Efficiency, Investment and Bank Lending in Transition and Emerging Economies

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by

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Abstract

This thesis studies the economic development in transition and emerging economies with focus on three particular economic issues: production efficiency, physical investment rate and bank lending under bank ownership perspective. The thesis chooses to study transition and emerging economies because they have undergone many important reform processes that may be thought of as experiments of different policy choices which lead to different economic outcomes.

The thesis contributes to the literature in several ways. First, it adds to the literature on institutional economics and transition economies by confirming the significant role of institutional quality for efficiency and investment in a panel of transition economies. Better institutions are associated with higher efficiency levels and investment rates in transition economies. Given that investment is one of the key determinants of growth this means good institutions are important for growth in transition economies. Second, the thesis finds that banks of different ownership respond in remarkably different ways to monetary policies, which has important implication for the transmission and effectiveness of monetary policy. It also finds an asymmetric effect of monetary policy on bank lending with regard to the monetary conditions: in easy regime bank lending may not be affected my monetary tightening. This result calls for duly consideration of the ownership structure of the banking system when monetary policy and its effect on credit are studied.

In summary, the thesis highlights the importance of institutional settings for economic development in transition and emerging economies.

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Contents

CHAPTER I - INTRODUCTION

1. MOTIVATION

> *Commerce and manufactures can seldom flourish long in any state which does not enjoy a regular administration of justice, in which the people do not feel themselves secure in the possession of their property, in which the faith of contracts is not supported by law, and in which the authority of the state is not supposed to be regularly employed in enforcing the payment of debts from all those who are able to pay. Commerce and manufactures, in short, can seldom flourish in any state in which there is not a certain degree of confidence in the justice of government.*
>
> Adam Smith, *Wealth of Nations*

Since Adam Smith, economists have long argued for the market institutions as pre-conditions for economic growth and prosperity. Though a huge amount of studies has been conducted on the subject of economic development the results have been unsatisfactory, or even retrogressive (North, 2000). The reason is that researchers take for granted the polities, demography and institutions which are essential building blocks for the existence and functioning of markets. In fact, neither neo-classical nor endogenous growth theories can explain why many developing countries are falling behind capital-rich developed countries in terms of growth rate. Differences in factor endowments cannot explain income gaps between countries though factor endowments are the foundation of various growth models. To understand how economies evolve to

different directions with remarkably different outcomes we need to understand institutions.

In the last two decades the literature on institutions has grown enormously following the seminal works of North (1981 & 1990) and Williamson (1985). Especially, with great efforts to quantify institutions by authors and organizations like Fraser Institution, Heritage Foundation, Freedom House, Transparency International, Daniel Kaufmann, Rafael La Porta, and others, research on institutions has been booming. In general, there has been an agreement among researchers that good institutions have positive effect on economic performance. Institutions are very important for growth and prosperity because they "provide the incentive structure of an economy; as that structure evolves, it shapes the direction of economic change towards growth, stagnation or decline" (North, 1991, p.112). According to institutional economists, it is the differences in institutions that finally lead to differences in economic performance across countries. Institutions are even considered more important than such factors as geography and economic integration. In Rodrik *et al.*'s words (2004), "institutions rule". Institutions affect allocation of resources, the effectiveness of the use of resource and, as a result, economic growth. The incentive structure shaped by institutions determines if resources are allocated to production or rent-seeking activities and how effectively resources are used to produce goods and services. Poor institutions are found to divert investment, thus limiting accumulation of capital and growth (Mauro, 1995). Besides, poor institutions are found to reduce productivity growth (Hall and Jones, 1999; Olson *et al.*, 2000; Meon and Weil, 2005). Therefore, it is not surprising that institutions are found to have a significant effect on growth even when investment is controlled for (Knack and Keefer, 1995). While

institutions can be endogenous, rigorous studies have shown that institutions indeed can explain growth when endogeneity is accounted for (Acemoglu *et al.*, 2001) and at least some aspects of institutions Granger-cause growth (Dawson, 2003).

Following the collapse of the Socialist System that spanned much of the Eurasian continent, the world has seen great transformations in the former socialist countries as they move from a planned economic system to a market-based one. They all head to a common ultimate objective of a well-functioning market economy but transition measures taken are very different. While many Eastern European transition countries have adopted a big-bang approach of various extents, their Asian counterparts have implemented gradual reform steps. Their economic achievements have been widely different too. There are countries like China and Vietnam that have achieved continuous growth at high rates. Others have quickly stabilized their economies and attained growth after an initial output fall (Poland, Hungary, Slovakia and Czech Republic). In contrast, some of them, especially the former Soviet republics, had to struggle hard for years before they could get back to the pre-transition level of output.

The experience of transition economies has been a natural economic experiment that attracted a lot of attention from economic researchers around the world (Blanchard *et al.*, 1991, McMillan and Naughton, 1992; Sachs and Woo, 1994; Aslund *et al.*, 1996; De Melo *et al.*, 1996; Krueger and Ciolko, 1998; Falcetti *et al.*, 2000; etc.). Initially, researches tended to focus on the reform strategies and the transition literature centred on the shock therapy vis-à-vis the gradualism debate. On one hand, the proponents of the shock therapy argued for a quick and simultaneous reform in all socio-economic areas while the political window of opportunity is still open (Sachs and Woo, 1994; Woo, 1994). On the other hand, others proposed a more gradualist approach on the

ground of necessary phasing of reforms, the lower cost to the budget and the lower risk of macroeconomic instability due to rapid restructuring (McMillan and Naughton, 1992; Dewatripont and Roland, 1992).

In general, institutions were ignored in the early literature on transition for different reasons. Institutions were sometimes considered to be less important than other transition issues (Blanchard *et al.*, 1991) or to take too long to establish so that other policies would be prioritized (Fischer and Gelb, 1991). Following the poor performance of East European transition economies in the 1990s researchers turned their attention to institutions in a search for explanations for the disappointing performance of these many transition economies and the marked differences in economic outcome between them (Fidrmuc, 2003; Havrylyshyn and Rooden, 2003; Murrell, 2006; Beck and Laeven, 2006).

In this context, this thesis attempts to further analyze the role of institutions in the context of transition economies in three directions as follows:

First, efficiency is one of the mortal weaknesses of the former socialist countries. For many transition economies factor accumulation was not a big problem but low efficiency really was. Therefore, the first question this thesis tries to answer is: how do institutions, in the sense of economic and political freedom, affect efficiency of transition economies?

Second, investment is one of the key determinants of growth which survives rigorous sensitivity analysis (Levine and Renelt, 1992). For the transition process to achieve expected results transition countries need to scrap obsolete capital and replace it with new investment that is in line with a market-based production system. Different countries with different institutional quality, business environment and policies should

attain different investment rates. Thus, the second question this thesis attempts to provide answers for is: how do economic freedom, political freedom and liberalization affect investment rates in transition countries?

The third question raised in the thesis is about how differences in property rights impact behaviour of banks in terms of credit supply. Managers of privately owned and publicly owned banks, or any other firms, have different incentive structures. Banks of different ownership also have different clienteles and ability and willingness to enforce contracts. These differences should have effect on various aspects of banks' operation, including lending, and consequently on the economy as a whole. To address this issue, we focus on a country which, while not strictly undergoing a transformation from central planning to a market economy, has features very similar to those of transition countries. Since early 1990s, the Indian economy has been undergoing reforms with liberalization and privatization measures similar to those observed in the former socialist countries. In many countries, including transition ones, banks still play the central role of channelling savings to investment (Demirguc-Kunt and Levine, 2001) and generating financial resources for the transition process. Banks of different ownership types may act differently in terms of loan supply, which would have different impacts on the real economy. Understanding behaviours of banks of different ownership types would help to calibrate more appropriate monetary policies towards a more stable macroeconomic environment and better access to funding for firms during the transition process.

2. STRUCTURE OF THE THESIS

This thesis has five chapters. Chapter I introduces the topic of the thesis and the motivations of the research. The next section of Chapter I will present the concept and

measures of institutions that have been used in the literature and in this thesis, followed by a brief survey of the related literature as a background for the thesis, a section on research methodologies employed in the analytical chapters and finally a section on the key findings of the thesis.

Chapter II studies the effect of institutions on efficiency of transition economies. Stochastic frontier analysis (SFA) is used to estimate efficiency scores for 30 transition countries and estimate the effect of institutions on efficiency. One problem inherent in this analysis is the lack of reliable data on capital stock in the transition economies. Therefore, the perpetual inventory method (PIM) is used to construct capital series used in the efficiency analysis. Measures of both political and economic institutions are used. Principal component analysis (PCA) is applied to select indicators that best represent the underlying institutional indicators for econometrical analysis. Economic and political freedoms are found to have positive effects on efficiency of transition economies.

Chapter III analyzes the effect of institutions on investment rates in transition economies by way of panel data methodology. The chapter centres on a comprehensive model of investment with a focus on institutional determinants of investment. Measures of institutions include economic freedom, political freedom and liberalization index. Principal components of economic freedoms are also employed together with individual indicators of economic institutions and liberalization. The chapter concludes by identifying the main factors determining investment rates in transition economies.

Chapter IV is an empirical analysis of effect of ownership on bank lending as a channel of monetary transmission in India. Since the early 1990s, India has liberalized its economy substantially and achieved admirable economic growth. The Indian

banking sector plays a very important role in this success and there have been some radical reforms with privatization and liberalization measures. In this chapter, a monetary conditions index (MCI) is used to highlight the asymmetry of the bank lending with respect to monetary policies. Interactions of bank ownership types, MCI and monetary policy are used to show the differences in the reaction of each bank type to changes in monetary policy in terms of lending.

The last chapter concludes the thesis with a summary of the findings and remarks on institutions and economic development in transition countries.

3. INSTITUTION – CONCEPT AND MEASURES

3.1. The concept

In the economic literature, there have been several approaches to the question what institutions are and these are succinctly by Crawford and Ostrom (1995). According to the authors, there are three approaches to answer the question. One approach considers institutions as regularities in the behaviour of social agents or equilibrium outcomes which arise from human interactions on the basis of rational behaviours. This approach was first pioneered by Friedrich von Hayek and then further discussed by Schotter (1981) and Riker (1980). Though this approach can depict regularities in the behaviours of agents that result from shared understandings about the appropriate actions for a particular situation it does not distinguish the roots of actions which may be voluntary or imposed and enforced by external forces. The second approach considers institutions as norms with an assumption that many patterns of behaviours are based on people's shared perceptions about what is proper and what is not in particular contexts. In this view, one needs to go beyond rationality to understand

human behaviours. The third popular approach views institutions as rules. This approach has been advanced by various works by Douglas North (1990, 1991), Olivier E. Williamson (1985), Elinor Ostrom (1986) and Jack Knight (1992). This institutional theory considers patterns of behaviours as necessary or required actions because non-compliant actions are likely to be sanctioned or rendered ineffective by authorities.

According to Crawford and Ostrom (1995), these three approaches are not mutually exclusive. They all try to explain social orders on individualistic and situational foundations. They all point to shared strategies and expectations that influence behaviours and involve constraints and opportunities. The first two approaches are very helpful for understanding the evolution and emergence of social orders or regularities of behaviours that emerge gradually over a long period of time. They lend themselves mostly to informal institutions which include customs, traditions, taboos, stigmas, etc.). However, there are social and political changes that quickly bring about new rules that involve new constraints and opportunities, shaping agents behaviour accordingly. These rules, constraints and opportunities are often referred to as formal institutions. Examples of formal institutions include constitutions and laws. This approach is specially relevant to the discussion about the role of the state in promoting (or hindering) economic growth and development and relationship between the state and the market. Therefore, in the context of this study about transition economies where markets are being built to cater for economic activities that reach far beyond community boundaries we choose to follow the third approach about institutions to focus on formal rules, constraints and opportunities. In addition, this approach is also widely adopted due to the fact that it is much easier to quantify and compare formal institutions with several dataset on institutional quality available for empirical explorations.

In this regard, institutions are referred to as "the humanly devised constraints that structure political, economic and social interaction" (North, 1991, p.97). Here, constraints are referred to as reference framework for actions rather than limitations on actions. These constraints are created to facilitate (or impede) economic exchanges and they form the incentive structure of an economy which in turn shapes the direction of economic change.

In general, this approach to institutions is widely subscribed to. Aron (2000), in a wide-ranging review of literature on institutions, and Acemoglu *et al.* (2004), also use North's definition. Rodrik (2000), summarising other economists, defines institutions as "a set of humanly devised behavioural rules that govern and shape the interactions of human beings, in part by helping them to form expectations of what others will do" which is the same in nature as the North's definition.

According to their views, of primary importance to economic performance are the economic institutions that influence the incentive structure in a society such as the structure of property rights and the presence and orderly functioning of markets. Without institutions human actions become very uncertain and economic exchange and cooperation can be subject to such high costs and risks that markets cannot be established, exchanges cannot be carried out and production potential cannot be realized. According to North and other institutional economists, institutions reduce uncertainty, facilitate economic exchange and thus play a major role in explaining economic performance across countries.

3.2. Measures

In the last two decades the literature on institutions has expanded enormously thanks to great efforts to quantify different aspects of institutions. The common

approach to quantify institutions is to measure the level of freedom to conduct exchanges and protection against arbitrary violation of property rights. Freedom is a concept that is complementary to "constraints" and "rules" which are central to North's and Rodrik's definitions of institutions. In this direction, several panel databases have been constructed that enable empirical analysis and comparison across country and over time. In terms of economic institutions, there are the Economic Freedom Index[1] (the Fraser Institute Index) available from the Fraser Institute and the Index of Economic Freedom[2] (the Heritage Foundation Index) which is compiled by the Heritage Foundation and Wall Street Journal. With regard to political freedom we have the Freedom Index by the Freedom House[3], the Polity Project data by the Center for Systemic Peace and Center for Global Policy[4], George Mason University, and the Governance Indicators[5] by the World Bank. For transition countries, the European Bank for Reconstruction and Development (EBRD) compiles a liberalization index which is also a measure of institutions since it reflects the level of control of the economy by private hands transferred from the state in the former socialist countries. These datasets often entail individual sub-indicators that measure different aspects of economic or political institutions.

The Fraser Institute Index and Heritage Foundation Index are very similar and they are highly correlated. For 21 transition countries over 6 years the correlation coefficient of the two measures is 0.83 (see Chapter 2). However, the Fraser Institute Index covers only 21 transition countries[6] and before 2000 it was only available for

[1] Gwartney *et al.*, 2008.
[2] Holmes *et al.*, 2008.
[3] www.freedomhouse.org.
[4] Marshall and Jaggers, 2009.
[5] Kaufmann *et al.*, 2008.
[6] 18 Central and Eastern European countries and three East Asian countries.

every five years while the Heritage Foundation Index covers all transition countries with yearly data starting in 1995. For this reason, the Heritage Foundation Index is used as an indicator of quality of economic institutions in chapter II and chapter III of this thesis. The EBRD liberalization index is also used for a smaller panel of transition countries for which the index is available.

In addition to economic freedom, the Freedom House's Political Rights (PR) and Civil Liberties (CL) are also used to analyze the impact of political institutions on economic performance (chapter II) and investment rates (chapter III). Basically, these measures of institutions are selected on the basis of coverage and availability for transition countries.

There have been several criticisms about the existing measures of institutions and the empirical studies that use aggregate indexes. Concerning the Fraser Institute Index, according to Berggren (2003), "it should be noted that the components of the EFI, as well as weighting schemes, have changed in the various editions that have been published" (pp.194-195). Heckelman and Stroup (2005) also observe that the weights of the various elements of the aggregate index do not appropriately reflect the magnitude or even the direction of each individual element's marginal impact on growth. In fact, they found that some elements of the EFI had a statistically significant negative impact on growth. The issue of aggregation can be dealt with by the PCA but it is not without caveat in the sense that there is no theoretical linkage between the components and the variables to be explained. In this thesis, together with individual elements of institutions and simple averages of them, the PCA is also used to link the components with the dependent variables of interest.

Another criticism is that these variables are not indicators of institutional quality because institutions do not change that much. However, there are different types or layers of institutions. According to Douglas North, there are formal (e.g., rules, laws, constitutions) and informal (e.g., norms of behaviour, conventions, self-imposed codes of conduct) institutions. According to Williamson (2000) there are four levels of institutions. The first level is social imbeddedness which mainly corresponds to informal constraints and where institutions change very slowly. At higher levels, institutions include formal rules, polity, judiciary, bureaucracy and governance, which may be considered as formal institutions. At these levels, institutions can change relatively quickly in the order of years or tens of years. Indeed, when assessing the institutional development of transition economies, Murrell (2003) shows that the transition economies have achieved institutional quality higher than often thought and the success is due to better formal institutions, not informal ones. Though not fully indicative of the quality of institutions of all types and levels the current measures of institutions as listed above are widely viewed as appropriate for empirical analysis of the effect of institutions on various economic variables. Of course, these measures of institutions are always subject to some level of subjectivity and imprecision due to the fact that the concepts of economic and political freedom refer to quality rather than quantity.

4. LITERATURE REVIEW

4.1. The institutions-growth relationship

Though the importance of institutions has been highlighted for a very long time the literature on institution-growth relationship did not really take off until the 1990s.

The main reason was the lack of data for empirical tests. Another reason is that despite many models to explain growth differences there were many puzzles when institutions are not accounted for. Hall and Jones (1999) find that variations in the Solow residuals among countries can be explained by social infrastructure which includes institutions. When surveying empirical studies on growth, Easterly and Levine (2001) mention that it is not factor accumulation that determines the bulk of cross-country growth differences but something else. De Melo *et al.* (2001) and Falcetti *et al.* (2002) observe that differences in application of standard policies do not explain differences in economic performance. There must be something else. One of the first attempts to relate institutions to growth is the paper by Barro (1991) which shows that growth rate is positively associated with political stability and inversely related to market distortions. Then, Knack and Keefer (1995) show that the impact of governance on growth remains significant even when investment is controlled for in growth equations. On the effect of corruption, Mauro (1995) finds that corruption is negatively associated with investment and growth. Dawson (1998) finds that free market institutions have positive effects on growth through total factor productivity directly and investment indirectly. In another attempt to estimate the effect of institutions, especially democracy, on growth Rodrik (2000) uses data of 90 countries over the 1970-1989 and finds that a higher level of democracy is associated with a smaller variance of long-run growth. In the context of transition economies, Fidrmuc (2003) shows that democracy has positive effect on growth though its effect on liberalization.

However, there have been doubts about these empirical results on the ground of measurement of institutions and possible endogeneity of institutions. Concerned with the measurement of institutions, De Haan and Sturm (2000) construct a new index of

economic freedom with a new mix of components of the Fraser Institute Economic Freedom Index and their empirical result shows that the change in the economic freedom (not the level) is a significant determinant of growth. This result is robust to an extreme bound analysis and a distributional analysis (for coefficients of institutions). In response to the question about endogeneity of institutional variables, Acemoglu *et al.* (2001) exploit the mortality rates of early European settlers in their colonies as an instrument for institutions and they find that improvement of institutions (like reducing expropriation risk) would result in higher per capital income. In a similar attempt, Acemoglu and Johnson (2005) use colonial characteristics (legal origin, mortality rate and population density) as instrument variables for institutional variables (protection of property rights and contracting institution). Their result shows that property rights institutions have direct effect on long-run growth, investment and financial development while contracting institutions seem to affect only financial intermediation. To produce a clear-cut result on the relationship between institutions and growth, Dawson (2003) tests for a Granger causal relationship between the two variables and shows that some aspects of economic freedom Granger-cause growth while some others are Granger-caused by growth or jointly determined with growth. Generally speaking, there seems to be a consensus among researchers of the field that institutions of high quality are definitely good for economic growth.

4.2. The effect of institutions on investment and efficiency

Concerning efficiency the most notable work is Adkins *et al.* (2002) who use a panel of more than 70 countries over the period 1975-1990 and stochastic frontier analysis to show that increase in economic freedom (Fraser Institute Index) leads to higher efficiency. In an attempt to test the relationship between governance, as reported

in Kaufmann *et al.* (1999), and technical efficiency, Meon and Weill (2005) find that for a sample of 62 countries in 1990 better governance, especially government efficiency, is associated with greater technical efficiency. Though literature on transition has expanded to a great extent and the transition process has been going on for almost two decades the efficiency of former socialist countries has not been studied properly, especially with effect of institutions. Therefore this thesis will try to add to the literature in this direction.

The effect of institutions on investment has received more attention from researchers. In general, the existing results postulate a positive effect of institutions on investment. Acemoglu (1995) shows that rent-seeking reduces marginal productivity of investment and that rent-seeking has increasing return to scale which makes rent-seeking relatively more attractive compared to investment in production. Mauro (1995) shows that corruption hurts both growth and investment. More seriously, corruption makes investment less efficient. In public sector corruption may shift public investment away from the most profitable projects to less profitable ones that offer more opportunities for corruption (Shleifer and Vishny, 1993). In addition, bad governance reduces the incentive to invest in R&D (Meon and Weil, 2005), thus limiting opportunities to improve efficiency. As a strong evidence for the positive effect of institutions, Dawson (1998) empirically shows that political and civil liberties stimulate investment in a cross section of 85 countries. However, works in this field study broad cross sections or panels of countries that do not cover transition economies. To our best knowledge, the literature on investment in transition countries is focused on firms' investment constraints and behaviour (e.g., Budina *et al.*, 2000; Konings *et al.*, 2003; Mueller and Peev, 2007). None has tried to analyze determinants of investment rates for

the whole group of transition countries. Another purpose of this thesis is to fill this gap in literature on transition economies. Since institutions are theoretically proposed and empirically found to be a very important determinant of growth and development, we are particularly interested in examining the role of institutions and reform policies in explaining investment difference among transition economies.

4.3. On the relationship between ownership and bank lending

According to La Porta *et al.* (2000), state-ownership of banks is ubiquitous in much of the world, especially in emerging markets. There are several arguments for and against state ownership of banks. State ownership of banks can serve a social objective of allocating funds to projects with high social returns (Stiglitz *et al.*, 1993). Given the socially desirable objective, however, managers of state-owned banks may not have the right incentives (Tirole, 1994), thus exerting less effort and allocating resources inefficiently. In addition, state-owned banks can be used as a tool for politicians to win support from political followers (Shleifer and Vishny, 1994) in pursuit of their own individual interests. Studying lending records of one state-owned bank in India, Banerjee and Duflo (2001) shows that this bank does not adjust credit limit to optimal level over time or according to customers' needs though the needs often change over time. Micco and Panizza (2006) report that public banks, especially those in developing countries, play a credit-smoothing role by lending anti-cyclically. However, Bhaumik and Piesse (2007) find that lending of private banks is more persistent than that of public banks. Entry of foreign banks also creates different effects on domestic credit markets. In the context of a Latin American country - Argentina, Berger *et al.* (2001) shows that foreign banks disburse less credit to informationally opaque and small firms. However, also in Argentina, Clarke *et al.* (2005) shows that increased foreign

ownership coincides with more lending outside of Buenos Aires. With regard to foreign bank entry in transition economies in Central and Eastern Europe, Haas and Lelyveld (2005) find that foreign banks help stabilize domestic credit by maintaining credit base during recession while domestic banks reduce their credit supply. So, there is large heterogeneity in terms of credit supply by banks of different ownership, depending on the context of study. India is in a process of privatizing and liberalizing its banking system in which state-owned banks, domestic banks and foreign banks coexist and compete on relatively equal terms (Bhaumik and Piesse, 2007). Therefore, India can be a good case for studying the effect of ownership on bank lending as a channel of monetary transmission.

