439	60.39%	1.092464	0.2905%	0.44157	3.0212%
3.5	0.8690507	0.0053	0.18786	0.3704	1.438	60.43%	1.092518	0.2504%	0.44153	3.0054%
4.0	0.8690504	0.0047	0.18784	0.3701	1.437	60.47%	1.09256	0.2200%	0.44150	2.9935%

	$\phi_t b_t$	$\frac{d_t}{\phi_t b_t}$	$d_t - \phi_t b_t$	$\theta_t M_t b_t$	**safe** Y_t	**risky** Y_t	**total** Y_t	$\frac{d_t - \phi_t b_t}{Y_t}$	$\frac{\theta_t M_t b_t}{b_t}$	$\frac{\phi_t b_t}{Y_t}$
	0.0055	34.14947	0.18243	4.7E-05	0.05327	0.94545	0.9987	18.2667%	0.855%	0.55%
	0.0045	42.17520	0.18345	3.85E-05	0.05314	0.94542	0.9986	18.3708%	0.865%	0.45%
	0.0037	50.20104	0.18413	3.26E-05	0.05306	0.94540	0.9985	18.4416%	0.872%	0.37%
	0.0032	58.22696	0.18463	2.83E-05	0.05300	0.94539	0.9984	18.4929%	0.876%	0.32%
	0.0028	66.25292	0.18501	2.5E-05	0.05296	0.94538	0.9983	18.5317%	0.880%	0.28%

Table 3: Endogenous model with $\sigma = 0.3$

z	μ	L_t	M_t	b_t	d_t	$l_{f,t}$	k_t	$l_{e,t}$	ϕ_t	π_t	w_t	θ_t
2.0	12	0.869071	0.25	0.05	0.18867	0.002	0.389	1.50	57.8%	1.089	0.4434	2.5%
2.0	14	0.869065	0.41	0.04	0.18844	0.001	0.382	1.48	58.7%	1.090	0.4429	1.8%
2.0	16	0.869060	0.71	0.02	0.18821	0.000	0.377	1.46	59.5%	1.091	0.4424	1.1%
2.5	12	0.869074	0.16	0.08	0.18880	0.004	0.397	1.53	56.5%	1.088	0.4437	3.5%
2.5	14	0.869070	0.24	0.06	0.18864	0.002	0.389	1.51	57.6%	1.089	0.4434	2.6%
2.5	16	0.869066	0.35	0.04	0.18849	0.001	0.384	1.49	58.4%	1.090	0.4430	2.0%
3.0	12	0.869073	0.12	0.10	0.18873	0.009	0.405	1.56	55.3%	1.086	0.4436	4.5%
3.0	14	0.869072	0.17	0.07	0.18870	0.005	0.396	1.53	56.6%	1.088	0.4435	3.4%
3.0	16	0.869069	0.24	0.06	0.18860	0.003	0.390	1.51	57.6%	1.089	0.4433	2.7%
3.5	12	0.869065	0.10	0.12	0.18844	0.015	0.412	1.60	54.0%	1.085	0.4429	5.5%
3.5	14	0.869069	0.14	0.09	0.18860	0.009	0.402	1.55	55.6%	1.087	0.4433	4.2%
3.5	16	0.869069	0.19	0.07	0.18860	0.005	0.395	1.53	56.7%	1.088	0.4433	3.3%
4.0	12	0.869051	0.09	0.14	0.18788	0.024	0.420	1.63	52.6%	1.083	0.4416	6.4%
4.0	14	0.869063	0.12	0.11	0.18834	0.014	0.408	1.58	54.5%	1.085	0.4427	4.9%
4.0	16	0.869067	0.15	0.08	0.18850	0.009	0.400	1.55	55.9%	1.087	0.4430	3.9%

