NCAER

INDIA POLICY FORUM

VOLUME 5

2008|09

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Editors' Summary

The fifth annual conference of the India Policy Forum was held on July 15 and 16 of 2008 in New Delhi. This issue of the journal contains the papers and discussion presented at the conference. A total of five papers were presented. The first paper examines the growth of private schools in India and their influence on school quality. It is an extension of recent issues of this journal that have evaluated the performance of India's education system. The second paper addresses a major question of why the growth of manufacturing output and employment in India has been disappointingly low. The final three papers share a common focus on India's external financial relations. The third paper analyzes the process of capital account liberalization and the integration of India's financial institutions into the global financial system. The fourth paper measures the evolution of prices in the nontradable and tradable sectors of the Indian economy and seeks explanations for the rise in the relative price of nontradables. The last paper addresses the issue of the adequacy of India's current foreign exchange reserves.

Although the growth of private schooling in India is ubiquitous even in rural areas, the contours and implications of this change remain poorly understood, partially due to data limitations. Official statistics often underestimate private school enrollment and our understanding of the effectiveness of private education in India is also limited. If we assume that parents know what is best for their children and that what is beneficial privately is also beneficial socially, their decision progressively to opt for private schools would suggest the superiority of the latter over public schools.

In their paper, Sonalde Desai, Amaresh Dubey, Reeve Vanneman, and Rukmini Banerji point out, however, that this is not a foregone conclusion. The vast body of research on school quality, especially that relating to the United States, suggests that much of the observed difference in school outcomes results from differences in parental background and levels of parental involvement with children going to different schools. In the Indian context, one runs the additional risk that many private schools are poorly endowed with resources, unrecognized (lack accreditation), and have untrained teachers. A proper empirical examination is essential to arrive at an informed assessment.

The authors use data generated from a new survey, the India Human Development Survey 2005 (IHDS), jointly conducted by researchers from

the University of Maryland and the National Council of Applied Economic Research. These data allow them to explore some of the links between private school growth and school quality in India. They begin by providing a description of public and private schools in India as well as some of the considerations that guide parents in selecting private schools. They then examine whether private school enrollment is associated with superior student performance and whether this relationship is concentrated in certain sections of the population.

The IHDS data show considerably higher private school enrollment, particularly in rural areas, than documented in other studies. The authors place private school enrollment (including in schools receiving grants-in-aid from the government) among children aged 6–14 years at 58 percent in urban and 24 percent in rural areas. Private school enrollment is particularly high in India's most populous state, Uttar Pradesh. In terms of outcomes, based on specially designed reading and arithmetic tests administered to children aged 8–11 years, those in private schools exhibit better reading and basic arithmetic skills than their counterparts in government schools.

But since these children also come from higher income households and have parents who are better educated and more motivated to invest in their children's education, it is important to control for selectivity bias. The paper utilizes a variety of techniques (including multivariate regression, switching regression, and family fixed effects) to examine the relationship between private school enrollment and children's reading and arithmetic skills. While no model is able to completely eliminate possible biases—there is a different source of bias left in each case—taken together, the results strongly indicate that private school enrollment is associated with higher achievements in reading and arithmetic skills. The magnitude of the gain from private school enrollment varies from one-fourth to one-third standard deviation of the scores.

The paper also distinguishes the relative magnitudes of the benefits from private schooling to children with rich versus poor economic backgrounds. It finds that the benefits to private school enrollment for children from lower economic strata are far greater than those for children from upper economic strata; at upper income levels, the difference between private and government school narrows considerably. This seems plausible since at upper income levels, students are likely to have better access to alternative educational resources including well-educated parents.

While the results of the paper point to positive benefits from private schools, especially for the underprivileged, the authors emphasize that their analysis does not imply that private schooling is the elixir that will cure the

woes of primary education for children from poor families. They argue that both empirical results based on the IHDS data and theoretical considerations point to the need for caution.

Empirically, the paper finds that while private school students perform better than their counterparts in government schools, these effects are modest in comparison to other factors influencing the outcomes. For example, the results show substantial inter-state variation in the scores of both government and private school students. Controlling for parental characteristics, government school students in states as diverse as Kerala, Himachal Pradesh, Chhattisgarh, and West Bengal perform at a higher level than private school students in many other states. More importantly, the private school advantage seems to be concentrated in states such as Bihar, Uttar Pradesh, Uttarakhand (formerly Uttranchal), and Madhya Pradesh—states known for poorly functioning public institutions as well as high rates of poverty or low per capita incomes.

These results suggest that before a blanket embrace of private schooling, it may be worthwhile to understand why some government schools function well and others do not. Blaming teacher absence is superficially appealing, but theoretical considerations suggest that the complete story may be more complex. If the classroom environment in private schools is favorably impacted by the demands made by paying middle-class parents, a voucher program that brings a large number of poorer parents to the schools may dilute this effect. But this argument would seem to be undermined by the fact that the authors themselves find the private school effect to be significant in poor states with many students coming from poor families.

Nevertheless, the authors are correct in noting that it will be useful to further examine the processes that give rise to different classroom environments as between government and private schools before jumping to wholesale voucher programs leading to privatization of education. We must know, for example, whether children from poor households in private schools benefit because their parents are able to prevent teachers from resorting to physical punishment. And if so, would this benefit be diluted when vouchers rather than parents pay for the tuition? Can we devise mechanisms to ensure that government school teachers do not resort to discriminatory behavior when dealing with students from poor families? To date, the discourse on the benefits of private schooling in a developing country context has focused on teacher absence, lack of accountability, and lower costs of private schooling. While these are important issues, perhaps future research could try to shed additional light on other processes that establish different environments in private and public schools.

The promotion of manufacturing, particularly for export, has been a key pillar of the growth strategy employed by many successful developing countries, especially those with abundant labor. India's recent experience is puzzling on two accounts. While India's economy has grown rapidly over the last two decades the growth momentum has not been based on manufacturing. Rather the main contributor to growth has been the services sector. Second, the relatively lackluster performance of Indian manufacturing cannot be ascribed to a lack of policy initiatives. India introduced substantial product market reforms in its manufacturing sector starting in the mid-1980s, but the sector has never taken off as it did in other high-growth countries. Moreover, insofar as subsectors within manufacturing have performed well, these have been the relatively capital or skill-intensive industries, not the labor-intensive ones as would be expected for a labor abundant country like India.

One of the main components of reforms in India was the liberalization of the industrial licensing regime, or "delicensing." Under the Industries Development and Regulation Act of 1951, every investor over a very small size needed to obtain a license before establishing an industrial plant, adding a new product line to an existing plant, substantially expanding output, or changing a plant's location.

Over time, many economists and policymakers began to view the licensing regime as generating inefficiencies and rigidities that were holding back Indian industry. The process of delicensing started in 1985 with the dismantling of industrial licensing requirements for a group of manufacturing industries. Delicensing reforms accelerated in 1991, and by the late 1990s, virtually all industries had been delicensed. Large payoffs were expected in the form of higher growth and employment generation with this policy reform.

However, the payoffs to date have been limited. It could be argued that a lag between the announcement and implementation of the policy, and also a lag between implementation and the payoffs may be responsible. However, as many as 20 years have passed since the first batch of industries was delicensed, and the last batch of industries was delicensed almost a decade ago; the view that payoffs would occur with a lag is no longer easy to sustain.

What then could be the reasons for the rather lackluster performance of the industrial sector? The following factors are usually cited: (*a*) strict labor laws have hindered growth, especially of labor-intensive industries; (*b*) infrastructure bottlenecks have prevented industries from taking advantage of the reforms; and (*c*) credit constraints due to weaknesses in the financial sector may be holding back small- and medium-sized firms from expanding.

More recently, two other factors have also been raised. First, it has been pointed out that the evolution of Indian industry may be influenced by path dependence or hysteresis so that despite the reforms of the mid-1980s and the early 1990s the relative profitability of capital and skill-intensive activities remains higher than that of labor-intensive activities. Second, the major reform initiatives undertaken so far—focused mainly on product market reforms—have been national ones. However, the working of product markets in a federal democracy such as India is influenced not only by regulations enacted by the Central Government, but also by those enacted by individual state governments. Moreover, much of the authority on administration and enforcement of regulation also rests with state governments. Accordingly, it has been pointed out that regulatory and administrative bottlenecks at the state level may be blunting the impact of reforms undertaken at the central level.

Using the Annual Survey of Industries (ASI) data at the three-digit level for major Indian states over the period 1980–2004, the paper by Gupta, Hasan, and Kumar analyzes the effects of delicensing reforms on the performance of what in India is called registered manufacturing. (The portion of manufacturing in the so-called unorganized sector is not covered by the ASI data and is therefore not analyzed in the paper; however, this component was also unlikely to have been affected by the licensing controls when these were in effect.) The paper utilizes variations in industry and state characteristics in order to identify how factors such as labor regulations, product market regulations, availability of physical infrastructure, and financial sector development may have influenced the impact of delicensing on industrial performance.

The main findings of the paper are as follows:

1. The impact of delicensing has been highly uneven across industries. Industries that are labor intensive, use unskilled labor, depend on infrastructure, or are energy dependent have experienced smaller gains from reforms.
2. Regulation at the state level matters. States with less competitive product market regulations have experienced slower growth in the industrial sector post-delicensing, as compared to states with competitive product market regulations. States with relatively inflexible labor regulations experience slower growth of labor-intensive industries and slower employment growth.
3. Infrastructure availability and financial sector development are important determinants of the benefits that accrued to states from reforms.

> If supportive regulatory conditions prevailed and infrastructure availability allowed it, businesses responded by expanding their capacity and grew; thus hysteresis does not seem to matter.

The authors acknowledge that their approach is subject to a few caveats. Several other major reforms have been introduced that impact Indian manufacturing, including reductions in barriers to trade and the dismantling of the policy of reserving particular industries for production by small-scale enterprises. These are not systematically examined and might interact with the impact of delicensing. Second, the neglect of the unorganized sector noted above means that the interactions between the "registered" and the "unorganized" sectors in adjusting to policy change is not systematically explored. Finally, regulations can affect firms and industries in many different ways. For example, they may create incentives for firms to operate in the informal sector, stay relatively small, or adopt particular types of techniques. While the analysis of aggregate data can shed (indirect) light on some of these effects, a more complete analysis would require the use of a micro-based approach utilizing plant-level data.

The authors conclude that the agenda of reforms to promote manufacturing is not yet complete. Areas for additional action include further reform of labor market regulations; improvement of the business environment; provision of infrastructure and further development of the financial sector. In addition, in a federal democracy like India, reforms at the Center (especially those related to labor) need to be complemented by reforms at the state level.

Capital account liberalization remains a highly contentious issue. Proponents argue that rising cross-border flows of financial capital allow for a more efficient allocation of financial resources across countries and also permit countries to share their country-specific income risk more efficiently. Detractors have blamed capital account liberalization as being the root cause of the financial crises experienced by many emerging market countries. Their case has been strengthened by the lack of clear evidence of the presumed benefits of financial globalization. This debate has again become topical as many emerging market economies and even some low-income countries are coping with volatile capital inflows, with major economies like China and India contemplating further opening of their capital accounts.

A common argument in the literature in favor of openness from the viewpoint of the developing economies has been that access to foreign capital helps increase domestic investment beyond domestic saving. The recent literature has revived another older argument emphasizing the indirect benefits of openness to foreign capital, including the development of domestic financial

markets, enhanced discipline on macroeconomic policies, and improvements in corporate governance.

In his paper, "Some New Perspectives on India's Approach to Capital Account Liberalization," Eswar S. Prasad argues that a major complication in considering capital account convertibility is that economies with weak initial conditions in certain dimensions experience worse outcomes from their integration into international financial markets in terms of both lower benefits and higher risks. For countries below these "threshold" conditions, the benefit–risk tradeoff becomes complicated and a one-shot approach to capital account liberalization may be risky and counter-productive. This perspective points to a difficult tension faced by low and middle-income countries that want to use financial openness as a catalyst for the indirect benefits mentioned above.

The author, nevertheless, maintains that the practical reality is that emerging market countries are being forced to adapt to rising financial globalization. In his view, capital controls are being rendered increasingly ineffective by the rising sophistication of international investors, the sheer quantity of money flowing across national borders, and the increasing number of channels (especially expanding trade flows) for the evasion of these controls. Hence, concludes the author, emerging market economies like China and India are perforce grappling with the new realities of financial globalization, wherein capital controls are losing their potency as a policy instrument (or at least as an instrument that creates more room for monetary and other macro policies). Against this background, the author provides a critical analysis of India's approach to capital account liberalization through the lens of the promised indirect benefits from such liberalization. In recent years, the Reserve Bank of India (RBI) has taken what it calls a calibrated approach to capital account liberalization, with certain types of flows and particular classes of economic agents being prioritized in the process of liberalization. The result of these policies is that, in terms of overall *de facto* financial integration, India has come a long way, experiencing significant volumes of inflows and outflows. Although foreign investment flows crossed 6 percent of GDP in 2007–08, in the author's view the flows are modest, placing India at the low end of the distribution of *de facto* financial integration measures in an international comparison across emerging market economies.

The RBI's cautious and calibrated approach to capital account liberalization has resulted in a preponderance of FDI and portfolio liabilities in India's stock of gross external liabilities. The author agrees that this is a favorable outcome in terms of improving the benefit–risk tradeoff of financial openness and has reduced India's vulnerability to balance of payments crises. But he goes

on to argue that the limited degree of openness has, nevertheless, hindered the indirect benefits that may accrue from financial integration, particularly in terms of broad financial sector development.

Against the backdrop of recent global financial turmoil, the author sees merit in a high level of caution in further opening the capital account. He states, however, that excessive caution may be holding back financial sector reforms and reducing the independence and effectiveness of monetary policy. He goes on to argue that increasing *de facto* openness of the capital account implies that maintaining capital controls perpetuates some distortions without the actual benefit in terms of reducing inflows. Flows of different forms are ultimately fungible and it is increasingly difficult, given the rising sophistication of investors and financial markets, to bottle up specific types of flows. In the author's view, rising *de facto* openness in tandem with *de jure* controls may lead to the worst combination of outcomes—new complications to domestic macroeconomic management from volatile capital flows with far fewer indirect benefits from financial openness.

The author takes the view that a more reasonable policy approach would be to accept rising financial openness as a reality and to manage, rather than resist (or even try to reverse), the process of fully liberalizing capital account transactions. Dealing with and benefiting from the reality of an open capital account will require improvements in other policies—especially in monetary, fiscal, and financial sector regulations. This approach could in fact substantially improve the indirect benefits to be gleaned from integration into international financial markets.

In terms of specific steps, the author suggests that this may be a good time to allow foreign investors to invest in government bonds as an instrument of improving the liquidity and depth of this market. A deep and well-functioning government bond market can serve as a benchmark for pricing corporate bonds, which could in turn allow that market to develop. By providing an additional source of debt financing, it would create some room for the government to reduce the financing burden it currently imposes on banks through the statutory liquidity ratio—the requirement that banks hold a certain portion of their deposits in government bonds.

The author also recommends an "opportunistic approach" to liberalization whereby outflows are liberalized during a period of surging inflows. He suggests that if undertaken in a controlled manner, it could generate a variety of collateral benefits—sterilization of inflows, securities market development, and international portfolio diversification for households. The RBI has recently adopted such an approach by raising ceilings on external commercial borrowings in order to compensate for capital outflows. According to the

author, these are steps in the right direction. But one potential problem he sees is that when taken in isolation rather than as part of a broader and well-articulated capital account liberalization agenda, these measures are subject to reversal and unlikely to be very productive.

Despite this enthusiasm for capital account liberalization, the author goes on to suggest that none of this implies that the remaining capital controls should be dropped at one fell swoop. What it does imply is that there are some subtle risks and welfare consequences that can arise from holding monetary and exchange rate policies as well as financial sector reforms hostage to the notion that the capital account should be kept relatively restricted for as long as possible. It may seem reasonable to maintain whatever capital controls still exist in order to get at least some protection from the vagaries of international capital flows. However, in the author's view, not only this is an unrealistic proposition, it could detract from many of the potential indirect benefits of financial integration. He sees steady progress toward a more open capital account as the most pragmatic policy strategy for India.

India's rapidly evolving economic landscape during the past two decades has elicited broad discussion of how changing economic factors will influence the future of India's growth and prosperity. Often overlooked in the discussion are the effects of India's changing economic structure on relative price dynamics, which have consequential effects on the allocation of resources in the economy. A host of recent developments would likely induce a change in relative prices, including the shift in economic policies beginning in 1991, the acceleration in economic growth, a rapid increase in exports, and rising per capita incomes and productivity growth. Taken together, these factors amount to the "catch-up" process that typically leads to an increase in the relative price of nontradables in developing economies.

In their paper, Renu Kohli and Sudip Mohapatra trace relative price developments in a two-sector, two-good (tradable and nontradable) framework for the Indian economy over the period 1980–2006. In line with their *a priori* expectations, the ratio of nontradable to tradable prices, also called the internal real exchange rate, rises consistently over the past one-and-a-half decades. Their empirical analysis confirms that this rise, or real appreciation, is driven by both demand and supply factors. A later section uses the results of the study to illuminate the evolution of past macroeconomic policies. Finally, using India's recent robust economic performance as a guide, the paper concludes with a discussion on an appropriate macroeconomic policy mix for the future.

The authors construct the relative price of nontradables from the national accounts statistics using the degree of participation in trade as a criterion

for classifying the economy into traded and nontraded sectors; the tradable–nontradable price series are derived as respective deflators for the two sectors. They find that the tradable and nontradable sectors are characterized by divergent inflation rates with the relative price of nontradables accelerating after 1991; on average, the difference exceeds 1 percentage point per year during 1991–2006. There are two competing explanations for such a divergent acceleration in prices: (*a*) the Balassa–Samuelson hypothesis posits that real exchange rates tend to appreciate as countries develop and (*b*) other demand-side explanations originate from changes in government spending and/or a shift in consumer preferences toward services (nontradable) as incomes rise. The preliminary analysis presented in the paper indicates a role for both factors in explaining the real exchange rate appreciation. A puzzle posed by the data, however, is the increase in the relative price of nontradables in conjunction with an expansion of the tradable sector, which suggests an offsetting role might have been played by economic reforms like import liberalization and exchange rate correction, leading to the emergence of new tradables through an increase in competitiveness.

The paper examines the determinants of this divergence in an integrated framework, exploring the role of both demand and supply side determinants. The relative price of nontradables is modeled as a function of the labor productivity growth gap between the tradable and nontradable sectors, real government expenditure as a share of gross domestic product, real per capita income, and a measure of import tariffs. The labor productivity growth gap and the import tariff rates capture the supply-side influences due to technological change (the Balassa–Samuelson effect) and the impact of trade liberalization, which accelerated after 1991. The fiscal and income growth variables summarize the demand side impact upon relative prices. The regression results reveal a significant influence of both demand and supply factors. A percentage point rise in the relative price of nontradables is associated with a 5 percent increase in the labor productivity growth gap, a 4 percent increase in per capita income growth, and a 3 percent increase in fiscal growth; the estimated impact of a fall in import prices upon the relative nontradables' inflation rate is 0.04. The results are robust to a number of sensitivity checks, including different estimation methods, stability, specification, omission, and inclusion of variables as well as alternate definitions of the variables.

A decomposition of the relative price change over the sample period indicates that demand factors accounted for almost three-fourths of the average relative price increase over the sample period. In contrast, the supply-side influence stemming from the labor productivity growth differential between

the two sectors accounted for only 35 percent of the mean of the dependent variable. Noting the rapid decline in import tariffs after 1991, the authors argue that this result underscores the role of convergence in tradable prices and its contribution to the divergence in sectoral inflation rates in liberalizing economies.

Kohli and Mohapatra link their results to macroeconomic policy by tracing the past evolution of exchange rate and fiscal policies in India. They argue that the fiscal expansion of the 1980s ending in the 1991 crisis led to a rise in the inflation rate of the nontradable sector, while the exchange rate policy favored steady depreciation in order to retain competitiveness and boost growth. Noting India's recent and potential economic performance, its buoyant exports, and strong per capita income growth, they observe that the pressures upon real exchange rate appreciation, internal as well as external, are likely to continue—and indeed, accelerate—in the future. Under the circumstances, an appropriate macroeconomic policy mix would be to continue with the gradual increase in exchange rate flexibility so as to absorb the equilibrium shifts in the economy. This could be complemented with fiscal consolidation to offset competitiveness losses arising from the nominal and real exchange rate appreciation.

Finally, the paper raises a number of critical data issues, not the least of which is the absence of a services price index in India. The implicit price series developed in the paper strongly suggests an understatement of generalized inflation through the current inflation indicator, the wholesale price index (WPI), which can be misleading. It also identifies gaps in the data on sectoral employment shares, emphasizing the need for sufficiently disaggregated information to enable fruitful analysis and informed policymaking.

The Asian financial crisis of 1997–98 served as a startling revelation to emerging economies of the drawbacks of financial integration. Neither the International Monetary Fund nor reliance on more flexible exchange rate regimes succeeded in preventing—or indeed, adequately combating—such a systemic crisis. Moreover, even countries practicing sound macroeconomic policies realized they were not immune to such crises as they can be hit by contagion and financial panic from other countries, regardless of their proximity. As a result, many countries have decided that they need to protect themselves against a speculative currency attack, and further, that the key to self-protection is the accumulation of substantial holdings of liquid foreign exchange. Over the past decade, developing countries, and particularly those in East and South Asia, have greatly expanded their foreign currency reserves. By the middle of 2008, the reserves of China, South Korea, Russia, and

India alone amounted to over US$2.85 trillion. In the case of India, reserve accumulation has increased five-fold since 2001–02.

The security that results from high reserves does come at a price, however. The magnitude of reserves being held combined with the fact that most reserves are held as low-yield government bonds suggests that the opportunity cost of reserve holdings can be substantial. In his paper, Abhijit Sen Gupta employs a new empirical methodology to evaluate the factors influencing the demand for international reserves in emerging markets, and he estimates the costs incurred in the process for India in particular. Sen Gupta argues that the traditional analysis of the costs of reserve holdings, which considers a single adequacy measure (namely, import cover), does not reflect the multitude of factors influencing demand for international reserves in a financially integrated world. In addition to the desire to meet potential imbalances in current account financing, a central bank may also hold reserves to defuse a potential speculative run on its currency or to cover its short-term debt obligations.