5. *METHODOLOGY*

5.1. Institutions and efficiency (chapter II)

First, the Stochastic Frontier Analysis (SFA) which was independently developed by Aigner, Lovell and Schmidt (1977) and Meeusen and van den Broeck (1977) is used to measure the efficiency of the economies in question. Another popular method to measure efficiency is the Data Envelopment Analysis (DEA). Although there has been an on-going debate on which method is superior, the SFA is thought to outperform the DEA in efficiency study for transition countries where measurement problem and uncertainty in the economic environment are prevalent (Fries and Taci, 2005). To estimate the effect of institutions on efficiency, stochastic frontier and the inefficiency function are estimated simultaneously by maximum likelihood as proposed by Battese and Coelli (1995). The capital series used in the frontier estimation is calculated from flows of physical capital by the Perpetual Inventory Method (PIM).

Two indicators of economic institutions are the first two principal components extracted from the PCA of ten economic freedoms (the Heritage Foundation).

5.2. Institutions and investment rates (chapter III)

In chapter III panel data methods are used to estimate the effect of institutions on investment rates of transition economies. A panel model is built on the basis of the theoretical and empirically tested relationship between institutions and other explanatory variables and the dependent variable – investment rate. The possible endogeneity of the explanatory variable is controlled for by tests (similar to the Hausman test) and use of lagged variables. Both aggregate and individual indicators of institutions are used to have a broader view about the role of overall institutions and those of different areas.

5.3. Ownership and bank lending in India (chapter IV)

Panel data analysis is also used in Chapter IV where the most important methodological innovation is the use of the interaction of monetary regime type and ownership type and monetary policy indicator to detect the different effects of monetary policy on bank lending of different ownership-based bank groups. Lag of monetary policy variable is used to avoid feedback from dependent variable to independent variable. Robust fixed effect panel estimation method is applied to obtain coefficients of interest.

6. KEY FINDINGS

The main finding of chapter II is that higher quality of institutions, both economic and political, is associated with higher efficiency in transition economies. This result is robust to different rates of depreciation that are used to estimate the capital

series for these countries. All else being equal, East Asian transition countries have higher efficiency than other transition counterparts in Europe and Central Asia. This chapter also shows that for transition economies the translog production function is more appropriate for estimating efficiency than the usual Cobb-Douglas production function.

Chapter III finds that political and economic freedoms significantly determine investment rates in transition economies. Higher freedoms induce more investment, thus generating indirect positive effect on growth. However, it is the overall improvement in economic institutions, not in individual aspects, that matters. The study also shows that higher level of financial development and savings rate help increase investment in transition economies.

In chapter IV the empirical analysis shows that banks' loan supply is asymmetric in the sense that, for some bank groups (public and foreign-owned), it is significantly cut down in a tight monetary regime but not so in an easy regime. In addition, banks of different types respond very differently to monetary policies in different monetary regimes. In a tight monetary regime, public and foreign banks cut back on lending when monetary tightening happens but others do not seem to be affected. On the contrary, when the state of the monetary environment is easy they either do not respond (new private and foreign banks) or increase lending in the face of monetary tightening. In other words, ownership makes a difference in terms of loan supply by banks for a given monetary policy and monetary condition and the ownership structure of the banking system plays a role in determining the effectiveness of monetary policy in an economy that is a process of transition from a public-dominated system to a more liberalized and competitive system.

CHAPTER II - INSTITUTIONS AND EFFICIENCY IN TRANSITION ECONOMIES

1. INTRODUCTION

The significant role of institutions in determining growth has been confirmed in many studies. Barro (1991) shows that growth rate is positively associated with political stability and inversely related to a proxy[7] of market distortions. Mauro (1995) concludes that bureaucratic efficiency causes high investment and growth. Rodrik's (2000) study on 90 countries over 1970-1989 leads to a conclusion that the more democratic a country is the smaller the variance of its long run growth. In addition, the effect of institutions on growth is not just to promote capital accumulation as Knack and Keefer (1995) reveal that it is still significant after controlling for factor accumulation and policy. This suggests that institutions should be an important determinant of efficiency.

The purpose of this chapter is to investigate the effect of institutions on efficiency in the context of transition economies. Since the fall of the socialist system, transition countries have undergone a transformation process from a centrally planned economy to a market-based economic system. We have observed marked difference in economic performance of these economies. In Eastern Europe and Central Asia, almost all of transition countries experienced sharp output fall in the early 1990s and then went through a recovery process with positive growth rates. At the same time in East Asia China, Vietnam and Cambodia managed to grow at high and steady rates.

While factor accumulation certainly plays an important part in explaining growth efficiency also matters a lot. In fact, as shown by Easterly and Levine (2001), productivity rather than factor accumulation explain most of the differences in income

[7] The deviation from the sample mean of the purchasing power parity for investment in 1960.

and growth among countries. For many transition countries the problem is more about utilizing existing factors efficiently than about accumulating them. We can say that they have been operating below the production possibility frontier (PPF) and it will take them a while to get to the level of efficiency attained in advanced economies. Moreover, due to differences in initial conditions, the speed of transition and socio-economic settings, we can expect large variation in efficiency level of these countries.

During the transition process, different institutional settings, both political and economic, have emerged in these countries. As noted in Murrell (2003), institutional quality in transition economies in general has improved quickly. However, there is a huge divergence in the levels of institutional development. Kaufmann *et al.* (2005) show that countries like Czech Republic, Slovakia and Poland have institutional quality that is in many aspects comparable to those of developed countries while other countries continue to lag far behind. Therefore, the experience of transition countries in terms of recovering from a disrupted system and building necessary institutions for a market economy can be viewed as something close to a natural experiment for analyzing the effect of institutions on growth in general and improvement in efficiency in particular.

Theoretically, there are many channels through which institutions can affect economic growth and efficiency. Democratic regimes with check and balance mechanisms are better able to curb corruption and prevent misuse of productive resources, especially in investment activities involving public funds, which is good for growth and efficiency. Sandholtz and Koetzle (2000) find that corruption is lower when democratic norms and institutions are stronger. In an effort to explain corruption Treisman (2000) also concludes that democracy reduces corruption though it is well established democracy rather than recent democratization process that matters (Sung

(2004) also comes to similar conclusion). Good institutions can encourage accumulation of physical capital, human capital and technological knowledge and these factors in turn help improve efficiency. Bevan *et al.* (2004) finds that development of legal institutions has positive effect on FDI inflows to transition countries in Europe, which is supposed to bring in more advanced technologies to local economies and help enhance their efficiency. In addition, economic freedom is found by Dawson (1998), among others, to affect growth directly via total factor productivity and indirectly through investment.

Though there have been many studies on the relationship between institutions and growth, there are very few attempts to relate efficiency to institutions, especially in the transition context. Monorey and Lovell (1997) compare the efficiency of 17 Western European market economies and that of 7 Eastern European planned economies. With a dummy variable to identify planned economies, their research shows that over the period 1978-1980 the Eastern European planned economies were only about three fourths as efficient as the Western European market economies. Using a panel of more than 70 countries over the period 1975-1990, economic freedom measures compiled by Gwartney *et al.* (2005) and stochastic frontier analysis, Adkins *et al.* (2002) show that increase in economic freedom leads to higher efficiency. However, two measures of political freedom, namely civil liberties and political rights taken from the Freedom House Index, are not significant in their model. In an attempt to test the relationship between governance, as reported in Kaufmann *et al.* (1999), and technical efficiency, Meon and Weill (2005) find that for a sample of 62 countries in 1990 better governance, especially government efficiency, is associated with greater technical efficiency.

To the best of our knowledge, there has not been any research that digs into the relationship between institution and efficiency in transition economies since the

collapse of the Soviet Bloc. Perhaps it is because of the lack of data about institutions, capital and labour in these countries. One of the contributions of this study is to estimate capital series for these countries from gross investment data using the Perpetual Inventory Method. Then, following Battese and Coelli (1995), Stochastic Frontier Analysis (SFA) is used to estimate the efficiency and effect of institutions on efficiency at the same time by maximum likelihood technique.

The next section presents stochastic frontier analysis and the specification of the production and efficiency functions. It will be followed by description of data in Section 3 and empirical results in Section 4. Section 5 will conclude the chapter.

2. *THE STOCHASTIC FRONTIER ANALYSIS AND THE MODELLING OF EFFICIENCY*

2.1. Stochastic frontier model

There are several methods to measure efficiency and the most popular two are the SFA and the Data Envelopment Analysis (DEA). Although there has been an on-going debate on which method is superior the SFA is supposed to outperform the DEA in efficiency study for transition countries where measurement problem and uncertainty in the economic environment are prevalent (Fries and Taci, 2005).

The stochastic frontier production function was independently developed by Aigner, Lovell and Schmidt (1977) and Meeusen and van den Broeck (1977). Many researchers have used the model to estimate technical inefficiency for comparing efficiencies of firms or economies. Technical efficiency is defined as the ratio of observed output over the maximum feasible output (the frontier) given the level of

inputs. For a panel data analysis with i as producer identifier and t as time period, the technical efficiency is depicted as:

$$TE_{it} = \frac{y_{it}}{f\left(x_{it};\beta\right)\exp\left(v_{it}\right)}; TE_{it} \leq 1 \qquad (2.1)$$

In equation (1), x_{it} is a (1 x k) vector of inputs, β is a (k x 1) vector of coefficients to be estimated; v_{it} is random error that are assumed to be independently and identically distributed as $N(0,\sigma_v^2)$. The v_{it} is the stochastic element of the production function that captures random shocks to each producer/country. So the production frontier model will look like:

$$y_{it} = f\left(x_{it};\beta\right).\exp\left(v_{it}\right).TE_{it} \qquad (2.2)$$

Let $TE_{it} = \exp(-u_{it})$ and assume that $f\left(x_{it};\beta\right)$ takes the log-linear Cobb-Douglas form the stochastic production frontier model becomes

$$\ln y_{it} = \beta_o + \sum_k \beta_k \ln x_{k,it} + v_{it} - u_{it} \qquad (2.3)$$

In equation (1.3) u_{it} is the measure of inefficiency because the higher the u_{it} the lower the TE_{it}. Equation (1.3) is a linear regression model with a composite error $\varepsilon_{it} = v_{it} - u_{it}$ where v_{it} is the two-sided stochastic error and u_{it} is the nonnegative inefficiency term. Because $TE_{it} \leq 1$ we have $u_{it} \geq 0$ and the composite error ε_{it} is asymmetric. Therefore, OLS estimation cannot provide a consistent estimate of β_0. Moreover, OLS cannot provide estimates of u_{it} which are central to efficiency analyses. In the standard efficiency literature, the frontier equation is estimated by maximum likelihood techniques with assumptions about distribution of v_{it} and u_{it} and u_{it} are extracted from the composite error.

Early attempts (Pitt and Lee, 1981 and Kalirajan and Shand, 1986) to explain efficiency effects adopt two-stage approach, in which efficiency scores are estimated in the first stage and then regressed against some explanatory variables in the second. However, the assumption of identical distribution of u_{it} in the first stage is violated in the second stage which is usually OLS estimation. Battese and Coelli (1995) propose a model for technical inefficiency effects in a stochastic frontier function for panel data. The stochastic frontier and the inefficiency function are estimated simultaneously by maximum likelihood. The panel specification of the model is as follows:

$$y_{it} = x_{it}\beta + v_{it} - u_{it} \tag{2.4}$$

where with i = 1, …, N and t =1, …, T; y_{it} is the logarithm of the output for country i in period t, x_{it} is a vector of inputs (in log), and β is a vector of unknown parameters to be estimated. vit is assumed to be i.i.d N(0, σv2) random error and distributed independently of u_{it}. Technical inefficiency u_{it} is a non-negative random variable assumed to be independently distributed such that u_{it} is obtained by truncation (at zero) of the normal distribution $N(z_{it}\delta, \sigma_u^2)$. In another word, the technical inefficiency effect u_{it} is modelled as:

$$u_{it} = z_{it}\delta + w_{it} \tag{2.5}$$

where the random error w_{it} is assumed to follow normal distribution $N(0,\sigma^2)$ truncated at such a point that $u_{it} \geq 0$; the z_{it} is a vector of explanatory variables associated with technical inefficiency and δ is a vector of unknown coefficients to be estimated.

The maximum likelihood estimation of the model's coefficients is facilitated by Battese and Corra (1977) parameterization, $\sigma^2 = \sigma_v^2 + \sigma_u^2$ and $\gamma = \sigma_u^2/(\sigma_v^2 + \sigma_u^2)$ and they are estimated by the software Frontier 4.1 (Coelli, 1996). σ^2 is the sum of variances

of the stochastic error and the inefficiency term and γ is the ratio of variance of the inefficiency term over the total variance. If γ is significant we can say that the inefficiency matters and we can model the inefficiency.

2.2. Specification of production function and modelling of efficiency

In stochastic frontier analysis, specification of production function is important because efficiency is measured against an estimated frontier. If the frontier function is miss-specified the conclusion about the dynamics or determination of efficiency may be wrong. The Cobb-Douglas production function is widely used in the literature on economic growth. However, there have been several studies which test the validity of the Cobb-Douglas specification. Based on a panel of 82 countries over a 28-year period, Duffy and Papageorgiou (2000) find that Cobb-Douglas can be rejected in favour of a more general CES specification. In theory, Cobb-Douglas is not as good as translog function since translog is a good first order approximation of many different types of functions with Cobb-Douglas as a special case. In another attempt to examine Cobb-Douglas specification with the presence of technical inefficiency with the same data set as the above, Kneller and Stevens (2003) also rejects Cobb-Douglas vis-à-vis the translog function.

In this chapter, we will also estimate the production frontier with both translog and Cobb-Douglas technologies. The production frontier equations are:

(i) Cobb-Douglas: $y_{it} = \beta_0 + \beta_1 k_{it} + \beta_2 l_{it} + \beta_3 t + v_{it} - u_{it}$ (2.6)

(ii) Translog: $y_{it} = \beta_0 + \beta_1 k_{it} + \beta_2 l_{it} + \beta_3 k_{it}^2 + \beta_4 l_{it}^2 + \beta_5 k_{it} l_{it} + \beta_6 t + v_{it} - u_{it}$ (2.7)

Here, y_{it} is the logarithm of output for country i at time t, k is the logarithm of capital stock and l is the logarithm of labour. The time trend (t) is added to account for movement in the frontier (Kneller and Stevens, 2003).

To examine the effect of institutions on efficiency, the inefficiency term u_{it} is modelled as a function of the degree of economic freedom as proxied by the Index of Economic Freedom (IEF), which is developed by the Heritage Foundation, and levels of Political Rights (PR) and Civil Liberties (CL) published by the Freedom House. The average value of PR and CL is collectively called Freedom House Index (FHI) .To account for systematic changes of efficiency over time, a time trend is also added to efficiency effect model. Time trend has been found significant in some efficiency analyses (see Kneller and Stevens (2003) for example).

Svejnar (2002) observes that the Central and Eastern and European countries had smaller output declines and could reverse the decline earlier than the countries of the Commonwealth of Independent States. At the same time, Eastern Asian transition economies did not suffer from recession and have had high growth rates. It seems there are regional characteristics that should be picked up by regional dummies. Therefore, three dummies are generated and added to the efficiency model to account for potential region-specific effects for Central and Eastern Europe (CEE), Commonwealth of Independent States (CIS) and East Asia (EA)[8]. In general, the technical efficiency function will look like this:

$$u_{it} = \delta_0 + \delta_1 IEF_{it} + \delta_2 FHI_{it} + \delta_3 RD_i + \delta_4 time + w_{it} \qquad (2.8)$$

with RD_i being dummies for CEE, CIS or EA.

3. DATA

This research uses a panel of 28 transition economies over the 1995-2005 period. The selection of countries and time period is mainly on the basis of data

[8] CIS countries include Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyz Republic, Latvia, and Lithuania.

availability. 1995 is the year when the Index of Economic Freedom data was first available. Two types of data that need detailing are input-output data and measures of institutions.

3.1. Input-output data

The growth and efficiency literature usually uses either the World Bank's STARS dataset[9] or Summers and Heston's dataset (Penn World Table). However, these datasets do not include all transition countries. So for the purpose of this research we use the World Bank Development Indicators (WBDIs) for output (GDP), gross investment and labour. Output is total GDP converted to 2000 constant US dollar at official exchange rate. The data on labour is the total labour force in the relevant countries.

Since capital stock data are not available for all countries in the sample in any existing databases, the transition countries' investment series (gross capital formation) are used to construct capital series by applying the Perpetual Inventory Method. According to the method, the capital stock evolves as follows:

$$K_t = I_t + (1-\delta)K_{t-1}, \tag{2.9}$$

with δ being the depreciation rate of capital.

By rearranging (1.9) we obtain:

$$K_{t-1} = \frac{I_t}{g+\delta}, \tag{2.10}$$

where g is the growth rate of the capital stock which is assumed to be equal the average of GDP growth rates over the estimation period.

[9] It is developed by two World Bank researchers V. Nehru and A. Dhareshwar (1993).

Selecting the correct depreciation rate δ in calculating capital stocks is very important. If the rate is too high capital accumulation will be low and productivity growth will be overestimated and vice versa. In the growth literature one depreciation rate is often applied across the whole sample of countries, be they developed or developing countries (4% in Nehru and Dhareshwar (1993) and 7% in Easterly and Rebelo (1993)). However, depreciation rates applied to developed and developing countries should be different because investment projects in developing countries are normally not as efficient as those in developed countries. That is not to mention corruption which is more pronounced in developing countries than in developed ones. Bu (2006) estimates depreciation rates from firm level data of some developing countries and finds them to be much higher than rates used in the above-cited growth and efficiency analyses. Pritchett (2000) reports that over half of developing countries in the sample under investigation have negative total factor productivity. One possible explanation could be the overvaluation of capital which is equivalent to low depreciation rate. Therefore, in this chapter the capital series are generated with a depreciation rate $\delta = 10\%$[10]. Unfortunately, we are unable to compare our capital series with existing ones because they are only available for pre-1990 periods[11] and we do not have investment series for most of transition countries (all but China and Hungary) to estimate capital stock for the pre-1990 period.

3.2. Measures of institutions

Many researchers of institutional economics use the Fraser Institute's Economic Freedom Index constructed by James D. Gwartney, Robert A. Lawson and J. R. Clark

[10] For robustness check 6% depreciation rate is also used to generate another capital series but the main estimation results do not change (see Table A.3).
[11] 1950-1988 in Penn World Table 5.6 (capital series not available in later version) and 1950-1990 in World Bank dataset.

(Gwartney *et al.*, 1999). However, this dataset does not cover all transition countries[12] and before 2000 it was only available for every five years. In this study I use the Index of Economic Freedom data developed by the Heritage Foundation and the Wall Street Journal. In fact, the Fraser Institute's Economic Freedom Index and the Heritage Foundation's Index of Economic Freedom are highly correlated with a coefficient of 0.8[13] for transition countries that have both measures of economic freedom.

The IEF dataset starts from 1995 and is available for all transition countries. The authors of the Index collect 50 independent economic variables that are categorized into ten economic freedom factors (IFE factors): trade policy, fiscal burden or government, government intervention, monetary policy, capital flows and foreign investment, banking and finance, wages and prices, property rights, regulation and informal market. The difference between this data set and others is that the values of the variables are calculated with data available from various sources[14] which are less subject to subjective survey data. Each factor is graded from 1 to 5, with a score of 1 representing an economic environment that is the most conducive to economic freedom. Table 2.1 in the Appendix shows the correlation matrix of these ten factors. In general the correlation between them is of a considerable level.

So far, many institution researchers have used the composite indexes such as the index of governance published by Daniel Kaufmann and his co-authors, the Gwartney *et al.*'s Economic Freedom Index (Fraser Institute) or the Heritage Foundation's Index of Economic Freedom in their empirical researches but there have been doubts about their consistency and relevance. Berggren (2003) observes that the Gwartney *et al.*'s index has different components and is constructed with different weighting schemes from one

[12] only 21 transition countries (19 Central and Eastern European countries and two East Asian countries).
[13] Note that for the Fraser Institute's index, the higher the score the more freedom there is.
[14] See Beach and Miles (2006) for details.

year to another. Heckelman and Stroup (2005) suggest that empirical researchers should use individual economic freedom indicators instead of the aggregate indexes because misinterpretation may arise with regard to different types of economic freedom.

Table 2.1

Correlations of Indices of Economic Freedom (Heritage Foundation)

	Trade	Fiscal	Gov_int	Mon_pol	For_inv	Banking	WP	PROP	REG
Trade	1								
Fiscal	0.2402	1							
Gov_int	0.4318	0.2383	1						
Mon_pol	0.1572	0.2839	0.377	1					
For_inv	0.5549	0.2203	0.3653	0.1128	1				
Banking	0.5336	0.2719	0.4498	0.374	0.6935	1			
WP	0.4637	0.2387	0.4395	0.3724	0.7131	0.7082	1		
PROP	0.547	0.142	0.2782	0.0192	0.6907	0.6465	0.5394	1	
REG	0.5114	0.1133	0.2802	0.112	0.686	0.6166	0.6133	0.7947	1
INFMKT	0.4629	0.1221	0.3875	0.2779	0.5447	0.5804	0.5393	0.6075	0.53

Note: Trade: trade policy; Fiscal: fiscal policy; Gov_int: government intervention; Mon_pol: monetary policy; For_inv: capital flows and foreign investment; Banking: banking and finance; WP: wages and prices; PROP: property rights; REG: regulation; and INF_MKT: informal market

To avoid the above problem of arbitrarily weighted composite index we apply the Principal Component Analysis to the ten IEF factors and select some principal components as measures of economic freedom. This technique can help reduce the dimensionality of the original data while retaining the maximum variation of the underlying variables. The principal components, by construction, are independent of each other. The parallel analysis and the Velicer's minimum average partial correlation analysis for selecting number of components to be retained indicate that we should use

two components. As a result, economic institutions will be represented by the first two principal components (COMP1 and COMP2).