z	μ	r_t^e	$\phi_t b_t$	$\frac{d_t}{\phi_t b_t}$	$d_t - \phi_t b_t$	$\phi_t(\theta_t M_t b_t + w_t l_{f,t})$	safe Y_t	risky Y_t	total Y_t	$\frac{d_t - \phi_t b_t}{Y_t}$	$\frac{\theta_t M_t b_t + w_t l_{f,t}}{b_t}$	$\phi_t l_{f,t}$
2.0	12	5.27%	0.032	6.0	0.157	0.0006	0.056	0.944	1.00063	15.7%	2.0%	0.0009
2.0	14	4.46%	0.022	8.5	0.166	0.0003	0.055	0.945	1.00031	16.6%	1.5%	0.0004
2.0	16	3.77%	0.014	13.4	0.174	0.0002	0.054	0.945	0.99968	17.4%	1.2%	0.0001
2.5	12	6.92%	0.044	4.3	0.145	0.0013	0.058	0.941	0.99939	14.5%	3.0%	0.0024
2.5	14	5.80%	0.033	5.7	0.156	0.0008	0.057	0.943	1.00007	15.6%	2.4%	0.0013
2.5	16	5.02%	0.025	7.5	0.163	0.0005	0.056	0.944	1.00012	16.3%	2.0%	0.0007
3.0	12	8.86%	0.054	3.5	0.134	0.0024	0.060	0.937	0.99629	13.5%	4.4%	0.0048
3.0	14	7.31%	0.042	4.5	0.147	0.0015	0.058	0.941	0.99857	14.7%	3.5%	0.0027
3.0	16	6.25%	0.033	5.7	0.156	0.0009	0.057	0.943	0.99947	15.6%	2.8%	0.0016
3.5	12	11.13%	0.064	2.9	0.124	0.0039	0.061	0.930	0.99105	12.5%	6.1%	0.0081
3.5	14	9.06%	0.050	3.7	0.138	0.0024	0.059	0.936	0.99569	13.9%	4.8%	0.0048
3.5	16	7.66%	0.040	4.7	0.148	0.0016	0.058	0.940	0.99787	14.9%	3.9%	0.0030
4.0	12	13.76%	0.073	2.6	0.115	0.0059	0.063	0.920	0.98343	11.7%	8.1%	0.0125
4.0	14	11.09%	0.058	3.2	0.130	0.0037	0.061	0.931	0.99124	13.1%	6.3%	0.0076
4.0	16	9.27%	0.047	4.0	0.141	0.0024	0.059	0.936	0.99519	14.2%	5.1%	0.0048

Table 4: Endogenous model with $\sigma = 0.7$

z	μ	L_t	M_t	b_t	d_t	$l_{f,t}$	k_t	$l_{e,t}$	ϕ_t	π_t	w_t	θ_t
2.0	12	0.86897	0.102	0.23	0.184	0.07	0.452	1.79	47%	1.076	0.434	10.4%
2.0	14	0.86899	0.097	0.20	0.185	0.06	0.443	1.74	48%	1.078	0.436	9.3%
2.0	16	0.86901	0.096	0.18	0.186	0.05	0.436	1.71	49%	1.079	0.438	8.5%
2.5	12	0.86891	0.138	0.23	0.182	0.10	0.454	1.82	45%	1.074	0.428	11.0%
2.5	14	0.86894	0.129	0.21	0.184	0.08	0.445	1.77	47%	1.076	0.432	9.9%
2.5	16	0.86897	0.124	0.19	0.185	0.07	0.438	1.73	48%	1.078	0.434	9.0%
3.0	12	0.86884	0.177	0.23	0.180	0.13	0.455	1.85	44%	1.073	0.422	11.5%
3.0	14	0.86889	0.164	0.21	0.182	0.10	0.446	1.79	46%	1.075	0.427	10.4%
3.0	16	0.86892	0.155	0.19	0.183	0.08	0.440	1.75	47%	1.077	0.430	9.5%
3.5	12	0.86877	0.217	0.24	0.177	0.16	0.456	1.87	43%	1.071	0.417	12.0%
3.5	14	0.86883	0.199	0.21	0.179	0.13	0.447	1.82	45%	1.074	0.422	10.8%
3.5	16	0.86888	0.187	0.20	0.181	0.11	0.441	1.77	46%	1.075	0.426	9.9%
4.0	12	0.86870	0.258	0.24	0.175	0.19	0.456	1.90	42%	1.070	0.410	12.5%
4.0	14	0.86878	0.236	0.22	0.177	0.15	0.448	1.84	44%	1.072	0.417	11.2%
4.0	16	0.86883	0.220	0.20	0.179	0.13	0.441	1.80	45%	1.074	0.421	10.3%