The author first introduces a simple empirical model to highlight the principal determinants of reserve holding in emerging countries. Using the results of this model, one can create an "international norm" of reserve holding, and thereby calculate a measure of "excess reserves" which is the difference between actual reserve holdings and this international norm. Next, Sen Gupta provides a brief discussion of the history of reserve accumulation in India. As the bulk of India's reserves are held in the form of highly liquid securities or deposits with foreign central banks and international organizations, the real return on these assets in recent years has been largely negative. In the final section, Sen Gupta estimates the cost of holding reserves in India by considering three alternative uses of the resources currently held in excess of the international norm described earlier.

The empirical section of the paper employs a sample of 167 countries over the period 1980–2005 and a regression framework that identifies the principal determinants of cross-country variation in the level of international reserves. In this context, reserves are defined as total reserves minus the country's holdings of gold. The dependent variable is this measure of reserves scaled by Gross Domestic Product (GDP). The results of this regression accord well with the *a priori* expectations. The log of per capita GDP and a proxy for trade openness (measured as the ratio of imports to GDP) both record positive and significant coefficients for reserve holding, implying that richer countries and more open countries tend to have higher reserves. In addition, the regression results reveal that countries with less flexible

exchange rate regimes and more capital account openness tend to accumulate greater reserves.

Next, the author uses the above framework for the period 1998–2005 to predict the demand for international reserves for various emerging countries. The difference between actual reserves and the reserve level predicted by the equation is interpreted as a measure of excess reserves. As illustrations of his results, Sen Gupta finds that by 2005, Indonesia, Philippines, and Argentina had reserves close to the amount predicted by the model, while Brazil's reserve accumulation fill significantly short of the predicted value. In contrast, China, India, Korea, Russia, and Malaysia all exhibit significantly more reserves than what could be interpreted as an "international norm."

In his discussion of India's experience in reserve accumulation, Sen Gupta identifies several distinct episodes of significant reserve buildup in India: April 1993 to July 1995, November 2001 to May 2004, and November 2006 to February 2008. These three episodes account for more than US$ 220 billion worth of India's current stock of reserve accumulation of US$ 300 billion. In each of these episodes, the author discusses the role that both the government and the Reserve Bank of India (RBI) played in the decision to accumulate reserves.

Sen Gupta estimates that by the end of 2007, India had more than US$ 58 billion of excess reserves. In order to impute the costs of holding these excess reserves, he considers three alternative uses of the resources: financing physical investment, reducing the private sector's external commercial borrowing, and lowering public sector debt. The cost is substantial across all specifications, both in terms of actual income foregone and as a percentage of GDP. The author estimates the annual cost of keeping excess reserves in the form of low-yielding bonds rather than employing the resources to increase the physical capital of the economy to be approximately 1.6 percent of GDP. Alternatively, if the resources were instead used to reduce private sector external commercial borrowing or public sector debt, India could gain more than 0.23 percent of GDP.

Some New Perspectives on India's Approach to Capital Account Liberalisation

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Prepared for Presentation at tbe Brookings-NCAER India Policy Forum 2008
New Delhi

July 15-16, 2008

Some New Perspectives on India's Approach to Capital Account Liberalization

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This draft: July 6, 2008

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I. Introduction

Capital account liberalization remains a highly contentious issue. Proponents argue that it fosters financial globalization—a term that broadly encompasses cross-border flows of financial capital in various forms. This phenomenon, in principle, should allow for a more efficient allocation of financial resources across countries and also permit countries to share their country-specific income risk more efficiently, thereby increasing economic welfare on both counts. Detractors have blamed capital account liberalization as being the root cause of the financial crises experienced by many countries and argue that the deck is particularly stacked against non-industrial countries, which have experienced few benefits but exposed themselves to considerable risks.

The polemics on both sides are again becoming heated as emerging market economies and even some low-income countries are being forced to cope with a wave of inflows, even as major economies like China and India are contemplating further opening of their capital accounts. Meanwhile, there have recently been important advances in the academic literature. This is causing researchers to take a more nuanced approach to the issue and to frame the debate in terms of a complex set of cost-benefit tradeoffs. One of the key conclusions of the new literature is that the principal benefit of financial openness for developing economies may not be access to foreign capital that helps increase domestic investment by relaxing the constraint imposed by a low level of domestic saving. Rather, the main benefits may be indirect ones associated with openness to foreign capital, including the catalytic effects of foreign finance on domestic financial market development, improvements in corporate governance and other aspects of institutional quality, enhanced discipline on macroeconomic policies etc.

A major complication, however, is that economies that have weak initial conditions in certain dimensions seem to have much worse outcomes from their integration into international financial markets, in terms of both lower benefits and higher risks. For countries below these “threshold” conditions, the benefit-risk tradeoff becomes complicated and a one-shot approach to capital account liberalization may be risky and

counter-productive. Some of these threshold conditions are similar to the list of indirect benefits, pointing to a difficult tension faced by low- and middle-income countries that want to use financial openness as a catalyst for those benefits but would then face the risks associated with being under the threshold conditions.

At the same time, the practical reality is that emerging market countries are having to adapt to rising financial globalization. Capital controls are being rendered increasingly ineffective by the rising sophistication of international investors, the sheer quantity of money flowing across national borders, and the increasing number of channels (especially expanding trade) for the evasion of these controls. Hence, emerging market economies like China and India are perforce grappling with the new realities of financial globalization, wherein capital controls are losing their potency as a policy instrument (or at least as an instrument that creates more room for monetary and other macro policies).

Developments in international financial markets also have a bearing on this issue. International investors, especially from industrial economies, have turned up in droves at the shores of emerging markets and are showing no signs of retreating despite the recent global financial turmoil. They have been lured by the strong growth prospects of many emerging markets as well as weak growth and low interest rates in their home countries. These same forces are also causing domestic investors in emerging markets to repatriate their capital from abroad. Many emerging markets have been getting more capital inflows than they can comfortably handle, causing complications for domestic macroeconomic policies and also exposing these economies even more to the volatility of foreign capital.

Against this background, the objective of this paper is to provide a critical analysis of India's approach to capital account liberalization program through the lens of the new literature on financial globalization. In recent years, the Reserve Bank of India (RBI) has taken what it calls a calibrated approach to capital account liberalization, with certain types of flows and particular classes of economic agents being prioritized (see Reddy, 2007). I will evaluate the effectiveness of this approach in terms of the narrow objectives of influencing the quantity and composition of flows, and also in terms of

macroeconomic consequences. This will involve an empirical characterization of the evolution of financial openness based on de jure measures of capital account openness as well as de facto measures of financial integration. I will also examine the evolution and structure of inflows and outflows. I will then relate these to the literature on the determinants and effects of external capital structure.

The cautious and calibrated approach has meant that India's capital account liberalization has proceeded in fits and starts but the net effect is that, over time, the capital account has become increasingly open and India has been rapidly integrating into international capital markets. While this approach has to some extent helped protect the country from the volatility induced by financial flows, a key question is whether this approach may have subtle costs in terms of efficiency and welfare that outweigh or diminish this benefit.

The main thesis of this paper is that, at this juncture, a more reasonable policy approach is to accept rising financial openness as a reality, manage rather than resist (or even try to reverse) the process of fully liberalizing capital account transactions, and reorient domestic macroeconomic policies to dealing with this reality. This approach could in fact substantially improve the indirect benefits to be gleaned from integration into international financial markets.

This line of reasoning does not mean that capital account liberalization should be a key policy priority and that the remaining restrictions on the capital account should be dropped at one fell swoop. But it does imply that there are some subtle risks and welfare consequences that can arise from holding monetary and exchange rate policies as well as financial sector reforms hostage to the notion that the capital account should be kept relatively restricted for as long as possible. It may seem reasonable to maintain whatever capital controls still exist in order to get at least some protection from the vagaries of international capital flows. Not only is this not a realistic proposition, but I will also argue that it could detract from many of the potential indirect benefits of financial integration.

In the final section of the paper, I will discuss the implications of India's approach towards capital account liberalization for monetary and exchange rate policies and for financial sector reforms. While full capital account liberalization is hardly an end in itself, it can provide a useful framework for setting in motion a broader set of macroeconomic reforms.

II. Paradoxical Results, But Composition of Liabilities Matters

Despite the strong theoretical presumption that financial openness should boost growth in developing countries, macroeconomic evidence of the growth benefits of financial openness remains elusive (see Kose et al., 2006, for a survey). Although there is a positive correlation between measures of financial openness and growth, this correlation vanishes once one controls for other determinants of growth such as financial development, quality of institutions, macroeconomic policies etc. More recent evidence based on better measures of de facto financial openness or specific types of liberalization (such as equity market liberalizations) does show more positive effects. Analysis based on industry- or firm-level data is also more supportive of the efficiency and growth benefits of financial globalization. But this evidence is hardly conclusive.

Indeed, there is some remarkable new evidence that non-industrial countries that rely *less* on foreign capital have on average posted better long-run growth outcomes (see Aizenman, Pinto and Radziwill, 2008; Gourinchas and Jeanne, 2007; Prasad, Rajan and Subramanian, 2007). This result is not just limited to the recent period of rising global imbalances, when some fast-growing economies like China have on net been exporting massive amounts of capital. This result holds up over much longer periods of time and is not specific to countries in any particular region. Rodrik (2008) interprets these new findings as suggesting that the real constraint to growth in many less-developed economies is investment not savings. Ineffectual financial systems may not be up to the task of efficiently intermediating domestic savings into investment, let alone being able to intermediate foreign capital efficiently.

Given these empirical findings, a new paradigm is emerging that the main benefits of financial globalization may not be through the direct channel of providing more financing. Rather, the main benefits may be in terms of catalyzing financial market and institutional development, stimulating gains in efficiency through competition and access to new technologies, and disciplining macroeconomic policies (see Schematic 1).[1] This has important implications for empirical analysis of the effects of capital account liberalization and also for designing such liberalization programs.

A complication, however, is that there appear to be some threshold conditions that influence the cost-benefit tradeoff. Indeed, factors such as financial market development and the quality of institutions also seem to play a crucial role in determining the extent of benefits a country can derive from financial openness and also how vulnerable it is to the risks associated with capital flows. These thresholds are considerably lower for certain types of financial flows—FDI and portfolio equity, in particular—and higher for debt inflows.[2] Indeed, there are many examples of how underdeveloped or poorly regulated financial markets and weak institutions can interact in ways that result in misallocation of foreign capital and make countries vulnerable to financial crises.[3]

This framework clearly highlights some deep tensions in the process of capital account liberalization that cannot easily be avoided. But the collateral benefits-thresholds framework also suggests a way forward. If one can prioritize the indirect "collateral" benefits that a country needs, it should in principle be possible to undertake a controlled

[1] Kose et al. (2006) develop this framework and survey the evidence on each of these potential collateral benefits. There is accumulating evidence—based on country case studies as well as cross-country analysis using both macroeconomic and microeconomic (firm- and sector-level) data—that financial openness tends to positively influence financial development and institutional quality. The evidence that it boosts macroeconomic discipline remains sparse, however. For a skeptical view on the notion that financial integration delivers such indirect benefits, see Eichengreen (2007) and Rodrik and Subramanian (2008).

[2] Kose, Prasad and Taylor (2008) review the theoretical basis for such threshold effects and provide some quantitative evidence that thresholds matter, even though it proves difficult to pin down precisely the exact levels of various thresholds.

[3] See Krueger and Yoo (2002) and Desai (2003) for interesting narrative accounts.

capital account liberalization that helps attain these benefits while reducing the risks. Thus, the framework encompasses a general approach that can take still take account of country-specific circumstances and initial conditions. For instance, Prasad and Rajan (2008) propose a method for countries experiencing sustained large inflows to securitize their reserve accumulation. This would, in a controlled way, help balance the inflows by encouraging outflows, and would deliver the indirect benefits of broadening financial markets and allowing citizens of these countries to benefit from international portfolio diversification.

Risk sharing

It is also worth considering other potential benefits of financial openness rather than just its effects on GDP growth. One of the main presumed benefits of financial integration is that it should facilitate international trade in financial assets, thereby enabling countries to diversify away their income risk and thereby smooth their consumption growth. Remarkably, the evidence shows that financial integration has, on average, led to *worse* risk sharing outcomes for emerging market economies during the period of globalization. Only industrial countries have been able to more efficiently share risk through the process of financial integration. Kose, Prasad and Terrones (2007) document these patterns in the data. They also probe more deeply into why financial integration seems to hurt emerging markets on this dimension.

They find that stocks of FDI and portfolio equity liabilities are in fact associated with better risk sharing outcomes while stocks of external debt liabilities are not. Indeed, this goes a long way towards explaining the paradoxical outcomes for emerging markets. Until recently, financial integration for these economies largely took place in the form of debt accumulation. Not only are debt flows themselves procyclical, interest payments on external debt are typically not indexed to the business cycle, so they have a procyclical element to them as well. FDI and portfolio equity flows by their very nature involve a sharing of risk between foreign investors and their host countries. They have also tended to be more stable than debt flows.

Productivity growth

The literature about the indirect benefits of financial integration emphasizes that the main benefits of financial integration are in terms of TFP growth. Interestingly, while there has been a vast literature examining the effects of integration on output growth, scant attention has been paid to its effects on TFP growth. In a recent contribution, Kose, Prasad and Terrones (2008) find that de jure capital account openness is positively associated with TFP growth. Surprisingly, however, overall de facto financial integration is not correlated with TFP growth. This turns out to mask a novel and interesting result. FDI and portfolio equity liabilities are in fact associated with much higher productivity growth, while stocks of debt liabilities are negatively correlated with TFP growth, especially in economies with underdeveloped financial systems. What explains this difference? The indirect "collateral" benefits of financial flows tend to flow from FDI, in terms of technological and skill spillovers, and from portfolio equity, in the form of increased depth and innovations in equity markets. Financial sector FDI has also been found to help in the import of good governance practices, financial innovations etc. (Goldberg, 2004).

A common theme that emerges from this new literature is that, in terms of evaluating the potential benefits and risks of financial integration, the composition of the stock of external liabilities is highly relevant in a number of dimensions. This is of course not a big surprise—for instance, it is in line with the earlier literature on sequencing of capital account liberalization. But it is nevertheless comforting that some of the theoretical predictions about the benefits of financial integration can be recovered with a suitable disaggregation of the data.

This brief overview of the new literature on the benefits and costs of financial openness will help us in understanding the implications of India's rising financial openness. But, to begin with, we need to know how open India's capital account actually is.

III. How Open is India's Capital Account

The traditional approach to measuring financial openness is to use measures of legal restrictions on cross-border capital flows. The conventional binary indicator of capital account openness is based on information contained in the International Monetary Fund's *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER) for each of the IMF's member countries (Schindler, 2007). Authors such as Miniane (2004), Chinn and Ito (2006), and Edwards (2007) have developed finer measures of capital account openness using disaggregated information from the AREAER.

An alternative approach is to use a de facto measure that tries to take into account how much a country is integrated into international capital markets in practice.[4] A measure of gross flows as a ratio to GDP captures two-way flows, which one would expect to see if economies were in fact sharing risk efficiently in a world with multiple financial instruments and agents with different risk profiles. Using the sum of gross inflows and outflows as a ratio to national GDP also yields a nice symmetry with the widely-used measure of trade openness, which is the sum of imports and exports as a ratio to GDP.

However, such annual flows tend to be quite volatile and are prone to measurement error. To mitigate (but obviously not eliminate) these problems, Kose et al. (2008) propose using the sum of gross stocks of foreign assets and liabilities as a ratio to GDP. For some purposes--particularly risk sharing--the stock measures are more appropriate. For instance, if countries have large gross stocks of assets and liabilities, small exchange rate changes can have large valuation effects and serve as a mechanism for risk-sharing even if net asset positions are small. For emerging market countries, another relevant measure of de facto financial integration is the ratio of gross stocks of external liabilities to GDP—a cumulated measure of inflows that is most closely related to the notion of

[4] Another approach has been to look at price-based measures of asset market integration. However, there are serious practical problems in using such measures for developing economies. Returns on financial instruments in those economies may incorporate a multitude of risk and liquidity premia that are difficult to quantify. Even interest parity conditions sometimes do not hold because of inefficiencies and lack of depth in some of these markets.

openness to foreign capital that could be associated with technological and other spillovers. We take these measures of de facto financial integration from the widely-used database created by Lane and Milesi-Ferretti (2006).

There is important information in both the de jure and de facto measures. De jure measures are relevant for analysis of the effects of capital account liberalization policies. But the existence of capital controls often does not accurately capture an economy's actual level of integration into international financial markets. These measures do not capture the degree of enforcement of capital controls (or the effectiveness of that enforcement), which can change over time even if the legal restrictions themselves remain unchanged. Many countries with extensive capital controls have still experienced massive outflows of private capital, while some economies with open capital accounts have recorded few capital inflows or outflows. For instance, despite its extensive regime of capital controls, China has not been able to block inflows of speculative capital in recent years (Prasad and Wei, 2007). A further complication is that, despite the extensive coverage of the IMF's annual AREAER publication, there could be other regulations that effectively act as capital controls but are not counted as controls. For instance, prudential regulations that limit the foreign exchange exposure of domestic banks could, under certain circumstances, have the same effect as capital controls.

The de facto measure may be conceptually more appropriate to the extent that one is interested in the effects of an outcome-based measure of financial integration. On the other hand, many of the indirect benefits of financial integration may be vitiated by the presence of capital controls. Efficiency gains from competition, technology transfers, spillovers of good corporate and public governance practices etc. may be associated with an open capital account. Inward flows that manage to circumvent capital account restrictions are much less likely to convey many of the indirect benefits of financial integration. Many authors have also pointed out that capital controls can impose significant distortionary costs at the microeconomic (firm or industry) level, even if economic agents find ways to evade those controls (see the survey by Forbes, 2005).

How does India stack up on these different measures of financial openness? Table 1 presents some summary statistics on each of the measures of de jure capital account openness discussed above at different points of time. For each measure and each date, the table shows the median value for the full sample of countries, different values for emerging market countries, and the value assigned to India. By any of these measures, it looks like India is at the low end of the distribution of the respective capital account openness measure in 1995. There is a trend increase in average capital account openness across the sample and India falls to near the bottom of the distributions of all three measures. By 2005, India remains near the bottom of the distribution of Chinn-Ito measures but moves up significantly per the Edwards measure.[5]

This does not seem fully representative because the RBI has in fact eased a number of controls, both on inflows and outflows. For instance, although capital outflows by individuals are in principle still restricted, each individual is allowed to take up to $200,000 of capital out of India each year, a generous ceiling by any standards. The restrictions on outflows by Indian corporates are even weaker. But these crude measures, which are based on a reading of the IMF's annual AREAER reports on each country, do signal that there are some restrictions on capital account transactions even in categories of flows that have been liberalized (even minimal registration requirements do get counted as restrictions).

We now turn to the picture of India's de facto integration with international capital markets. Figure 1 shows that gross external liabilities, gross external assets, and the sum of these two variables (expressed as ratios to GDP) have all increased significantly in recent years, indicative of the rapid pace at which India has been integrating into international capital markets. From 1980 to the mid-1990s, the total integration measure rose by about 25 percentage points, with almost this entire increase accounted for by an

[5] A different measure of de jure capital account openness is the equity market liberalization measure created and used by Bekaert and Harvey (2000) and Harvey (2000). This is considered a one-off liberalization that occurs when domestic equity markets are opened up to foreign investors. These authors list India as having liberalized its equity markets in 1992 (and China as having done so in 1994).

increase in external liabilities. In the mid-1980s, especially with the onset of the Asian financial crisis, de facto integration leveled off, although it is interesting to note that assets continued to increase gradually during this period. From 2000 to 2006, the integration measure shot up by nearly 26 percentage points, with accumulation of external liabilities and assets accounting in almost equal part for this increase.

Nevertheless, on a cross-country comparison and relative to its size, India appears to have one of the least financially open economies amongst the group of emerging markets. Figure 2 shows that India was near the bottom of the distribution of the preferred de facto integration measure; its relative position among emerging markets remains quite stable despite the rapid increase in its absolute level of integration. Thus, in terms of both de jure and de facto measures, India's low level of financial openness puts it in the illustrious company of China. This perspective is useful to keep in mind while discussing whether India has exposed itself to considerable risks from rapid integration into international capital markets.

IV. The Balance of Payments

In order to dissect the forces behind the accumulation of foreign assets and liabilities, we now turn to an analysis of the underlying flows. India's engagement with the world economy through both trade and financial linkages can best be seen through the prism of the balance of payments. There have been dramatic changes in the evolution of India's balance of payments since the currency crisis of the early 1990s (Table 2). During and right after the period of the Asian financial crisis, the current account and capital account roughly balanced each other. In the early part of this decade, the current account balance turned slightly positive, despite a trade deficit. Indeed, this has been a consistent story in India during this decade—that the trade deficit has been offset to a considerable extent by a surplus on invisibles trade and remittances from Indian workers abroad.

Reserve accumulation gradually picked up speed during the early 2000s. There has been a marked shift in the structure of the balance of payments during the last two years (2006-

07 and 2007-08). The merchandise trade deficit has risen sharply (to 8 percent of GDP) and the current account deficit is now 1.5 percent of GDP, both larger than at any other time during the past decade. But large capital inflows have more than offset the current account deficit, leading to rapid reserve accumulation.

At the end of financial year 2008, gross international reserves stood at $310 billion, representing about 27 percent of nominal GDP. Figure 3 shows that reserve accumulation has hardly been a steady and unrelenting process in India (unlike in China, where it has). There have been a number of months, even during this period of unprecedented reserve accumulation, when reserves have actually fallen. But the overall trend is clearly one of not just a rising level of reserves but also a rising pace of reserve accumulation.

It is instructive to break down the reserve buildup into its components to examine what factors can explain the increase in the rate of accumulation. For this exercise, I split the nine-year period since the Asian financial crisis into three periods: 1998-99 to 2000-01; 2001-02 to 2005-06; and 2006-07 to 2007-08. The first three columns of Table 3 show the average annual increase in foreign exchange reserves during each of these periods and the breakdown of this increase into the main components. The next two columns show the changes in these averages across periods.

The rate of reserve accumulation was higher by an average of $17 billion per year in the second period relative to the first. The current account balance shifted from an average deficit of $4 billion per year in the first period to a surplus of $2 billion per year in the second period, implying that the current account contributed about $6 billion to the increase in the rate of reserve accumulation in the second period compared to the first. The change in the non-FDI capital account balance, which mainly constitutes portfolio flows, accounts for most of the remainder.