Table 2.2

Principal component loading matrix for Economic Freedom factors

	Component									
Factor	1	2	3	4	5	6	7	8	9	10
Trade policy	0.3173	-0.0304	0.1902	0.5506	0.182	0.6822	-0.2146	0.0856	-0.0844	-0.0016
Fiscal burden	0.1453	0.4527	0.8229	-0.1347	0.1491	-0.2153	0.0245	0.0651	-0.0561	-0.0464
Government consumption	0.2545	0.3719	-0.2087	0.6592	-0.2696	-0.417	0.2683	-0.0026	0.0164	-0.0014
Monetary policy	0.16	0.6411	-0.3547	-0.3297	0.1732	0.3709	0.2282	0.0794	0.2891	0.1393
Foreign investment	0.3753	-0.175	0.1129	-0.0826	-0.3349	-0.0709	-0.3159	0.0664	0.7656	-0.0374
Banking and finance	0.3823	0.0629	-0.0534	-0.1741	-0.1205	0.0638	-0.0823	-0.8241	-0.2062	-0.2641
Wage and policy	0.3663	0.0792	-0.1186	-0.2658	-0.4359	-0.016	-0.3226	0.3825	-0.5186	0.2551
Property rights	0.3599	-0.3411	0.1002	-0.0406	0.2089	-0.0877	0.3841	-0.1672	0.0179	0.7178
Regulation	0.3574	-0.2935	0.0206	-0.161	-0.0323	0.0851	0.5843	0.3246	-0.0826	-0.5458
Informal market	0.3308	-0.0396	-0.278	-0.0093	0.6932	-0.3905	-0.36	0.1376	-0.0329	-0.1703
Cumulative variance	0.5049	0.6434	0.7264	0.7954	0.8476	0.8931	0.9321	0.9616	0.9838	1

Table 2.2 is the loading matrix of the principal component analysis and the cumulative variance that is explained by variances of components. It tells us about the importance of principal individual components how they are related to the underlying variables. The first component, which by construction has the highest variance, can be interpreted as a general measure of freedom. The variance of the first component explains 50.5% of the total variance of the 10 factors. The second component is positively correlated with fiscal policy, government intervention and monetary policy

and negatively correlated with foreign investment, property rights and regulation. We can think of the second component as a contrast between macroeconomic policy and business-related policy. Higher scores on this component are associated with less freedom in terms of macroeconomic environment and more freedom in the business environment. Between the first two components they explain 64.3% of the total variance of all factors.

Table 2.3

Summary statistics for 28 countries, 1995-2005

Variable	Mean	Standard deviation	Minimum	Maximum
y	23.29	1.65	20.52	28.26
k	23.76	1.76	20.49	29.03
l	15.32	1.51	13.4	20.47
FHI	3.805195	1.98	1	7
PR	3.75	2.26	1	7
CL	3.86039	1.75	1	7
COMP1	-4.74E-09	2.24695	-5.69	4.74
COMP2	5.13E-10	1.176851	-2.69	2.42

y, k and l are logarithms of output, capital and labour; FHI is the simple average index of Political Rights (PR) and Civil Liberties (CL); COMP1 and COMP2 are the first two principal components of ten economic freedom factors.

As for political institutions two measures are widely used in the literature: civil liberties (CL) and political rights (PR). These measures are published by the Freedom House which uses surveys and assessment reports to evaluate the actual rights and freedoms enjoyed by individuals. PR and CL are scored from one to seven for each country in each year with larger number indicating less freedom. PR and CL are highly correlated (0.94) in this sample. In the actual estimations, a simple average index of them (FHI) is also used (estimations with PR and CL used separately are reported in the

Appendix – Table A2.1). Table 2.1 presents the summary statistics of variables used to estimate efficiency and effects of determinants of efficiency.

4. *EMPIRICAL RESULTS AND DISCUSSIONS*

4.1. Baseline estimation

Both Translog and Cobb-Douglas production functions are estimated with the final efficiency model being:

$$u_{it} = \delta_0 + \delta_1 COMP1_{it} + \delta_2 COMP2_{it} + \delta_3 FHI_{it} + \delta_4 RD_i + \delta_5 time + \varepsilon_{it} \quad (1.11)$$

Regressions are run with one regional dummy separately and with CEE as control group but only the EA dummy is significant. PR, CL and the simple average of them (FHI) are used separately in the regressions but there are no qualitative changes. Changes in terms of coefficients' magnitude are not substantial. Since u_{it} represents inefficiency and higher values of institutional variables mean less freedom we expect to have positive coefficients β_1, β_2 and β_3. Table 2.4 presents the result with FHI as measure of political freedom, with and without and EA - dummy for East Asia (see Table A2.1 in the Appendix for results with PR and CL).

In all specifications the likelihood ratio test results show that the coefficients of the efficiency equation and σ^2 and γ are jointly significant. This means the specification of the model is correct. The significance of the variance parameters σ^2 (sum of variances) and γ (variance of inefficiency term over sum of variances) indicates that technical efficiency does matter in the production function and that the stochastic specification is appropriate. With γ being very close to one in all specifications we can say that variation in technical efficiency is substantial among transition economies.

Table 2.4

Estimation results with FHI

	Translog without regional dummy (1)	Cobb-Douglas without regional dummy (2)	Translog with EA dummy (3)	Cobb-Douglas with EA dummy (4)
Production frontier				
Constant	9.23** (2.68)	10.00*** (19.99)	10.25** (3.58)	10.58*** (21.69)
k	-0.46* (-1.86)	0.1*** (13.87)	-0.65** (-3.01)	0.09*** (12.18)
l	1.18** (4.51)	0.76*** (24.24)	1.35*** (8.4)	0.73*** (22.86)
k2	0.03*** (30.13)	-	0.03*** (34.28)	-
l2	-0.02 (-1.22)	-	-0.03** (-2.7)	-
kl	-0.01 (-0.82)	-	-0.001 (-0.9)	-
time	-0.02** (-4.0)	0.03** (2.92)	-0.02*** (-5.12)	0.03** (2.91)
Efficiency effects				
Constant	-34.86*** (-0.6)	-44.14*** (-15.01)	-33.68*** (-26.59)	- 51.27*** (-0.67)
COMP1	1.23*** (9.61)	0.81** (4.89)	0.82** (3.86)	0.59** (2.43)
COMP2	2.46*** (7.4)	13.8** (3.2)	1.48** (3.45)	0.96** (2.33)
FHI	2.85*** (12.27)	5.3*** (12.19)	3.68*** (13.02)	6.7*** (17.74)
East Asia			- 15.82*** (-2.77)	-7.8*** (-6.57)
Time trend	1.1*** (11.81)	0.89*** (7.9)	0.79*** (5.46)	0.86*** (7.1)
σ^2	13.64*** (24.1)	19.41*** (10)	11.57*** (11.64)	25.12*** (10.66)
γ	0.99*** (3423.1)	0.99*** (402.11)	0.99*** (3425.9)	0.99*** (715.15)
Log likelihood	-195.73	-419.4	-181.75	-414.3
Likelihood ratio test	845.86	425.4	873.82	435.6

*t-ratio in parenthesis; *, ** and *** denote significance at 10%, 5% and 1% levels. Higher COMP1, COMP1 and FHI mean less freedom.*

In efficiency analysis, it is important to have good specification of the production function since different technologies will result in different measures of efficiency. As mentioned in Section II the Cobb-Douglas technology has been rejected

in several tests. Here, following the same line, specification tests are also done by calculating generalized likelihood ratios and they show that translog models should be used in frontier and efficiency analyses for transition economies (the ratios are 447.4 and 465.2 for specification with and without EA dummy respectively).

The first important finding of this chapter is the significance of economic and political freedoms in determining efficiency. In all the models presented in the Table 2.4, economic and political freedoms have positive and significant coefficients. Since u_{it} in equation (2.8) is inefficiency (or distance from the frontier) and higher values of economic and political freedoms means less freedom, the positive coefficients can be interpreted as implying that higher level of freedom is associated with higher level of efficiency.

Empirically, the effect of democracy on growth and efficiency has been controversial in the literature. Minier (1998) finds that countries that democratized early growth faster than others who did not choose a democratic path. Barro (1996) reports a hump-shaped relationship between democracy and growth. When trying to disentangle the effect of democracy on growth Tavares and Wacziarg (2001) concludes that, overall, the negative effect of democracy is larger than the positive one. In Adkins *et al.* (2002) the Political Rights and Civil Liberties are not significant. Here they do turn out to be significant both through the composite index and on their own (Table A2.1 in the Appendix), even after the economic freedom has been controlled for. This is consistent with the result found in Meon and Weill (2005) for a larger set of countries that the rule of law and control of corruption are associated with higher efficiency.

The second significant finding is that the coefficient of East Asia dummy is negative and significant. This means that East Asia's transition economies on average,

ceteris paribus, are more efficient than the Eastern European and Former Soviet Union countries in the sample. This empirical result may look counter-intuitive for some people since many Eastern European countries (Czech Republic, Hungary and Poland for example) have rather advanced production base vis-à-vis the East Asian ones. However, this result can manifest the fact that the Eastern European transition economies underwent an initial period of "disorganization" when the old production system was destroyed almost overnight and a new one has not been in place (Blanchard and Kremer, 1997). It takes time to build new business links, to employ new technology and to adjust production methods to market signals, especially when market was fledgling. At the same time China, Vietnam and, to a lesser extent, Cambodia had been experimenting with market economy for a while before the beginning of the period under study. The interesting point is that East Asian transition countries manage to use more efficiently the resources they have though they have less production capacity than Central and Eastern European ones in this period.

Among the East Asian economies China was the first to reform and adopt market economy, though gradually. More importantly, China is a huge country and it has produced a remarkable growth rate since the beginning of its reform. Therefore there are reasons to believe that the East Asian effect is dominated by China and possibly only by China. To check if Cambodia and Vietnam also have the efficiency effect the model (3) in Table 2.4 is estimated again with a dummy for China and another one for Cambodia and Vietnam in the efficiency equation. The result is that are both significant (Table A2.2 in the Appendix). Thus, there seems to be evidence to suppor the argument that the East Asian transition economies have higher efficiency than the other countries in the sample given the same level of production factors and institutions.

All this said, it is worth mentioning that East Asian countries have less economic and political freedom on average (3.68 compared to 3.06 of CEE and 3.5 of FSU on aggregate EFI score; 6.39 compared with 2.15 and 4.38 on FHI).

4.2. Robustness check: endogeneity of capital and use of factor analysis

The capital series that is generated from equation (2.10) may be correlated with output because it calculated with average output growth rate. This correlation would make the estimation of production frontier and efficiency scores inaccurate. Therefore, we re-estimate the model with lagged k. In addition, instead of using regional dummies and time variable we use country dummies and year dummies to see if institutional measures have any effect on efficiency scores after country-specific and year-specific characteristics have been controlled for.

In the previous section we use principal component analysis to reduce the data dimension of the economic freedom indexes but principal component analysis is less accurate than principal factor analysis in exploring latent structures. In addition, imposing orthogonality between components is not a practical strategy since socioeconomic variables are usually correlated. Therefore, we apply principal factor analysis to economic freedom indexes in order to in an effort to better conceptualize the relationship between constructed indexes of economic freedom and transition progress and investment rate. The difference between principal component analysis and factor analysis is that principal component method uses all variability in an item while factors analysis uses only the variability in an item that it has in common with the other items for identifying latent structures. Therefore, factor analysis is seen as a better tool to detect the underlying structure of the data and more accurate (Widaman, 1993). Following factor analysis researchers often apply rotation techniques to find factors

whose relationships with the underlying variables are clearer or easier to identify. In other words, we make use of oblique rotation to have a clearer pattern of loadings. As for the number of factors to be retained both scree test and parallel analysis suggest two factors.

Table 2.5 shows the loadings of economic freedom indexes on the first two components or factors, with and without rotation. Without rotation, factors and components have high loadings from several indexes, which makes it difficult to interpret the factors or components. When oblique rotation is applied we have a clearer pattern of loadings. We can say that rotated factor 1 is defined by foreign investment freedom and wage and price freedom while rotated factor 2 is defined by property rights.

Table 2.5

Loadings of principal components and principal factors (rotated)

	Principal component analysis		**Factor analysis, no rotation**		**Factor analysis, rotation by oblique method**	
	Component 1	Component 2	Factor 1	Factor 2	Factor 1	Factor 2
Trade policy	0.317	-0.030	0.659	-0.002	0.166	0.263
Fiscal burden	0.145	0.453	0.280	0.287	0.028	0.002
Government consumption	0.255	0.372	0.513	0.336	0.190	-0.045
Monetary policy	0.160	0.641	0.323	0.577	-0.020	-0.024
Foreign investment	0.375	-0.175	0.827	-0.151	**0.798**	0.085
Banking and finance	0.382	0.063	0.836	0.125	0.359	0.337
Wage and policy	0.366	0.079	0.798	0.150	**0.761**	-0.008
Property rights	0.360	-0.341	0.803	-0.381	-0.050	**0.918**
Regulation	0.357	-0.294	0.790	-0.303	0.137	0.769
Informal market	0.331	-0.040	0.696	0.012	0.088	0.456

Table 2.6

Estimations with lagged k, East Asia dummy and time trend

	Two components and FHI (1)	Two components (2)	Two factors and FHI (3)	Rotated Factor 1 (4)	Rotated factor 2 (5)	FHI (6)
Production frontier						
Constant	8.46***	8.05***	8.75***	7.16***	7.79***	8.37***
k	-0.48***	-0.47***	-0.48***	-0.48***	-0.47***	-0.49***
l	1.34***	1.36***	1.31***	1.5***	1.39***	1.37***
k2	0.03***	0.03***	0.03***	0.03***	0.04***	0.03***
l2	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***
kl	-0.02***	-0.02***	-0.02***	-0.02***	-0.03***	-0.02***
Time trend	-0.03***	-0.03***	-0.03***	-0.03***	-0.03***	-0.03***
Efficiency effects						
Constant	-41.44***	-29.93***	-40.88***	-22.31***	-35.88***	-35.06***
COMP 1/Factor 1	0.3***	3.32***	-0.25	7.9***		
COMP 2/Factor 2	0.55	2.51***	4***		12.15***	
FHI	5.44***		4.51***			5.16***
East Asia	-19.53***	-8.39***	-17.66***	-15.75***	0.32	-13.84***
Time trend	0.48***	1.52***	0.84***	0.22**	2.45***	0.27**
Sigma-squared	16.31***	21.74***	17.05***	21.45***	20.14***	11.06***
Gamma	0.99***	0.99***	0.99***	0.99***	0.99***	0.99***
Log likelihood	-238.62	-276.98	-236.05	-285.67	-264.64	-252.63
Likelihood ratio test	902.97	826.26	908.12	808.87	850.94	874.95

, ** and * denote significance at 10%, 5% and 1% levels. Higher value of COMP1, COMP2, Factor 1, Factor 2 and FHI mean less freedom.*

Table 2.6 presents the estimation results when lagged k is used in production function, East Asia dummy, time trend and either principal components or principal factors. Here, we focus only estimate translog production function since we have evidence that translog function is favoured over Cobb-Douglas function. Likelihood ratio tests for all specifications suggest that stochastic model is correct and that efficiency is indeed significant. The general impression is that the effect of institutional variables on efficiency is still significant. However, there are differences now as lagged k is used. Result in column (1) of Table 2.6 shows that the second principal component becomes insignificant though having expected sign. The specification in column (2)

caters for the fact that there is considerable correlation between the two components and FHI. Without FHI in the efficiency equation both components are significant and of large magnitude. Concerning the principal factors, the first factor has unexpected sign and is not significant when they are used together with FHI. However, when they are used one by one all of their coefficients are significant and have expected sign. As for East Asia dummy it is significant in all specification except in column (5) when the second factor which indicates quality of property rights is used. That means property rights institution is an important determinant of efficiency and when we only control for property rights East Asia no longer has advantage in efficiency over other regions.

Table 2.7 presents the results when country and year dummies are used to control for country-specific and year-specific variables that could have impact on production efficiency of transition economies. In general the results are similar to those obtained by using contemporaneous k with East Asia dummy and time trend (Table 2.4) or lagged k with East Asia dummy and time trend (Table 2.6). In column (3) the coefficient of the first factor is negative, which suggests that better institution in terms of foreign investment and wage and price policy would lead to lower efficiency. However, this result is flawed by correlation between the two factors (due to oblique rotation) and FHI. Therefore, conclusions should be drawn from results in column (2) and columns (4)-(6). Again, factor two or property rights institution is more important than factor 1. Another thing to be noted is that when country and year dummies are used the coefficients of institutional indicators are smaller as compared to when East Asia dummy and time trend is used. Looking from any angle, however, we can confirm that institutional quality has a significant and positive effect on efficiency of transition economies.

Table 2.7

Estimations with lagged k, country dummies and year dummies

	Two components and FHI (1)	Two components (2)	Two rotated factors and FHI (3)	Rotated Factor 1 (4)	Rotated factor 2 (5)	FHI (6)
Production frontier						
Constant	9.58***	9.44***	9.71***	9.66***	9.56***	9.66***
k	-0.5***	-0.49***	-0.51***	-0.5***	-0.49***	-0.46***
l	1.22***	1.21***	1.2***	1.2***	1.2***	1.13***
k2	0.04***	0.04***	0.04***	0.04***	0.04***	0.04***
l2	-0.02***	-0.02***	-0.02***	-0.01***	-0.01***	-0.01***
kl	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.03***
Time trend	-0.02***	-0.02***	-0.02***	-0.02**	-0.02***	-0.02***
Efficiency effects						
Constant	-14.12***	-9.72***	-13.47***	-9.34***	-11.36***	-18.71***
COMP 1/Factor 1	0.53***	0.72***	-1.84***	1.02***		
COMP 2/Factor 2	2.33***	2.15***	5.18***		3***	
FHI	0.89***		0.84***			0.68***
Sigma-squared	8.83***	7.95***	8.49***	9.36***	8.33***	9.65***
Gamma	0.99***	0.99***	0.99***	0.99***	0.99***	0.99***
Log likelihood	-139.86	-138.19	-136.16	-144.04	-136.60	-149.26
Likelihood ratio test	1100.50	1103.84	1107.89	1092.13	1107.01	1081.71

, ** and * denote significance at 10%, 5% and 1% levels. Higher value of COMP1, COMP2, Factor 1, Factor 2 and FHI mean less freedom. Country dummies are jointly significant and the same is true for year dummies but their coefficients are not reported.*

5. CHAPTER CONCLUSION

The role of institutions in economic growth and efficiency has been discussed widely in the literature. Though empirical results change from one measure of institution to another, or from one dataset to another there seems to be a general conclusion that institutions do have positive effects on growth and efficiency. Since the collapse of the Soviet Bloc the experience of transition economies has provided something akin to a natural experiment to test the effect of institutions on efficiency. Applying stochastic frontier analysis technique, this chapter has confirmed the positive

effects of economic and political institutions as measured by the Index of Economic Freedom (Heritage Foundation) and the Freedom House Index respectively. For 28 transition economies over the period 1995-2005, more economic or political freedom is found to reduce the level of inefficiency. In other words, better institutions are associated with higher level of efficiency. Particularly, the use of principal factors has shown that property rights protection is very important for improving production efficiency. So far the empirical result about the effect of political freedom on economic performance has been mixed but this empirical study shows that it does have significant role in improving efficiency, at least in the context of transition economies. Of course institutions do not solely determine efficiency but improvement of institutional quality should help transition economies to gain higher efficiency. The positive role of institutions found here is robust to different constructed measures of capital series (depreciation rates of 10% and 6%).

Though the issue of causality between institution and efficiency is controversial and the results obtained here can be subject to questions about the quality of institutional measurement, we think this research will contribute to clearer understanding of the role of institutions in economic performance, both economic and political.

CHAPTER III - INSTITUTIONAL DETERMINANTS OF INVESTMENT IN TRANSITION ECONOMIES

1. INTRODUCTION

Investment is the key to maintaining and expanding the capital stock and production capacity of an economy. In the neoclassical growth framework higher capital accumulation means higher output and higher growth in transition to the steady state of an economy. In endogenous growth theory investment affects growth directly through accumulation of input and indirectly through improved factor productivity. New investment in physical and human capital introduces new technologies into the production base of an economy, thus improving its efficiency and productivity and altering its long run growth rate. The role of investment has been empirically confirmed in many studies such as: Barro (1990), Rebelo (1991), Mankiw *et al.* (1992), De Long and Summers (1991), Fischer (1993), Khan and Kumar (1997), Bouton and Sumlinski (2000) and others. In fact, investment is one of the few determinants of growth that remain significant in a sensitivity analysis by Levine and Renelt (1992).

Since the fall of the Soviet Bloc the former socialist countries in Central and Eastern Europe and Central and Eastern Asia have embarked on largely different growth paths. All of them except East Asian ones saw their output plunge in the early 1990s. Following initial production collapse in Eastern and Central Europe and former Soviet Union some countries quickly settled down and regained positive growth as early as 1992 or 1993 (Poland and Czech Republic) while others dragged on with their output contraction until 1995-1996 (Russia, Ukraine, and some other former Soviet Union countries). One the basis of growth performance, there seems to be some geographical

pattern. Countries of the former Soviet Union had to endure longest output drop. Those in Central Europe and Baltic area had a shorter period of recession. Those in East Asia did not suffer from any output loss at all.

Many researchers have formulated theoretical explanations and empirical tests for various factors that may have caused the marked variation in the growth performance of transition economies. Among the often cited determinants of the growth variation are initial conditions, liberalization and transition policies, and institutional factors[15]. The question about what drives investment has been long studied[16]. However, works in this field study broad cross sections or panels of countries that do not cover transition economies. To our best knowledge, the literature on investment in transition countries is focused on firms' investment constraints and behaviour. Budina *et al.* (2000) study the relation between liquidity constraints and firms' investment in Bulgaria and find that liquidity constraints only bind for small firms; large firms still have access to easy bank finance. Similarly, Konings *et al.* (2003) find soft budget constraints for firms in Bulgaria and Romania but Polish and Czech's firms face hardened liquidity constraints which are an impediment for investment. Mueller and Peev (2007) study investment returns of publicly traded firms in Central and Eastern Europe and find evidence of under investment due to asymmetric information and over investment due to managerial discretion. In general, these studies use firm level data and relate firms' investment behaviour to financial constraints. None has tried to explain difference in investment rates for the whole group of transition countries. The purpose of this chapter is to fill this gap in literature on transition economies. Since institutions are theoretically

[15] See, for example, De Mello *et al.* (1996 & 2001), Krueger and Ciolko (1998), Fidrmuc (2003), Harvrylyshyn and Roden (2003), Falcetti *et al.* (2006) for details.
[16] Some examples are: Levine and Renelt (1992), Ozler and Rodik (1992), Dawson (1998), Ghura and Goodwin (2000), Attanasio *et al.* (2000) and Campos and Nugent (2003).

proposed and empirically found to be a very important determinant of growth and development, we are particularly interested in examining the role of institutions and reform policies in explaining investment difference among transition economies.