z	μ	r_t^e	$\phi_t b_t$	$\frac{d_t}{\phi_t b_t}$	$d_t - \phi_t b_t$	$\phi_t(\theta_t M_t b_t + w_t l_{f,t})$	safe Y_t	risky Y_t	total Y_t	$\frac{d_t-\phi_t b_t}{Y_t}$	$\frac{\theta_t M_t b_t + w_t l_{f,t}}{b_t}$	$\phi_t l_{f,t}$
2.0	12	23%	0.106	1.7	0.079	0.016	0.071	0.87	0.94	8.4%	15%	0.034
2.0	14	21%	0.098	1.9	0.088	0.013	0.069	0.89	0.96	9.2%	13%	0.028
2.0	16	19%	0.091	2.0	0.095	0.011	0.067	0.90	0.96	9.9%	12%	0.024
2.5	12	29%	0.105	1.7	0.077	0.021	0.073	0.85	0.92	8.4%	20%	0.045
2.5	14	26%	0.098	1.9	0.086	0.017	0.070	0.87	0.94	9.1%	18%	0.037
2.5	16	24%	0.092	2.0	0.093	0.015	0.069	0.88	0.95	9.8%	16%	0.032
3.0	12	35%	0.103	1.7	0.076	0.026	0.074	0.83	0.90	8.5%	25%	0.056
3.0	14	31%	0.097	1.9	0.084	0.022	0.072	0.84	0.92	9.2%	22%	0.047
3.0	16	28%	0.091	2.0	0.091	0.019	0.070	0.86	0.93	9.8%	20%	0.040
3.5	12	41%	0.101	1.8	0.076	0.031	0.076	0.80	0.88	8.7%	30%	0.067
3.5	14	37%	0.096	1.9	0.084	0.026	0.073	0.82	0.90	9.3%	27%	0.057
3.5	16	33%	0.091	2.0	0.090	0.022	0.072	0.84	0.91	9.9%	25%	0.049
4.0	12	47%	0.099	1.8	0.076	0.035	0.078	0.78	0.85	8.9%	36%	0.079
4.0	14	42%	0.094	1.9	0.083	0.030	0.075	0.80	0.88	9.5%	32%	0.067
4.0	16	38%	0.089	2.0	0.090	0.026	0.073	0.82	0.90	10.0%	29%	0.058

Variable	Sample	Mean	Std. Dev.	Min	Max	Observations
Net Bank Flows (%)	overall	0.3707	7.3421	-84.3697	71.8332	N = 1265
	between		3.6197	-26.5325	17.4553	n = 135
	within		6.5067	-72.4888	75.8153	T-bar = 9.4
Net FDI Flows (%)	overall	2.6128	7.9720	-128.6324	80.3949	N = 1132
	between		5.5370	-39.4774	27.3914	n = 123
	within		5.8557	-86.5422	75.4589	T = 9.2
Control of Corruption	overall	2.5115	0.9974	0.6882	5.0908	N = 1851
	between		0.9814	1.0718	4.9757	n = 171
	within		0.1915	1.8769	3.4022	T = 10.8
Government Effectiveness	overall	2.5413	0.9639	0.2288	4.8740	N = 1848
	between		0.9500	0.7746	4.6371	n = 171
	within		0.1701	1.4500	3.3042	T = 10.8
Political Stability	overall	2.4532	0.9529	0.0017	4.1628	N = 1828
	between		0.9160	0.3332	4.0376	n = 170
	within		0.2921	1.2301	3.7911	T = 10.7
Regulatory Quality	overall	2.5675	0.9231	0.1550	4.6504	N = 1846
	between		0.9033	0.4025	4.4243	n = 171
	within		0.1856	1.7652	3.4744	T = 10.7
Rule of Law	overall	2.4858	0.9674	0.4142	4.5142	N = 1851
	between		0.9555	0.8704	4.4482	n = 171
	within		0.1689	1.6657	3.3249	T = 10.8
Voice & Accountability	overall	2.5154	0.9398	0.2820	4.3255	N = 1852
	between		0.9211	0.4084	4.1082	n = 171
	within		0.1842	1.4670	3.2908	T = 10.8
Stocks Traded (% of GDP)	overall	33.4936	62.8788	0.0000	755.0607	N = 1130
	between		52.7856	0.0148	244.0213	n = 109
	within		32.8885	-92.5343	548.1824	T = 10.3
Treasury Bill Rate (%)	overall	9.1278	8.8827	-0.0800	93.2400	N = 946
	between		7.3816	1.3755	37.3750	n = 95
	within		5.5068	-20.2460	64.9928	T = 9.9
Exchange Rate per USD	overall	542.4667	1,878.0900	0.2300	16,302.2500	N = 1878
	between		1,834.9930	0.2945	15,172.7000	n = 171
	within		415.8589	-5,033.3690	5,201.3690	T = 10.9
Openness (M+X/GDP), %	overall	90.5623	50.9312	0.3088	444.1000	N = 1810
	between		49.3043	0.8398	387.7838	n = 168
	within		13.0080	11.5082	170.8922	T = 10.7