During 2006-08, the rate of reserve accumulation jumps by a further $57 billion per year relative to the preceding period. The forces driving the reserve buildup in this period are very different from the previous period. The current account switches back into a deficit,

resulting in a negative contribution of nearly $16 billion per year from the current account. FDI and valuation changes account for $8 billion and $13 billion, respectively. The latter factor represents an increase in the dollar value of reserve assets held in currencies other than dollars as a consequence of the significant depreciation of the dollar against other major reserve currencies during this period. The big story during the last two years has clearly been the surge in portfolio inflows and various other debt inflows, which together meant that the non-FDI capital account balance contributed nearly $52 billion per year to the faster pace of reserve accumulation during this period.

To better understand the implications of these patterns in the balance of payments, it is important to examine in more detail the structure of inflows and external liabilities.

V. Composition of Gross Flows and External Liabilities

I now provide a disaggregated perspective on India's de facto financial integration. As discussed in the review of the academic literature in Section II, the costs and benefits of financial openness are crucially dependent on the nature of financial integration. In this section, I review the composition of India's capital inflows and outflows, the structure of its external liabilities, and the implications for the benefit-cost trade-off.

V.1 Gross Flows

Table 4 indicates that gross inflows have risen sharply since the early 2000s, from an average level of about 2 percent of GDP over the previous decade, to nearly 9 percent in 2007-08. The shares of the components of gross inflows fluctuate markedly from year to year and it is difficult to detect any strong trends over the full sample of data. Focusing on the last four years, it is clear that FDI and portfolio inflows have together become a major constituent of overall inflows. The trend in outflows, which still remain at very low levels (2 percent of GDP in 2007-08), is much clearer, with FDI accounting for the lions' share of outflows in recent years and portfolio flows barely registering on the scale.

V.2 Composition of External Liabilities

As discussed earlier, stocks of external liabilities are more reliable measures of the benefits that emerging markets can potentially attain from financial integration, and also the potential risks. For this part of the analysis, we turn again to the dataset of Lane and Milesi-Ferretti (2006). Figure 4 shows that the ratio of FDI and portfolio liabilities in gross external liabilities risen steadily, from a level below 10 percent in the early 1990s to 60 percent at present. Based on the discussion in Section II about the relative merits of different forms of capital, this is clearly a positive development.

Figure 5, which provides a cross-country comparison of this ratio for emerging markets, shows that India is now in the middle of the pack and not too far off the level of the leading country. Indeed, India has moved up quite significantly from its position near the bottom of this cross-country distribution in 1995. It is also interesting to note that the dispersion of this ratio across emerging markets has decreased considerably over the past decade. This is of course consistent with other evidence that the composition of private capital flows to emerging markets has shifted markedly towards FDI and portfolio flows in recent years.[6] Thus, in India, as in most other emerging markets, the structure of external liabilities has become quite favorable in terms of attaining the risk sharing and TFP growth benefits of financial openness.

[6] Kose et al. (2006) report that, in 2000-04, debt accounted for about 52 percent of gross external liabilities of emerging markets, while FDI accounted for 37 percent. Portfolio equity liabilities accounted for most of the remainder. In 1980-84, the corresponding shares for debt and FDI were 85 percent and 14 percent, respectively.

V.3 Structure of External Debt

One component of foreign liabilities that is of particular interest is the stock of external debt. The size of the stock of short-term external debt denominated in foreign currencies has been identified as an important factor triggering many emerging market financial crises of the last two decades. Moreover, short-term debt flows tend to be highly procyclical and so do the financing terms for these flows (Kaminsky, Reinhart and Vegh, 2004). Consequently, countries that rely to a great extent on short-term foreign-currency debt face a double whammy when they are hit with negative shocks and when financing is in principle even more important to smooth domestic consumption.

India has taken a cautious approach to allowing the accumulation of foreign-currency denominated external debt, resulting in a low level of vulnerability on this front. The ratio of external debt to GDP has fallen from levels of around 35 percent in the early 1990s to under 20 percent in the last five years (see Table 5). Moreover, the share of short-term debt in total debt has consistently remained under 10 percent. With the opening up to capital inflows, the share of deposits by Indians who live abroad and other foreign currency deposits in total debt has gone from 12 percent in the early 1990s to 28 percent in 2008. External commercial borrowings by corporates have risen to about 28 percent of total debt.

Consider adding together three elements of the debt structure that could represent potential flight capital--foreign currency deposits, external commercial borrowings and short-term debt. Even if one adds all of these together, for 2007 the total amounts to only about 10 percent of GDP.[7] Some authors such as Williamson (2007) have expressed concerns that the liberalization of debt inflows may bode ill for India. The levels of debt are not high enough to warrant significant concern.

[7] I have not been able to find an official number for the share of short-term debt in total debt for 2008. The share of 20 percent implied by the share of long-term debt (calculated by adding up the reported shares of the components) suggests a discontinuity in the breakdown of external debt data by maturity.

But the surge in external commercial borrowings does bear further consideration. Given the practically nonexistent domestic corporate debt market, firms interested in issuing debt may have been pushed to issue debt abroad. Moreover, the RBI's attempts to resist exchange rate appreciation may in fact have created incentives for firms to seek capital abroad using debt denominated in foreign currencies. Firms may have been betting on an eventual currency appreciation via this financing instrument. Thus, rather than viewing foreign debt as the problem to be dealt with, it would be more appropriate to think about aspects of the financial system and macro policies that may be creating incentives for firms to obtain financing through foreign-currency debt. I will return to this theme in the concluding section.

VI. Does India Have Enough Reserves?

In determining a country's vulnerability to external shocks, the structure of external assets and liabilities is an important indicator. I now examine the evolution of India's official international investment position (IIP) and its implications for India's financial openness.[8] The IIP effectively represents a country's balance sheet vis a vis the rest of the world. Table 6 shows that, at the end of 2006-07, India had a net negative IIP position of $45 billion. This represents a significant improvement from the level of minus $81 billion in 1996-97, just before the Asian financial crisis. The stock of external assets has quadrupled from $60 billion in 2000-01 to $244 billion in 2006-07. A substantial portion of this stock is accounted for by reserves. At the end of FY 2006-07, the total stock of reserve assets was close to $200 billion, of which foreign exchange reserves amounted to $192 billion. This latter number has gone up to $310 billion at the end of FY 2007-08.

[8] Due to some differences in how valuation effects are computed for various components of external assets and liabilities, there are some discrepancies between the values of these stocks in the official IIP data and the Lane and Milesi-Ferretti (2006) dataset. These discrepancies have grown in the last few years as the stocks have increased, along with the magnitude of fluctuations in the value of the U.S. dollar. Hence, I use the official IIP data here but have used the Lane and Milesi-Ferretti in other sections to facilitate international comparisons.

From an insurance perspective, the adequacy of the stock of foreign exchange reserves is typically measured relative to a country's imports or level of short-term external debt. Table 7 shows that, by both these measures, India has more than adequate reserves. As of 2008, reserves are enough to cover more than a year's worth of imports, well above the conventional threshold of six months of imports. Moreover, reserves far exceed the level of short-term foreign currency-denominated debt.

From the perspective of capital account liberalization, an even more stringent criterion than the coverage of external debt is whether reserves cover a major portion of the stock of all non-FDI foreign liabilities, on the assumption that all liabilities other than FDI are relatively liquid and could fly out of a country at short notice. The IIP numbers show that, at the end of 2006-07, India's foreign exchange reserves ($192 billion) were nearly adequate to cover its entire stock of non-FDI liabilities, which amounted to about $217 billion.

A different criterion suggested by some authors is whether reserves are sufficient to cover a significant portion of a broad monetary aggregate such as M2.[9] Demand deposits and currency can in principle flee a country at short notice; protecting the economy from the financial instability that could arise from such an event could be an important benchmark for policymakers to gauge a "safe" level of reserves. By this criterion, India, like many other emerging market economies (including China) does not have an excessively high level of reserves. The last column of Table 7 shows that India's reserves cover about 20 percent of M2, which is a large share but obviously not enough to offset a complete financial collapse and the accompanying loss of confidence in the domestic banking system. Given the relative prudence of the RBI and the large banks themselves, this seems a highly unlikely scenario.

[9] Obstfeld, Shambaugh and Taylor (2008) argue that concerns about domestic financial stability could be a key motive for the massive amount of reserve accumulation by emerging market economies in recent years. Given the current levels of external debt, imports etc., the levels of reserves in many of these countries are well above those that could be justified on precautionary grounds based on these standard criteria. These authors find that a model that includes the ratio of M2 to GDP does a much better job of fitting cross-country variations in reserve levels.

The basic conclusion of this section is that India has accumulated a level of foreign exchange reserves that exceeds most standard norms of reserve adequacy from an insurance perspective. Indeed, the fact that India has accumulated an additional $110 billion of reserves during 2007-8 makes this picture look even more benign than indicated by the ratios in Table 7. The traditional risks faced by emerging markets with open capital accounts—sudden stops or reversals of capital flows—are therefore not a major concern. Nevertheless, there is clearly an important difference relative to China, which has been accumulating reserves at a hectic pace through current account as well as capital account surpluses.

While China is running a current account surplus in excess of 12 percent of GDP, India registered a current account deficit of 1.5 percent in 2007-08. Is India vulnerable on this dimension? Since foreign exchange reserves amount to 27 percent of GDP, a sudden stop of capital inflows by itself isn't going to create major problems for financing the current account deficit. But current account deficits that reflect consumption booms have often ended disastrously—is this a risk for India? On this score, there isn't a strong case for concern. Figure 6 shows that both the national savings and investment rates have been rising since the early 2000s, although the investment rate has risen a little faster, accounting for the current account deficit. Thus, India seems to fit the textbook example of a developing country borrowing from abroad to finance investment as its capital to labor ratio is low and its productivity growth is high relative to its major trading partners.[10]

One aspect in common with China is the risk of a banking crisis—a significant tremor in the banking system may trigger a surge of outflow of deposits from the banking system and into foreign currency assets (see Prasad, 2008). Accumulating enough reserves to deal with this potential source of financial instability may seem prudent. But the costs of accumulating such a large stock of reserves—especially in terms of the other distortions

[10] Bosworth and Collins (2008) conduct a growth accounting exercise for India and China. They conclude that India has in recent years been experiencing higher productivity growth than most industrial countries (but less than China).

in the system needed to maintain a rapid pace of accumulation—implies that this insurance may have costly welfare consequences. I will return to this theme in the concluding section.

VII. India's Position in the International Financial System

With its strong growth prospects, India will remain an attractive destination for capital inflows. And its emergence as an economic power will mean that the economy is likely to continue to export private capital. But what form these inflows and outflows take will of course determine the effects on macroeconomic outcomes. While such prognostications are difficult, a first step is to evaluate how much of various types of flows to emerging markets can be accounted for by India. For this exercise, we rely on IMF data on total gross inflows into and outflows from all emerging markets and other developing countries. This includes not just flows between these countries and advanced industrial economies but also flows amongst these countries themselves.

Figure 7 shows India's share in total gross flows to emerging markets and other developing countries. This share was just 2 percent in 1997 but shot up to 8 percent in 1998, the second year of the Asian financial crisis, mainly because the overall quantum of flows to emerging markets shrank substantially and economies like China and India that were not devastated by the crisis got more of whatever flows there were. The share has averaged about 5 percent during the 2000s and has been quite stable. India's share of FDI has been quite low over the last decade and inched up to just over 4 percent in 2006. Likewise, India's share of portfolio flows to non-industrial countries hit 12 percent in a couple of years (2001 and 2003) but has otherwise been rather low, amounting to only 4 percent in 2006 (based on the strong portfolio inflows in 2007-08, it has no doubt gone up by at least a couple of percentage points).

In parallel with the inflows it has been receiving, India has of course been investing abroad. Encouraged by the RBI's easing of restrictions on outward FDI, Indian corporates have ramped up these flows, which now account for more than 6 percent of

total gross FDI flows emanating from all non-industrial countries (including flows going to other emerging markets). The share of portfolio flows, by contrast, has remained at minuscule levels.

Its low share of total inflows into emerging markets suggests that, despite its growth story, India has a considerable way to go in terms of even obtaining a significant share of total flows to non-industrial countries. It also suggests that, unless there is a fundamental shift in the structures of world financial markets, there could be a lot more capital coming into India if growth prospects remain strong and other international investors "discover" it.[11] Factors that could lure more capital into India include its relatively high productivity growth, well-developed equity markets, and the profit opportunities from rising income levels and a rapidly expanding domestic market.

At the same time, India's growth is also likely to unleash resources that will result in more capital outflows. As household income levels rise, the demand for international portfolio diversification will increase. Indian institutional investors will also be looking for a wider range of investment opportunities, both domestically and abroad, as their asset pools increase. And Indian companies will almost certainly continue to expand their reach abroad.

The net implication is that there are powerful forces that will impel a substantially higher degree of integration into international financial markets, with capital controls becoming increasingly irrelevant even if they remain on the books. Given India's financial structure and changes in the structure of international financial flows, much of this integration is likely to take the form of inflows and outflows of FDI and portfolio equity, which would of course be a favorable outcome. But the reality is that it will become increasingly difficult to bottle up specific types of flows if the economic incentives favoring them are

[11] Patnaik and Shah (2008) note that India's actual weight in the global equity portfolio is only about one-sixth the predicted weight that India should have according to a standard international capital asset pricing model (ICAPM). This is in fact an improvement relative to 2001, when the actual weight was only about one-tenth the predicted weight (and, of course, India's ICAPM weight has risen substantially--almost four-fold--from 2001 to 2007).

powerful enough. So the best that macroeconomic policies can do is to foster macroeconomic and financial stability, which could serve to promote the right kinds of flows in both directions.

VIII. Implications for Policies Towards Capital Account Liberalization

There are some odd aspects to India's capital account openness. On the one hand, the capital account has become quite open and restrictions on both inflows and outflows have been eased significantly over time.[12] Nevertheless, there seems to be a residual element of government control that is maintained on many types of flows—sometimes as modest as registration requirements on foreign investors but also some as onerous as virtually keeping foreign investors out of the government debt market—which seems to go against the spirit of unrestricted financial flows. In terms of de facto financial integration, India has come a long way and has experienced significant inflows and outflows in recent years. Relative to the size of its economy, however, these flows are rather modest, putting India at the low end of the distribution of de facto financial integration measures in an international comparison across emerging market economies.

The outcome of the RBI's calibrated approach to capital account opening appears to have resulted in a preponderance of FDI and portfolio liabilities in India's stock of gross external liabilities. All elements of the literature point to this as being a favorable outcome in terms of improving the benefit-risk tradeoff of financial openness. But the excessive caution in further capital account opening may be hurting financial sector reforms and reducing the independence and effectiveness of monetary policy.

Why not move more rapidly towards capital account convertibility? One of the main concerns about capital account liberalization is that it makes exchange rate management harder. Some authors have argued that opening of India's capital account should be resisted as that would make it harder to maintain an undervalued exchange rate and

[12] For a chronology, see Bery and Singh (2006). Patnaik and Shah (2008) discuss a few recent steps towards more openness, some remaining restrictions, and their consequences.

thereby promote export-led growth (e.g., Bhalla, 2007; Subramanian, 2007). Not only is this not a realistic proposition, but also it has detracted from many of the potential indirect benefits of financial integration.

Although India does not have a formal exchange rate target, the Indian rupee has been managed to varying degrees at different times. Even though the nominal exchange rate relative to the U.S. dollar has fluctuated over a wide range in the last decade (Figure 8), the effective exchange rate—measured in either nominal or real terms—has been managed within a much narrower range (Figure 9). The problem is that this has constrained the independence of monetary policy, which now involves a mix between inflation and exchange rate objectives. The RBI does in fact have a medium-term inflation objective but also focuses on the exchange rate when needed. As recent events have indicated, this has made the central bank more susceptible to political pressures and might have made it harder for the RBI to manage inflationary pressures.

Resisting exchange rate appreciation has resulted in large costs of sterilizing inflows that are recycled into foreign exchange reserves, which are usually held in low-yield industrial country government bonds. Figure 10, which shows the interest rate differential between Indian and U.S. government securities, drives this point home. The stock of sterilization bonds (Market Stabilization Bonds) also rose sharply during 2006 and 2007, implying that the quasi-fiscal costs of the RBI's sterilization operations have mounted rapidly. Clearly, tight exchange rate management is not a viable strategy, especially as the capital account is becoming more open in de facto terms over time. The Rajan Committee report (2008) makes the point that monetary policy would be far more effective if it was focused on the objective of a low and stable inflation rate. Indeed, the evidence suggests that making an inflation objective the key priority of monetary policy would be the best contribution that monetary policy can make to stabilizing domestic business cycles, maintaining financial stability, and even reducing exchange rate volatility (Rose, 2006). In short, maintaining capital controls as a device to try and manage the exchange rate better is unlikely to work and also weakens monetary policy in insidious ways.

Williamson (2007) argues that India may have liberalized its capital account too quickly and that it should slow down the process noting, in particular, that liberalizing debt flows could be risky and would have few benefits. This proposition has some validity to it but comes up against the reality that it is now very difficult to bottle up specific types of flows. As discussed earlier, the increase in external commercial borrowings in foreign currencies by Indian corporations may be driven in large part by other policy distortions such as the attempt to manage the exchange rate as well as the absence of other markets to hedge currency risk. Maintaining capital controls simply perpetuates these distortions. Indeed, rising de facto openness in tandem with de jure controls may lead to the worst combination of outcomes—the complications for domestic macroeconomic management from volatile capital flows and far fewer indirect benefits from financial openness.

One key issue is whether India falls afoul of the threshold conditions that seem to make a big difference to the benefit-risk tradeoff of financial openness. Kose, Prasad and Taylor (2008) report that, while it is difficult to precisely identify the critical levels of the threshold conditions that influence the outcomes of financial openness, there are a few general propositions that do come out of the analysis for particular countries such as India. Given India's level of financial and institutional development, the accumulation of FDI and portfolio equity liabilities is relatively "safe" as the levels of these two thresholds for such liabilities are rather low. As for debt accumulation, India is moving towards the threshold in terms of financial development but is not there yet.

Another important threshold condition is related to trade integration. Many authors have found that greater openness to trade not only reduces the risks of financial crises but also makes it easier for a country to recover quickly if it does get hit by a crisis (see, e.g., Frankel and Cavallo, 2004, and references therein). On this dimension, it is encouraging that there has been a rapid increase in India's external trade, with the standard trade openness measure (ratio of the sum of exports and imports to GDP) nearly doubling from its level of 25 percent in 2000 (see Figure 12).

Thus, in terms of the collateral benefits-thresholds framework, India is a good example of a country where the benefit-risk tradeoff of further capital account is finely balanced. It turns out that there is another important threshold condition, which is the level of financial integration itself. Countries that are more integrated into international financial markets seem to achieve better risk sharing outcomes and also seem to suffer few ill effects of even a stock of external liabilities that is tilted towards more debt.

Given the cushion provided by India's high level of reserves, there is now an opportunity to push forward more aggressively with capital account opening in order to gain some of the indirect benefits of financial integration. For instance, a specific recommendation of the Rajan Committee (2008) is that allowing foreign investors to invest in government bonds could improve the liquidity and depth of this market. This would have numerous ancillary benefits. A deep and well-functioning government bond market is a prerequisite for serving as a benchmark for pricing corporate bonds, which could allow that market to develop. By providing an additional source of debt financing, it would create some room for the government to reduce the financing burden it currently imposes on banks through the statutory liquidity ratio—the requirement that banks hold a certain portion of their deposits in government bonds. And it might even have the beneficial effect of imposing some discipline on fiscal policy since foreign investors could pull out and raise the cost of debt financing if the government budget deficit were to start rising again.

An opportunistic approach to liberalization of outflows during a period of surging inflows is also worth considering as it would serve multiple objectives. If undertaken in a controlled manner along the lines suggested by Prasad and Rajan (2008), it would generate a variety of collateral benefits—sterilization of inflows, securities market development, international portfolio diversification for households—without the risks of a full and irrevocable opening of the taps for outflows.

Does all this mean that financial integration should be a key policy priority and that the capital account should be opened at one fell swoop? Hardly. But holding exchange rate policy and financial reforms hostage to the notion that the capital account can be kept

closed or restricted for a prolonged period may prove to be a costly delusion. While full capital account convertibility may not be an immediate priority, it is important not to lose sight of the longer-term objective while dealing with short-term pressures caused by inflows. Indeed, in terms of facilitating adjustment and deriving more indirect benefits, there is a case to be made for taking advantage of the various favorable circumstances discussed in this paper and laying down a well-articulated roadmap towards rapid capital account liberalization.[13]

[13] The reports of the Mistry Committee (2007) and Rajan Committee (2008) lay out a fairly aggressive timetable, noting the large benefits that could be gained from financial openness, including how it could foster more effective monetary policy and boost financial sector reforms. The Tarapore Committee (2006) recommends a much slower pace of liberalization. Rajan and Zingales (2003) note that capital account liberalization can also be useful as a framework for building consensus around reforms and for thwarting coalitions that try to block reforms.

References

Aizenman, Joshua, Brian Pinto and Arthur Radziwill. 2007. "Sources for Financing Domestic Capital--Is Foreign Saving a Viable Option for Developing Countries?" *Journal of International Money and Finance*, 26(5): 682-702.

Aoki, Kosuke, Gianluca Benigno and Nobuhiro Kiyotaki. 2005. "Adjusting to Capital Account Liberalization." Working Paper, London School of Economics.

Arteta, Carlos, Barry Eichengreen, and Charles Wyplosz. 2003. "When Does Capital Account Liberalization Help More than It Hurts?" in *Economic Policy in the International Economy: Essays in Honor of Assaf Razin* edited by Elhanan Helpman and Efraim Sadka. (Cambridge, U.K.: Cambridge University Press).

Bekaert, Geert, Campbell R. Harvey, and Christian Lundblad. 2005. "Does Financial Liberalization Spur Growth?" *Journal of Financial Economics.* 77(1): 3–55.

Bery, Suman, and Kanhaiya Singh. 2006. "Domestic Financial Liberalization and International Financial Integration: An Indian Perspective." In *China and India: Learning from Each Other* edited by Jahangir Aziz, Eswar Prasad, and Steven Dunaway. Washington: International Monetary Fund. pp. 145-180.

Bosworth, Barry and Susan M. Collins. Winter 2008. "Accounting for Growth: Comparing China and India." *Journal of Economic Perspectives*, 22(1):45-66.

Bhalla, Surjit S. 2007. *Second Among Equals: The Middle Class Kingdoms of India and China*. (Washington, DC: Peterson Institute of International Economics).

Chinn, Menzie, and Hiro Ito. 2006. "What Matters for Financial Development? Capital Controls, Institutions and Interactions." *Journal of Development Economics*, 81(1): 163-192.