Analyzing a dataset on transition economies over the period 1990-2007 we find that institutional factors, both economic and political, have significant effect on the investment rate. In addition, more transition progress is also found to be associated with higher investment. Besides, domestic saving and financial deepening are strong determinants of investment as well.

Section 2 of this chapter will explore possible determinants of investment in transition economies. Section 3 will discuss institutional development and investment in transition economies since the early years of the transition process. After that Section 4 will present the data and empirical approach for estimating the effects of institutional factors on investment. Section 5 will discuss the results and the chapter is concluded in Section 6.

2. LITERATURE REVIEW - DETERMINANTS OF INVESTMENT RATE

In this section we explore some essential factors that are theoretically expected and empirically proven to affect investment rate in contexts other than transition economies. They are categorized as institutions, transitional reform policies, macroeconomic factors, and financial development.

2.1. Institutional factors

As discussed in Chapter 1, institutions facilitate economic exchanges and determine resource allocation and efficiency of economic activities. An important indicator of the quality of institution is the level of freedom, both economic and

political, that economic actors can enjoy in pursuit of their economic goals. When people are free from fear of expropriation and troubles inherent in market (information, agency, coordination, etc.) they have more incentive to invest in economic activities and do so with higher efficiency.

With regard to investment the most important institution is the protection of property rights. Without secure property rights the incentives to invest will be reduced, especially in research and development activities that require large investment but, potentially, are very profitable. When properties are not properly protected resources will be diverted away from production, often to rent-seeking activities which further deter investment while encouraging further rent-seeking. Murphy *et al.* (1993) argue that rent-seeking activities exhibit natural increasing returns, which may lead to multiple equilibria with high levels of rent-seeking and low output. Acemoglu (1995) shows that rent-seeking reduces marginal productivity of investment and that increased rent-seeking makes rent-seeking relatively more attractive compared to investment in production. It has been argued by many authors, like North (1990) and Knack and Keefer (1995), that the private property rights are the backbone of the prosperous Western capitalism.

Transaction cost is a big hurdle for economic exchange and evolution of institutions through economic history has been the finding of solutions to the problem of high transaction cost. New institutions help reduce transaction cost, encourage more production and exchanges, thus allowing economic actors to realize gains from specialization and trade. As a result productive activities become more attractive and more investment is made. With the same level of investment, lower transaction cost means more output.

Corruption is an example of bad institutions and it is very harmful to investment. Corruption is a kind of tax, hence raising costs and uncertainty for business activities. Worse than tax, corruption is not transparent, not predictable and not reliable. Corruption tends to reduce government revenues (Gray and Kaufmann, 1998) because corruption is the most manifest in tax collection and the corrupt money, instead of being spent by the government on investment or consumption, goes into private pockets. Therefore the level of investment will be lower when corruption is rampant, which is proved empirically by Mauro (1995). More seriously, corruption makes investment less efficient. In public sector corruption may shift public investment away from the most profitable projects to less profitable ones that offer more opportunities for corruption (Shleifer and Vishny, 1993). Pritchett (2000) cites an example of a steel mill in Nigeria where spending overshot by US$ 4 billion and US$ 2 billion are reported to be stolen by government officials. In the private sector, corruption favours those with connections with government officials over those who have high productive efficiency (Elliott, 1997). In addition, bad governance reduces the incentive to invest in R&D (Meon and Weil, 2005), thus limiting opportunities to improve efficiency.

However, there have been arguments that corruption helps "grease the wheel" (Leff, 1964; Huntington, 1968; and Leys, 1965 as cited in Meon and Sekkat, 2005). The hypothesis suggests that corruption and bribery may be the second best solution due to distortions caused by ill-functioning institutions. When bad institutions are in place and there are no ways to change them, corruption may serve as a device to overcome hurdles to economic transactions, investment and promoting growth. This hypothesis has been tested by Meon and Sekkat (2005) and they find evidence against it. Their study shows that a weak rule of law, an inefficient government and political violence make the

negative effect of corruption on investment worse. So, it seems that all empirical evidences point to the negative effect of corruption on investment.

Apart from institutions that constrain directly economic activities, political and civil institutions are also very important for capital accumulation. Rodrik (2000) considers democracy as a meta-institution for building good institutions and argues that participatory political systems are the most effective ones for processing and aggregating local knowledge which is essential for building institutions. Sandholtz and Koetzle (2000) find that corruption is lower when democratic norms and institutions are stronger. In an effort to explain causes of corruption Treisman (2000) also concludes that democracy reduces corruption though it is well-established democracy rather than recent democratization process that matters (Sung (2004) also comes to similar conclusion). As Dawson (1998) empirically shows, political and civil liberties stimulate investment in a cross section of 85 countries.

2.2. Transitional factors

Transition process involves liberalization of markets and prices, privatization of state-owned firms, restructuring firms towards market incentives and building economic and social institutions and infrastructures to promote growth. When markets and prices are liberalised, investors have more incentives to invest and do business because they have the freedom to set prices and sell and buy goods to where/who they want. Privatization of state assets is perhaps the most important drive for investment because more assets are in private sector's hand with their rights recognized by the state. Privatization is a signal of commitment to private ownership and offers profitable investment opportunities, especially in public utilities sector (Holland and Pain, 1998).

Besides, governments would have larger budget from privatization proceeds to spend on public investment.

Structural reforms in transition countries have been implemented extensively, especially privatization of small scale enterprises (IMF, 2000). However, the reform progress has been uneven across countries. In 2005 the Transition Index, which is constructed by European Bank for Reconstruction and Development's (EBRD) to reflect the transition progress, ranges from 1.89 (Turkmenistan) to the highest level of 4.3 (Hungary, Czech Republic and some others).

Reform as measured by the EBRD Transition Index is expected to boost investment in transition countries because they create room for private sector's participation in economic activities through privatization and incentives for entrepreneurs to invest. Moreover, privatization generates government revenue for government investment development programmes.

2.3. Macroeconomic and financial factors

Macroeconomic policies, together with institutions, shape the incentive structures that investors face when making investment decision. Domestic saving and growth provide the necessary resources for both government and entrepreneurs to invest. Trade policy, macroeconomic stability (inflation) and public finance are important factors to be considered. Financial system is the blood vessel of an economy that channel funds from saving to investment and the level of financial development is expected to have a strong role in determining investment of an economy.

The relationship between saving and investment has been a focal topic in economic literature since the study of Feldstein and Horioka (1980), which identified what later came to be called the Feldstein-Horioka puzzle. Contrary to the prediction of

the perfect capital mobility theory, Feldstein and Horioka observe that, for OECD countries, domestic saving rates and domestic investment rates are highly correlated. Nowadays, global financial integration has gone very far but most transition economies still face many obstacles in accessing the international capital market and domestic savings is still critical for investment and growth. Analyzing a panel of 150 countries over 1960-1994 period, Attanasio *et al.* (2000) find that lagged saving rates are positively correlated with investment rates. As a result, we expect that lagged savings rate in transition economies should have a positive effect on the investment rate.

The significant role of investment in growth has been found in many cross section studies as mentioned in the Introduction. Some other growth models suggest that a rise in productivity growth causes both growth rates and investment rates to move together (Barro, 1991 and Islam, 1995). For the effect of growth on investment the accelerator theory argues that high growth rates lead to high demand for capital stock and real investment and vice versa though the adjustment may take time. The effect could also run indirectly through saving rate as Loayza *et al.* (2000) shows that private saving rates rise with the level and growth rate of real income. Empirically, when the dynamics of the growth-investment relation is studied it has been shown that "growth rates Granger-cause investment rates with a positive sign" (Attanasio *et al.*, 2000). Therefore, we expect lagged growth rate to have positive effect on investment.

Gains from trade have long been studied and emphasized in the economic literature. A more export-oriented economy would have more access to world market, which makes it possible for producers to invest and obtain gains from economy of scale. More export would bring about more foreign exchange earnings necessary to finance import of capital goods, which is very important for economies in the process of

restructuring their production base. However, trade liberalization may lead to domestic market being swamped by imported goods and domestic producers find it hard to compete, thus limiting domestic producers' investment and expansion activities. Therefore, there is an argument for protection of some infant industries with high level of externalities, learning by doing and economy of scale against foreign competition (Rodriguez and Rodrik, 1999). Of course whether the infant industries grow to be competitive internationally requires much more than protection by trade measures.

According to Fisher (1993) inflation is the most important single indicator of the macroeconomic environment as far as investment and growth is concerned. Inflation signals uncertainty and makes it difficult for investors to evaluate their investment projects, thus forcing them to postpone investment. During high inflation episodes economic actors tend to switch from long term to short term transactions, which increase transaction cost. In some empirical studies inflation has been found to have significantly negative effect on private investment (e.g. Greene and Villanueva, 1991; Ozler and Rodrik, 1992 and Madsen, 2003). However, high inflation often means low real interest rate, which makes borrowings cheaper for investors. Romer (2001) argues that inflation is also a potential source of government revenue through seignorage and under some conditions it is optimal for government to use this revenue resource in addition to usual taxes. Empirically, Bleaney (1996) finds no negative effect of inflation on total investment. Therefore, we can expect some mixed or insignificant effect of inflation on investment.

Analyzing an endogenous growth model with government spending, Barro (1990) argues an increase in non-productive government expenditures, for a given level of productive government expenditures, would raise income tax rate. As a result, private

sector investment would decrease because individuals have less incentive to invest. In reality, it is possible that an increase in non-productive government spending leads to a decrease in investment in both public and private sectors. Especially, if government consumption is financed by borrowing it gives rise to public debt and consequently investors' doubt about the stability of the macroeconomic environment and future tax burden. Empirically, Barro (1991) shows that higher government consumption is associated with lower growth in a panel of 98 countries in the 1960-1985 period. Therefore, higher level of government consumption relative to GDP is expected to have negative impact on investment.

Availability of finance is one of the most important factors for entrepreneurs to carry out business activity. Financial system pools savings together and channels funds from savers to investors. Without a financial system savers often hoard their savings in non-productive assets such as gold and jewellery. According to Levine (1997) individual savers may not have the time, capability and means to collect and process information on firms and investment opportunities, therefore they are not willing to invest. Financial institutions help solve this information problem. Financial institutions select, supposedly, the best investors who can make the most from available funds. Financial system in developing or transition economies play an even more important role because firms in these economies depend more on external financing than those in developed economies (Oshikoya, 1994). In addition, financial intermediation creates money and provides means of transaction, reducing transaction cost and promoting economic exchange and expansion of production (Levine, 1997). Without a well-functioning financial system it is very difficult for firms to engage in selling their

products to foreign markets and importing capital goods for investment and expansion. In general, we can expect a positive effect of financial deepening on investment.

Last but not least, interest rate is the cost of capital that is taken into account when investment decisions are made. High interest rates mean high discount rates which render projects not viable financially, especially for small or newly-established businesses that are more reliant on borrowings. Bernanke (1983) reports that high interest rates are a major source of sluggishness in capital expenditure in 1947-1979 period in the United States. For developing countries, Greene and Villanueva (1991) shows that real interest rate is one of several macroeconomic determinants of private investment in the 1975-1987 period. Therefore, we also include real interest rate as an explanatory variable. One thing we should keep in mind is that our dependent variable is total investment rate which includes both private and public investment as percentage of GDP. In episodes of high interest rates private investment may be depressed but public investment may not be affected since major investment projects are planned and implemented over a long period of time. In times of tightened monetary policy the government may utilize fiscal expansion to maintain the demand level through investment in infrastructure projects. Therefore, in the context of this study it is an open question whether real interest rate would have a significant effect on the national investment rates. One more thing to keep in mind is that real interest rate might be correlated with inflation rate and regressions that include both of them might be biased due to multicollinearity.

3. *INSTITUTIONS AND INVESTMENT IN TRANSITION ECONOMIES*

3.1. Institution building in transition economies

Transition economies are in a process of building new market-based institutions to promote economic growth. Most of them started with an "institutional collapse" (Campos and Coricelli, 2002) which is often cited as one of the reasons for the initial output drop in these economies. However, institutional quality in transition economies has improved quickly and substantially. Figure 1 in the Appendix shows the evolution of the Heritage Foundation's Index of Economic Freedom[17] (IEF) and the Freedom House Index (FHI)[18]. The Heritage Foundation's Index is a composite index of ten different factors of economic freedom rated on the scale of 0-100, with higher value representing more freedom. The FHI is a measure of political freedom which is a simple average of civil liberties (CL) and political rights (PR) with score going from 0 to 7 with 7 being no freedom. In Figure 1, for the ease of comparison, the Freedom House Index is rescaled to the 0-100 range and higher value means more freedom[19]. The lines in Figure 1 represent the averages of either IEF or FHI for three groups of transition economies: Central and Eastern Europe (CEE), former Soviet Union (FSU) and East Asia (EA). All three groups have made significant moves towards freedom, both economic and political, but the CEE countries are the fastest. They started with better institutional quality and are now in a much better position than the FSU or EA countries. The EA countries started at the lowest level of freedom and are still far behind the others.

[17] See Holmes *et al.*, 2008 for details.
[18] Data available at http://www.freedomhouse.org/template.cfm?page=439
[19] See more details about these indexes in Section 4

Another widely used measure of economic freedom is the Fraser Institute's Economic Freedom Index (EFI)[20]. This index is available from 1970 but before 2000 it is only available for every five years. Besides, we have EFI for only 21 transition countries. The EFI scores ranges from 0 to 10, with 10 being most free. Figure 2 in the Appendix shows the changes of EFI for three groups of transition economies over 2000-2006 and we can see the same trend as shown in Figure 1.

There is a wide gap in institutional quality between transition economies. Some countries have achieved institutional quality that is at the same level or even higher than developed countries. In 2008 Latvia, Czech Republic and Hungary had higher IEF score than France or Portugal. At the same time Russia, Belarus and Turkmenistan were ranked 136, 147 and 152 respectively out of 157 countries in 2008. In terms of political freedom, the Freedom in the World Report 2008 categorizes all CEE countries as free while most of FSU and EA countries as not free. The experience of transition economies in terms of building a completely new institutional system (in Central and Eastern Europe and former Soviet Union countries) or reforming an old system (in East Asia) for the functioning of a market economy can be viewed as something close to a natural experiment for analyzing the effect of institutions on investment.

3.2. Investment in transition economies

Initially, investment fell sharply in the CEE and FSU countries. When the government revenue was low and business environment was just taking form this was quite a foreseeable situation. In East Asian countries, though the investment did not fall but it hardly saw any growth in the early 1990s. Figure 3 in the Appendix shows that the investment was cut the most in the FSU countries and these are the last who recovered

[20] See Gwartney *et al.*, 2008 for details

from investment downturn. On average, EA has the highest investment growth (11.13%), followed by CEE (6.62%) and FSU (3.65%).

Figure 4 in the Appendix depicts the investment-GDP rates of transition economies by groups. Except for 1990 the EA has always maintained a higher investment rate than those of CEE and FSU. Since 1997 this rate has gone up from around 25% to 33% (in 2007). The investment rates of CEE and FSU have also increased from 20% in early 1990s to 25% in 2007.

Figure 5 (Appendix) is a scatter plot of the investment rate and GDP growth rate in 30 transition economies over the 1995-2006 period. It shows us some positive association between growth rate and investment rate. Though the investment-growth relation is not the subject of this chapter it helps justify the purpose of this. If we know factors that drive investment we may know what drives growth, at least partially. To better understand causes of growth we need to understand the factors that determine the investment rate.

4. DATA AND MODEL

4.1. Data

For economic freedom the Heritage Foundation's Index of Economic Freedom (IEF) and the Fraser Institute's Economic Freedom Index (EFI) are the most popular measures. However, the Fraser Institute's EFI covers only 21 transition countries[21] and before the year 2000 it was only available for every five years. Therefore, we use the Heritage Foundation's IEF as a proxy of economic freedom. The data start in 1995 and are available for all transition countries. The IEF is a simple average of 10 individual

[21] 18 Central and Eastern European countries and three East Asian countries.

freedoms which are considered vital to the development of personal and national prosperity. The individual freedoms are: business freedom, trade freedom, fiscal freedom, government size, monetary freedom, investment freedom, financial freedom, property rights, freedom from corruption and labour freedom. The methodology for constructing the freedoms has been revised several times to enhance the robustness and the entire time series have been recalculated accordingly. For the 2008 version of the IEF the authors use a 0-100 percent grading scale so that a higher score represents more freedom. The difference between this data set and others is that the values of the variables are calculated with data available from various sources like the World Bank Development Indicators[22], which are more objective than subjective survey data. For available data, the correlation coefficient between the Heritage Foundation's IEF and the Fraser Institute's EFI is 0.83 (126 observations).

For political institutions, two measures are widely used in the literature: civil liberties (CL) and political rights (PR) reported in the Freedom House's *Freedom of the World* (Rodrik, 2000; and Havrylyshyn and Rooden, 2003, for example). The Freedom House uses surveys and assessment reports to evaluate the actual rights and freedoms enjoyed by individuals in almost all countries in the world since 1972. Political rights refer to free participation in the political process, right to vote freely for distinct alternatives in legitimate elections, right to compete for public office, join political parties and organizations. Civil liberties mean the freedoms of expression and belief, associational and organizational rights, rule of law, and personal autonomy without interference from the state. *The Freedom of the World* does not rate government or government performance per se but the real world rights and freedoms. The PR and CL

[22] See Miles *et al.* (2006) for details.

are scored from one to seven for each country in each year with larger number indicating less freedom. The PR and CL are highly correlated (0.94) in this sample.

The EBRD transition scores are the judgement of the EBRD's Office of the Chief Economist about country-specific progress in transition. The scores range from 1 to 4+, with 4+ coded as 4.33 and 4- equal 3.67 and so on. Averages are obtained by rounding down. For example, a score of 2.6 is treated as 2+, but a score of 2.8 is treated as 3-. The higher the scores the more transition progress a country has made. The following aspects of transition are assessed and scored: large scale privatization, small scale privatization, governance and enterprise restructuring, price liberalization, trade and foreign exchange system, competition policy, banking reform and interest rate liberalization, securities market and non-bank financial institutions, and infrastructure reform. Due to data availability, we do not use scores of infrastructure reform in this chapter. The data on transition indicators is available for download from the EBRD's website. Unfortunately, we do not have the transition indicators for four East Asian transition countries (Cambodia, China, Laos and Vietnam).

Data for dependent variable and control variables other than institutional ones are collected from the World Bank Development Indicators (2008). Investment is total fixed capital formation as percentage of GDP. Saving is domestic saving as percentage of GDP. Growth is the real GDP growth rate. Openness is measured by the sum of import and export as percentage of GDP. For inflation we use the change in GDP deflator instead of change in Consumer Price Index (CPI) because the CPI inflation series has more missing observations. Real interest rate is the difference between average lending rate and inflation rate which is based on GDP deflator. For financial

development we use a very popular indicator which is the liquid liabilities as percentage of GDP (M3/GDP).

Table 3.1

Descriptive statistics

Variable	Observation	Mean	Std. Dev.	Min	Max
Investment	373	23.69	6.72	4.03	53.20
Growth	383	5.44	5.10	-16.70	34.50
Saving	374	17.58	13.15	-22.65	57.61
Real interest rate	334	7.62	15.70	-70.15	77.11
OPEN	382	99.29	32.48	36.39	181.68
M3	366	36.77	27.94	6.72	163.31
Government consumption	375	15.60	5.41	3.47	29.39
Inflation	383	31.81	104.71	-5.18	1174.29
Economic Freedom	358	54.53	9.45	30.02	77.96
Transition Index	338	3.79	0.67	1.78	4.33
Freedom House Index	390	3.80	2.02	1	7

Source: World Bank Development Indicators, Freedom House, Heritage Foundation, EBRD; author's calculation.

Table 3.1 presents the summary statistics of variables used in this chapter and Table 3.2 shows the pair-wise correlation between them. As discussed in Section II, there are quite large variations in both the dependent and independent variables. The correlation between three composite measures of institution is high, ranging from 0.58 to 0.74 in absolute value (Table 3.2). This suggests some consistency in measuring institutional quality in transition economies, especially between the economic freedom and transition progress index (correlation coefficient of 0.74). In addition, inflation and

real interest rate are significantly and negatively correlated (-0.37). This calls for caution when both inflation and interest rate are used in the same regression equation.

Table 3.2

Correlation matrix of explanatory variables

	Growth	Saving	Interest rate	Open-ness	M3	Government consumption	Inflation	Economic Freedom	Transition Index
Growth	1								
Saving	0.0638	1							
Interest rate	0.0797	-0.0564	1						
Openness	0.0273	0.0153	-0.0478	1					
M3	0.0201	0.3805	-0.0841	-0.0356	1				
Government consumption	-0.211	0.0798	-0.031	0.1256	0.0996	1			
Inflation	-0.3695	-0.1369	-0.3713	0.066	-0.0635	-0.0685	1		
Economic Freedom	0.1072	-0.0121	0.068	0.3012	0.2325	0.1723	-0.2452	1	
Transition Index	0.5501	-0.1715	0.2390	0.1612	0.1706	-0.0163	-0.2613	0.7448	1
Political Freedom	0.0437	0.077	-0.0321	-0.2753	-0.1181	-0.349	0.0916	-0.662	-0.58

Source: World Bank Development Indicators, Freedom House, Heritage Foundation, EBRD; author's calculation.

4.2. Model and methodology

In order to test empirically for the role of institutions in determining investment rate we estimate a panel data model as follows:

$$INV_{it} = \alpha_0+\alpha_1 INS_{it}+ \alpha_2 GRO_{i,t-1}+ \alpha_3 SAV_{i,t-1}+ \alpha_4 OPEN_{it}+ \alpha_5 M3_{it}+ \alpha_6 INF+ \alpha_7 IR_{it} + \alpha_8 GCON_{it}+ c_i +\varepsilon_{it} \quad (3.1)$$

with i=1, 2, …N and t=1, 2, …, T

The dependent variable INV_{it} is investment as percentage of GDP and c_i is an unobserved effect that is country specific and time constant. The ε_{it} are the idiosyncratic errors that change across time t and country i. INS_{it} is institutional variable which can be composite indexes like IEF, FHI and EBRD or any individual factors of them. $GRO_{i,t-1}$

is the lagged real GDP growth rate[23]. $SAV_{i,t-1}$ is the lagged gross domestic saving as percentage of GDP. $OPEN_{it}$ is the level of openness of an economy or the ratio of the sum of import and export to GDP. $M3_{it}$ is the ratio of liquid assets to GDP. INF_{it} is inflation rate based on GDP deflator and IR is real interest rate. $GCON_{it}$ is the government consumption as percentage of GDP.