Table 5: Summary Statistics

Quadratic Model - Hausman Test			
	Mid-income	Rich	All
χ^2	16.0718	0.1112	15.4532
d.f.	*16*	*16*	*16*
p-value	*0.4480*	*0.9980*	*0.4917*
NOTE: Hausman (1978) specification test			

Table 6: Specification Test

Quadratic Model - Breusch Pagan Test			
	Mid-income	Rich	All
χ^2	348.201	3.650	17.920
d.f.	*1*	*1*	*1*
p-value	*0.0000*	*0.0561*	*0.0000*
NOTE: Breusch-Pagan LM Test (1980)			

Table 7: Random Effects Test

Quadratic Model - Serial Correlation Test			
	Mid-income	Rich	All
χ^2	1.659	18.369	7.893
d.f.	*1*	*1*	*1*
p-value	*0.1977*	*0.0011*	*0.0050*
NOTE: Breusch (1978) Godfrey (1978) LM Test			

Table 8: Residual Autocorrelation Test

Dep = Net Bank Flows (% of GDP)	All Countries	Rich	Mid-Income
regulatory quality	2.273	−1.7941	8.4398***
government effectiveness	1.7551	−4.4423	−2.1401
rule of law	2.8524	16.2828***	6.8067***
voice & accountability	−0.8300	−5.0850**	4.0481***
political stability	0.7586	1.7304	−2.6231***
control of corruption	−6.0163***	−13.8278***	−10.5547***
Lagged Differenced Exchange rate (per US$)	−0.3131**	−0.9061***	−0.0986
Lagged Treasury Bill Rate (%)	−0.9767***	0.7976	−1.4754***
Lagged Openness (abs(X+M)/GDP, %)	1.3314**	2.7653***	−0.3539
Lagged Stocks traded total value (% of GDP)	−0.2411*	0.4165*	−0.5029***
Constant	−2.1312	−7.6621	0.7641
Total Number of Obs.	457	224	233
Number of Countries	56	26	30
Overall R^2	0.0249	0.1150	0.1410

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

Table 9: FGLS Random Effects (Level-Log): 1998-2008

Dep = Net Bank Flows (% of GDP)	All Countries	Rich	Mid-Income
regulatory quality:			
-Level	10.5030	−28.9970	−3.9263
-Squared	−4.7290	11.0040	6.2504
government effectiveness:			
-Level:	7.3720	59.8850	10.8650
-Squared:	−2.7700	−23.1030	−8.5435*
rule of law:			
-Level:	−2.6520	136.8010***	−8.5214
-Squared:	2.8860	−56.8000***	6.7150*
voice & accountability:			
-Level:	−1.1870	−39.8600***	−7.5247**
-Squared:	−0.4580	18.1810***	6.9551***
political stability:			
-Level:	−0.1520	−1.7110	−1.0022**
-Squared:	2.1080***	2.8880	0.1650
control of corruption:			
-Level:	1.4400	−51.2450*	1.4037
-Squared:	−3.3670	20.5840*	−4.7924
Lagged Differenced Log Exchange rate (per US$)	−0.5029	−1.0016***	−0.0160
Lagged Log Treasury Bill Rate (%)	−1.0630***	−0.6490	−1.0923***
Lagged Log Openness (abs(X+M)/GDP, %)	1.2610***	1.9530**	0.8361
Lagged Log Stocks traded total value (% of GDP)	−0.3180**	−0.5180**	−0.1368
Constant	−8.9630*	−53.9520	1.0978
Total Number of Obs.	457	224	233
Number of Countries	56	26	30
Overall R^2	0.0404	0.1574	0.1565

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

Table 10: FGLS Quadratic Random Effects (Level-Log): 1998-2008

	Mid-income	Rich	All
Regulatory Quality	-	-	-
Government Effectiveness	-0.864	-	-
Rule of Law	0.804	-2.890	-
Voice & Accountability	0.717	1.323	-
Political Stability	-	-	-0.008
Control of Corruption	-	1.409	-