Claessens, Stijn, Aslí Demirgüç-Kunt, and Harry Huizinga. 2001. "How Does Foreign Entry Affect Domestic Banking Markets?" *Journal of Banking and Finance*, 25(5): 891–911.

Claessens, Stijn, and Luc Laeven. 2004. "What Drives Bank Competition? Some International Evidence." *Journal of Money, Credit, and Banking*, 36(3): 563-83.

Clarke, George R. G., Robert Cull, Maria Soledad Martinez Peria, and Susana M. Sanchez. 2003. "Foreign Bank Entry: Experience, Implications for Developing Economies, and Agenda for Further Research." *World Bank Research Observer*, 8(1): 25–59.

Desai, Padma. 2003. *Financial Crisis, Contagion, and Containment: From Asia to Argentina.* (Princeton, NJ: Princeton University Press).

Edwards, Sebastian. 2007. “Capital Controls, Sudden Stops and Current Account Reversals.” in *International Capital Flows*, edited by Sebastian Edwards (Chicago, IL: University of Chicago Press).

Eichengreen, Barry. 2007."The Cautious Case for Capital Flows." Presented to Rating Agency Malaysia's conference on "Free Capital Mobility: What's in Store for Asia?" held in Singapore, 1 August 2007.

Forbes, Kristin J., 2007. “The Microeconomic Evidence on Capital Controls: No Free Lunch.” in *International Capital Flows,* ed. Sebastian Edwards (Chicago, IL: University of Chicago Press).

Frankel, Jeffrey, and Eduardo A. Cavallo. 2004. “Does Openness to Trade Make Countries More Vulnerable to Sudden Stops or Less? Using Gravity to Establish Causality.” NBER Working Paper 10957.

Goldberg, Linda. 2004. “Financial-Sector Foreign Direct Investment and Host Countries: New and Old Lessons.” NBER Working Paper 10441.

Gourinchas, Pierre-Olivier, and Olivier Jeanne. 2007. “Capital Flows to Developing Countries: The Allocation Puzzle.” NBER Working Paper No. 13602.

Henry, Peter B. 2000. “Stock Market Liberalization, Economic Reform, and Emerging Market Equity Prices.” *Journal of Finance*, 55(2): 529–64.

Jeanne, Olivier. 2007. “International Reserves in Emerging Market Countries: Too Much of a Good Thing?” *Brookings Papers on Economic Activity*, Vol. 2001(1): 1-80.

Kaminsky, Graciela, Carmen M. Reinhart, and Carlos A. Vegh. 2004. “When it Rains, it Pours: Procyclical Capital Flows and Macroeconomic Policies.” *NBER Macroeconomics Annual: 2004*.

Klein, Michael, and Giovanni Olivei. 2006. “Capital Account Liberalization, Financial Depth, and Economic Growth” Tufts University Working Paper.

Kletzer, Kenneth M. 2004. “Liberalizing Capital Flows in India: Financial Repression, Macroeconomic Policy, and Gradual Reforms.” ” *India Policy Forum 2004*, edited by Suman Bery, Barry Bosworth, Arvind Panagariya (New Delhi: Brookings Institution Press and NCEAR), pp.227-263.

Kose, M. Ayhan, Eswar Prasad, Kenneth Rogoff and Shang-Jin Wei. 2006. “Financial Globalization: A Reappraisal.” NBER Working Paper No. 12484. Forthcoming in *IMF Staff Papers*.

Kose, M. Ayhan, Eswar Prasad, Kenneth Rogoff, and Shang-Jin Wei. 2008. "Financial Globalization and Economic Policies." Forthcoming in *Handbook of Development Economics*. edited by Dani Rodrik and Mark Rosenzweig.

Kose, M. Ayhan, Eswar Prasad, and Marco Terrones. 2007. "How Does Financial Globalization Affect Risk Sharing? Patterns and Channels." Manuscript, IMF and Cornell University.

Kose, M. Ayhan, Eswar Prasad, and Ashley Taylor. 2008. "Thresholds in the Process of Financial Integration." Manuscript, IMF and Cornell University.

Kose, M. Ayhan, Eswar Prasad, and Marco Terrones. 2008. "Does Openness to International Financial Flows Contribute to Productivity Growth." Manuscript, IMF and Cornell University.

Krueger, Anne O., and Jungho Yoo. 2002. "Chaebol Capitalism and the Currency-Financial Crisis in Korea," in *Preventing Currency Crises in Emerging Markets*, edited by Sebastian Edwards and Jeffrey Frankel (Chicago, IL: University of Chicago Press). pp. 461–501.

Lane, Philip R., and Gian Maria Milesi-Ferretti. 2006. "The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970–2004." IMF Working Paper 06/69.

Lane, Philip R., and Sergio L. Schmukler. 2006. "The International Financial Integration of China and India." manuscript, World Bank.

Levine, Ross, and Sara Zervos. 1998. "Capital Control Liberalization and Stock Market Development." *World Development*, 26(7): 1169–83.

Mishkin, Frederick. 2006. *The Next Great Globalization: How Disadvantaged Nations Can Harness Their Financial Systems to Get Rich* (Princeton, NJ: Princeton University Press).

Mohan, Rakesh. 2007. "India's Financial Sector Reforms: Fostering Growth While Containing Risk." Address at Yale University on December 3, 2007.

Mohan, Rakesh. 2007. "Recent Financial Market Developments and Implications For Monetary Policy." Valedictory Address at IIF's Inaugural Asia Regional Economic Forum on September 20, 2007.

Obstfeld, Maurice, Jay C. Shambaugh, and Alan M. Taylor. 2008. "Financial Stability, the Trilemma, and International Reserves." CEPR Discussion Papers No. 6693.

Patnaik, Ila. 2004. "India's Experience with a Pegged Exchange Rate." *India Policy Forum 2004*, edited by Suman Bery, Barry Bosworth, Arvind Panagariya (New Delhi: Brookings Institution Press and NCAER), pp.189-216.

Patnaik, Ila, and Ajay Shah. 2008. "Managing Capital Flows: The Case of India." NIPFP Working Paper 2008-52.

Prasad, Eswar. 2008. "Is China's Growth Miracle Built to Last?" IZA Discussion Paper No. 2995. Forthcoming in *China Economic Review*.

Prasad, Eswar, Raghuram Rajan, and Arvind Subramanian. 2007. "Foreign Capital and Economic Growth." *Brookings Papers on Economic Activity*, 2007(1): 153-230.

Prasad, Eswar, and Raghuram Rajan. 2008. "A Pragmatic Approach to Capital Account Liberalization." NBER Working Paper No. 14051. Forthcoming in *Journal of Economic Perspectives*.

Prasad, Eswar, and Shang-Jin Wei. 2007. "The Chinese Approach to Capital Inflows: Patterns and Possible Explanations." in *Capital Controls and Capital Flows in Emerging Economies: Policies, Practices, and Consequences*, edited by Sebastian Edwards. Chicago, IL: University of Chicago Press.

Rajan, Raghuram, and Luigi Zingales. 2003. "The Great Reversals: The Politics of Financial Development in the 20th Century." *Journal of Financial Economics*, 69: 5–50.

Reddy, Yaga V. 2005. "Overcoming Challenges in a Globalising Economy: Managing India's External Sector," Lecture delivered at the Foreign Policy Center, London, on June 23, 2005; posted at www.rbi.org.in.

Reddy, Yaga V. 2007. "Converting a Tiger." *Finance & Development*, 44(1): 20-23.

Report of the Committee on Fuller Capital Account Convertibility (S. S. Tarapore). 2006. http://www.rbi.org.in/scripts/PublicationReportDetails.aspx?UrlPage=&ID=468

Report of the Committee on Fuller Capital Account Convertibility (Chairman: S.S. Tarapore). 1997. http://www.rbi.org.in/scripts/PublicationReportDetails.aspx?UrlPage=&ID=169

Report of the High Level Committee on Financial Sector Reforms (Chairman: Raghuram Rajan). 2008. http://planningcommission.nic.in/reports/genrep/report_fr.htm

Report on Making Mumbai an International Financial Center (Chairman: Percy Mistry). 2007. http://finmin.nic.in/reports/index.html

Rodrik, Dani, 2007. "The Real Exchange Rate and Economic Growth: Theory and Evidence." Manuscript, Kennedy School of Government, Harvard University.

Rodrik, Dani, and Arvind Subramanian. 2008. "Why Did Financial Globalization Disappoint?" Manuscript, Harvard University. Forthcoming in *IMF Staff Papers*.

Rose, Andrew. 2006. "A Stable International System Emerges: Bretton Woods, Reversed." CEPR Discussion Paper No. 5854.

Shah, Ajay. 2008. "New Issues in Indian Macro Policy." Forthcoming in *Business Standard India, 2008* edited by T.N. Ninan. (Business Standard Books).

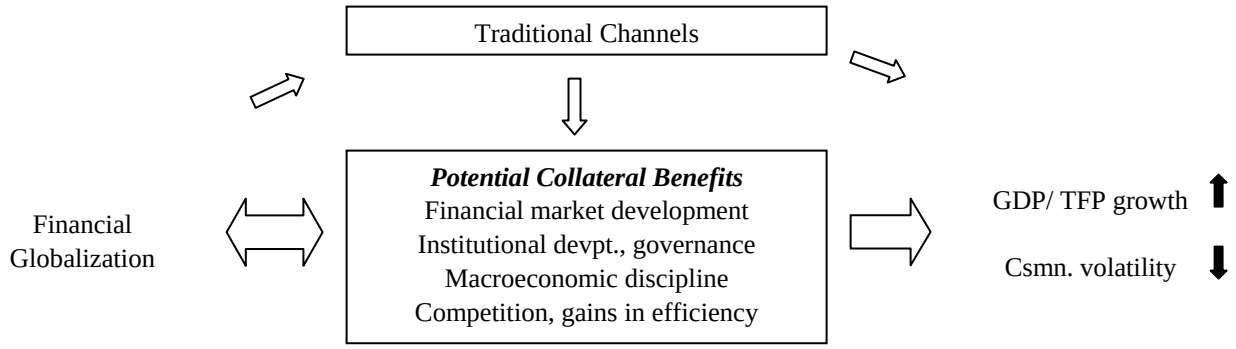
Williamson, John. 2006. "Why Capital Account Convertibility in India Is Premature." *Economic and Political Weekly* May 13, pp.1848-1850.

Schematic 1

The Traditional View

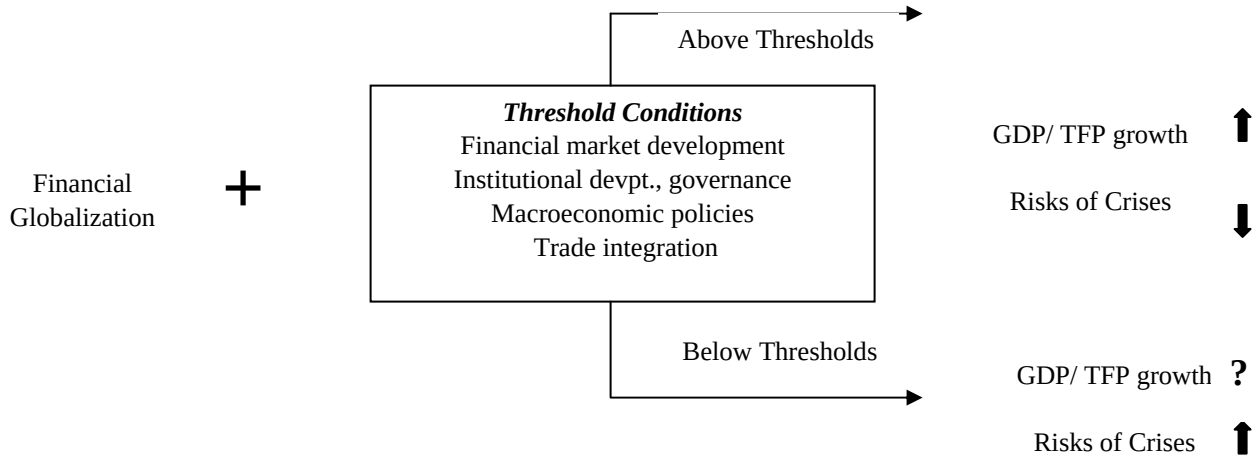
The traditional view focuses on the importance of channels through which capital flows could directly increase GDP growth and reduce consumption volatility.

A Different Perspective



Our perspective acknowledges the relevance of the traditional channels, but argues that the role of financial globalization as a catalyst for certain collateral benefits may be more important in increasing GDP/TFP growth and reducing consumption volatility.

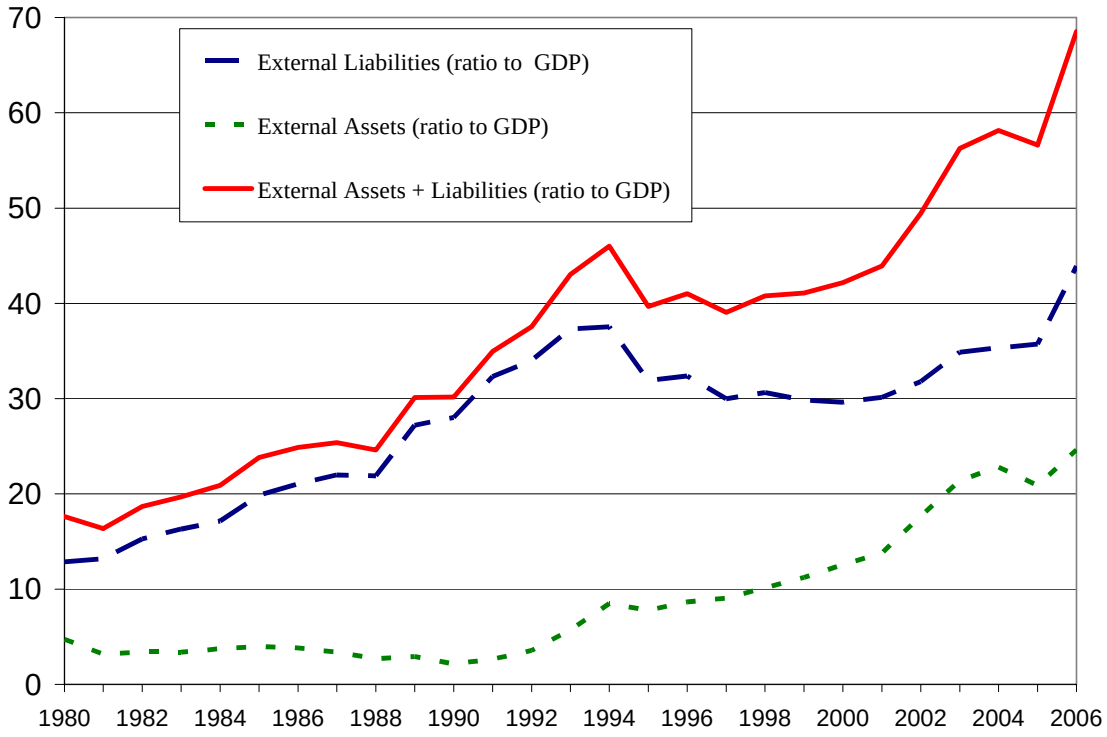
But There are Thresholds



Financial globalization leads to better macroeconomic outcomes when certain threshold conditions are met. This generates a deep tension as many of the threshold conditions are also on the list of collateral benefits.

Source: Kose, Prasad, Rogoff and Wei (2006).

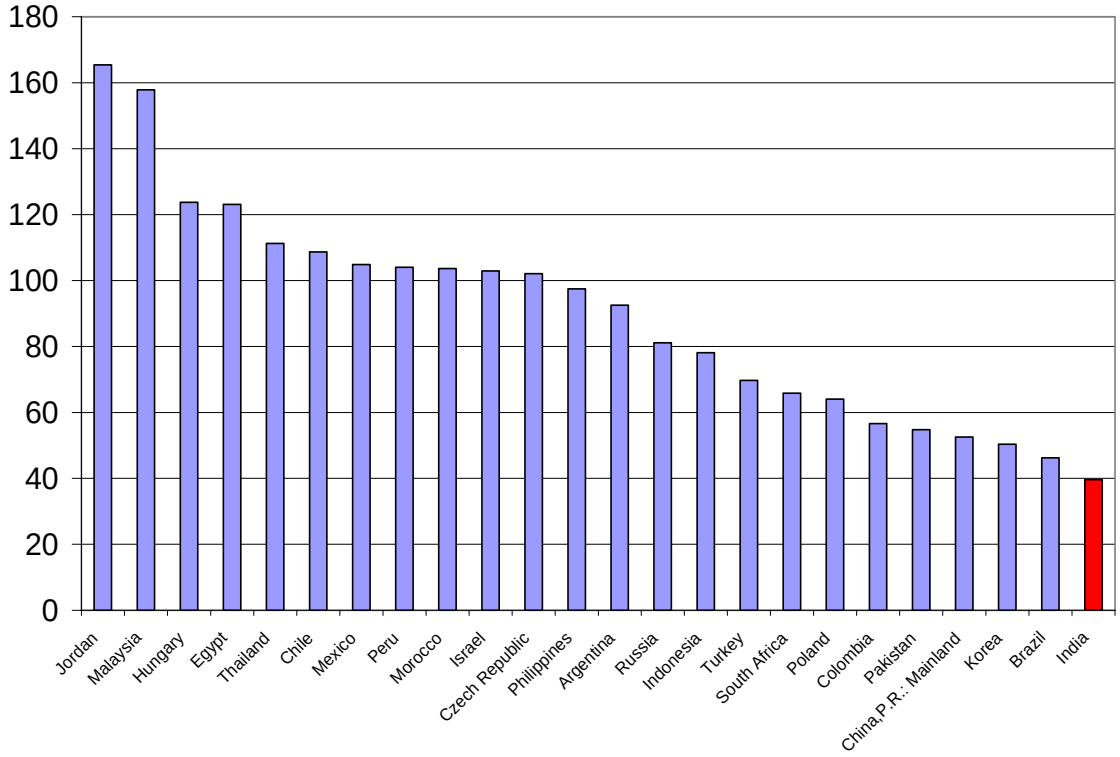
Figure 1. De Facto Financial Openness



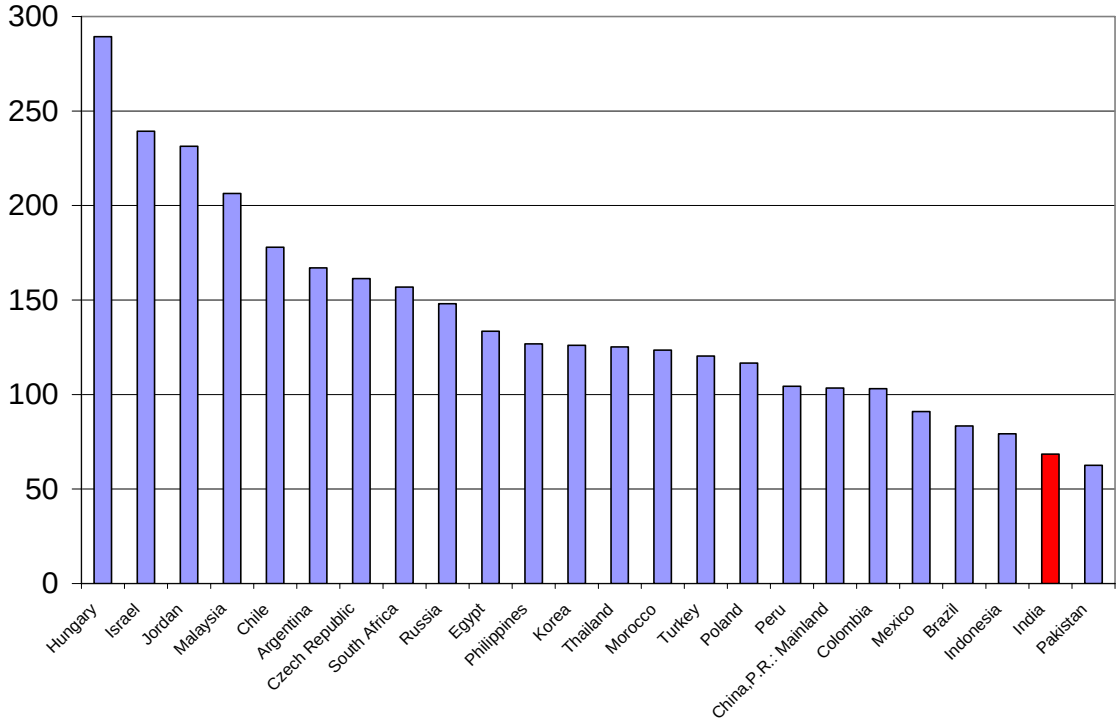
Source: Lane and Milesi-Ferretti (2006) dataset and author's calculations.

Figure 2. De Facto Financial Openness: Emerging Markets

1995

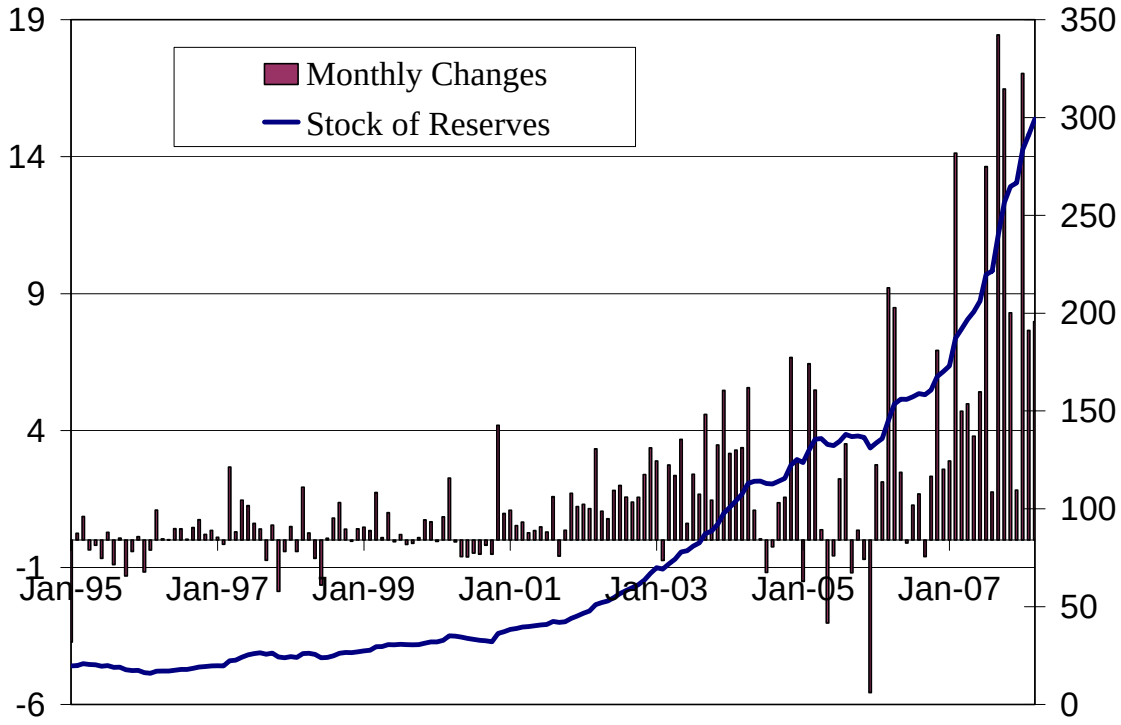


2006



Source: Lane and Milesi-Ferretti (2006) dataset and author's calculations.