This is a panel data model with a country specific unobserved effect that can be estimated by either fixed effect (FE) estimation or random effect (RE) estimation techniques[24]. The difference between FE and RE is that the RE model assumes no correlation between the regressors and c_i. If the assumption is correct, together with assumptions on the idiosyncratic error, the RE is more efficient than the FE. Otherwise, the RE is not consistent but the FE is. When estimating this model we try both FE and RE and test for the one that fits the data better and report results accordingly[25]. Besides we also test for the exogeneity of the regressors[26]. The test results reject the hypothesis that $OPEN_{it,}$ $M3_{it}$, INF_{it}, IR_{it}, $GCON_{it}$ are endogenous. We always report results which are robust to serial correlation and heteroskedasticity. In the literature, static panel models have been used before to study determinants of investment (Mueller and Peev, 2007; Ghura and Goodwin, 2000; and Odedokun, 1997).

As we can see in the Table 3.2, the IEF, FHI and EBRD are highly correlated. Therefore they are entered to the regression equation separately[27]. For estimation with

[23] Use of real GDP per capita growth rate does not change the result.

[24] We also estimated a dynamic panel model by differenced GMM two step robust method but the lagged dependent variable is not significant though Sargan test confirms validity of instruments and there is no second order serial correlation.

[25] Hausman test is often used to determine the choice of RE or FE but Hausman test is not robust to heteroskedasticity of the error term. We use a robust method suggested by Wooldridge (2002, p.290) which is done by "xtoverid" command in STATA.

[26] Under strict exogeneity, γ should not be significant in the regression $\Delta y_{it} = \Delta x_{it}\beta + w_{it}\gamma + \Delta\varepsilon_{it}$ where w_{it} is a subset of x_{it} (Wooldridge, 2002, p. 285).

[27] When any pair of them is used in a regression at least one variable becomes insignificant. Consequently, they are used separately.

IEF and its individual indexes we use the data for the period 1995-2007 because the IEF is only available from 1995. For estimation with FHI, EBRD and their components the data is from 1990-2007 but the EBRD data is only available for 26 countries (former socialist countries in Eastern Europe and members of the former Soviet Union plus Mongolia). Because of missing observations our dataset is an unbalanced panel. A list of countries in the dataset and country averages of variables used in our regression can be found in the Table A3.1 of the Appendix.

5. RESULTS AND DISCUSSION

5.1. Baseline results

First, we estimate equation (3.1) with the composite measures of economic freedom (IEF), political freedom (FHI) and transition progress (EBRD). Table 3.3 shows the result of the estimations.

Table 3.3

Regressions with inflation and interest rate

Dependent variable: investment/GDP

	IEF (1)	FHI (2)	EBRD (3)	PR (4)	CL (5)
Institution	0.11**	0.09	4.379***	0.099**	0.012
Lagged growth	0.01	0.13	0.02	0.135*	0.131
Lagged saving	0.15***	0.12*	0.099	0.125*	0.098
Openness	0.02	0.02	-0.004	0.019	0.029
M3/GDP	0.09***	0.09***	0.106***	0.104***	0.105***
Inflation	0	0	0.002**	0	0
Interest rate	0	-0.02	-0.013	-0.019	-0.011
Government consumption	0.02	0.01	0.049	0.026	-0.024
Constant	9.49***	10.31***	3.474	9.006***	13.9***
Estimation method	FE	FE	FE	FE	FE
Number of observations	302	357	313	357	357
R^2	0.28	0.29	0.29	0.31	0.27

, ** and * indicates significance at 10%, 5% and 1% respectively (based on robust standard errors).*

As we can see, economic freedom and transition progress indicators are significant and have expected signs. The effect of EBRD measure is higher than that of the IEF, which is due to the fact that EBRD index is measured on a much smaller scale. The political freedom measure FHI is not significant but the political rights component (PR) is positive and significant, which suggests that more political rights is associated with higher investment rates. However, CL is not significant though it has an expected sign. Of the control variables, saving and financial development indicator (M3/GDP) perform well with expected and significant coefficients.

As discussed earlier the results in Table 3.3 may be incorrect due to correlation between inflation and real interest rate. Hence, we estimate the model with inflation only and real interest rate only, and the results are reported in Table 3.4 and Table 3.5 below.

Table 3.4

Regressions with inflation

Dependent variable: investment/GDP

	IEF	FHI	EBRD	PR	CL
	(1)	(2)	(3)	(4)	(5)
Institution	0.16***	0.136***	2.769***	0.11***	0.045
Lagged growth	-0.014	0.162***	0.112**	0.169***	0.165***
Lagged saving	0.129**	0.126***	0.108***	0.131***	0.115***
OPEN	0.009	0.006	0.007	0.006	0.019
M3/GDP	0.102***	0.055***	0.064***	0.069***	0.061***
Inflation	-0.001	0	0.002*	0	0
Government consumption	0.105	-0.073	-0.075	-0.096	-0.119
Constant	6.449*	12.24***	11.277***	13.2***	21.26***
Est. method	FE	FE	RE	FE	RE
No. of obs.	325	408	361	408	408
R^2	0.3	0.31	0.29	0.3	0.28

, ** and * indicates significance at 10%, 5% and 1% respectively (based on robust standard errors).*

Table 3.5

Regressions with interest rate

Dependent variable: investment/GDP

	IEF	FHI	EBRD	PR	CL
Institution	0.153**	0.087	4.018***	0.087	0.013
Lagged growth	-0.012	0.13	0.014	0.13	0.127
Lagged saving	0.14**	0.117*	0.102*	0.117*	0.099
Openness	0.02	0.021	-0.004	0.021	0.028
M3/GDP	0.106***	0.094***	0.108***	0.094***	0.105***
Interest rate	0.003	-0.017	-0.023	-0.017	-0.014
Government consumption	0.137	0.013	0.034	0.013	-0.026
Constant	4.633	10.348***	4.921	10.348***	14.012***
Estimation method	FE	FE	FE	FE	FE
Number of observations	302	357	313	357	357
R^2	0.29	0.29	0.29	0.31	0.27

, ** and * indicates significance at 10%, 5% and 1% respectively (based on robust standard errors).*

The first thing to note is that we have strong consistency across various specifications. Both inflation rate and interest rate are not significant in any specification but we have the most significant results when only inflation is used. This is our preferred specification[28].

According to Table 3.4, on average a ten point increase in the composite measure of economic freedom, all else equal, is associated with 1.6% increase in the investment rate and an additional point in political freedom (a lower score of FHI by one point) is associated with 1.36% increase in the investment rate. Of the political freedom measures, only the political rights have significant effect on investment but the inclusion of civil liberties in the political freedom measure reinforces the effect (see column (2) and (4) in Table 3). This may be due to the fact that we have more variation

[28] We also estimate the model without inflation but the results do not change with respect to coefficients of institutional variables with some reduction in R^2. Models with a quadratic term of inflation are also estimated without any significant coefficients of inflation. Lagged inflation rate is also used in place of current inflation rate but the result does not change. Ghura and Goodwin (2000) do not find significant effect of inflation either.

in PR than in CL[29]. If the general indicator of transition progress EBRD is one point higher we can expect to have an increase of 2.77% in the investment rate. Our result here concurs with what is found in Dawson (1998) and Ghura and Goodwin (2000) with regard to the effect of institutions on growth.

Lagged GDP growth rate is highly significant in all estimations except for that with IEF (column (1)). When political freedom or transition index are used the effect of lagged growth on investment is from 0.13 to 0.17, which means a 1% increase in last year's growth is associated with an increase of from 0.13% to 0.17% in investment rate. The lagged saving rate also has significant impact on investment as expected and the magnitude of the impact does not change much across estimations. A 1% increase in lagged saving rate causes the investment to increase by from 0.11% to 0.13%.

In these estimations, the trade openness and inflation rate have no significant effects on investment rate of transition economies. The indicator of financial development M3/GDP is always significant and positive, which means more financial deepening is associated with higher investment rate. The government consumption expenditure has negative coefficients in all estimations but the effect is not significant.

5.2. Results with individual indexes

The use of composite indexes of economic freedom aggregated from various components has been criticised by several authors (Heckelman and Stroup, 2000) on the ground of the arbitrariness of weighting schemes and differences in effects of different freedom components[30]. Therefore, one question we want to answer is which individual economic freedoms and transition indicators have significant effect on investment and

[29] PR and CL have means of 3.85 and 3.88 and standard deviations of 2.21 and 1.77 respectively.
[30] Carlsson and Lundstrom (2002) find that only legal structure, private ownership and freedom to use alternative currency have positive and robust relation with growth.

which are not.

Table 3.6

Estimation results with nine individual economic freedoms

Dependent variable: Investment/GDP

	Business	Trade	Fiscal	Government	Monetary	Investment	Finance	Property	Corruption
Institution	0.07*	0.034	0.036	0.017	0.018*	0.018	0.028	-0.01	0.045*
Lagged growth	0.035	0.016	0.003	0.022	0.008	0.03	0.027	0.027	0.022
Lagged saving	0.135**	0.149**	0.154***	0.146**	0.14**	0.143**	0.144**	0.148***	0.149**
OPEN	0.022	0.014	0.011	0.015	0.013	0.018	0.014	0.016	0.017
M3/GDP	0.113***	0.112***	0.117***	0.123***	0.112***	0.125***	0.12***	0.122***	0.118***
Inflation	-0.002	-0.002	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.001
Government consumption	0.069	0.108	0.086	0.092	0.127	0.102	0.108	0.099	0.088
Constant	9.52**	11.56***	11.69***	12.65***	12.83	12.23***	12.24***	13.87***	12.18
Est. method	FE	FE	FE	FE	FE	FE	FE	FE	FE
No. of obs.	325	325	325	325	325	325	325	325	325
R^2	0.28	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27

, ** and * indicates significance at 10%, 5% and 1% respectively (based on robust standard errors).*

Table 3.6 shows results of estimations with nine individual economic freedoms[31]. To our surprise, of the nine economic freedoms, we find that only three have significant effect on investment rate: business freedom, monetary freedom and freedom from corruption. The result shows that when individual freedoms are considered they do not have strong effect on investment because each of them does not make a considerable difference to the investment environment. However, when they stand together in the form of a composite indicator (IEF) they have a significant joint effect on investment. This calls for improvement of the quality of economic institutions in all aspects in order to promote investment (an expectedly growth). With regard to other explanatory variables the same results emerge in Table 3.6. Financial depending is

[31] We do not use labour freedom because data for labour freedom is only available from 2005.

consistently significant and positive while trade openness, inflation and government consumption are not significant.

Table 3.7 shows estimation results when individual transition indicators are used. All of them, except price liberalization, have a significant and positive effect on investment rate. The result of price liberalization is unexpected because it is one of the most advocated topics in transition reform. Among the transition indicators large scale privatization has the highest effect on investment rate. The reason may be that large scale privatization is a strong signal of commitment to restructuring of an economy and determination to develop a market economy, which stimulates investment from private sector. In addition, large scale privatization is an important source of revenue for governments to carry out their development programmes. Progress in reforming securities market and non-financial institutions have the smallest effect on investment.

It may reflect the fact that financial market in transition economies are still in the very initial stage of development and they are mostly dependent on the banking system to cater for their investment needs (Mueller and Peev, 2007). Once again, financial development in form of the ratio of liquid assets to GDP has positive and significant effect on investment rate.

5.3. Results with principal components and factors

In Tables 3.3-3.5 we use indexes of economic freedom and liberalization which are aggregated by equal weighting. Because arbitrary weighting schemes may not appropriately reflect the magnitude or even the direction of each individual element's marginal impact (Heckelman and Stroup, 2000) we use principal components analysis (PCA) to construct composite measures of freedom that best reflect the original data.

Table 3.7

Estimation results for eight EBRD individual transition indicators

Dependent variable: Investment/GDP

	Large scale privatization	Small scale privatization	Governance and enterprise restructuring	Price liberalization	Trade and foreign exchange system	Competition policy	Bank reform and interest liberalization	Securities market and non-financial institutions
Institution	2.812***	1.681**	1.773*	0.626	1.223*	2.328**	1.563***	1.374**
Lagged growth	0.092**	0.11*	0.141***	0.167***	0.136***	0.14***	0.13***	0.135***
Lagged saving	0.101**	0.116***	0.109***	0.107***	0.108***	0.096**	0.108***	0.104***
OPEN	-0.01	0.009	0.015	0.02	0.018	0.008	0.012	0.014
M3/GDP	0.075**	0.075***	0.063***	0.065***	0.069***	0.057**	0.058***	0.057**
Inflation	0.001*	0.001	0.001	0	0.001	0	0.001	0
Government consumption	-0.068	-0.087	-0.114	-0.131	-0.095	-0.062	-0.096	-0.117
Constant	12.21	12.58***	14.96***	16.17***	13.64	13.87	15.23***	16.57***
Est. method	FE	RE	RE	RE	RE	FE	RE	RE
No. of obs.	361	361	361	361	361	361	361	361
R^2	0.31	0.27	0.25	0.23	0.26	0.26	0.26	0.25

, ** and * indicates significance at 10%, 5% and 1% respectively (based on robust standard errors).*

The PCA helps reduce the dimensionality of the data while retains the maximum variation of the underlying variables. More importantly, the PCA does not impose any subjective judgement but combine variables together according to their relative variance. Moreover, by construction the principal components are independent of each other. Usually, the number of principal components to retain for estimation is determined by the parallel analysis and the Velicer's minimum average partial correlation analysis. Another "rule of thumb" is the Kaiser's eigenvalue>1 but it is not very popular.

After applying the PCA for nine IEF variables and eight EBRD variables and selecting the number of components according to those methods, we come up with two principal components (PC1 and PC2) for both the economic freedom measures and the liberalization indexes. The reason is because for the economic freedom data Velicer's method suggests one, while the parallel analysis and Kaiser's eigenvalue suggest nine, which is not meaningful. For the EBRD data the Velicer's method suggests two while the parallel analysis and the Kaiser's eigenvalue indicate that two components should be used.

Though principal component analysis has a nice property of allowing the data to determine both the proper magnitude and sign for aggregating the elements into a single index, this method is not without caveat which is the difficulty in interpreting the coefficients of the components because they are not chosen on the basis of any relationship to the explained variable. In order to make sense of the components we need to look at the relation between them and the underlying variables whose relationship with the explained variable are better known to us. Table 3.8 shows the eigenvectors of the components we retain. The left panel is for the first two components

of the IEF data and the right panel is for those of the EBRD data.

Table 3.8

Eigenvectors of principal components (PC1 and PC2)

IEF			**EBRD**		
Variable	PC1	PC2	Variable	PC1	PC2
BIZF	0.2609	-0.0416	LSPRI	0.3891	0.1627
TRAF	0.1811	0.0711	SSPRI	0.4284	-0.186
FISF	-0.0176	0.2881	RESTRU	0.2927	0.2772
GOV	-0.4076	0.4608	PLIB	0.3277	-0.4889
MONF	0.274	0.8098	TRA_FOREX	0.4757	-0.4339
INVF	0.418	-0.0259	COMPET	0.2262	0.35
FINF	0.4949	0.1109	BANK_IR	0.3582	0.2697
PROPF	0.3813	-0.1659	SECU	0.2574	0.4895
CORF	0.3044	-0.0388			

Concerning the IEF data, the first component is strongly and positively related to investment freedom, financial freedom, property rights and freedom from corruption but it is strongly and negatively related to freedom of government. If we have higher score for this component it can be attributed to either advance in investment freedom, financial freedom, property rights and freedom from corruption or less freedom from government. If the coefficient of this component is positive and significant we can say that more involvement of the government in the economy is associated with higher investment rate, which is not surprising given that we use total investment measure. The second IEF component is dominated by monetary freedom and freedom from government. Concerning the EBRD data, the first component is positively and strongly

correlated with all measures of liberalisation. It can be seen as representing the overall liberalization progress. The second EBRD component is positively related to liberalisation scores in securities market, banking and interest rate and level of competition but negatively related to liberalisation scores in terms of price and trade and foreign exchange. So it can be thought of as a contrast between financial sector liberalisation and price liberalisation. We have seen that price liberalisation alone does not have significant effect on investment while other liberalisation indexes do in Table 3.7.

Table 3.9

Estimation results with first two components (PC1 and PC2) of IEF and EBRD

Dependent variable: Investment/GDP

Variable	IEF	EBRD
PC1	0.037**	1.366***
PC2	0.014	0.34
Lagged growth	0.003	0.085*
Lagged saving	0.131**	0.102**
OPEN	0.012	-0.008
M3/GDP	0.106***	0.077***
Inflation	-0.002	0.002**
Government consumption	0.14	-0.036
Constant	9.394***	8.218*
Estimation method	FE	FE
No. of obs.	325	361
R^2	0.29	0.3

*PC1 and PC2 are first two components retained from the principal component analysis of the underlying IEF and EBRD variables. *, ** and *** indicates significance at 10%, 5% and 1% respectively (based on robust standard errors).*

Using these principal components for regression we obtain the results as presented in the Table 3.9. As we can see the first components of both IEF and EBRD

data are positive and significant while both of the second components are not. The results for economic freedom is reassuring when the simple average index is significant but just some of individual variables are (Table 3.3 and 3.4). The result for the EBRD components confirms the importance of liberalisation, including price liberalisation. An increase in any liberalisation measures will lead to considerably higher score for the first EBRD principal component and this is associated with higher investment rate. With regard to control variables we have similar results as compared to previous specifications.

Another method to reduce data dimension is factor analysis. The difference between principal component analysis and factor analysis is that principal component method uses all variability in an item while factors analysis uses only the variability in an item that it has in common with the other items for identifying a latent structure. Often, factor analysis is seen as a better tool to detect the underlying structure of the data and more accurate (Widaman, 1993). In an attempt to add robustness to this study we perform factor analysis to nine economic freedom indexes and eight EBRD transition indexes to extract factors for regression analysis. Different criteria also suggest that two factors should be retained for both economic freedom and transition progress. Usually, after factor analysis researchers use rotation methods to simplify and clarify the data structure in order to have a clearer picture of the relationship between the factors and the underlying variables. However, there are cases in which we can interpret the factors in terms of underlying variables without rotation. Here, we try to use both rotated and unrotated factors. Rotation techniques are either orthogonal or oblique but oblique rotation is often preferred because there are no *ex ante* reasons to believe that factors are not correlated.

Table 3.10

Loadings on rotated and unrotated factors of IEF and EBRD

IEF indexes					EBRD indexes				
	F1	F2	F3	F4		F1	F2	F3	F4
BIZF	**0.803**	0.018	**0.743**	0.119	LSPRI	**0.909**	0.018	0.414	0.342
TRAF	0.473	0.221	0.101	**0.378**	SSPRI	**0.906**	0.211	0.158	0.687
FISF	-0.070	**0.624**	0.153	0.095	RESTRU	**0.935**	-0.161	0.770	0.084
GOV	-0.623	**0.472**	-0.143	-0.121	PLIB	0.794	0.357	-0.068	**0.954**
MONF	0.267	**0.541**	-0.030	0.138	TRA_FOREX	0.886	0.302	0.076	**0.820**
INVF	**0.818**	0.103	**0.918**	-0.067	COMPET	0.844	-0.275	**0.886**	0.054
FINF	**0.806**	0.250	0.647	0.077	BANK_IR	**0.939**	-0.100	0.700	0.150
PROPF	**0.870**	-0.169	0.686	0.142	SECU	0.835	-0.336	**0.984**	-0.088
CORF	0.780	-0.082	0.246	0.105					

Note: F1 and F2 are the first two unrotated factors; F3 and F4 are the first two rotated factors using oblique rotation.

Table 3.10 shows the relationships between the two rotated and unrotated factors and the economic freedom and transition indexes. When no rotation is used the factors have high loadings from many indexes, which makes it difficult to identify a common concept covering those indexes. When rotation is applied we can see a clearer pattern of relationship between the factors and indexes. For economic freedom, we can see that F3 is defined by investment freedom and business freedom while F4 is defined by trade freedom. For transition progress, F3 is defined by scores for securities markets and competition while F4 is characterized by price liberalization and liberalization in trade and foreign exchange. The IEF's F3 can be thought of as an indicator of the economic institution that supports entrepreneurship. The EBRD's F4 can be generalized as an index of price liberalization. Using these factors for estimation we get the results reported in Table 3.11.

Because oblique-rotated factors are by definition correlated they are not used in the same regression equation[32]. In general the results are similar to those obtained by using principal components. We have positive and significant effects of institutional indicators on investment rate. If we use unrotated factors then both IEF's F1 and F2 are significant (column 1-3) while only EBRD's F1 is significant. Property rights index loads the most on the unrotated IEF factor 1 which has a positive and significant effect on investment. This shows that property rights are really important if investment is to be increased to achieve higher rate or growth.

We are more interested in models with rotated factors and all of them are significant and positive as expected. Previous results show that business freedom and investment freedom, in isolation, can hardly have significant effect on investment but when they are combined in a single measure (IEF Factor 3) they do have significant effect on investment (column 4). The IEF's F4 is a puzzle since it largely defined by trade freedom which is not significant alone. Here, in contrast to the results in Table 3.7, we see that price liberalization can serve as an important driver of investment. However, price liberalization must be accompanied by other transition measures as well. This suggests that the results in Table 3.7 may be affected by missing variable problem.

[32] In fact, correlation between IEF's F3 and F4 is 0.95 and between EBRD's F3 and F4 is 0.83, which reflects the fact that underlying indexes are correlated.

Table 3.11

Estimation with IEF and EBRD unrotated (F1 and F2) and rotated (F3 and F4) factors

	Economic freedom					EBRD transition progress				
	IEF F1 and F2 (1)	IEF F1 (2)	IEF F2 (3)	IEF F3 (4)	IEF F4 (5)	EBRD F1 and F2 (6)	EBRD F1 (7)	EBRD F2 (8)	EBRD F3 (9)	EBRD F4 (10)
Factor 1	1.741**	1.843**		1.569*		2.376***	2.318***		1.958**	
Factor 2	0.954*		1.007*		2.807***	0.149		-0.32		2.261**
Lagged growth	-0.004	0.028	-0.006	0.029	-0.001	0.111**	0.111**	0.165***	0.119***	0.122**
Lagged saving	0.129**	0.138**	0.14**	0.136**	0.14**	0.109***	0.108***	0.106***	0.106***	0.111***
Openness	0.011	0.02	0.007	0.02	0.014	0.007	0.007	0.022	0.009	0.01
M3/GDP	0.106***	0.117***	0.111***	0.121***	0.097***	0.065***	0.063***	0.06**	0.056**	0.073***
Inflation	-0.002	-0.003	-0.002	-0.003	-0.003	0.002*	0.001*	0	0.001	0.002*
Government consumption	0.113	0.101	0.111	0.097	0.109	-0.074	-0.075	-0.136	-0.084	-0.083
Constant	14.802***	13.325***	14.921***	13.316***	14.623***	18.448***	18.56***	18.834***	19.04***	17.869***
Estimation method	FE	FE	FE	FE	FE	RE	RE	RE	RE	RE
Number of observations	325	325	325	325	325	361	361	361	361	361
R^2	0.29	0.28	0.28	0.28	0.29	0.29	0.28	0.23	0.27	0.28

, ** and * indicates significance at 10%, 5% and 1% respectively (based on robust standard errors).*

6. CHAPTER CONCLUSION

Investment is the vehicle of growth and efficiency. Without investment growth cannot be sustained. More importantly, investment is the channel of "creative destruction" that both raises production capacity and improves efficiency. For transition countries investment plays a very important role because they need to restructure their economies to shift production from central planning to market economy. Therefore, it is important to understand what drives investment in transition economies.