Table 11: Percentage point change in net flows

given a 1 std. dev. increase from mean

Dep = Bank Inflows (% of GDP)	All Countries	Rich	Mid-Income
regulatory quality:			
-Level	−2.7160	28.8310*	−45.9168
-Squared	14.3126***	−19.6582*	15.7296
government effectiveness:			
-Level	−39.1140***	−28.1044*	−8.0546
-Squared	18.1259***	21.1164***	−5.0195
rule of law:			
-Level	27.2588***	3.7760	52.7912*
-Squared	−27.7450***	−3.2914	−68.7042***
voice & accountability:			
-Level	−39.5149***	−10.3739	31.7148**
-Squared	−1.9174	8.8044*	5.9648
political stability:			
-Level	−1.4070*	3.0425	6.5698***
-Squared	−0.9854	−1.4136	4.6777***
control of corruption:			
-Level	57.7105***	−2.5932	−64.9982***
-Squared	−25.3452***	−2.7138	57.979***
Lagged Differenced Log Exchange rate (per US$)	0.0869	0.0284	−1.0393**
Lagged Log Treasury Bill Rate (%)	1.5997***	1.8562***	−3.6091***
Lagged Log Openness (abs(X+M)/GDP, %)	−12.2127***	−1.0326	−9.1719***
Lagged Log Stocks Traded total value (% of GDP)	−0.1616*	0.1095	0.6480
Constant	57.5594***	1.2635	60.3831***
Total Number of Obs	458	236	222
Number of Countries	56	26	30
Overall R^2	0.0618	0.0746	0.0771

$^{*}p < 0.1, ^{**}p < 0.05, ^{***}p < 0.01$

Table 12: FGLS - Inflow Regression (Level-Log): 1998-2008

Dep = Bank Outflows (% of GDP)	All Countries	Rich	Mid-Income
regulatory quality:			
-Level	−1.6179	12.0556	−16.4334
-Squared	0.8531	−33.6537***	11.1893
government effectiveness:			
-Level	3.0275	−55.3683***	44.7999***
-Squared	−4.3208	43.6348***	−34.1337***
rule of law:			
-Level	10.1492	42.1717***	13.1196
-Squared	−12.6942*	−34.1244***	−22.1335**
voice & accountability:			
-Level	4.0867	16.4131*	36.5301***
-Squared	−0.4520	2.6293	−21.6229***
political stability:			
-Level	−1.6055	−11.7341***	6.8871**
-Squared	4.9720**	12.9768***	−4.3436*
control of corruption:			
-Level	−5.1843	45.2377***	−29.3698
-Squared	3.6277	−30.9482***	36.8631***
Lagged Differenced Log Exchange rate (per US$)	−0.1744	−0.3973	−2.4516***
Lagged Log Treasury Bill Rate (%)	−1.1242**	−12.8861***	0.2056
Lagged Log Openness (abs(X+M)/GDP, %)	−3.2138**	−1.7267***	−0.5175
Lagged Log Stocks Traded total value (% of GDP)	0.4093*	−0.0466	−0.2115
Constant	14.1471*	30.3538***	−17.4925*
Total Number of Obs	482	239	243
Number of Countries	59	26	33
Overall R^2	0.0181	0.0619	0.0155

$^{*}p < 0.1, ^{**}p < 0.05, ^{***}p < 0.01$

Table 13: FGLS - Outflow Regression (Level-Log): 1998-2008

List of Countries

Mid-income	*Rich*
Armenia	Australia
Bolivia	Austria
Brazil	Barbados
Egypt	Belgium
Georgia	Canada
Indonesia	China: Hong Kong
Jamaica	Cyprus
Kazakhstan	Czech Republic
Latvia	Denmark
Lebanon	France
Lithuania	Germany
Malta	Hungary
Malaysia	Iceland
Mexico	Israel
Moldova	Italy
Mongolia	Japan
Nigeria	Kuwait
Pakistan	Poland
Papua New Guinea	Singapore
Philippines	Slovenia
Romania	Spain
Russia	Sweden
Serbia Republic of	Switzerland
South Africa	Trinidad and Tobago
Sri Lanka	United Kingdom
Swaziland	United States
Thailand	
Turkey	
Uruguay	
Zambia	

Table 14: List of 56 Countries In The Sample