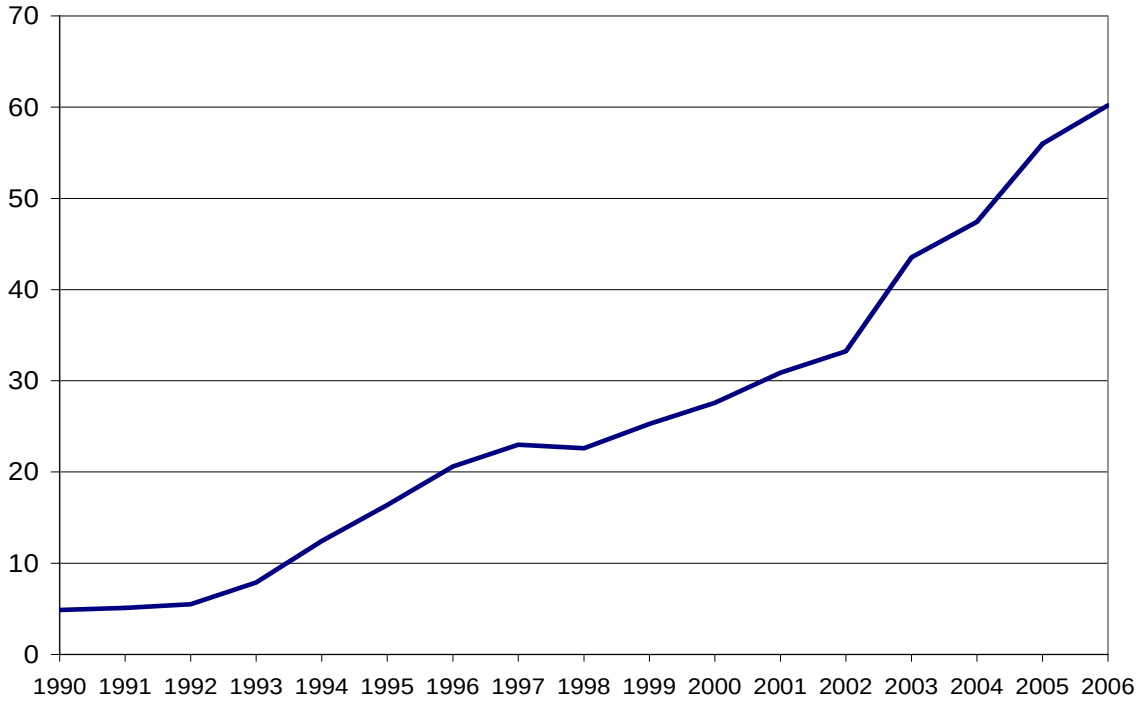
Figure 3. Foreign Exchange Reserves: Flows and Stocks
(in billions of U.S. dollars)



Note: The data in this figure go through March 2008.

Source: CEIC and author's calculations.

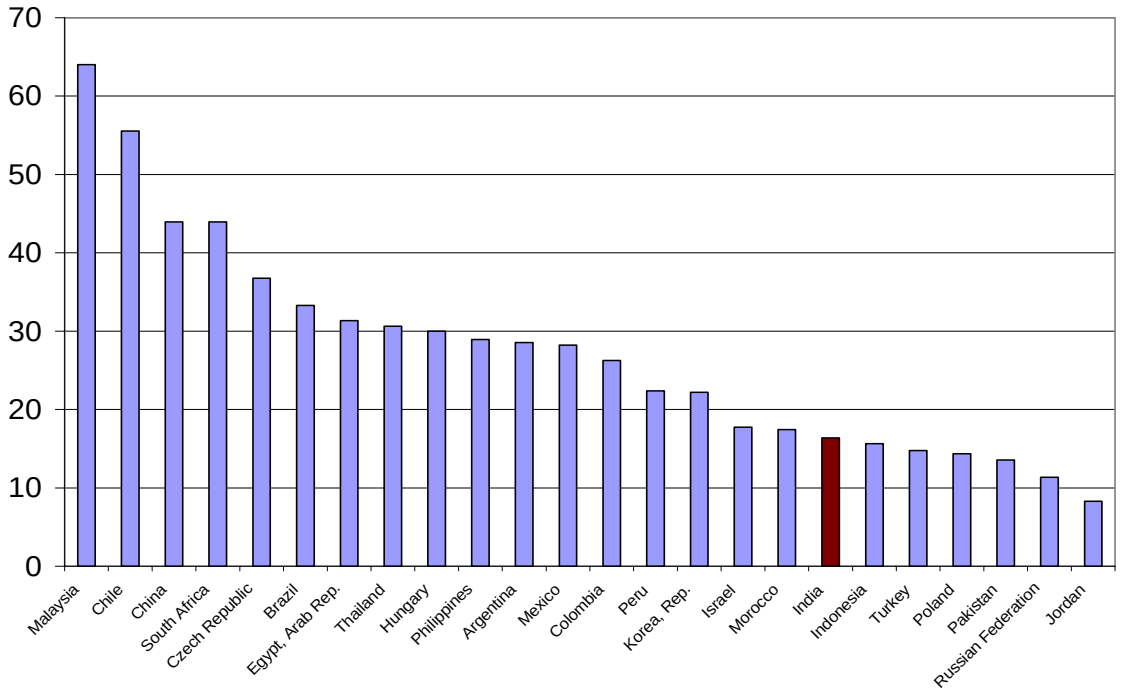
Figure 4. Share of FDI and Portfolio Liabilities
in Gross External Liabilities



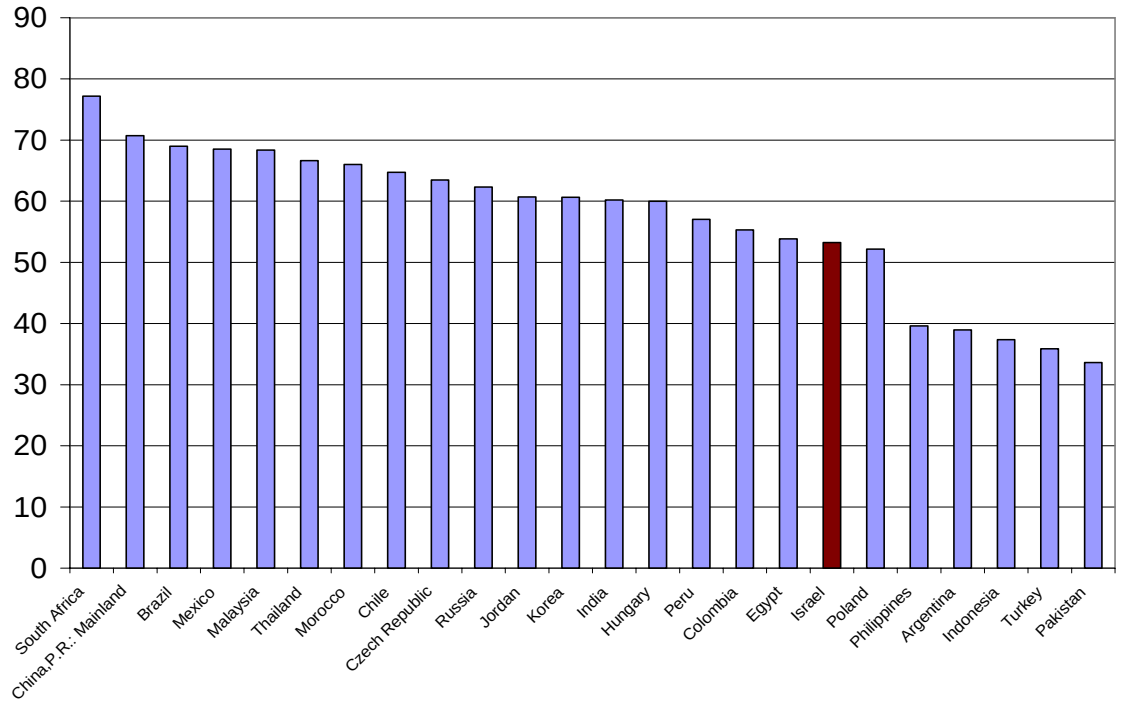
Source: Lane and Milesi-Ferretti (2006) dataset and author's calculations.

Figure 5. Ratio of FDI and Portfolio Liabilities to Gross External Liabilities: Emerging Markets

1995

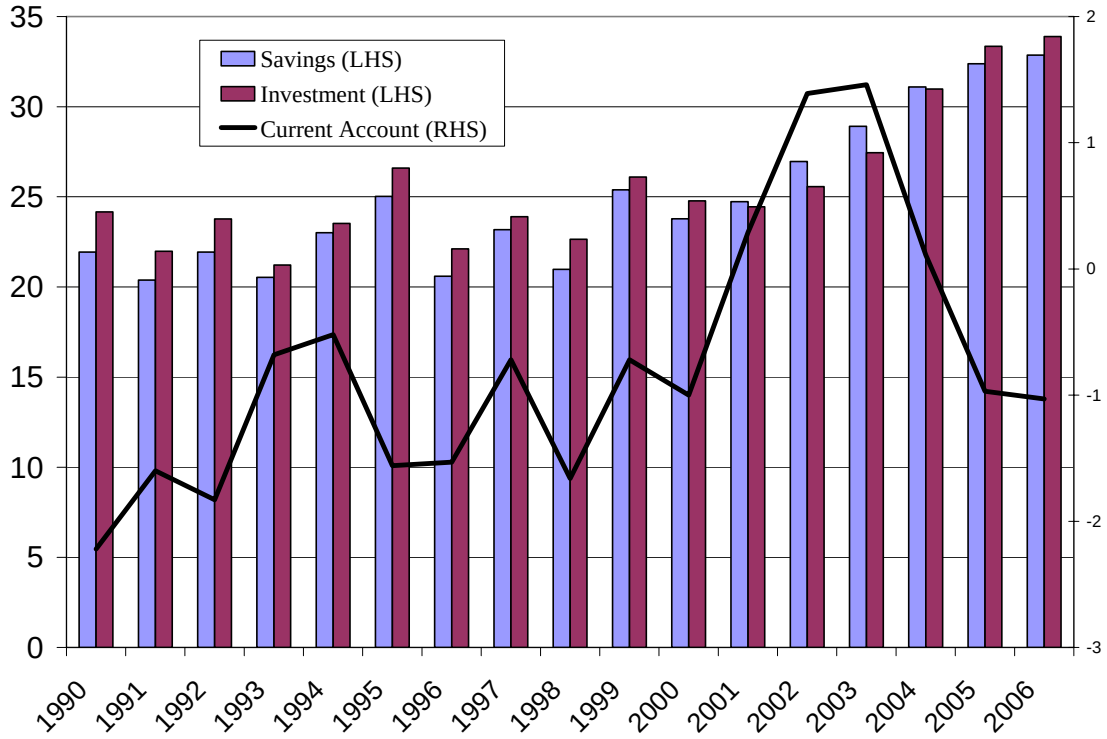


2006



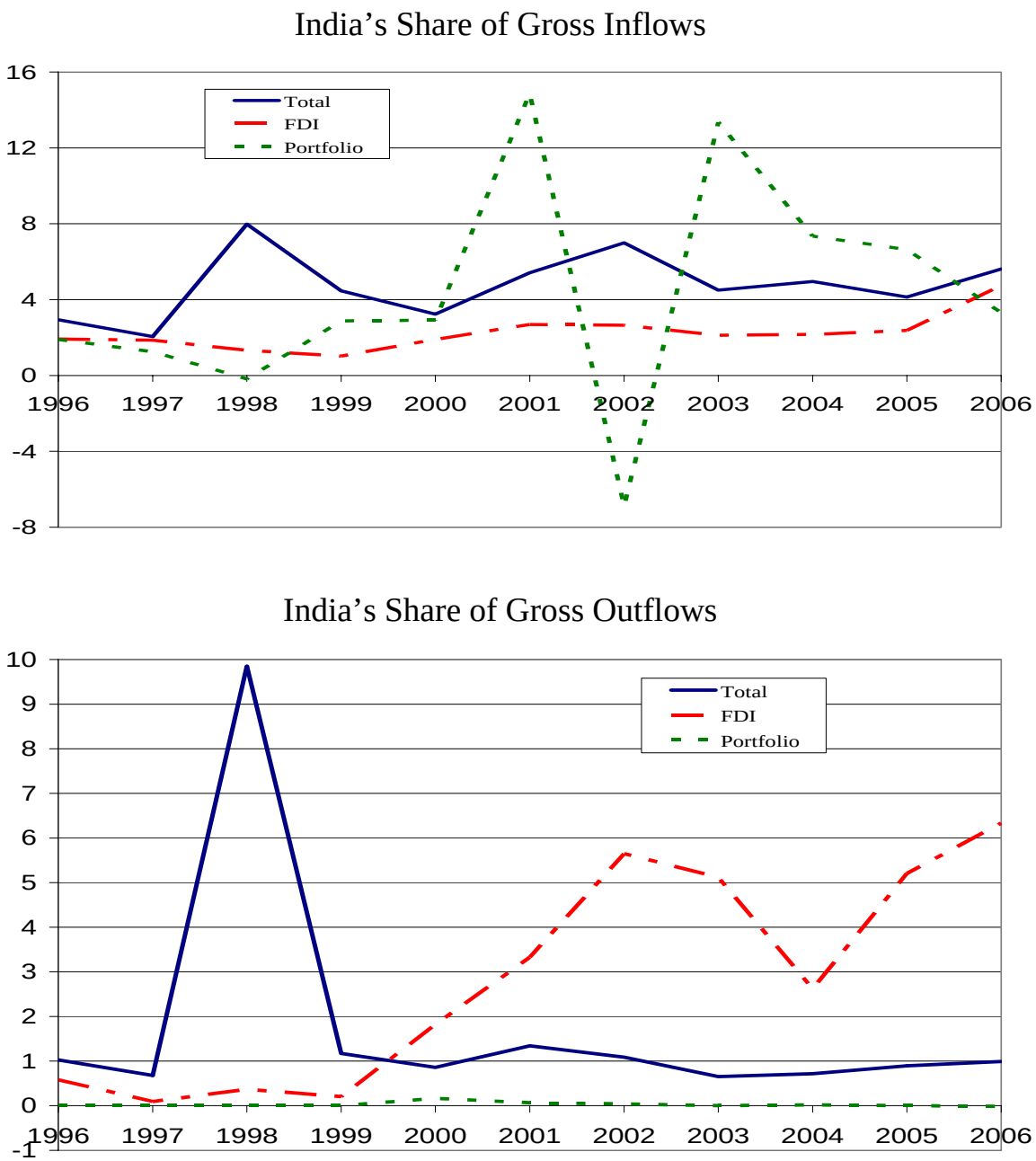
Source: Lane and Milesi-Ferretti (2006) dataset and author's calculations.

Figure 6. The Savings-Investment Balance
(in percent of GDP)



Source: World Development Indicators (World Bank)

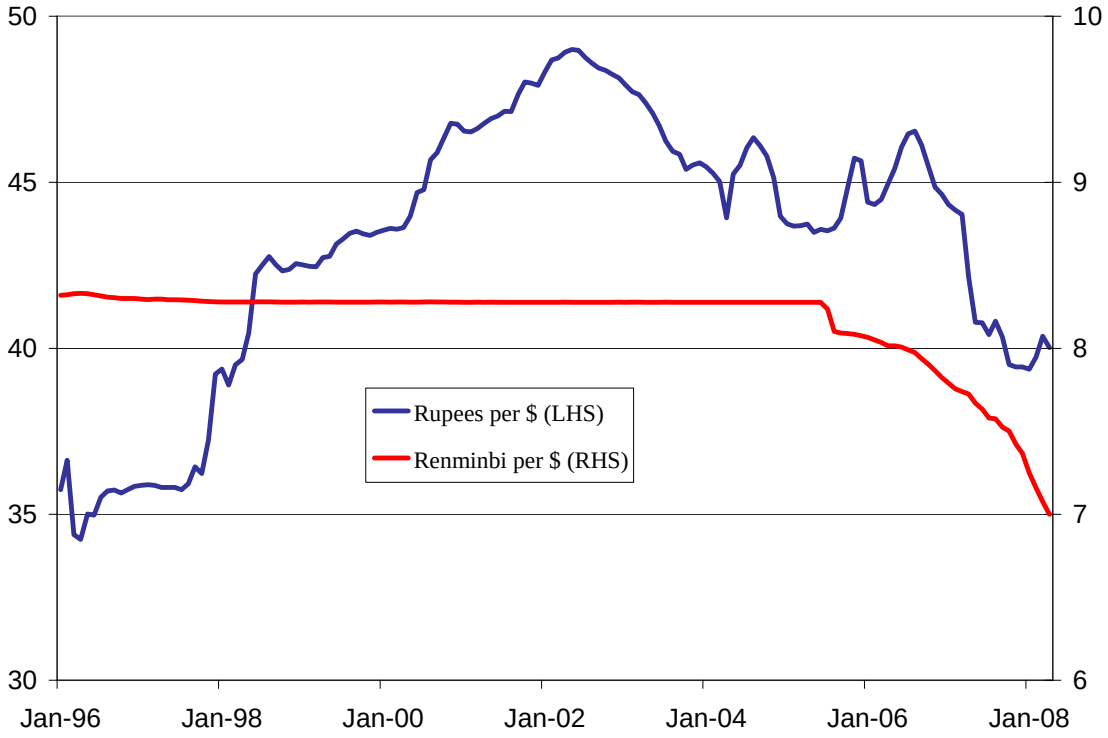
Figure 7. India's Share of Gross Inflows to and Outflows from Emerging Markets and Other Developing Countries



Note: This top panel shows the volume of gross inflows into India in specific categories of capital flows as a ratio of the corresponding total gross inflows into all emerging markets and other developing countries. The denominator includes flows amongst emerging markets and other developing countries since these are counted as part of gross inflows of the recipient countries. The bottom panel shows India's share of tota gross outflows from all emerging markets and other developing countries (including to other countries within this group).

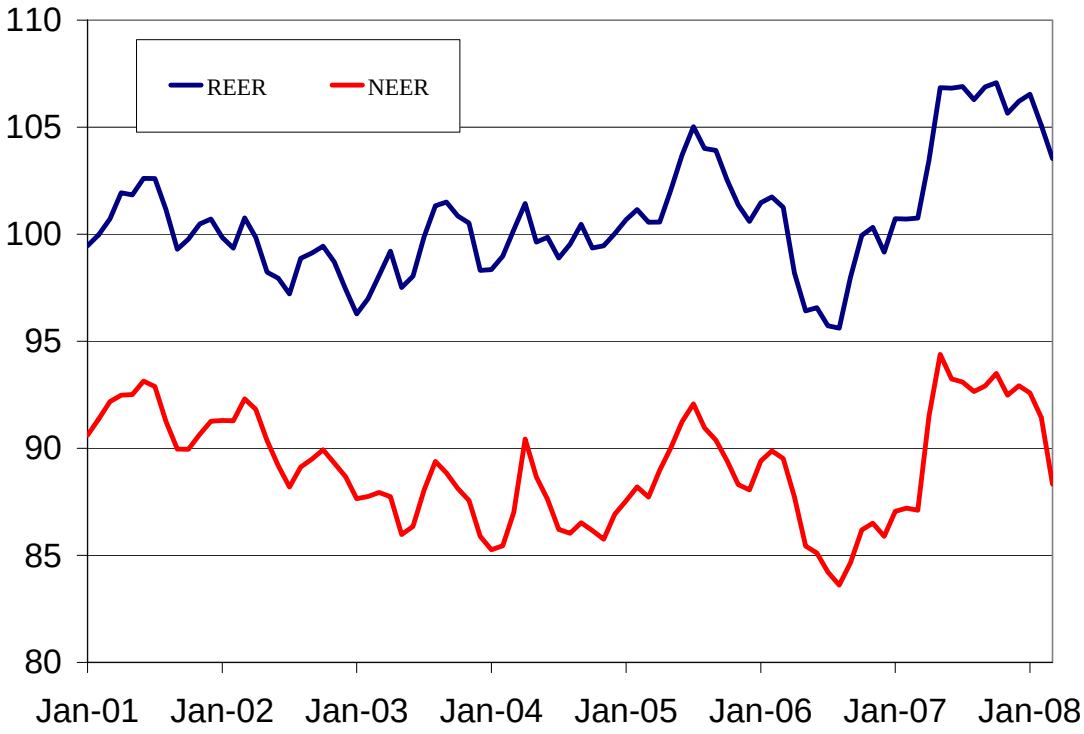
Source: CEIC, Global Financial Stability Report 2008 and author's calculations.