This chapter shows that institutional factors play a significant role in explaining investment differences. In general, higher degree of both economic and political freedoms is associated with higher ratio of investment to GDP. However, it should be stressed that one individual aspect of economic institution alone would not make much difference. It is the overall bettering of the economic institutions that matters in inducing investment. However, seems that investment and business freedoms may be emphasized as key aspects of economic institutions that can strongly drive investment.

As far as political freedom is concerned political rights are seems to be more important than civil liberties in promoting investment. Since many studies have confirmed that institutions have significant effect on growth, even after controlling for investment, and given the fact that investment has been found to have significant effect on growth, our results further strengthen the argument for institutions as significant factors in explaining economic growth. This is in line with Dawson's (1998) claim that institutions affect growth directly through total factor productivity and indirectly through investment.

In addition, this chapter shows that those who are ahead in the transition process have higher investment rate, especially with regard to large scale privatization and price

liberalization. This should be an encouragement for transition countries that are still lagging behind in the race to building a mature market economy. Last but not least, domestic saving and financial development is crucial if transition countries are to boost investment and achieve healthy growth. In general, the findings in this chapter are in line with previous findings in the literature on determinants of investment. Our findings are robust to different measures of institutions and specifications. Of course, they are may be questioned on the ground of data quality and the general implications should be viewed in the context of transition economies.

CHAPTER IV- EFFECTS OF BANK OWNERSHIP ON BANK LENDING - THE CASE OF INDIA

1. INTRODUCTION

Traditional macroeconomic models such as the IS-LM assume that monetary policy affects the real economy by changing interest rates which, in turn, affects the investment demand of the firms. This line of argument has increasingly come under scrutiny. To begin with, there is evidence to suggest that investment decisions of firms are affected much more by factors such as cash flows rather than by the cost of borrowing (Bernanke and Gertler, 1995). Further, there is evidence to suggest that banks are not passive intermediaries between the central bank and end users of money such as the firms. For example, in an early discussion of this issue, Bernanke and Blinder (1992) demonstrate that the composition of banks' portfolios changes systematically in response to monetary policy initiatives. They conclude that the impact of monetary policy on the investment of firms is not entirely demand driven, and that at least part of it can be explained by the supply side or the bank lending channel. Kashyap and Stein (1995) demonstrate that if a central bank pursues tighter monetary policy, there is a decline in the amount of bank loans to firms and simultaneously a rise in the issuance of commercial paper, and conclude that contractionary monetary policy reduce loan supply.

Research suggests that there might be significant heterogeneity in the reaction of banks to monetary policy initiatives. Peek and Rosengren (1995) argue that an important determinant of a bank's reaction is its capital-to-asset ratio. If banks find it difficult (or expensive) to raise capital, for example, they would be reluctant to lend

even if there is ample demand for credit in the aftermath of easing of monetary policy. This hypothesis finds significant support in the empirical literature. Kishan and Opiela (2000) find that monetary policy affects most banks that are small and undercapitalised. Gambacorta (2005) too finds that lending of undercapitalized Italian banks is adversely affected by contractionary monetary policy, even though lending is not correlated with bank size. Further, there is a directional asymmetry in the impact of monetary policy on the lending behaviour of undercapitalised banks (Kishan and Opiela, 2006). In the event of contractionary monetary policy, there is a sharp tightening in loan disbursal by undercapitalised banks, but in the event of an expansionary monetary policy there is no corresponding expansion of credit disbursal.

The reaction of banks to monetary policy would also depend on the composition of their assets. The traditional or money view of monetary policy transmission assumes that all asset classes are perfect substitutes of each other. If, therefore, contractionary monetary policy leads to a reduction in deposits, a bank is capable of substituting for this loss of deposits dollar for dollar, using other assets like CDs, such that loan supply would not be affected. Stein (1998) argues that, contrary to this view, assets included in a bank's balance sheet are not perfect substitutes. For example, since deposits are guaranteed by the Federal Deposit Insurance Corporation (or its overseas counterpart), while CDs are not, there may be adverse selection in the market for CDs, such that banks will not use these instruments to compensate for loss of deposits dollar for dollar. This would result in a decline in loan supply. It follows that banks that have less liquid assets such that it cannot quickly and costlessly compensate for loss of deposits in the event of contractionary monetary policy or, alternatively, those that cannot raise funds quickly to the same end, would react more to monetary policy changes. Kashyap and

Stein (2000) find that monetary policy has greater impact on loan supply of small banks and banks with low securities-to-assets ratios.

The literature does not, however, examine the impact of bank ownership on the lending channel of monetary policy transmission. This is hardly surprising, given that much of the literature is based on the United States and Western European experiences, where private ownership of banks overwhelmingly dominates. However, as pointed out by La Porta *et al.* (2002), state-ownership of banks is ubiquitous in much of the world, especially in emerging markets. Indeed, the 2008-09 financial crisis has led to emergence of significant state ownership of banking assets in countries such as the United Kingdom, and concerns about the lending activities of the de facto nationalised banks have brought into focus the impact of bank ownership on the lending channel in the developed country context as well. This chapter tries to address this gap in the literature and examine whether the impact of monetary policy on lending differs across banks depending on their ownership.

India is a fast growing emerging market that embraced the market economy in the early nineties and has since liberalised its economy substantially. Importantly, in the absence of a well developed market for corporate bonds,[33] banks are by far the largest source of credit for Indian companies,[34] and hence bank lending plays an important role in the transmission of monetary policy in India. The Indian banking sector is also marked by the presence of a number of state-owned and private-owned (including foreign) banks, who compete on a level playing field. The state-owned banks themselves have autonomy regarding lending decisions, and many of them have sold shares to private (and even foreign) shareholders, thereby opening themselves up to

[33] Corporate bonds account for only 3 percent of the Indian bond market (Asuncion-Mund, 2007).
[34] Domestic credit provided by banking sector increased from 44.1% in 1995 to 64.2% of GDP in 2007 (World Bank Development Indicators, 2008).

greater scrutiny. The state-owned banks are somewhat less efficient than their privately owned counterparts (Kumbhakar and Sarkar, 2003). However, evidence suggests that, contrary to the popular wisdom about state-owned companies, ownership does not significantly affect profitability of Indian banks (Sarkar *et al.*, 1998; Bhaumik and Dimova, 2004). The state maintains an arm's-length relationship with the banks, such that the banks are autonomous and focussed on profitability. In that respect, the state-owned and privately-owned banks are similar, and hence the presumption of profit focus that underlies the analyses of banks in the stylised literature is applicable to all Indian banks. There are, nevertheless, important differences between state-owned and privately-owned banks in terms of their customer base (Berger *et al.*, 2008), and also in terms of factors that affect their lending (Bhaumik and Piesse, 2007). Therefore, there are likely to be differences in ways in which the state-owned and privately-owned banks react to monetary policies affected by India's central bank, the Reserve Bank of India (RBI).

The results of this chapter indicate that banks of different types respond very differently to monetary policies in different monetary regimes. In easy regime, public and foreign banks cut back on lending following monetary tightening but others do not seem to react. On the contrary, when the state of the monetary environment is easy they either do not respond (new private and foreign banks) or increase lending in the face of monetary tightening.

The rest of the chapter is structured as follows: Section 2 provides an overview of the banking system and the operation of monetary policy in India. Section 3 explains the empirical methodology and the model specification, and discusses the data. The results are discussed in Section 4. Finally, Section 5 concludes.

2. BANKING SECTOR AND MONETARY POLICY IN INDIA

2.1. Banking Sector

Independent India inherited a weak financial system. Commercial banks mobilized household savings through demand and term deposits, and disbursed the credit primarily to large corporations (Ghosh, 1988). This lop-sided pattern of credit disbursal, and perhaps a spate of bank failures that reduced the number of banks from 566 in 1951 to 90 in 1968, led the government to nationalize the banks in 1969. The main thrust of nationalization was social banking, with the stated objective of increasing the geographical coverage of the banking system, and extension of credit to the priority sector that comprised largely of agriculture, agro-processing, and small-scale industries. This phase of banking in India was characterized by administered interest rates, mandatory syndicated lending, and pre-emption of the banks' deposit base by the government in the form of measures like the statutory liquidity ratio (SLR). Banks were required to invest a significant proportion of their deposits in bonds issued by the government and "approved" (quasi-government) institutions. At the same time, between 1969 and 1990, the nationalized banks added over 55,000 branches to their network (Sarkar and Agarwal, 1997).

While the social agenda of the banking sector, measured in terms of geographical and sectoral coverage, was arguably a success, the Indian banking sector, about 88 percent of whose assets were managed by state-owned banks, was in distress. While the ratio of gross operating profit of the scheduled commercial banks rose from 0.8 percent (of assets) in the seventies to 1.5 percent in the early nineties, the net profit of the banks declined. More importantly, perhaps, financial repression involving state-owned banks was not in harmony with the agenda of real sector reforms that the

government of India unleashed in the aftermath of the balance of payments crisis of 1991. The Reserve Bank of India (RBI), therefore, initiated reform of the banking sector in 1992, based on the recommendations of Narasimham Committee I (see Reddy, 1999).

Between 1992 and 1997, the cash reserve ratio (CRR) was reduces from 15 percent to about 10 percent, and the statutory lending requirement (SLR) was reduced from 38.5 percent to 25 percent over the same period. The interest rates were gradually liberalized. Prior to 1992, the lending rates structure consisted of six categories based on the size of advances. During the 1992-94 period, the lending rates structure was rationalised to three categories, and in 1994 banks were given the freedom to determine interest rates on all loans exceeding Indian rupees (INR) 200,000 (i.e., USD 4,500). By 1998, banks were free to determine the interest rates for all loans, with the understanding that the lending rates on loans up to INR 200,000 would not exceed the declared prime lending rates (PLR) of the banks.

Prior to the initiation of reforms, banks were required to refer all loans above a size threshold to the RBI for authorization, and formation of a consortium was mandatory for all loans exceeding INR 50 million (about USD 1 million at currently exchange rate). Bank credit was delivered primarily in the form of cash credit for use as working capital, and there were significant restrictions on the ability of banks to deliver term credit for projects. Finally, the RBI implemented selective credit controls on "sensitive" commodities.

In the wake of the reforms, as early as in 1993, the threshold for the mandatory formation of consortiums was raised from INR 50 million to INR 500 million. Further, banks within consortiums were permitted to frame the rules or contractual agreements governing the consortium lending. In 1996, selective credit controls on all sensitive

commodities except sugar were removed. Banks were also allowed much greater flexibility about the proportion of the cash credit component of the loans, the new floor being 25 percent. The following year witnessed further elimination of credit controls: Banks were no longer subjected to the instructions pertaining to Maximum Permissible Bank Finance (MPBF), and were allowed to evolve their own methods for assessing the credit needs of the potential borrowers. Further, banks were no longer required to form consortiums to lend in excess of INR 500 million (about USD 10 million at current exchange rate), and restrictions on their ability to provide term loan for projects were withdrawn. However, prudential regulations required that an individual bank not be over-exposed to any one (or group of) creditor(s).

Finally, in 1998, the RBI initiated the second generation of banking reforms, in keeping with the recommendations of Narasimham Committee II. The most important recommendation of the Committee was the creation of asset reconstruction companies (ARCs) to simultaneously improve the quality of the balance sheets of the banks and to facilitate recovery of loans. In a separate development, after a prolonged period of legal disputes, debt recovery tribunals (DRTs) began functioning in India, in earnest, by 1999.

Another important aspect of the Indian banking reforms in 1990s is the opening up of the banking market to private and foreign entries and privatization of state-owned banks. New private banks and foreign banks are allowed to establish. Foreign investors are allowed to hold up to 74% of private banks. At the same time ownership in public sector banks is diversified with government shareholding reduced to 51% in many banks. Currently, most of the state-owned banks in our sample have been listed in Indian stock exchanges.

To summarize, by 1996, banks operating in India, were, by and large, in a position to take independent decisions on the composition of their asset portfolio, and on the choice of potential borrowers. Furthermore, there is evidence to suggest that these banks, including the state-owned ones, allocated resources in a way that was consistent with maximization of returns.[35] There are, however, significant differences across credit market behaviour of banks of different ownership. Berger *et al.* (2008) find that comparative advantage of Indian banks with respect to relationship with potential borrowers varies considerably with ownership. State-owned banks typically have banking relationship with small firms, state-owned firms and rural firms, domestic private banks have comparative advantage with respect to opaque closely held firms, and foreign banks have banking relationship with large, listed and foreign firms. The likelihood of adverse selection, therefore, depends on ownership type. Bhaumik and Piesse (2008) demonstrate that bank ownership also has an impact on risk aversion among Indian banks, with foreign banks being significantly more risk averse than domestic banks. Since the impact of monetary policy on bank lending depends in large measure on the risk of adverse selection and the extent of risk aversion of banks, we should expect to see considerable differences in the impact of such policy on banks of different ownership.

2.2. Monetary Policy

The authority to implement monetary policy in India rests with the RBI. It was established under the Reserve Bank of India Act of 1934, as a private shareholders'

[35] The empirical literature on the Indian banking sector (e.g., Bhaumik and Dimova, 2004) suggests that the public sector banks were responding to the changed policy and competition paradigm, and that, by the end of the 1990s, ownership itself could no longer explain cross-sectional variations in profitability of banks. Since catching up with the profitability and, conversely, cost efficiency, of the private sector and foreign banks requires that the public sector banks be able to allocate their resources efficiently, there is *prima facie* evidence to suggest that the public sector banks too are behaving as optimizing agents.

bank, and was subsequently nationalised in 1949. Unlike the Bank of England, which was formally granted independence in 1997, the RBI does not have de jure independence from the Government of India. However, with the end of automatic monetisation of fiscal deficit by 1997, the central bank was granted de facto independence. There are strict limits on the ways and means advances by the RBI to the government, and the former does not participate in primary market auctions of government securities. While the RBI takes into account the federal government's views about the state of the economy, it de facto sets monetary policy independently.

Originally, the bank rate and open market operations were the RBI's instruments of choice for conducting monetary policy. In the seventies and eighties, with increased accommodation of the federal government's fiscal policies by the central bank, these instruments lost their efficacy, and the cash reserve ratio (CRR) became the primary instrument for conducting monetary policy. In 1998, in light of the realisation that in an increasingly complex environment broad money supply in the medium term cannot be the sole intermediate target of monetary policy, the RBI formally adopted a multifactor approach to monetary policy. This resulted in a focus on the use of short term interest rates as the instruments of monetary policy, facilitated by the deregulation of interest rates, which was initiated as early as 1989. The bank rate, therefore, made a comeback in 1997-98, and was complemented by the rates for reverse repo (and, from 2000-01, repo) transactions. The repo and reverse repo rates have emerged as the primary instruments of monetary policy since the turn of the century. The CRR, which was reduced steadily from 15 percent in the early nineties to 5 percent by 2004, has not completely been abandoned. It is still used in situations that demand significant monetary response, or when other monetary policy options have been exhausted.

Table 4.1

RBI monetary policy operations

Year	Bank rate (%)			CRR (%)			REPO (%)[a]			Reverse REPO (%)[b]		
	1 April	31 March	No. of changes	1 April	31 March	No. of changes	1 April	31 March	No. of changes	1 April	31 March	No. of changes
1996-1997	12	12	0	14	10	7	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1997-1998	12	10.5	5	10	10.25	5	n.a.	n.a.	n.a.	4.5**	8	5
1998-1999	10.5	8	3	10.25	10.5	3	n.a.	n.a.	n.a.	8	6	5
1999-2000	8	8	0	10.5	9	3	n.a.	n.a.	n.a.	6	10	4
2000-2001	8	7	4	9	8	6	11.5%	9	6	10	6	5
2001-2002	7	6.5	1	8	5.5	3	9	8	5	6	5	6
2002-2003	6.5	6.25	1	5.5	4.75	2	8	7	4	5	4.5	1
2003-2004	6.25	6	1	4.75	4.5	1	6	6	1	4.5	4.75	1
2004-2005	6	6	0	4.5	5	3	6	6	0	4.75	4.75	0
2005-2006	n.a.	n.a.	n.a.	5	5	1	6	6.5	2	4.75	5.5	3
2006-2007	n.a.	n.a.	n.a.	5	5.5	1	6.5	7.75	5	5.5	6	2

Source: RBI Annual Reports

Note: [a] Started in June 2000

[b] Started on 27 November 1997

The use of all monetary policy instruments of the RBI are summarised in Table 4.1. It is evident that it is difficult to select any one instrument as the indicator of monetary policy of the RBI. This poses a problem because empirical analysis requires the use of a single monetary policy signal; the US literature on the lending channel of monetary policy focuses on changes in the federal funds rate (Kashyap and Stein, 1995 & 2000), while the European literature uses short-term interest rates (Erhmann *et al.*, 2001) or the refinancing rate (Gambacorta, 2005). However, Indian banks declare their respective prime lending rates (PLR) – the rate at which they are prepared to lend to the most credit-worthy borrowers – that is linked to their cost of funds. The average PLR of the five largest banks is quoted by the RBI. As shown in the Figure 4.1 in the Appendix, movements of this average PLR closely replicates movements in the CRR, bank rate, and, to a somewhat lesser extent, also the repo and reverse repo rates[36]. Hence, we use the average PLR reported by the RBI as the basis for our measure of monetary policy. We are not alone in our use of such constructs as the basis for the measure for monetary policy. In the British context, Huang (2003) used the average of the base rates of selected banks as the indicator of monetary policy, while Hofmann and Mizen (2004) eschewed the official Bank of England rate in favour of the average of the base rates of four major clearing banks.

3. DATA AND METHODOLOGY

In the traditional IS-LM model, a reduction in money supply is immediately translated into a higher equilibrium interest rate in the money market, and this in turn affects the real sector through a reduction in investment. On a bank's balance sheet, a

[36] The coefficients of correlation between the PLR and the CRR, bank rate and repo rate are 0.94, 0.97 and 0.56 respectively.

reduction in deposits on the liability side is matched by a reduction in the bank's holding of bonds and loans on the asset side. If bonds and loans are perfect substitutes, as in the traditional Keynesian framework, there would be proportionate reduction in the bonds and loans portfolios. The impact of monetary policy on the asset composition of the banks (and the firms, the borrowers) is of no interest.

Now, suppose that bonds and loans are imperfect substitutes. For example, at least some of the banks might find it easier to both build up and unwind their loan portfolios than their bond portfolios. In the presence of such imperfections in capital market access, a contractionary monetary policy is likely to be followed by a much greater reduction in loan supply than in sale of (or a drop in the demand for) bonds.[37] The literature on the bank lending channel of monetary policy transmission takes this change in the asset composition of banks into consideration.

As discussed earlier in this chapter, there can be considerable cross-sectional variation in the nature of bank's reaction to monetary policy. Banks with strong linkages with their corresponding borrower pools, with resultant amelioration of the informational asymmetry and hence credit risk, might downsize (or reduce the growth of) their loan portfolios less in response to contractionary monetary policy than other banks. On the other hand, less capitalised banks and smaller banks that find it more difficult to raise capital might cut back on lending (or reduce lending growth) far more than larger and well-capitalised banks. Since these cross-sectional variations affect only the supply side of the loan market – the banks and not the firms that demand credit –

[37] Alternatively, if bonds are safer than loans, which is often the case in developing countries where the main issuer of bonds are the sovereign governments, a monetary contraction initiated by a central bank might trigger a flight to the less risky asset, with banks downsizing their loans portfolios much more aggressively than their bonds portfolios (Bernanke *et al.*, 1994; Ashcraft and Campello, 2002). This is the so-called balance sheet channel of monetary transmission that, together with the bank lending channel, comprises the credit channel of monetary policy transmission.

they can be used to circumvent identification problem of empirical modelling of the bank lending channel, i.e., distinguishing between the demand and supply side effects of monetary policy on the amount of loans disbursed.

In keeping with the literature, the theoretical basis for which can be found in Ehrman *et al.* (2003) and Gambacorta and Mistrulli (2004), we model change in loans disbursed by bank *i* (y_i) as a function of the change in the monetary policy instrument (MP) – the average PLR of the five largest Indian banks in our case. Given the aforementioned cross-sectional heterogeneity in banks' response to monetary policy based on their characteristics, we control for three different bank characteristics in our specification, namely, liquidity (LIQ), capitalisation (CAP) and profitability (PROFIT). This is consistent with the stylised literature (Gambacorta, 2005). In light of the evidence that suggests that bank behaviour in India can be affected by being subjected to market scrutiny (see Bhaumik and Piesse, 2008), we also include in our specification a dummy variable (LISTING) that takes the value 1 if a bank is listed at one of the country's stock exchanges. Finally, in order to further facilitate identification to distinguish between loan demand and loan supply, we include industrial growth (IND) that affects the demand for funds much more than banks' behaviour.[38]

Our base specification, therefore, is as follows:

$$\Delta y_{it} = \alpha + \beta \Delta MP_{t-1} + \gamma_1 \Delta CAP_{i,t-1} + \gamma_2 \Delta LIQ_{i,t-1} + \gamma_3 PROFIT_{i,t-1} + \gamma_4 LISTING_{i,t} + \gamma_5 IND_{t-1} + \mu_i + \varepsilon_{it} \quad (4.1)$$

[38] In the literature, the controls for loan demand usually are GDP growth rate and the inflation rate, sometimes used together in the specification. However, there is evidence to suggest that in the Indian context bank's behaviour is influenced more by industrial growth than by GDP growth (Bhaumik and Piesse, 2008), and hence our choice. We also experimented with specifications that included the inflation rate, in isolation as well as together with the industrial growth rate. The coefficient of inflation was never significant, and hence we do not report that specification in the thesis.

where *t* represents time, i the index of bank, μ_i is the bank-specific fixed effect and ε_{it} is the i.i.d. error term. In the literature, bank lending models are usually estimated using quarterly data. Since a change in monetary policy in quarter *t* is likely to affect disbursal in bank loans with at least a one-period lag, Δy_{it} is modelled as a function of monetary policy in the previous four quarters. However, in the Indian context, only annual data are available for banks, such that the time unit of analysis is a year, as opposed to a quarter. Therefore, we assume that a change in monetary policy in a given year will affect loans disbursal of the following year. Hence, we model Δy_{it} as a function of $\Delta MP_{i,t-1}$, the lagged change in the monetary policy indicator.

Our empirical approach is different from the literature in several ways. Since our study focuses on the differences in the reactions of banks with different ownership to monetary policy, we interact bank ownership dummies with $\Delta MP_{i,t-1}$. Second, we argue that a given change in interest rates cannot have the same impact in a tight and an easy monetary regime; a 50 basis point increase in the interest is likely to have a very different impact on loan disbursal when the initial value of the interest rate is (say) 8 percent, compared to the case when the initial value of the interest rate is (say) 2 percent. Hence, we further interact the $\Delta MP_{i,t-1}$ variable with an indicator of the nature of the monetary regime. In other words, our regression estimates identify the impact of monetary policy on loan disbursal for banks of each ownership type, in each monetary regime. In order to facilitate this process further, following Huang (2003), we include interactions between $\Delta MP_{i,t-1}$ and indicators of both of these type of regimes: a dummy

variable *MCI* that takes the value 1 in an easy monetary regime, and its inverse *IMCI* that takes the value 1 in a tight monetary regime[39].

The resultant specification is as follows:

$$\Delta y_{it} = \Sigma_j \alpha_j (IMCI_{t-1} \times \Delta MP_{t-1} \times OWN_{jit}) + \Sigma_j \beta_j (MCI_{t-1} \times \Delta MP_{t-1} \times OWN_{jit}) + \gamma_1 \Delta CAP_{i,t-1} + \gamma_2 \Delta LIQ_{i,t-1} + \gamma_3 PROFIT_{i,t-1} + \gamma_4 LISTING_{it} + \gamma_5 IND_{t-1} + \mu_i + \varepsilon_{it} \quad (4.2)$$

where *OWN* is a dummy variable capturing type of bank ownership and *j* is the index of the types of bank ownership.

This equation represents a collection of baseline equations that are estimated for each bank group in each monetary regime while setting dummies for other bank groups to zero. So if the coefficient α_j of $IMCI_{t-1} \times \Delta MP_{i,t-1} \times OWN_{jit}$ is negative it means when the last period regime is tight banks of that ownership type j would lower their lending if there was an increase in last period monetary indicator MP. Similarly, if the coefficient β_j of $MCI_{t-1} \times \Delta MP_{t-1} \times OWN_{jit}$ is negative it means when the last period regime is easy banks of ownership type j would decrease their lending if MP rate increased in the past period.

The data for the estimation are obtained from a number of sources. Bank balance sheets are obtained from the Indian Banks' Association. Using these financial statements, we are able to measure the change in loan disbursal by each bank during each financial year (Δy_{it}). We measure *CAP* as the log of capital and reserves, *LIQ* as the log of liquid assets, and *PROFIT* as the return on assets. The information about year of stock exchange listing of banks is obtained from the Prowess database marketed by

[39] This approach is also used by Oliner and Rudebusch (1996) to estimate the asymmetric effect of cash flow on investment in a monetary tightening and by Vermeulen (2000) to estimate the additional financial accelerator effect in periods of recessions.

the Centre for Monitoring the Indian Economy. The ownership types of the banks[40] – public sector, old domestic private, new domestic private, and foreign – are obtained from the RBI. As mentioned earlier in the chapter, the central bank is also the source for our measure of monetary policy. We measure ΔMP_{it} as the change in the yearly average of the aforementioned PLR. Finally, the indicators of easy and tight monetary regime are obtained from the monetary conditions index (MCI) estimated by Kannan *et al.* (2006).

An MCI is a weighted average of the change in the domestic interest rates and exchange rates relative to their values on a pre-specified base date. The weights could be derived from empirical economic models that estimate the impact of these variables on either aggregate demand or prices. When the MCI is positive (negative) the monetary condition is said to be tight (easy). While there are doubts about the use of MCIs as an operational tool it is widely accepted that MCIs can serve as an important indicator of monetary stance (Hyder and Khan, 2007; Kannan *et al.*, 2006). According to the Kannan *et al.*' (2006) estimation the weights of interest rate and exchange rate are equal 0.58 and 0.42 respectively, suggesting a more important role of interest rate for the macroeconomic environment. This MCI turns out to explain the monetary policy environment better than either interest rate or exchange rate does independently when matched with actual past macroeconomic episodes of the Indian economy.

[40] The nature of public sector (or state-owned) and foreign banks are easily understood, even though it should be noted that private investors own minority shares in a number of public sector banks. The distinction between the two types of domestic private banks is more complex. The *old* domestic private banks were in operation much before the initiation of the financial reforms in the early 1990s. They were typically closely held, often by members of trading communities. Subsequent to the reforms, many of these banks have floated themselves on stock exchanges and have expanded beyond their traditional geographical enclaves. The *new* private banks came into existence after the financial reforms paved the way for market entry for new banks. Many of them have links to large former or existing non-bank financial institutions. These de novo banks by and large have professional management, almost always are stock exchange listed, and have expanded their shares of the deposit and loans markets aggressively. For further details, see Sarkar, Sarkar and Bhaumik (1998) and Bhaumik and Dimova (2004).

Following Bhaumik and Piesse (2008), we include in our sample banks with at least two branches. This primarily leads to exclusion of foreign banks that have a sole branch in India to finance trading activities of their respective client multinationals. We also exclude from our sample banks that experienced very large changes to their balance sheets, often on account of acquisition of non-banking assets of other financial organisations, or on account of financial distress. Our final sample consists of 58 banks, and the data covers the 2000-07 period, resulting in over 300 bank-year observations (we lose one year of data due to lagging). Of these banks, 24 are public sector banks, 21 are old private sector banks, 3 are new private sector banks and 10 are foreign banks. Summary statistics of the variables used in the regression model are reported in Table 4.2.

In general, Indian public banks are much larger than private banks. Indian public banks' lending grows faster than that of private banks but private banks' lending growth under tight regime is higher than their lending growth under easy regime. Term-wise speaking, Indian private banks make relatively more short-term advances than public banks.

Table 4.2
Summary statistics by bank ownership and monetary regime

Variable		Public banks			Private banks		
		All	Easy	Tight	All	Easy	Tight
Level and ratio							
Total assets	Mean	52846.43	57588.06	49290.21	7834.33	8675.76	7216
	Std. Dev.	75552.61	80082.95	72190.76	8978.79	9257.59	8752.08
Capital and reserves	Mean	2712.99	2981.494	2511.611	564.76	654.084	498.44
	Std. Dev.	3822.872	4022.267	3674.706	772.78	811.65	738.74
Liquid assets	Mean	22302.41	25337.98	20025.74	2713.12	3130.53	2412.71
	Std. Dev.	35251.67	39345.45	31863.85	2905.52	3109.8	2721.66
Advances	Mean	23474.7	25374.02	22050.21	3719.32	4142.14	3408.61
	Std. Dev.	32289.41	31536.51	32934.94	4422.98	4466.68	4381.54
Advances, debentures and bonds	Mean	26117.14	28077.81	24646.65	4243.66	4745.03	3875.23
	Std. Dev.	34877.7	34350.24	35375.83	4945.26	5222.77	4717.16
Short-term advances	Mean	8926.752	9535.028	8423.351	1943.48	2187.42	1750.68
	Std. Dev.	12004.92	12821.93	11334.99	2382.46	2630.69	2157.79
Medium-term advances	Mean	8206.04	8555.75	7916.62	1093.68	1121.28	1071.86
	Std. Dev.	11223.34	9452.559	12548.61	1435.51	1343.57	1509.26
ROA (%)	Mean	0.96	1.13	0.832	1.1	0.794	1.32
	Std. Dev.	0.78	0.378	0.969	1.88	1.845	1.89
Listing on stock exchanges	Mean	0.65	0.750	0.583	0.64	0.65	0.64
	Std. Dev.	0.48	0.436	0.496	0.48	0.48	0.48
Growth							
Δ log of advances	Mean	0.197	0.201	0.193	0.157	0.132	0.175
	Std. Dev.	0.118	0.136	0.104	0.196	0.195	0.195
Δ log of advances, debentures and bonds	Mean	0.183	0.179	0.185	0.140	0.111	0.161
	Std. Dev.	0.127	0.145	0.112	0.193	0.189	0.193
Δ log of short-term advances	Mean	0.189	0.167	0.213	0.140	0.129	0.149
	Std. Dev.	0.212	0.187	0.237	0.324	0.321	0.328
Δ log of medium-term advances	Mean	0.190	0.188	0.193	0.102	0.012	0.177
	Std. Dev.	0.266	0.204	0.325	0.631	0.669	0.589
Δ log of capital and reserves	Mean	0.152	0.175	0.134	0.159	0.150	0.166
	Std. Dev.	0.143	0.157	0.129	0.186	0.196	0.179
Δ log of liquid assets	Mean	0.103	0.126	0.086	0.091	0.078	0.100
	Std. Dev.	0.131	0.107	0.144	0.238	0.250	0.228

All level variables are in Indian rupee crores (10 millions). Liquid assets include cash, balances with RBI and other banks, money at call and short notice, government and other approved securities. Short-term means less than 1 year and medium-term means from 1 year up to 3 years.

4. RESULTS AND DISCUSSION

We start our empirical exercise by estimating the baseline equation for all banks with no regard for monetary regime. This equation is normally conducted by the random effect (RE) or fixed effect (FE) methods but the FE method is more popular because the assumption of no correlation between the unobserved effect and explanatory variables that underlies the RE method is often seen as unrealistic.

Therefore, we use the FE method in this chapter to obtain consistent estimates[41]. Unfortunately, the estimation for the pooled data (i.e. banks of all type and no regime discrimination) does not yield any significant coefficients with very small F-statistic. This means that it is we cannot build a model for a sample of banks that are very heterogeneous and for both easy and tight monetary regimes. Therefore, we proceed by estimating equation (4.2).

When money regime is tight we expect that all banks will reduce their lending in the following year if there is a further tightening. In other words, we expect all the αs to be negative. However, in easy money regime a rate increase may not necessarily result in contraction of lending across the board. Some banks may have more customers who are refused by other banks. Some may have more available funds for lending thanks to expansionary monetary policy in previous years. In general, we cannot tell *a priori* the sign of the βs.

[41] We do use RE estimation but it does not detect unobserved effect while FE estimation does. We also try to estimate a dynamic panel model with the lag of log change of advances as an explanatory variable but it is never significant even though GMM assumptions are satisfied by Sargan/Hansen tests.

Table 4.3
Fixed effect estimation – determinants of credit disbursal (I)

	Dependent variable: log change in advances			Dependent variable: log change in advances and debentures		
	All banks	**State-owned**	**Private sector**	**All banks**	**State-owned**	**Private sector**
	(1)	(2)	(3)	(4)	(5)	(6)
Tight money regime						
Rate change x Public	-0.136***	-0.133***		-0.104**	-0.119**	
	(0.049)	(0.043)		(0.047)	(0.045)	
Rate change x Old private	-0.046		-0.07	-0.042		-0.049
	(0.048)		(0.054)	(0.044)		(0.054)
Rate change x New private	-0.069		-0.096	-0.111		-0.122
	(0.186)		(0.196)	(0.149)		(0.165)
Rate change x Foreign	-0.383***		-0.399***	-0.32***		-0.324***
	(0.082)		(0.088)	(0.093)		(0.102)
Easy regime						
Rate change x Public	0.078	0.049		0.153*	0.174	
	(0.059)	(0.058)		(0.081)	(0.104)	
Rate change x Old private	0.146**		0.169**	0.165***		0.169**
	(0.058)		(0.067)	(0.056)		(0.067)
Rate change x New private	0.1		0.063	0.054		0.012
	(0.277)		(0.242)	(0.217)		(0.19)
Rate change x Foreign	0.06		0.119	0.096		0.127
	(0.138)		(0.133)	(0.144)		(0.137)
Control variables						
Capital (lagged)	-0.09	-0.434	0.094	-0.095	-0.417	0.054
	(0.137)	(0.255)	(0.076)	(0.131)	(0.245)	(0.09)
Liquidity (lagged)	-0.059	-0.02	-0.066	-0.042	0.015	-0.053
	(0.059)	(0.108)	(0.065)	(0.054)	(0.117)	(0.059)
Return on assets (lagged)	0.056**	0.026	0.055**	0.054**	0.065	0.052**
	(0.025)	(0.05)	(0.026)	(0.024)	(0.053)	(0.025)
Stock exchange listing	-0.008	0.009	0.025	0.011	0.024	0.033
	(0.023)	(0.026)	(0.042)	(0.023)	(0.021)	(0.05)
Industrial growth (lagged)	0.04***	0.046***	0.044***	0.036***	0.043***	0.036***
	(0.008)	(0.008)	(0.012)	(0.008)	(0.009)	(0.013)
F-statistic	5.97	11.19	2.95	4.43	5	7.74
Prob(F-stat>0)	0	0	0	0	0	0
R-square	0.28	0.34	0.32	0.23	0.26	0.28
No. of observations	334	144	190	334	144	190

*The values in parentheses are robust standard errors. ***, **, * indicate significance at 1%, 5% and 10% levels, respectively.*

Table 4.3 shows estimation results when two measures of loan supply are used: advances (log change) and total advances, debentures and bonds (log change). Columns (1) and (4) are results of regressions of all banks; columns (2) and (5) are results of regressions of only public banks; and columns (3) and (6) are results of regressions of private banks only. The F-statistics show that the model as represented by the equation (4.2) fits the data well.

In general, when the regime is tight it seems that all banks reduce their lending. We have negative α as expected for all bank types and they are significant for public and foreign banks. The coefficient α of foreign banks is much larger than that of the public banks. So, the Indian public banks are more responsive to policy shocks than domestic private banks but less so than foreign banks. This result is the same for both measures of lending.

This result seems to be in contrast with the Micco and Panizza's (2006) result where public banks in a group of both developed and developing countries are less responsive to macroeconomic shocks than private banks. However, these private banks are both domestic and foreign owned. In addition, our result is just for period of tight monetary regime. The strong reaction of foreign banks suggests that they are more risk-averse than local banks. In addition, foreign banks often have disadvantages in obtaining and processing information about opaque firms (Stein, 2002) and they have less room in terms of customer base to cushion adversary shocks[42]. Foreign banks usually depend more on money market and funds from mother banks. In fact in 2006-07 the average credit-deposit ratio of the foreign banks in the sample is 105.9% while those of public banks and domestic private banks (both old and new) are 65% and 61.8%

[42] Berger *et al.* (2008) show that foreign banks in India tend to establish relationship with more transparent firms, mainly foreign and large local ones.

respectively. In the face of monetary tightening foreign banks often do not have relatively cheap working fund in form of deposits obtained from previous periods. Consequently, they have to cut back credits more sharply than domestic banks.

In easy money regime, banks expand their business. When interest rate is raised banks may significantly cut back their lending or go on to supply credit if they have relatively cheap funds obtained from previous periods or sources other than insured deposits. In Table 12 we see that in easy regime when monetary condition is tightened Indian banks either show no reactions or disburse more credit. All the coefficient βs are positive and they are significant for old private sector banks and public banks (in model (4), though not really strongly). In other words, public and old private sector banks still supply more credit when they face monetary contraction given that the previous period regime is easy.

There can be several explanations for this result. It may reflect the expectations about future state of market by old private banks and, to some extent, public sector banks. In easy money regime banks would expect an increase in interest rate to be temporary and they would expand their businesses in preparation for the future when conditions become favourable again. There may be some sort of strategic market expansion activities among the banks. When new private sector banks and foreign banks are following a kind of "wait and see" policy the public sector banks and old private banks may be more aggressive in credit disbursal in order to capture more market share. Another possible explanation is that old private banks have special relationship with their clients which are not affected by monetary policy shocks. One may argue that public sector banks are under some pressure to maintain the level of credit supply to their clients but this cannot explain why they supply substantially less credit PLR

increases and the previous regime is tight. This is clearly pointing to an asymmetric effect of monetary policy on bank lending. The result here shows some counteraction by old private and public banks against monetary shocks and it calls into question the effectiveness of monetary policy in easy monetary regime. Given that banks of different ownership types have different clienteles it should follow from the results here that monetary policies would have asymmetric effects across firms as well.

Of the control variables, capital and liquidity have no effect on credit growth. However, return on assets is positive and significant across estimations except for data of public banks only, which means profit is an important determinant of credit supply of Indian banks. As expected, industrial growth has positive and significant effect on credit supply and the effect is similar for different bank types and measures.

Table 4.4 presents estimation results when we use log change of short term (up to one year) and medium term (from one up to three years) advances as dependent variables. In general, we have similar pattern of banks' response to monetary shocks in terms of short-term and medium-term credit supply. Under tight regime, public and foreign banks reduce short-term and medium-term lending significantly while domestic private banks do not. Foreign banks' response is two to three times stronger than that of public banks, depending on the term of credit: they cut back on medium-term credit much more than short-term credit. This can be considered an evidence of risk-averseness. In difficult time, banks prefer short term advances over those of longer term for fear of future uncertainty.

Table 4.4
FE estimation – determinants of credit disbursal (II)

	Dependent variable: log change in short term advances			**Dependent variable: log change in medium term advances**		
	All banks	**State-owned**	**Private sector**	**All banks**	**State-owned**	**Private sector**
	(1)	(2)	(3)	(4)	(5)	(6)
Tight money regime						
Rate change x Public	-0.171	-0.22*		-0.3**	-0.069	
	(0.111)	(0.116)		(0.145)	(0.133)	
Rate change x Old private	-0.092		-0.078	-0.194		-0.353
	(0.124)		(0.153)	(0.2)		(0.26)
Rate change x New private	0.13		0.141	-0.391		-0.539
	(0.317)		(0.329)	(0.422)		(0.443)
Rate change x Foreign	-0.348***		-0.336**	-1.02***		-1.15***
	(0.123)		(0.14)	(0.345)		(0.347)
Easy regime						
Rate change x Public	0.142	0.253*		0.367**	0.105	
	(0.095)	(0.136)		(0.158)	(0.201)	
Rate change x Old private	0.326**		0.307*	0.287		0.446
	(0.164)		(0.173)	(0.343)		(0.371)
Rate change x New private	-0.081		-0.088	0.614		0.623
	(0.272)		(0.291)	(0.522)		(0.48)
Rate change x Foreign	-0.15		-0.141	0.552		0.721
	(0.449)		(0.514)	(0.733)		(0.784)
Control variables						
Capital (lagged)	-0.008	-0.216	0.018	0.305	0.227**	0.6
	(0.142)	(0.186)	(0.222)	(0.265)	(0.096)	(0.408)
Liquidity (lagged)	0.02	-0.093	0.031	-0.472**	-0.077	-0.517*
	(0.08)	(0.212)	(0.08)	(0.225)	(0.209)	(0.256)
Return on assets (lagged)	0.062**	0.19*	0.058**	-0.027	-0.164	-0.015
	(0.024)	(0.125)	(0.024)	(0.03)	(0.151)	(0.028)
Stock exchange listing	-0.051	0.039	-0.2	0.003	-0.298*	0.6
	(0.11)	(0.05)	(0.249)	(0.248)	(0.155)	(0.416)
Industrial growth (lagged)	0.031**	0.032*	0.029	0.081**	0.045*	0.115**
	(0.016)	(0.019)	(0.029)	(0.031)	0.029	(0.052)
F-statistic	2.09	2.78	2.03	3.99	2.39	4.47
Prob(F-stat>0)	0.03	0.03	0.057	0	0.054	0
Pseudo R-square	0.1	0.09	0.1	0.1	0.09	0.15
No. of observations	319	135	184	319	135	184

*The values in parentheses are robust standard errors. ***, **, * indicate significance at 1%, 5% and 10% levels, respectively.*

In easy regime we also obtain results similar to those of total advances regressions. State-owned banks lend more in both short term and medium term even though interest rate increases in previous period. However, old private banks only supply more short term loans in easy regime, perhaps because it is less risky than expanding medium-term loans.

Concerning control variables in Table 13, one point which is noteworthy is that banks' responses to industrial growth are much higher for medium term credit than for short-term credit. This is line with the fact that medium term advances are mostly provided to manufacturing firms as working capital.

5. *CHAPTER CONCLUSION*

In this chapter we analyze the effect of ownership on bank lending under different monetary regimes in the context of an important emerging economy. This empirical exercise has shown that banks of different types respond very differently to monetary policies in different monetary regimes. In easy regime, public and foreign banks cut back on lending when monetary tightening happens but others do not seem to be affected. On the contrary, when the state of the monetary environment is easy some either do not respond (new private and foreign banks) or increase lending in the face of monetary tightening.

In general the results support the existence of a bank lending channel in India but it is a peculiar one. It can either reinforce or attenuate, or even counteract the traditional effect of monetary policies. Public banks have been found to play a smoothing role in general (Micco and Panizza, 2006) but it is necessary to distinguish their responses under different regimes. The result of this chapter shows that Indian

public banks, following important reforms, are very active in responding to monetary shocks in under different monetary regimes.

The chapter has shown evidence of asymmetry of the effect of monetary policy on bank lending. When previous period regime is tight banks respond negatively to monetary shocks but when previous period regime is easy they do not respond or do so positively to monetary shocks.

Finally, the results of this chapter further stress the need to take careful consideration of the ownership structure of the banking system when policy measures are prescribed. Moreover, existing monetary environment should also be an important factor to be considered due to the asymmetric effect of monetary policy. As for many transition economies in Eastern Europe where the percentage of assets in banks with majority foreign ownership is high (Bonin *et al.*, 2005) the findings of this chapter should warrant some extra attention for the conduct of monetary policy because foreign banks are much more responsive to monetary tightening than domestic banks.

CHAPTER V - CONCLUSIONS

Institutions determine the incentive structure of an economy and, in turn, the structure shapes the direction of economic change towards growth, stagnation or decline (North, 1991). Institutions create the favourable environment for division of labour, specialization and trade to take place, thus generating growth. Since the 1990s the role of institutions has been evaluated in many empirical studies and the literature is still expanding fast.

The collapse of the planned economic system in former socialist countries and their reforms toward market economy have offered a good socio-economic experiment for us to study the effect of institutions for the purpose of further understanding institutions and possibly offering guidance for future reform steps in transition countries in particular and others that are also striving to achieve economic growth and prosperity in general.

This thesis has tried to examine the effect of institutions in transition economies in three directions: efficiency, investment and credit supply by banks. In general, the thesis finds positive effect of institutions on efficiency and investment rates in transition economies. It also shows that different ownerships of banks have significantly different effects on credit supply by banks.