Figure 8. Nominal Exchange Rate Relative to U.S. Dollars
(1996-present)



Source: CEIC

Figure 9. Real and Nominal Effective Exchange Rates

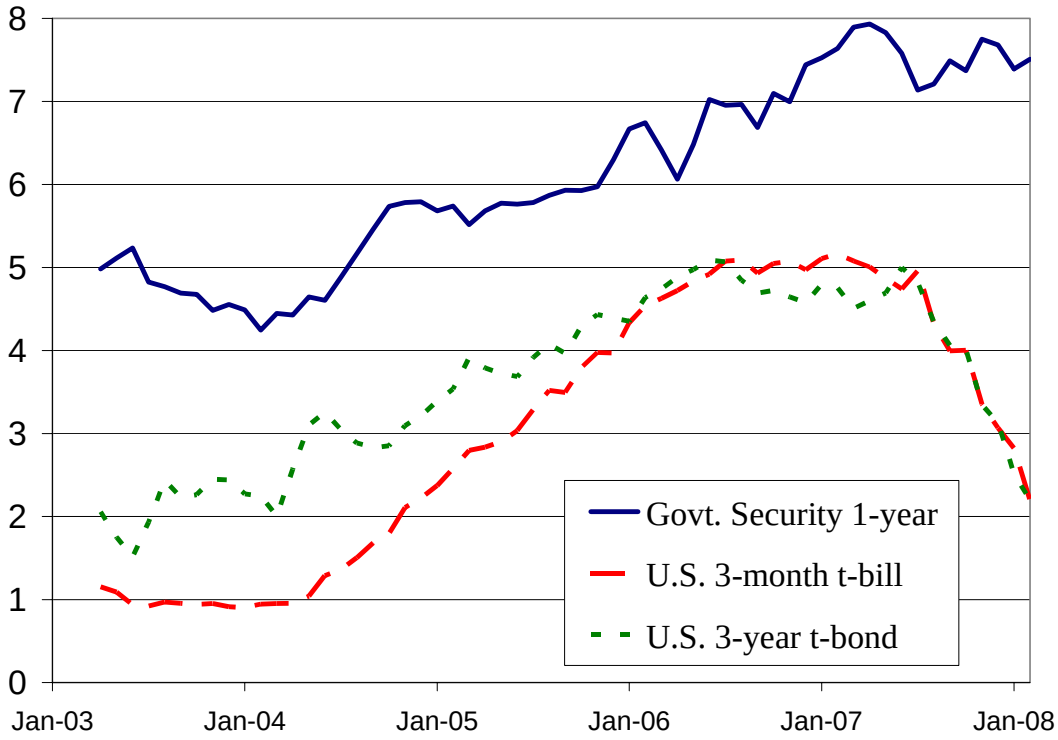


Notes: The effective exchange rates here are trade-weighted and measured against 36 currencies.

REER =100 (1993-94), NEER =100 (1993-94)

Source: CEIC

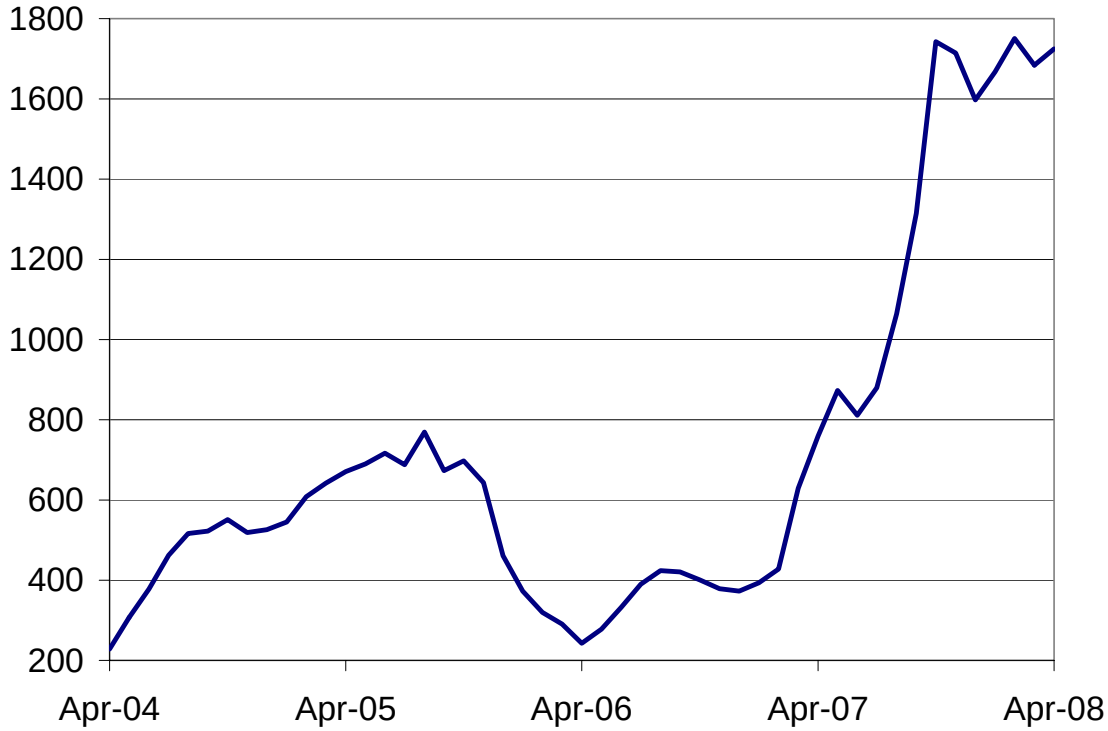
Figure 10. Interest Rate Differentials Relative to U.S.



Note: The data in this figure go through February 2008.

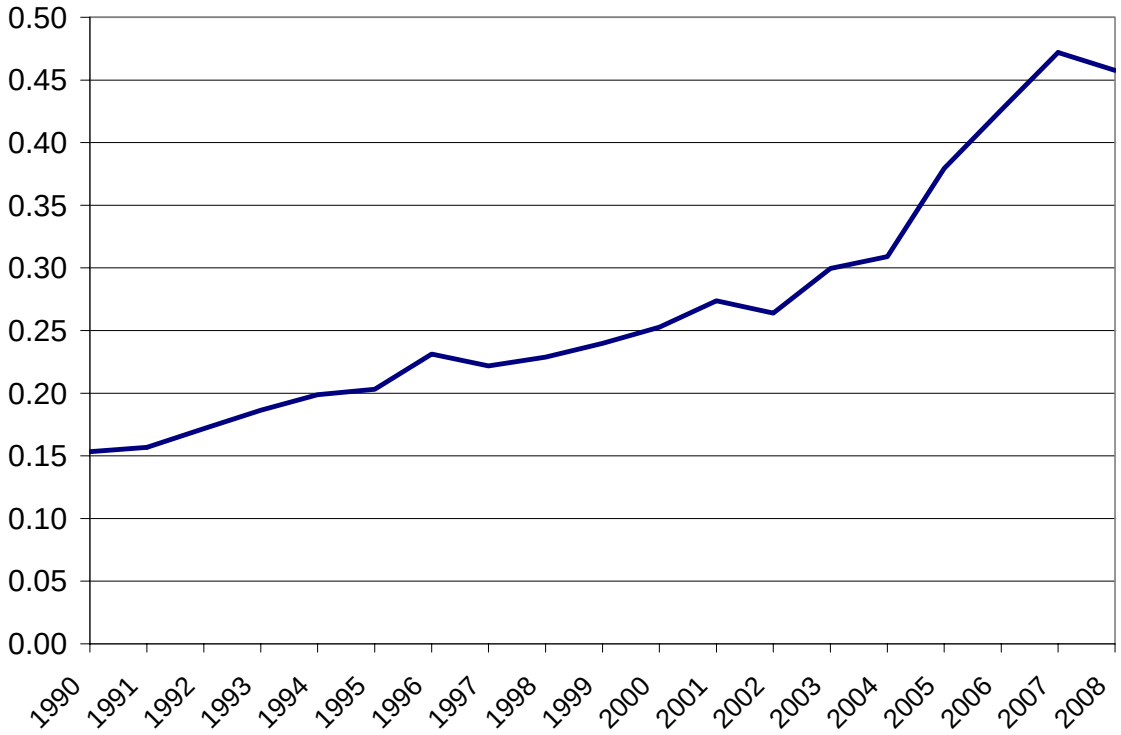
Source: CEIC and author's calculations.

Figure 11. Outstanding Stock of Market Stabilization Bonds
(in billions of INR)



Source: CEIC

Figure 12. Trade Openness Ratio



Note: This figure shows the sum of imports and exports of goods and services as a ratio to GDP.

Source: CEIC and authors' calculations.

Table 1. De Jure Capital Account Openness

	Full Sample	Emerging Markets			India	China
	Median	Minimum	Median	Maximum		
Chinn Ito						
1985	-1.13	-1.80	-1.13	2.54	-1.13	-1.13
1995	-0.09	-1.80	-0.09	2.54	-1.13	-1.13
2006	0.14	-1.13	0.03	2.54	-1.13	-1.13
Edwards						
1985	50.00	12.50	37.50	75.00	25.00	37.50
1995	75.00	25.00	50.00	100.00	25.00	37.50
2000	81.25	37.50	62.50	100.00	75.00	37.50
Miniane						
1985	0.86	0.83	0.86	1.00	0.83	
1995	0.43	0.71	0.86	1.00	0.83	
2000	0.36	0.71	0.86	0.86	0.86	

Note: The Chinn-Ito index goes from -2.54 to 2.54, with a higher number indicating a more open capital account. The Edwards index goes from 0 to 100, with a higher number indicating a more open capital account. The Miniane index goes from 0 to 1, with a lower number indicating a more open capital account.

Source: Edwards (2007), Chinn and Ito (2006), Miniane (2004) and author's calculations.

Table 2. The Balance of Payments
(in billions of U.S. Dollars)

	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08
Gross international reserves	29.7	33.2	38.7	42.9	54.7	76.1	113.0	141.5	151.6	199.2	309.7
(in percent of GDP)	*7.2*	*8.0*	*8.6*	*9.3*	*11.4*	*15.0*	*18.8*	*20.3*	*18.8*	*21.6*	*27.2*
Change in international reserves	2.9	3.5	5.5	4.2	11.8	21.4	36.9	28.5	10.1	47.6	110.5
A. Current account balance	-5.5	-4.0	-4.7	-2.7	3.4	6.3	14.1	-2.5	-9.2	-9.6	-17.4
(in percent of GDP)	*-1.3*	*-1.0*	*-1.0*	*-0.6*	*0.7*	*1.2*	*2.3*	*-0.4*	*-1.1*	*-1.0*	*-1.5*
Merchandise trade balance	-15.5	-13.2	-17.8	-12.5	-11.6	-10.7	-13.7	-33.7	-51.8	-64.9	-90.1
(in percent of GDP)	*-3.8*	*-3.2*	*-4.0*	*-2.7*	*-2.4*	*-2.1*	*-2.3*	*-4.8*	*-6.4*	*-7.0*	*-7.9*
B. Capital account balance	9.8	8.4	10.4	8.8	8.6	10.8	16.7	28.0	23.4	44.9	108.0
FDI, net	3.5	2.4	2.1	3.3	4.7	3.2	2.4	3.7	4.7	8.4	15.5
portfolio flows, net	1.8	-0.1	3.0	2.6	2.0	0.9	11.4	9.3	12.5	7.1	29.3
C. Errors and omissions, net	0.2	-0.2	0.7	-0.3	-0.2	-0.2	0.6	0.6	0.8	1.3	1.5
D. Valuation change	-1.6	-0.7	-0.9	-1.7	0.0	4.5	5.5	2.4	-4.9	11.0	18.4
Memorandum Items:											
Non-FDI capital account balance (including errors and omissions)	6.5	5.9	9.0	5.3	3.6	7.4	14.9	24.9	19.5	37.7	94.0
Nominal GDP	410.0	414.0	450.0	460.0	478.0	508.0	602.0	696.0	806.0	922.7	1140.0

Sources : CEIC, RBI and author's calculations.

Notes: The non-FDI capital account balance is the capital account balance minus net FDI plus net errors and omissions.

Table 3. A Decomposition of the Recent Reserve Buildup
(in billions of U.S. dollars)

	Annual averages			Changes	
	1998-2001	2001-06	2006-08	2001-06 -1998-2001	2006-08 -2001-06
	(1)	(2)	(3)	(2) - (1)	(3) - (2)
Increase in foreign reserves	4.4	21.7	79.1	**17.3**	**57.3**
Current account balance	-3.8	2.4	-13.5	**6.2**	**-15.9**
Capital account balance	9.2	17.5	76.5	8.3	59.0
FDI, net	2.6	3.8	12.0	**1.2**	**8.2**
Errors and omissions, net	0.1	0.3	1.4	0.3	1.1
Valuation Changes	-1.1	1.5	14.7	2.6	13.2
Non-FDI capital account balance (including errors and omissions)	6.7	14.1	65.9	7.3	51.8

Sources: CEIC, RBI and author's calculations.

Notes: The non-FDI capital account balance is the capital account balance minus net FDI plus net errors and omissions.

Table 4. Composition of Gross Inflows and Gross Outflows

Inflows

	Gross Inflows		Components			
			FDI	Portfolio	Loans	Other
	(USD billions)	(percent of GDP)	(as percent of gross inflows)			
1995-96	7.8	2.1	27.6	34.3	28.4	9.6
1996-97	13.6	3.5	20.9	24.4	35.3	19.4
1997-98	14.0	3.3	25.4	13.1	34.3	27.2
1998-99	10.8	2.5	23.0	-0.6	41.0	36.7
1999-00	10.8	2.4	20.0	28.0	14.8	37.2
2000-01	14.9	3.2	27.0	18.5	35.3	19.2
2001-02	9.2	1.9	66.7	22.0	-13.7	25.0
2002-03	4.0	0.8	125.7	24.4	-96.1	46.0
2003-04	16.3	2.8	26.4	69.5	-26.7	30.8
2004-05	35.4	5.1	16.9	26.3	30.9	25.9
2005-06	35.2	4.3	25.3	35.4	22.4	16.9
2006-07	61.3	6.7	35.9	11.4	40.1	12.6
2007-08	98.1	8.6	18.3	33.5	28.9	19.3

Outflows

	Gross Outflows		Components			
			FDI	Portfolio	Loans	Other
	(USD billions)	(percent of GDP)	(as percent of gross outflows)			
1995-96	3.5	0.9	5.4		0.2	94.4
1996-97	3.1	0.8	6.1		0.0	93.9
1997-98	2.5	0.6	1.5		0.4	98.0
1998-99	2.9	0.7	3.4		0.5	96.0
1999-00	2.9	0.6	2.5		-0.3	97.8
2000-01	3.5	0.8	21.6	4.8	0.6	72.9
2001-02	3.1	0.6	45.4	2.3	2.7	49.6
2002-03	3.1	0.6	57.9	1.1	0.7	40.2
2003-04	4.3	0.7	44.9	0.0	2.3	52.7
2004-05	6.8	1.0	33.5	0.4	4.9	61.2
2005-06	10.9	1.3	53.9	0.0	2.9	43.2
2006-07	17.5	1.9	77.0	-0.3	1.8	21.5
2007-08	26.0	2.3	64.6	-0.6	0.1	35.9

Note: Prior to 2000-01, outward FDI and portfolio outflows were not reported separately.

Source: CEIC, RBI and author's calculations.

Table 5. External Debt Stocks: Levels and Composition

	Total		By Maturity		Composition of Long Term Debt						
			Long Term	Short Term	Multilateral	Bilateral	IMF	Export Credit	Commercial Borrowing	Non Residents and Foreign Currency Deposits	Rupee Debt
	(USD billions)	(percent of GDP)	(as percent of total debt)								
1990	75.9	26.7	90.1	9.9	25.3	17.9	2.0	6.1	12.3	12.0	14.5
1991	83.8	28.6	89.8	10.2	24.9	16.9	3.1	5.1	12.2	12.2	15.3
1992	85.3	38.6	91.7	8.3	27.1	18.1	4.0	4.7	13.7	11.8	12.2
1993	90.0	37.3	93.0	7.0	27.8	17.9	5.3	4.8	12.9	12.4	11.8
1994	92.7	33.5	96.1	3.9	28.3	18.8	5.4	5.6	13.3	13.7	10.9
1995	99.0	30.7	95.7	4.3	28.8	20.5	4.3	6.7	13.1	12.5	9.7
1996	93.7	26.9	94.6	5.4	30.5	20.5	2.5	5.7	14.8	11.7	8.8
1997	93.5	24.4	92.8	7.2	31.3	18.7	1.4	6.3	15.3	11.8	8.0
1998	93.5	24.2	94.6	5.4	31.6	18.1	0.7	7.0	18.2	12.7	6.3
1999	96.9	23.5	95.6	4.4	31.5	18.1	0.3	7.0	21.7	12.2	4.9
2000	98.3	22.0	96.0	4.0	32.0	18.5	0.0	6.9	20.3	13.8	4.5
2001	101.3	22.5	96.4	3.6	30.7	15.8	0.0	5.8	24.1	16.4	3.7
2002	98.8	21.2	97.2	2.8	32.3	15.5	0.0	5.4	23.6	17.4	3.1
2003	104.9	20.3	95.5	4.5	28.6	16.0	0.0	4.8	21.4	22.1	2.7
2004	111.6	17.8	96.0	4.0	26.2	15.5	0.0	4.2	19.7	28.0	2.4
2005	133.0	18.5	86.7	5.7	23.9	12.8	0.0	3.8	19.9	24.6	1.7
2006	138.1	17.2	85.9	6.3	23.6	11.4	0.0	3.9	19.1	26.3	1.5
2007	169.7	17.8	84.5	7.1	20.8	9.5	0.0	4.2	24.6	24.3	1.1
2008	221.2	18.8			17.8	8.9	0.0	4.6	28.0	19.7	0.9

Source: CEIC and author’s calculations.

Table 6. India's International Investment Position
(in billions of U.S.dollars)

	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Net Position	**-81**	**-81**	**-79**	**-77**	**-76**	**-69**	**-60**	**-45**	**-42**	**-48**	**-45**
A. Assets	**38**	**42**	**47**	**55**	**62**	**74**	**96**	**138**	**168**	**183**	**244**
1. FDI	**1**	**1**	**2**	**2**	**3**	**4**	**6**	**8**	**10**	**13**	**24**
2. Portfolio	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Equity	0	0	0	0	0	0	0	0	0	1	**0**
Debt	0	0	0	0	0	0	0	0	0	1	**0**
3. Other investment	**10**	**11**	**12**	**14**	**16**	**14**	**13**	**16**	**16**	**18**	**20**
4. Reserve assets	**27**	**30**	**33**	**39**	**43**	**55**	**76**	**113**	**142**	**152**	**199**
Foreign exchange reserves	**22**	**26**	**30**	**35**	**40**	**51**	**72**	**107**	**136**	**145**	**192**
B. Liabilities	**119**	**122**	**126**	**132**	**139**	**143**	**156**	**183**	**210**	**231**	**289**
1. FDI	**11**	**14**	**15**	**18**	**20**	**25**	**31**	**38**	**44**	**51**	**72**
2. Portfolio	**19**	**20**	**23**	**25**	**31**	**32**	**32**	**44**	**56**	**65**	**80**
Equity	14	14	13	16	17	19	20	34	43	55	**63**
Debt	5	6	10	9	14	13	12	10	13	10	**17**
3. Other investment	**89**	**88**	**87**	**89**	**87**	**86**	**92**	**101**	**110**	**116**	**136**

Source: Reserve Bank of India and CEIC

Table 7. Reserve Adequacy
(ratio of reserves to relevant variables)

	Non-FDI external liabilities	External Debt	Months of imports	M3
1992		0.1	3.3	0.0
1993		0.2	6.6	0.0
1994		0.2	7.6	0.1
1995		0.2	4.8	0.1
1996	0.2	0.2	6.0	0.1
1997	0.2	0.3	6.7	0.1
1998	0.2	0.3	6.7	0.1
1999	0.3	0.4	6.9	0.1
2000	0.3	0.4	7.4	0.1
2001	0.3	0.5	9.6	0.1
2002	0.4	0.7	10.8	0.1
2003	0.5	0.9	12.6	0.2
2004	0.6	1.0	11.4	0.2
2005	0.7	1.1	9.5	0.2
2006	0.7	1.1	9.6	0.2
2007		1.4	12.5	0.2

Source: CEIC, RBI and author’s calculations.

The Cost of Holding Excess Reserves: Evidence from India

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Prepared for Presentation at the Brookings-NCAER India Policy Forum 2008
New Delhi

July 15-16, 2008

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Abstract

Most of the existing literature has used single reserve adequacy measures to evaluate the volume of excess reserves. In this paper, we present a theoretical model and employ empirical methods to generate a comprehensive reserve adequacy measure, incorporating the various objectives of holding reserves, and compare the actual reserve accumulation experience of various emerging markets with the prediction of our models. Using this comprehensive reserve adequacy measure we calculate the cost of holding excess reserves for India by looking at three different alternative uses of resources. We find that India is foregoing as much as 2% of its GDP by accumulating excess reserves instead of employing resources in alternative uses.

JEL Classification: F37, F47, C33
Keywords: Reserve Holdings, Reserve Management, Opportunity Cost

1. Introduction

With the collapse of the Bretton Woods, the pressure on industrial countries to accumulate reserves eased as they moved to flexible exchange rate regimes and overcame the problem of "original sin" i.e. the inability to borrow from abroad in domestic currencies. On the other hand, emerging market policymakers have been struggling to define adequate reserve levels, and have been typically motivated by the principle of "non-satiability" while dealing with international reserves. Over the last decade, developing countries, particularly those in East and South Asia, accumulate massive stockpile of international reserves. Emerging economies like China, South Korea, Russia, and India have acquired reserves in excess of $2.5 trillion by 2007.[2] These massive scales of reserve accumulation have raised several questions about the cost of holding high volume of reserves given most of it is held in low yield government bonds. Such costs are extremely important for a country like India, where scarce resources are being diverted towards reserve accumulation, which has increased over five folds from 2001-02.

Prior to investigating the cost of holding reserves, it is important to understand the factors influencing the demand for international reserves. Central banks of most countries maintain a stockpile of international reserves to meet imbalances in current account financing, cover short-term debt obligations, prevent excessive volatility in the exchange rate etc. In line with these objectives, the empirical literature points out that the demand for international reserves is based on a number of structural variables like economic size, current account openness, financial liberalization, exchange rate regime, financial depth, etc.

Reserves provide self insurance against sudden stops and adverse fiscal shocks. Sudden stops are typically associated with large reduction in the flow of capital followed by major exchange rate depreciation leading to significantly lower rates of return, investment and growth. International reserves help mitigating the effects of such sudden stops. Ben-Bassat and Gottlieb (1992b) argue that international reserves reduce the probability and the intensity of an output drop due to a sudden stop. Burke and Lane (2001), point out that apart from trade openness, financial depth and external indebtedness also influence the demand for international reserves.

Aizenman and Marion (2004) find that the size of international transactions, their volatility, exchange rate arrangement and political stability are key determinants of international reserve holdings in most of East Asia. Countries characterized by sovereign risk, costly tax collection and large inelastic fiscal liabilities are likely to exhibit greater precautionary demand for international reserves. Countries would also hold large precautionary balances of international reserves if they attach more weight to bad outcomes than good ones. Using a simple empirical model Edison (2003) shows that real GDP per capita, the population level, ratio of imports to GDP and volatility of the exchange rate are found to be statistically significant determinants of reserve holdings.

The pattern of reserve accumulation has changed over the period of time. Aizenman and Marion (2004) point out that in the aftermath of the Asian crisis the pattern of reserve

[2] These reserves do not include gold.

accumulation has changed considerably with Asian economies exhibiting increased demand for reserves for self insurance purposes. Focusing on Korea, Aizenman et al (2003) find evidence of a structural break in the pattern of reserve holding after the Asian crisis with financial openness and external indebtedness becoming significant and strong predictor of reserve holdings.

Reserves also help to lower the real exchange rate volatility, induced by terms of trade shocks. It has been widely argued that exchange rate volatility has an adverse impact on a country's growth. In a recent paper, Aghion et al. (2006) showed that in countries characterized by low level of financial development, exchange rate volatility has a negative impact on the growth rate. Thus any mechanism that reduces the volatility of exchange rate will enhance the growth performance of an economy.

Dooley et al. (2003) point out that the growing stockpiles of international reserve can be attributed to a deliberate strategy, which facilitates growth by maintaining an undervalued exchange rate. This would imply that every time there is pressure on the domestic currency to appreciate, the central bank intervenes by printing domestic currency and buying up all the foreign currency, which translates into additional reserves.

Thus it is clearly evident that reserves are held to meet a wide range of objectives. However, this is in sharp contrast with bulk of the literature on cost of holding reserves, which has focused either on entire reserve holding, or reserves holdings in excess of a single adequacy measure like three to four months of import cover.

Early papers looking at the cost of holding reserves like Iyoha (1976) and Frenkel and Jovanovic (1981) treat the opportunity cost as the inverse of the discount rate and finds that demand for international reserves varies inversely with the opportunity cost. However, Shinkai (1979) points out that use of domestic discount rate to calculate the opportunity cost of holding reserves is erroneous as most the of reserves are held in dollar denominated assets. Thus it makes sense to use the difference between returns on such assets and a country specific interest rate, which measures the net gain (inverse cost) of holding reserves instead of investing the equivalent sum within the country.

Another measure usually employed to capture the cost of holding reserves is the return on investment in physical capital. Neely (2000), Ben-Bassat and Gottlieb (1992b) and Baker and Walentin (2001) assume that if assets were not held as reserves they would be available to fund domestic investment in physical capital. These papers conclude that the increase in reserves represents an enormous cost to the developing nations as they forego domestic investment in either physical or human capital. Baker and Walentin (2001) point out that these costs exceed 1% of GDP and possibly 2% of GDP for many developing economies.
In a recent paper Rodrik (2006) terms excess reserves as reserves held over and above what is required to meet three months of imports. Using this rule Rodrik (2006) finds that by investing resources in accumulation of reserves instead of reducing private sector's short-term borrowing, the developing nations are losing about 1% of their GDP.

By taking into consideration the entire stockpile of reserves or reserves in excess of a single adequacy measure (import cover), the literature implicitly assumes that holding international reserves do not generate any benefits or they are held only to meet a single objective like current account financing. Such a perspective fitted well a world where financial markets were not integrated and trade openness reflected countries' vulnerability to external shocks i.e. the Bretton Woods period. However, with increased financial integration in recent years, the emerging markets have increased their exposure to volatile short-term inflows of capital that are subject to frequent sudden stops and reversals.

In this paper we present a theoretical model and use empirical methods to evaluate the factors influencing the demand for international reserves in emerging markets. Using the results of our empirical analysis we generate a comprehensive reserve adequacy measure, incorporating the various objectives of holding reserves. This comprehensive reserve adequacy measure is then used to calculate the predicted volume of reserves, which tells us the quantum of reserves a country needs to hold. The difference between actual and predicted volume of reserves gives us the volume of excess reserves held by various emerging markets. Thereafter we focus on India and calculate the cost of holding these excess reserves. We consider three alternate uses of the resources employed in building up the stockpile of reserves i.e. financing physical investment, reducing private sector's external commercial borrowing and lowering public sector debt.

The rest of the paper is structured as follows. Section 2 focuses on a model of a small open economy subject to sudden stops and highlights the principle factors affecting the demand for international reserves. In Section 3, we evaluate the predictions of the theoretical model using empirical methods. We also compare the reserve accumulation experience of major emerging markets vis-à-vis the predictions of our empirical model. Section 4 focuses on India and highlights the cost of holding excess reserves focusing on various alternative uses of resources. Finally, Section 5 lists out the main conclusions of the study.

2. A Small Open Economy Model

The model presented here is a variant of the model developed in Jeanne and Rancière (2008). In their paper, Jeanne and Rancière (2008) consider the case where the small open economy interacts with the rest of the world by borrowing from it in one period and repaying the external debt in the next period. We assume that apart from borrowing and repaying, the small open economy also engages with the rest of the world through international trade. We believe that this is an important issue as one of the key reasons for central banks to hold international reserves is to enable the economy to continue to import in the face of an economic crisis.

Following Jeanne and Rancière (2008), we focus on a small open economy which produces a single good that is consumed both at home and abroad. The economy faces the risk of being subject to sudden stops, in which case output falls by a fraction. This economy consists of representative agent whose consumption is given as

$$C_t = Y_t + FD_t - (1+r)FD_{t-1} + IM_t - X_t + Z_t \quad (1)$$

where Y_t is the domestic output, FD_t is the external debt, IM_t is the total amount of goods imported into the country, X_t is the volume of exports and Z_t is a transfer from the government, with a negative value implying a tax. The interest rate r is exogenously determined with the small open economy having no influence over it.

There is a limit on the output that can be used to repay foreign debt and the debt is repaid fully in period t only of

$$(1+r)FD_{t-1} = aY_t^g, \tag{2}$$

where Y_t^g is the output in the good state of the world i.e. when the economy is not subject to a sudden stop and a is the parameter indicating the proportion of output promised to be devoted to repayment of foreign debt. Both a and Y_t^g is known in period t-1 thereby ensuring that there is no default on external debt.

In the good state of the world, the economy grows at a constant rate x and the value of output in period t is assumed to be

$$Y_t^g = (1+x)^t Y_0 \tag{3}$$

where Y_0 is the initial stage output. In the event of a crisis associated with a sudden stop, the economy switches to the bad state and output falls by fraction g. Moreover, the amount of output devoted to repayment of foreign debt falls to zero in this state.

$$Y_t^b = (1-g)(1+x)^t Y_0 \tag{4}$$

The representative consumer smoothens her consumption path by entering into a reserves insurance contract with the government. In good states the consumer pays a tax in the form of an insurance premium $x_t R_t$. In the bad state also she pays the same tax but receives a transfer R_t. So long as $x_t < 1$, the insurance contract transfers purchasing power from the good state to the bad state.

Similarly, the imports of the representative consumer are also related to the output according to the propensity to import m. In the bad times, with a decline in output, imports also witness a similar decline.

$$\begin{aligned} IM_t^g &= mY_t^g \\ IM_t^b &= m(1-g)Y_t^g \end{aligned} \tag{5}$$

Unlike imports, exports are assumed to remain unchanged during the sudden stop episode. Higgins and Klitgaard (2000) find that in the Asian crisis almost all the

adjustment in the merchandise trade balance, due to a sudden stop in capital flow, came from a steep decline in imports in dollar terms. Dollar exports largely remained unchanged during this period. This is largely because exports are largely influenced by destination countries' income and the real exchange rate, which are exogenous to our model.

Thus the representative agent's consumption in good times is given as

$$C_t^g = Y_t^g + FD_t - (1+r)FD_{t-1} + IM_t^g - X_t - x_t R_t, \tag{7}$$

while her consumption in bad times is

$$C_t^b = Y_t^b + FD_t - (1+r)FD_{t-1} + IM_t^b - X_t + (1-x_t)R_t \tag{8}$$

Finally, the inter-temporal utility function of the representative individual is given as

$$U_t = E_t\left(\sum_{t=0}^{\infty}(1+r)^{-t}\,u(C_{t+t})\right) \tag{9}$$

where the period utility function is given as

$$u(C_t) = \frac{C_t^{1-s}}{1-s},\ s \neq 1 \tag{10}$$

and $u(C) = \log(C)$ for $s = 1$ and s is the degree of relative risk aversion .

In normal times the country maintains, a constant ratio of short-term debt to GDP, l , given by

$$l = \frac{FD_t^g}{Y_t^g} = \frac{a(1+x)}{(1+r)} \tag{11}$$

The representative agent chooses the level of reserves that maximizes the expected utility of period t+1 consumption.

$$L = \text{Max}\ (1\text{-}p)\,u\left(C_{t+1}^g\right) + p\,u\left(C_{t+1}^b\right) \tag{12}$$

where p is the probability of the economy being subject to a sudden stop. The first order conditions can be rewritten as:

$$\frac{u'\left(C_{t+1}^{g}\right)}{u'\left(C_{t+1}^{b}\right)} = \frac{p_t}{\left(1-p_t\right)} \frac{\left(1-x_t\right)}{x_t} \tag{13}$$

where consumption in good state is given as

$$C_{t+1}^{g} = Y_{t+1}^{g} + FD_{t+1} - (1+r)FD_t + IM_{t+1}^{g} - X_{t+1} + Z_{t+1}^{g}$$
$$\Rightarrow C_{t+1}^{g} = \left(1+x\right)^{t}\left[1 - \frac{r-x}{\left(1+x\right)}\, l + m - \bar{x} - x_t r_t\right] Y_0$$

and $\bar{x}$ is the ratio of exports to output, assumed to be constant. The consumption in bad state is given by

$$C_{t+1}^{b} = Y_{t+1}^{b} + FD_{t+1} - (1+r)FD_t + mY_{t+1}^{b} - X_{t+1} + Z_{t+1}^{b}$$
$$\Rightarrow C_{t+1}^{b} = \left(1+x\right)_t\left[\left(1-g\right) - \frac{1+r}{1+x}\, l + \left(1-x_t\right) r_t + m\left(1-g\right) - \bar{x}\right] Y_0$$

Assuming the utility function to be of the type in equation (10), the first order condition can be written as

$$\frac{C_{t+1}^{g\ -s}}{C_{t+1}^{b\ -s}} = q_t$$

where $q_t = \frac{p_t}{1-p_t}\frac{1-x_t}{x_t}$

The optimal ratio of international reserves to output can be obtained by solving the above equation. The optimal ratio is given as

$$\Rightarrow r_t = \frac{g + l + mg - \left(1 - q^{\frac{1}{s}}\right)\left(1 - \frac{r-x}{1+x}\, l - m + \bar{x}\right)}{\left[1 - x_t\left(1 - q^{\frac{1}{s}}\right)\right]} \tag{14}$$

According to equation (14), the optimal level of reserves depend on the output loss due to sudden stop$\left(g\right)$, ratio of short-term debt to output$\left(l\right)$, probability of a crisis$\left(p\right)$, ratio of imports to output$\left(m\right)$, reserve insurance premium$\left(x\right)$, share of exports in output$\left(\bar{x}\right)$, risk free interest rate$\left(r\right)$, degree of risk aversion$\left(s\right)$ and the

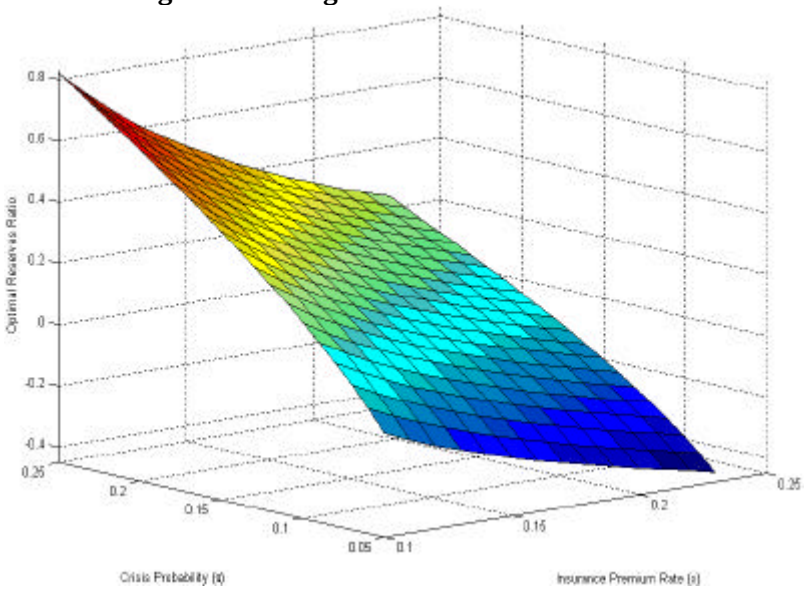
growth rate of the economy (x). The baseline parameters have been mostly taken from Jeanne and Rancière (2008).

Table 1: Calibrated Parameters

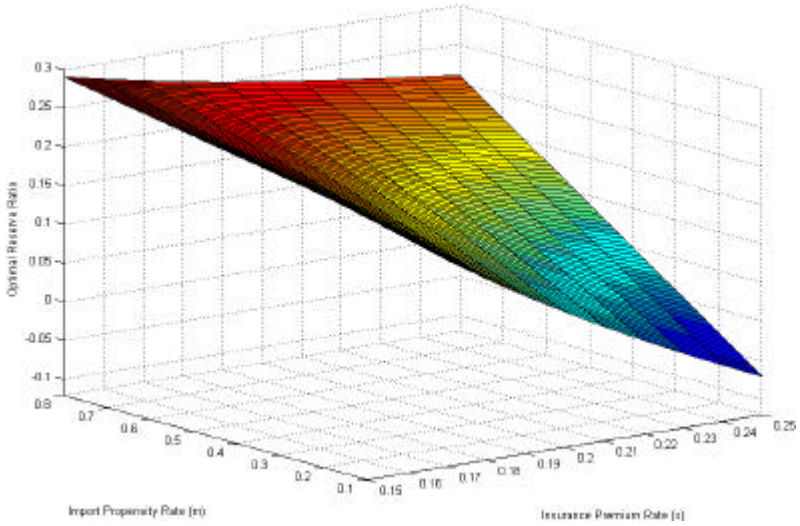
$p = 0.1$	$l = 0.11$	$m = 0.2$
$g = 0.065$	$x = 0.20$	$\overline{x} = 0.15$
$x = 0.033$	$s = 2$	$r = 0.05$

Next, we look at how our model predicts change in optimal reserve ratio requirements as we change some of the key parameters of the economy like the probability of a crisis, propensity to import and the ratio of short-term debt to output. The optimal reserve ratio is going to differ according to how costly is it to purchase a reserve insurance contract, i.e., the insurance premium rate (x). As the cost of acquiring the reserve insurance contract increases the representative consumer would find it optimal to hold fewer reserves. Figure 1 below shows the results of our numerical analysis.

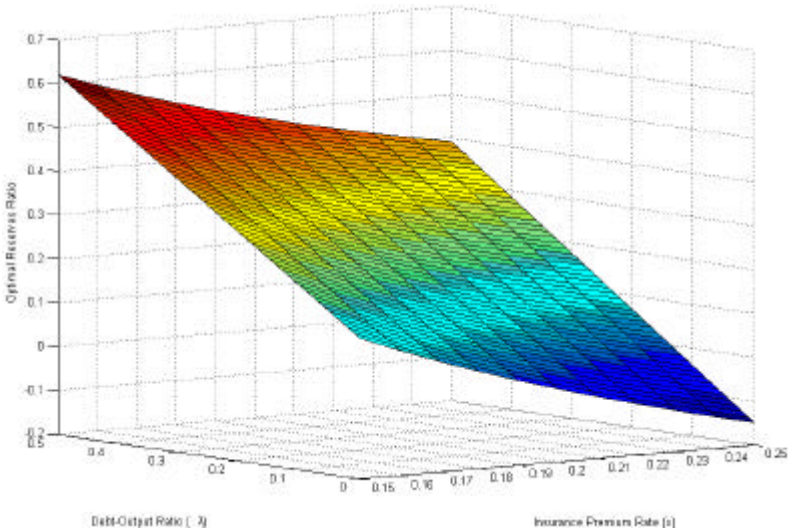
Figure 1: Change in International Reserves



(a) Change due to an Increase in Crisis Probability



(b) Change due to an Increase in Import Propensity



(c) Change due to an Increase in Debt-Output Ratio

An increase in crisis probability is associated with a monotonic increase in optimal reserve ratio. However, the increase in the reserve ratio is not linear with most of the increase coming at low probability levels. An increase in the probability of a crisis by three percentage points from its benchmark value of 10% raises the optimal reserve ratio from 13% to 28%. However, a similar increase in crisis probability when the probability is already high yields a much more modest increase. An increase in crisis probability from 22% to 25% raises the optimal reserve ratio by only 11 percentage points.

Our model also predicts that an increase in import propensity is associated with an increase in optimal reserve ratio. Thus as the economy opens itself to more imports, it finds it prudent to hold a greater volume of reserves. However, the increase in optimal

reserve ratio as a result of the rise in import propensity is relatively modest. At the benchmark value of insurance premium rate of 0.15, an increase in the import propensity from 20% to 80% results in an increase in the optimal reserve ratio from 23% to 29%. An increase in the ratio of short-term debt to GDP also leads to an increase in the optimal reserve ratio. An economy having a short-term debt to GDP ratio of 10% finds it optimal to hold nearly 23% of its GDP as reserves. On the other hand an economy holding short-term debt equivalent to half of the GDP will find it optimal to have a reserve-GDP ratio of more than 60%.

Across all the specifications we find that the optimal reserve ratio declines with an increase in the insurance premium rate. In the trivial case of high insurance premium ($x > 0.2$), coupled with low crisis probability, low import propensity and low short-term debt to GDP ratio, the individual prefers to hold negative reserves. In such circumstances, the net increase in utility in the bad state due to higher consumption on the back of available reserves is less than the decline in utility in the good state due to lower consumption as a result of paying high insurance premium rate.

3. Determinants of Reserves

In this section, we use empirical methods across 167 countries over the period 1980-2005 to identify the principal determinants of cross-country variation in the level of international reserves. The dependent variable is the ratio of reserves minus gold to GDP. The reserves include special drawing rights, reserves of IMF members held by the IMF, and holdings of foreign exchange under the control of monetary authorities. Data on reserve holdings, imports, short-term debt and GDP are taken from the *World Development Indicators* (WDI). On the basis of the empirical analysis, we create a comprehensive reserve adequacy measure and calculate the predicted demand for international reserves. Comparing the predicted demand with actual reserve accumulation helps us to identify the volume of excess reserves held by various emerging markets.

We also consider several other variables that have been found in the literature as principal determinants of reserve holding. The first variable is a measure of real income per capita, which acts as a measure of the overall development of the economy and captures a wide range of factors affecting reserve holdings. Owing to the large variation in this variable across the countries, we use the log of real per capita GDP instead of level.

There is a close association between domestic financial development and exposure to external crises. To the extent that the liabilities of the domestic sector are partly denominated in foreign currency, financial deepening should be matched by an increase in international reserves. We measure financial depth with the ratio of money and quasi money (M2) to GDP. Data on M2 are taken from the WDI.

The volume of reserves is also crucially affected by the exchange rate regime. A country with a currency peg is likely to hold more reserves either to defend against attacks on the exchange rate or as a consequence of resisting an appreciation of the domestic currency. On the other hand in a flexible exchange rate regime, the exchange rate can freely float to reflect market reality and hence such a country is likely to hold fewer reserves. To control

for exchange rate regime, we use the exchange rate index formulated by Levy- Yeyati and Sturzenegger (2005), which is a *de facto* classification based on data on exchange rates. The index ranges from 1 to 5 with a lower number implying a more flexible exchange rate regime.[3]

The degree of capital account liberalization is another variable that influences the precautionary motive of capital account liberalization. As a country opens up to greater capital flows, it needs to put in place adequate safeguards to protect it against sudden stops. Thus greater capital account openness is likely to be associated with higher volume of reserves. We measure capital account openness using Chinn-Ito index developed in Chinn and Ito (2006). The index ranges from - 1.7 to 2.7 and a higher value of the index indicates greater financial openness.

Aizenman and Marion (2004) point out that political uncertainty will influence a country's strategy regarding holding of reserves. Suppose alternatively the government in a country has a 'tough' administration that ensures responsible fiscal behavior and a 'soft' administration that behaves opportunistically in appropriating and allocating resources to special interest groups with high discount rates. A 'soft' administration would want to increase the consumption of special interest groups and reduce international reserve holdings and accumulate international debt to achieve that. On the other hand, a 'tough' administration would be reluctant to hold lot of reserves if there is a high probability that it will loose power in the near future and the future administration will be 'soft' and grab the rewards for the special interest rate groups. Thus, political instability can reduce the level of reserve holdings below the level supported by efficiency considerations. We use the political stability index developed by *Intra Country Risk Guide*. The index is made up of variables like government stability, socioeconomic conditions, conflicts, law and order etc. The index ranges from 0 to 100 with a higher number indicating a more politically stable regime.

Finally, we also include a series of dummy variables that indicate the behavior of the Asian and the Latin American economies after the crises of 1994 and 1997. These dummies intend to capture the change in the reserve holding behavior of these economies after they were hit by these crises.

The empirical model is given by following equation

$$Y_{it} = a_0 + b_1 X_{1it} + b_2 X_{2it} + b_3 X_{3it} + b_4 X_{4it} + b_5 X_{5it} + b_6 X_{6it} + b_7 X_{7it} + u_i + e_{it} \quad (15)$$

where i refers to the country and t represents the time period. Here Y is the dependent variable, measured as ratio of reserves (minus gold) to GDP. Among the explanatory variable, X_1 is log of per capita GDP, X_2 is a measure of trade openness, X_3 is a measure of exchange rate regime, X_4 is a measure of capital account openness, X_5 measures

[3]Another popular exchange rate regime measure is the one created in Reinhart and Rogoff (2002). However, this measure ends in 2001 and is thus not suitable for our purpose.

financial depth, X_6 is a measure of political stability and X_7 is the ratio of short-term debt to GDP.

In our sample of countries, a Woolridge test for autocorrelation, suggests the presence of first order serial correlation. In the presence of autocorrelation, the error term in equation 15 can be written as

$$e_{it} = r_i e_{it-1} + m_{it} \tag{16}$$

In the literature, there are several ways to estimate the model in the presence of serial correlation. One can use a feasible GLS with AR1 correlation. However, this procedure has been criticized for underestimating the standard errors. The panel corrected standard error estimates, which uses Prais-Winstein regression, addresses this problem. It assumes that the disturbances are heteroskedastic and contemporaneously correlated across panels. The panel corrected standard error estimates allow for first order correlation, AR(1), with a common coefficient of the AR(1) process across all the panels, ($r_i = r, \forall i$), as well as a specific coefficient of the AR(1) process for each panel, ($r_i \neq r, i \neq j$).