With regard to efficiency, the thesis shows that higher quality of institutions, both economic and political, is associated with higher efficiency in transition economies. This result is robust to different rates of depreciation that are used to estimate the capital series for these countries. This result is in line with other studies in different context (Kaufmann *et al.* 1999; Meon and Weill, 2005). So far the empirical result about the effect of political freedom on economic performance has been mixed

but this empirical study shows that it does have significant role in improving efficiency, at least in the context of transition economies. Of course institutions do not solely determine efficiency but improvement of institutional quality should help transition economies to gain higher efficiency. This thesis also shows that for transition economies the translog production function is more appropriate for estimating efficiency than the usual Cobb-Douglas production function.

Investment is the vehicle of growth and efficiency. Without investment, growth cannot be sustained. More importantly, investment is the channel of "creative destruction" that both raises production capacity and improves efficiency. This thesis shows that institutional factors play a significant role in explaining investment differences, therefore positively affecting growth. In general, higher degree of both economic and political freedoms is associated with higher rate of investment to GDP ratio. However, it should be stressed that one aspect of economic institution alone would not make much difference. It is the overall bettering of the economic institutions that matter in inducing investment. As far as political freedom is concerned both political rights and civil liberties are important in promoting investment through the effect of political rights is stronger than that of civil liberties. In addition, this thesis shows that those who are ahead in the transition process have higher investment rate, especially with regard to large scale privatization.

On the effect of ownership on bank lending the thesis finds that banks' loan supply is asymmetric in the sense that, for some bank groups (public and foreign-owned), it is significantly cut down in a tight monetary regime but not so in an easy regime. In addition, banks of different types respond very differently to monetary policies in different monetary regimes. In easy regime, public and foreign banks cut

back on lending when monetary tightening happens but others do not seem to be affected. On the contrary, when the state of the monetary environment is easy they either do not respond (new private and foreign banks) or increase lending in the face of monetary tightening. In other words, ownership makes a difference in terms of loan supply by banks for a given monetary policy and monetary condition and the ownership structure of the banking system plays a role in determining the effectiveness of monetary policy in an economy that is a process of transition from a public-dominated system to a more liberalized and competitive system.

The thesis has several weaknesses. First, the measure of institutions is open to criticism because of subjectivity and imprecision. Second, the causal relationship between institutions and efficiency and investment rates are is not tested. The third is that the case of India might not represent the situation in many other developing and transition economies. However, we believe this thesis can serve as additional evidence in support of building high quality institutions for economic performance and as encouragement for transition and developing countries to step up their reforms toward better functioning of their market economies.

APPENDIX

1. *TABLES*

Table A2.1

Estimation result with Political Rights and Civil Liberties
with translog production function

	Translog without regional dummy		**Translog with EA dummy**	
	PR	CL	PR	CL
Production frontier				
Constant	6.33** (1.91)	6.45 (1.81)	9.69*** (3.19)	11.48 (3.77)
k	-0.34 (-1.3)	-0.29 (-1.13)	-0.64** (-2.63)	-0.74 (-3.06)
l	136*** (7.08)	1.29*** (6.92)	1.41*** (8.86)	1.33 (8.07)
k2	0.03*** (30.1)	0.03*** (30.38)	0.03*** (30.8)	0.03 (29.17)
l2	-0.02 (-1.17)	-0.01 (-0.93)	-0.03** (-2.48)	-0.04** (-2.72)
kl	-0.02 (-1.26)	-0.02 (-1.38)	-0.002 (-0.13)	0.005 (0.28)
time	-0.02*** (-4.2)	-0.02*** (-4.93)	-0.02*** (-4.01)	-0.02*** (-5.16)
Efficiency effects				
Constant	-30.7*** (-21.8)	-33.87*** (-18.49)	-32.1*** (-20.63)	-35.97*** (-18.52)
COMP1	1.89*** (10.41)	1.05*** (5.65)	1.14*** (4.01)	0.23 (1.51)
COMP2	3.7*** (7.6)	2.45*** (5.17)	2.1*** (4.6)	0.47 (1.59)
PR	1.2** (2.94)	-	2.69*** (5.1)	-
CL	-	3.3*** (9.92)		4.72*** (12.67)
EA dummy	-	-	-13.49*** (-5.16)	-17.15*** (-11.8)
time	1.7*** (10.21)	1.13*** (10.23)	1.04*** (4.15)	0.69*** (8.2)
σ2	12.72*** (12.42)	10.84*** (8.7)	12.73*** (13.35)	10.3*** (11.02)
γ	0.99*** (3495.8)	0..99*** (3685.64)	0.99*** (3837.9)	0.99*** (2688.5)
Log likelihood	-202.18	-184.48	-193.74	-168.59
Likelihood ratio test	832.96	868.36	849.85	900.15

*T-ratios are in parenthesis. *, ** and *** means significance at 10%, 5% and 1% levels. Higher COMP1, COMP2 and FHI mean less freedom.*

Table A2.2

Translog production function with 10% and 6% depreciation rates, and with China (CHN) and Cambodia-Vietnam (CBD_VN) dummies

	10% depreciation	**6% depreciation**
Production frontier		
Constant	11.11*** (3.8)	47.28*** (47.51)
k	-0.73*** (-3.47)	-2.22*** (-27.04)
l	1.36*** (8.02)	-0.72** (-3.46)
k^2	0.03** (30.61)	0.021*** (34.8)
l^2	-0.04** (-3.15)	-0.07*** (-5.2)
kl	0.004 (0.26)	0.12** (2.04)
time	-0.026*** (-3.76)	-0.04*** (-68.6)
Efficiency effect		
Constant	-33.41*** (-28.54)	-10.27*** (-12.47)
COMP1	0.92*** (7.18)	0.58*** (5.24)
COMP2	1.7*** (5.73)	2.79*** (8.71)
FHI	3.59*** (14.99)	1.52*** (9.95)
CHN	-20.61** (-3.27)	-1.91*** (-4.09)
CBD_VN	-14.81*** (-12.53)	-5.19*** (-5.9)
time	0.87*** (9.33)	0.31** (3.3)
σ2	12.26*** (13.26)	3.97*** (22)
γ	0.99*** (2966.5)	0.99 (0.98E+8)
Log likelihood	-182.29	-427.82
Likelihood ratio test	871.4	382.57

*T-ratios are in parenthesis. *, ** and *** means significance at 10%, 5% and 1% levels.*

Higher COMP1, COMP2 and FHI mean less freedom.

Table A3.1

Transition economies and averages of variables used in the regressions (1990-2007)

Country	Investment[1]	IEF[2]	FHI	EBRD	Growth	Saving[1]	Openness	M3[1]	Inflation	Interest rate	Government consumption[1]
Albania	20.34	56.20	3.72	3.64	2.813	-5.979	59.70	61.64	29.58	0.04	12.07
Armenia	22.43	61.70	4.15	3.39	3.757	0.703	80.13	21.10	375.50	20.27	12.50
Azerbaijan	29.46	48.21	5.44	2.91	3.778	23.109	92.35	21.01	232.01	8.4	15.12
Belarus	25.51	41.00	5.59	2.06	2.776	23.464	122.54	19.83	338.90	-28.81	20.27
Bulgaria	17.99	53.66	2.11	3.55	0.775	13.786	108.89	57.32	91.14	2.3	16.86
Cambodia	14.48	59.10	5.72	n.a.	8.571	5.1236	86.63	14.54	3.64	13.16	5.63
China	35.18	52.95	6.72	n.a.	9.983	42.542	47.42	126.74	5.76	2.03	14.97
Croatia	21.50	51.81	3.06	3.96	1.373	14.233	103.15	50.14	137.14	9.4	24.22
Czech Republic	27.57	67.86	1.47	4.01	2.021	27.475	117.03	68.64	8.76	2.51	21.64
Estonia	26.84	73.28	1.68	3.84	2.702	24.419	151.71	41.16	71.65	-7.81	19.90
Georgia	20.60	55.60	4.06	3.38	-1.652	2.5051	79.67	12.24	1286.97	21.92	11.20
Hungary	21.62	61.26	1.47	4.06	1.793	23.065	110.38	48.73	14.54	4.34	10.64
Kazakhstan	23.26	51.78	5.38	3.22	2.211	25.443	90.47	19.65	277.01	n.a.	12.29
Kyrgyz Republic	16.39	56.09	4.65	3.62	0.027	4.902	85.55	17.74	117.84	23.15	19.25
Lao PDR	28.50	39.41	6.50	n.a.	6.42	17.881	60.53	15.99	23.74	8.68	7.77
Latvia	20.87	64.58	1.88	3.78	1.974	21.072	100.75	32.67	73.39	6.13	19.07
Lithuania	22.60	63.98	1.68	3.74	1.595	16.294	107.27	28.02	96.96	-0.64	18.85
Macedonia	17.35	58.63	3.25	3.88	0.482	7.0175	93.49	29.18	118.61	13.32	19.95
Moldova	19.14	54.47	3.68	3.24	-2.734	8.357	113.83	31.14	137.48	8.96	17.74
Mongolia	28.57	56.15	2.42	3.44	2.719	19.684	120.67	30.91	49.19	29.66	17.85
Poland	19.90	58.94	1.53	4.10	3.942	19.315	58.36	39.23	16.18	7.55	19.45
Romania	20.32	51.32	2.83	3.51	1.205	16.267	64.11	33.97	71.32	1.71	11.00
Russia	19.76	51.61	4.38	3.26	0.398	32.5	57.57	26.32	182.12	9.67	17.64
Slovak Republic	28.57	60.27	1.89	3.97	2.564	23.892	133.02	61.10	9.10	5.64	21.70
Slovenia	23.37	58.79	1.41	3.97	2.88	24.924	120.47	40.35	27.15	27.49	19.15
Tajikistan	14.94	47.35	5.88	2.78	-1.272	9.058	111.10	7.83	180.02	-1.61	12.47
Turkmenistan	33.21	43.02	6.89	1.66	-1.787	32.885	135.71	16.08	647.15	n.a.	13.39
Ukraine	21.68	47.67	3.47	2.91	-1.655	25.128	88.20	29.15	379.08	-4.56	19.41
Uzbekistan	26.48	40.51	6.56	2.30	2.483	21.93	59.28	n.a.	220.74	n.a.	19.77
Vietnam	29.14	44.35	6.72	N/A	7.509	21.745	104.74	48.05	15.36	6.37	7.23

[1] as % of GDP; [2] only available from 1995. Source: WBDI (2008), Heritage Foundation (2008), Freedom House (2008) and EBRD Transition Index (2008).

2. *FIGURES*

Figure 3.1: Fraser Institute's Index of Economic Freedom (1995-2007) and Freedom House Index (1990-2007)

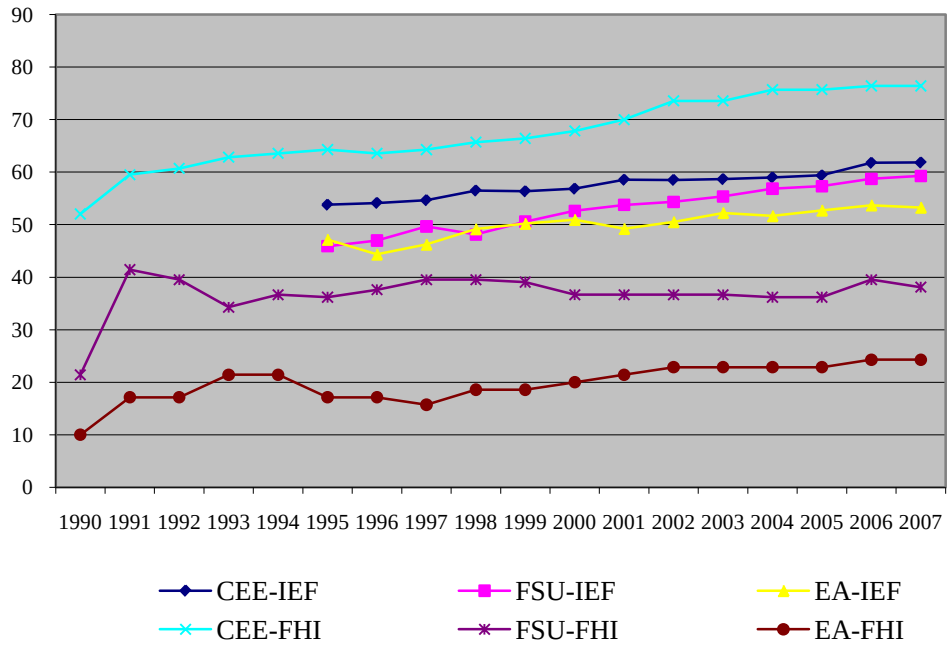


Figure 3.2: Fraser Institute's Economic Freedom Index, 2000-2006

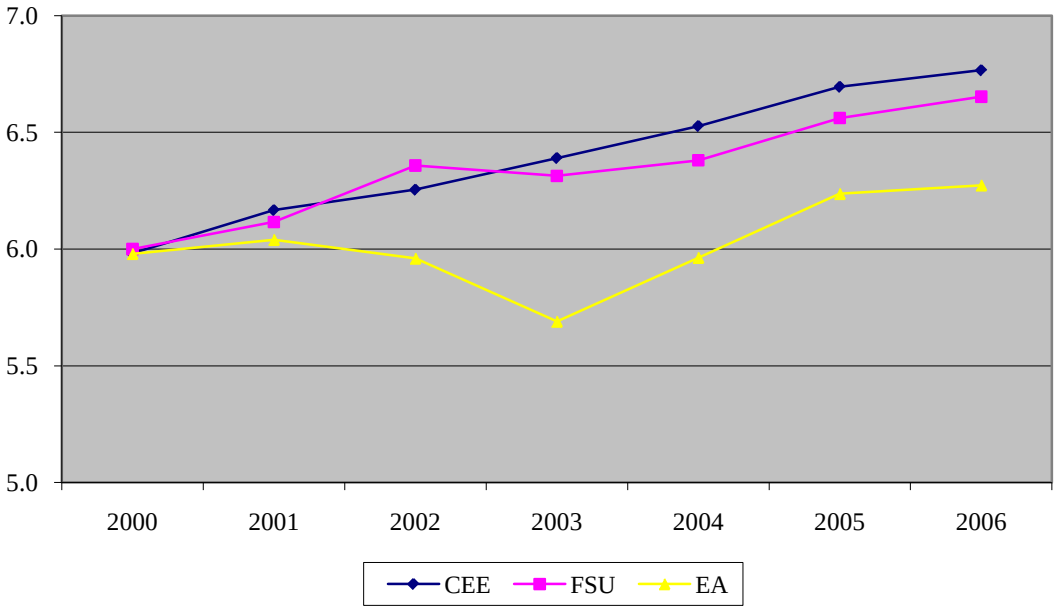
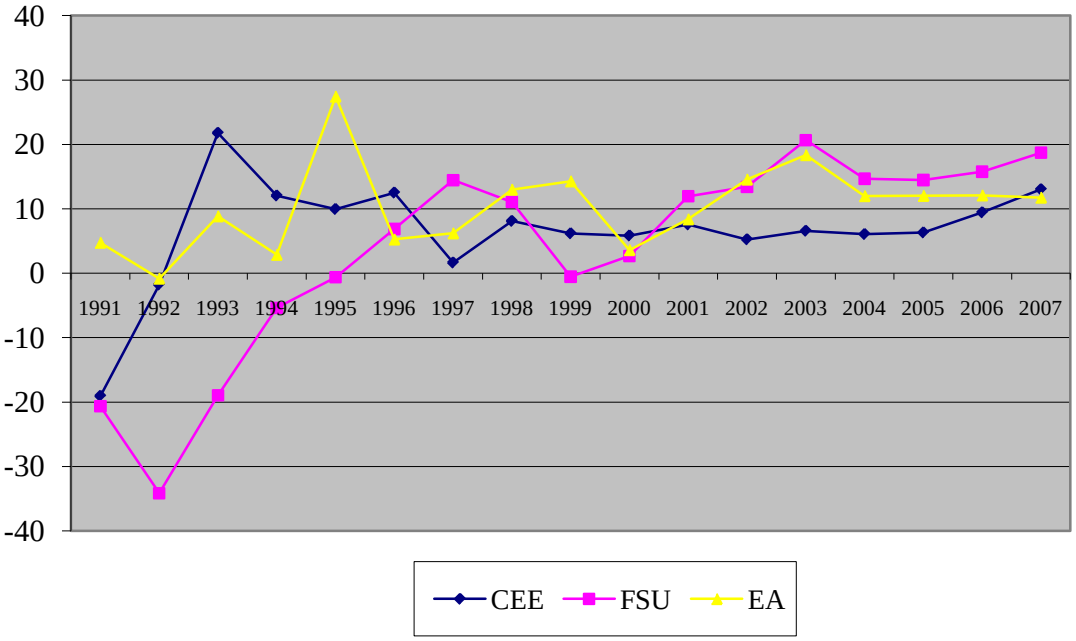
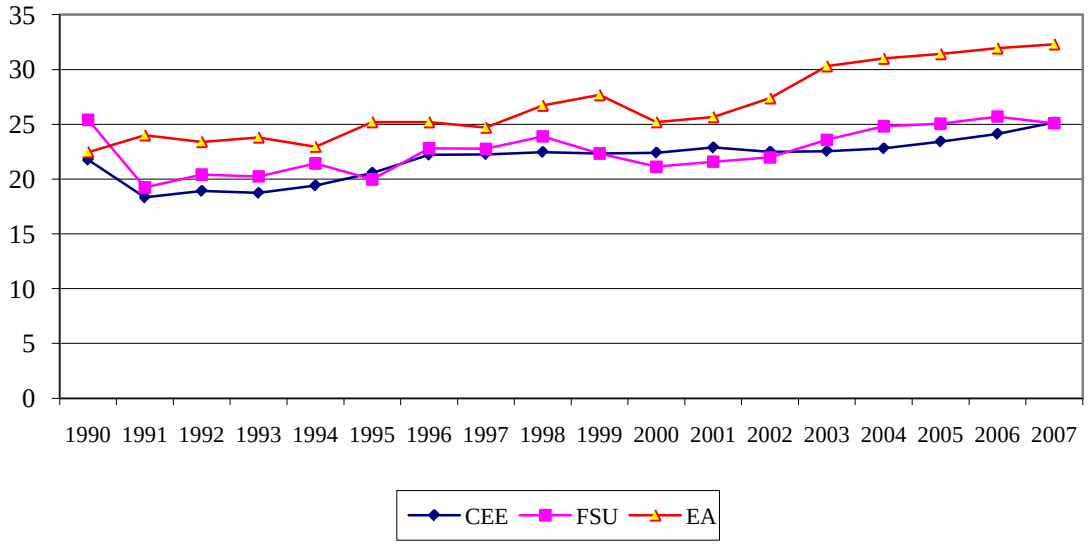


Figure 3.3: Growth rate of investment, 1992-2007



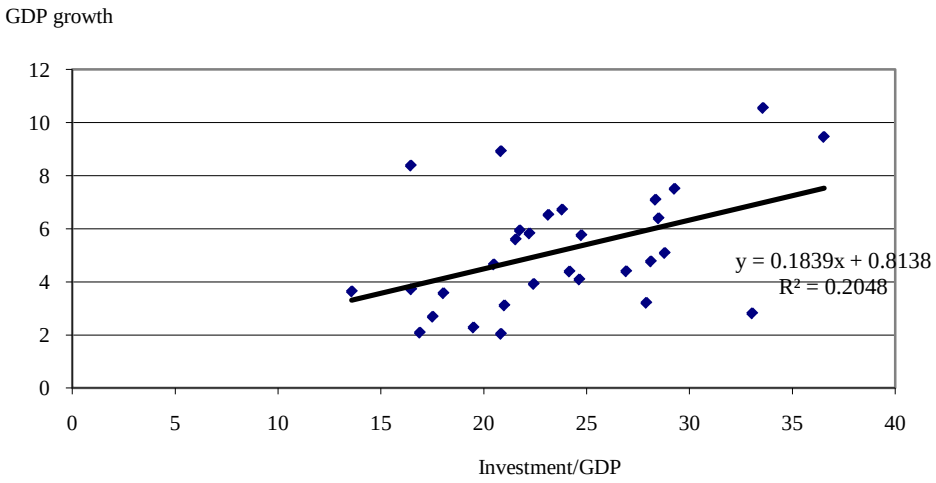
Source: World Bank Development Indicators, 2008.

Figure 3.4: Investment/GDP (%), 1990-2007



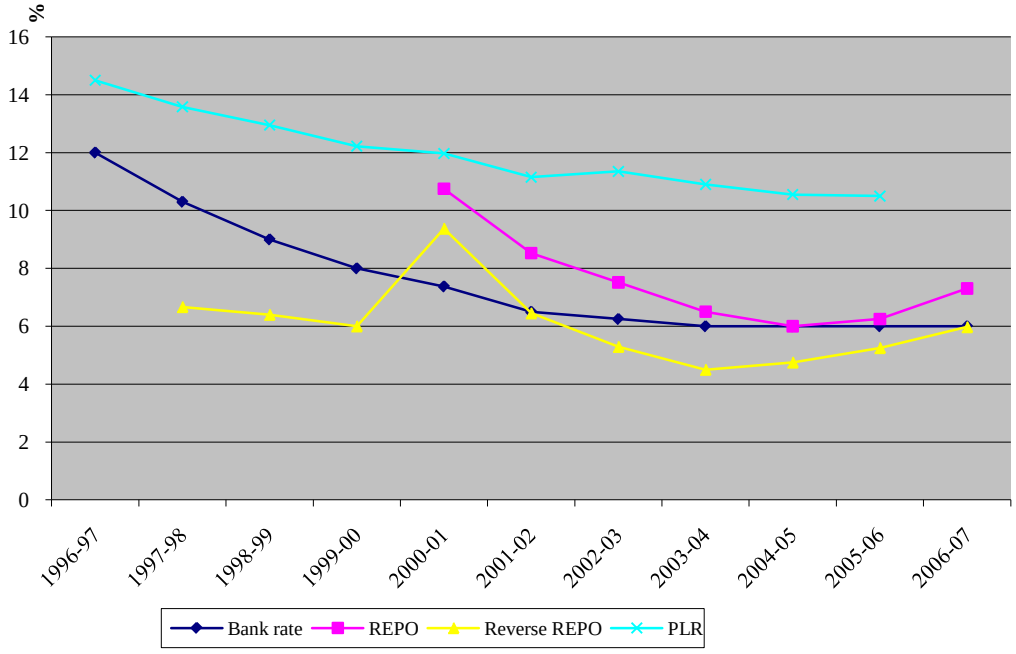
Source: see Figure 3.

Figure 3.5: Investment-growth in transition economies, 1995-2006



Source: see Figure 3.

Figure 4.1: Movement of prime lending rate and other policy rates



Source: Reserve Bank of India.

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