Table 2 displays the results of the Prais-Winstein regression with panel specific autocorrelation coefficients. We focus on all the countries in our sample as well as just the emerging market economies. Across the entire sample, log of per capita GDP has a positive and significant impact on reserve holding. Richer countries tend to have higher reserve holdings. Trade openness also exerts a strong positive and significant impact on reserve holding thereby highlighting the precautionary motive, where countries having higher share of trade want to hold enough resources to be able to finance their imports.

Table 2: Prais Winstein Estimates with Panel Specific Correlation Coefficient

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)
	Full Sample of Countries				Emerging Market Economies				
Import Share	0.119***	0.144***	0.181***	0.150***	0.268***	0.254***	0.163***	0.114**	0.163***
	[12.69]	[14.35]	[11.26]	[8.44]	[9.47]	[8.05]	[3.92]	[2.41]	[3.46]
Per Capita GDP	0.917***	0.687***	0.254	1.409***	0.84	0.862	1.066	4.045***	2.444**
	[3.82]	[2.86]	[0.75]	[3.24]	[1.39]	[1.19]	[1.48]	[4.40]	[1.98]
Exchange Rate Regimes		0.136**	0.280***	0.273***		0.093	0.072	0.094	0.235
		[2.37]	[3.50]	[3.13]		[0.78]	[0.51]	[0.59]	[1.13]
Capital Account Openness		0.533***	0.548***	0.549***		0.540**	0.467*	0.502*	0.790***
		[4.17]	[3.27]	[2.69]		[2.09]	[1.85]	[1.90]	[3.05]
Financial Depth			0.090***	0.116***			0.112***	0.134***	0.178***
			[6.08]	[5.71]			[3.84]	[4.19]	[7.68]
Political Stability			0.032*	0.059***			0.046	0.038	-0.056
			[1.92]	[2.80]			[1.58]	[1.10]	[1.11]
Short-term Indebtedness				0.004				0.022	0.049***
				[0.94]				[1.48]	[3.64]
Observations	3633	2958	1830	1455	585	516	440	388	168
Number of countries	167	158	112	89	24	24	24	22	21

Robust z statistics in parentheses

*** indicates significant at 1 % , ** indicates significant at 5 % and *indicates significant at 10 %

Across all specifications for the full sample exchange rate regime has a significant positive impact on reserves. According to the exchange rate regime measure used, a higher number indicates less flexible regime. Thus countries with fixed exchange rate regime tend to accumulate greater reserves. Like trade openness, capital account openness is also positively affects international reserve holdings. Thus countries that opened up the capital account tend to hold greater reserves to protect themselves against episodes of sudden stops.

We also find that greater financial depth tends to have a positive influence on reserve holdings. In many countries, the liabilities of the financial sector are denominated in foreign currencies and this is reflected in higher volume of reserves. Political stability also has the expected positive impact on reserve holding but the impact is not significant across all specifications. Finally, we find that the extent of external indebtedness has no significant influence on reserve holdings. Among the dummy variables, only the dummy for Asian economies after the Asian crisis has a strong positive and significant effect on reserves implying that post Asian crisis, the Asian economies made a deliberate attempt to bolster their reserve holdings to prevent another such attack.

When we focus only on emerging markets we find that political stability along with exchange rate regime are no longer a significant predictor of the volume of reserves. However, both trade and capital account openness along with per capita GDP, short-term indebtedness and financial depth continue to be the major determinants of reserve accumulation.[4]

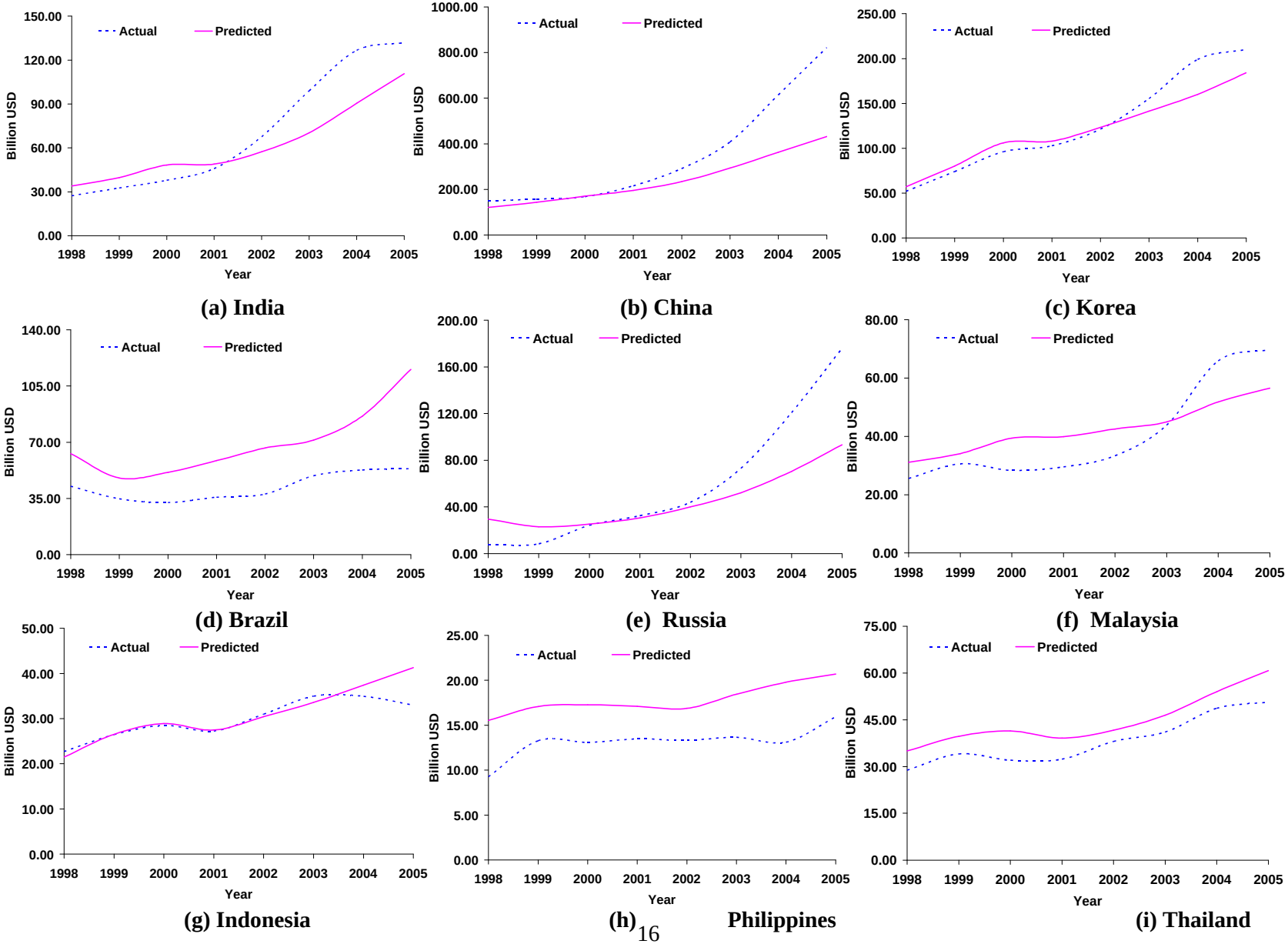
Next, we use the above empirical model to predict the demand for international reserves for various emerging countries and groups. In particular, we use the regression in Column (IX) of Table 1 to calculate the volume of reserves predicted by our model. If the actual reserves exceed predicted reserves then the difference is termed as excess reserves. Several papers like Gosselin and Parent (2005) and Edison (2003) have pointed out a structural break in the volume of reserves in 1997 due to the emergence of financial crisis in several countries in Asia. Consequently, in Column (IX) we focus on post 1998 period.

In Figure 2, we look at the reserve accumulation performance of some selected emerging markets in Asia and Latin America. Figure 5 brings out several interesting facts. There

[4] The robustness of the results reported in Table 1 was checked using alternative explanatory variables. For financial depth, variables such as share of credit allocated to the private sector and ratio of liquid liabilities to GDP. Trade openness was measured using total trade as a percentage of GDP, while capital account openness was measured by looking at the volume of capital flows to GDP. Political stability was proxied by government stability, law and order and corruption from Intra Country Risk Guide. The results were broadly similar to the ones reported in Table 1.

are five countries whose actual reserve accumulation was significantly higher than what our model predicted. These include India, China, Korea, Russia and Malaysia. By 2005, the excess reserve accumulation in these countries stood at $22 billion, $390 billion, $26 billion, $83 billion and $13 billion, respectively. On the other hand, by 2005, Indonesia,

Figure 2: Reserve Accumulation in Selected Emerging Markets



Philippines and Thailand had accumulated reserves close to the amount predicted by our model. Finally, only Brazil faced a shortfall in excess reserves of $60 billion in 2005.

4 Cost of Reserve Holdings: The Indian Experience

Prior to the time of financial globalization, countries used to hold reserves mainly to manage foreign exchange demand and supply arising from current account transactions. India was no exception to this rule. It followed a restrictive foreign trade policy and used its reserves for essential items like petroleum and foodgrains. Consequently, the volume of international reserves was almost stagnant from 1950-51 to 1990-91. Since 1991, there has been major shift in the external policy with import substitution giving way to export promotion. For this policy to succeed, sufficiency of international reserves was a major requirement and the stockpile of international reserves increased from less than $6 billion in 1990-91 to over $270 billion by December 2007.

Today India is in a relatively comfortable position. Its stock of international reserves can finance more than a year's imports and thus provides a comfortable cushion in the case of a terms of trade shock or a sudden reversal of capital flow. This massive accumulation of reserves has also meant that the ratio of short-term debt to international reserves has witnessed a steep decline from nearly 150% in 1990-91 to below 7% in 2006-07.[5] This ratio is well below the Greenspan-Guidotti rule, which stresses that sufficient international reserves must be maintained to meet external obligations for about a year, without any external assistance.

Reserve hoarding is not a phenomenon that has been unique to India. Most of the Southeast Asian economies as well as Latin American economies have also been indulging in this kind of a behavior. This has been the primary response to currency crises these economies faced in the 1990s.

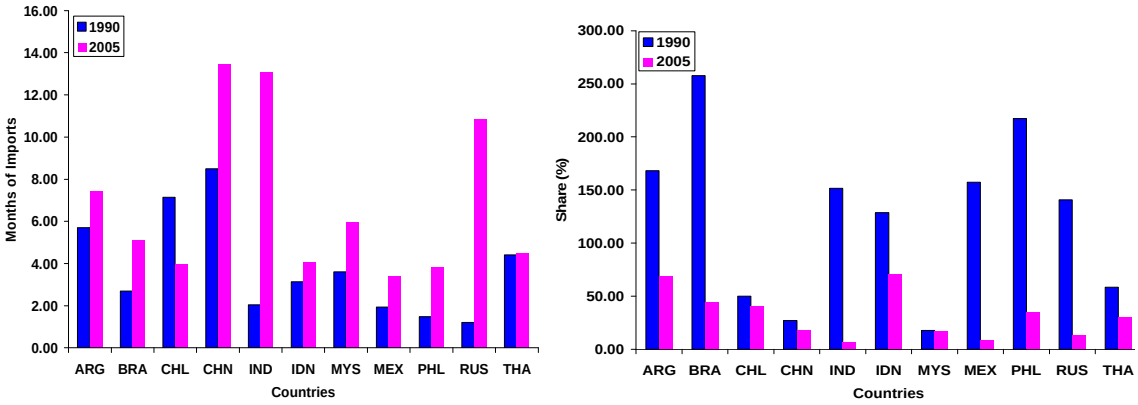
Figure 3 exhibits some of the key reserve adequacy indicators for major emerging economies. It can be clearly seen that, barring Argentina and Chile, most of the emerging economies have witnessed a significant increase in their import cover of international reserves as well as the ratio of international reserves to M2. Again, Chile was the only major developing country that did not experience an increase in the ratio of international reserves to GDP. All the major developing countries also witnessed a fall in the ratio of short-term debt to reserves. The fall was again smallest for Argentina and Chile.

Comparing India's performance with other emerging economies it can be clear seen that India has done remarkably well. Figure 4a shows that in terms of import cover of international reserves, India is better covered than most other major emerging markets. The only major emerging market, with a higher import cover is China. Similarly, according to Figure 4b India is well placed in terms of ratio of short-term debt to

[5] Short-term debt has been redefined since 2005-06 to include suppliers' credit up to 180 days. However, to maintain consistency we stick to the original definition. As per the new definition the ratio of short-term debt to the foreign exchange reserves stood at 12.5% as at end-March 2005, but increased slightly to 12.9% as at end-March 2006 and further to 13.2% at end-March 2007, but declined to 12.4% at end September 2007.

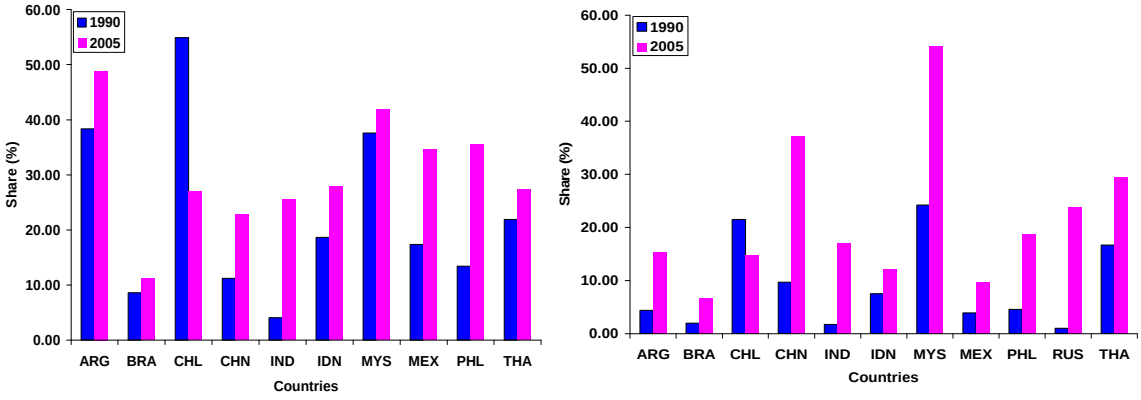
international reserves. At 7%, this ratio is also smaller than most other developing countries. Even with the other two indicators, India is relatively comfortably placed. In terms of ratio of international reserves to GDP, India is behind economies like China, Thailand, Russia and Malaysia but ahead of most Latin American economies. On the other hand, at 25.53%, the ratio of international reserves to M2 in India is higher than China and Brazil but lower than most of the Latin American economies and Korea.

Figure 3: Cross Country Comparison of Reserve Adequacy Measures



(a) Import Cover of International Reserves

(b) Ratio of Short-term Debt to International Reserves



(c) Ratio of International Reserves to M2

(d) Ratio of International Reserves to GDP

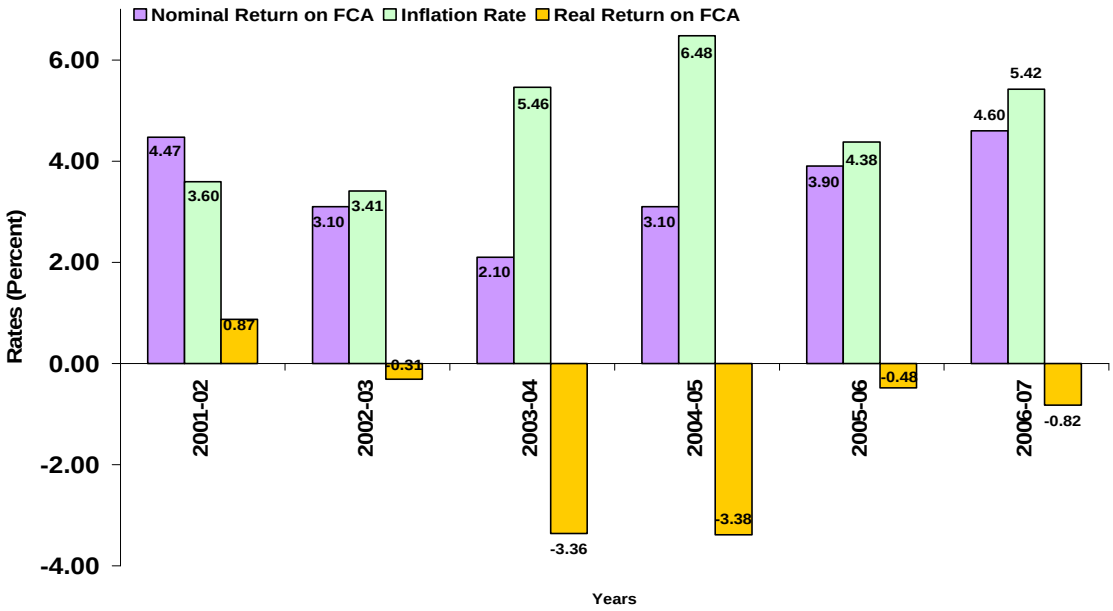
Source: World Development Indicators 2007

In the Indian case the dominant policy objectives in regard to international reserves include maintaining confidence in monetary and exchange rate policies, limiting external vulnerability, and providing confidence in the market that external liabilities will always be met thereby adding to the comfort of the market participants. Thus in India lot of weight is put on the precautionary and self-reliance motive. A lot of this has to do with India's historical experience. In June 1991 India faced a severe external crisis as volume of reserves dwindled down to levels that could finance less than three weeks of imports. At that point, the Government of India had to ship 47 tonnes of gold to Bank of England

to secure a loan of $415 million before the funds were arranged from the IMF to ride out the crisis. One of the causes of the crisis in mid 1991, apart from widening current account deficit and political uncertainty, was the loss of investor confidence. During this period commercial bank financing became difficult to obtain. Moreover, outflows began to take place on short-term external debt, as creditors became reluctant to roll over maturing loans. There was also a reversal of the strong inflows on nonresident Indian deposits. Again, an immediate aftermath of the Pokharan explosions was the imposition of sanctions, which curtailed India's access to global financial market. Reddy (2002) points out that given these experiences an overwhelming desire for international reserve buildup is understandable. However as highlighted by Lal et al. (2002), with current reserves being able to finance more than a year's import and India doing exceptionally well on all reserve adequacy measures, continuation of such a policy is highly questionable given the high costs associated with such a policy, some of which are highlighted below. Lal et al. (2003) conclude that if capital flows were fully absorbed and invested, instead of being neutralized by building up of foreign reserves, growth could have been significantly higher.

In India, international reserves are managed by the RBI in consultation with the Government of India. The main objectives of reserve management are liquidity and safety with due attention being paid to the currency composition and duration of investment so that a substantial part can be converted to liquid form at a short notice. The framework for deployment of these international reserves is guided by the RBI Act, 1934.

Figure 4: Rates of Return on Foreign Currency Assets



Source: Reserve Bank of India, Handbook of Statistics

The strategy to focus on safety and liquidity at the expense of return has had strong implications for the rate of returns on investment of the international reserves. Given the low interest rate prevailing in most of industrialized countries the direct financial return

on holdings of international reserves has been low. RBI (2007) points out that the rate of earning on foreign currency assets and gold, after accounting for depreciation, was only 4.6% in 2006-07 and 3.9% in 2005-06. The inflation rates during these two years were around 5.42% and 4.38%, implying a real rate of return of -0.82% in 2006-07 and -0.48% in 2005-06. Indeed as shown in Figure 4, in recent years, the real rates of return on foreign currency assets have been largely negative.

Such low returns have raised several questions about the management of international reserves by RBI. In particular, there has been a focus on calculating the cost of holding reserves. As shown in Section 3, India is one of the countries that have accumulated more reserves than is predicted by our model. When we extend the analysis for India till 2007 by taking into account the behavior of the explanatory variables for additional two years, we find that in 1998, India's actual accumulation of reserves were slightly less than predicted and this trend continued till 2001 with the gap between the two reducing significantly during the latter part of the period.[6] However, since then actual volume of reserves have overtaken the predicted volume, mainly due to a current account surplus in some of these years and rising net investment inflows. There was a marginal moderation in the growth rate of reserves in 2005 but it picked up again in 2006. Increased opening up of trade and capital account along with financial deepening also meant that predicted volume of reserves also showed an upward trend but the gap between the two widened significantly by Dec 2007, and amount of excess reserves stood well over $80 billion.

Below we compute the cost of accumulating reserves instead of utilizing the resources to increase the productive capacity of the economy. All the costs are reported in terms of income foregone as well as loss in terms of percentage of GDP. In the literature, different measures have been used to calculate the cost of hoarding reserves. We look at some of the important measures and calculate the costs of holding excess reserves in India.

4.1 Cost in Terms of Physical Investment Foregone

Several papers like Ben-Bassat and Gottlieb (1992a) and Neely (2000) have pointed out that the opportunity cost of reserve holdings can be equated to the marginal product of capital. The underlying rationale being that resources that could have been used to increase the domestic capital have been employed in hoarding reserves. In such cases, the cost of holding reserves is given by the interest rate spread between the return on foreign currency assets and marginal product of capital, which is a proxy for the return on physical investment. We look at the opportunity cost in terms of actual income foregone as well as a percentage of the GDP.

Typically the marginal product of capital is seen as the inverse of the incremental capital-output ratio (ICOR), with the latter reflecting the amount of additional capital required to generate a unit increase in output. The growth rate of the real output y can be stated as

[6] We extend the data on India for 2005 and 2006 by looking at various publications of the Reserve Bank of India and Ministry of Finance, Government of India. We reestimated our model using the additional information. However, there were only marginal change in the coefficients and their significance level (changes were only at the second decimal point).

$$y = \frac{1}{Y}\frac{\Delta Y}{\Delta T}, \tag{17}$$

where Y is the real output, T is time and ? is the first difference operator. Multiplying the numerator and the denominator by $\frac{\Delta K}{\Delta Y}$ we obtain

$$y = \frac{1}{Y}\frac{\frac{\Delta K}{\Delta T}}{\frac{\Delta K}{\Delta Y}}, \tag{18}$$

where K is the capital stock of the economy. In the above equation, $\frac{\Delta K}{\Delta T}$ refers to the change in capital stock from one period to the next and is equal to the investment undertaken (I). Similarly, $\frac{\Delta K}{\Delta Y}$ reflects the amount of capital required to raise output by one unit and can be approximated by the ICOR. Thus the above equation can be rewritten as

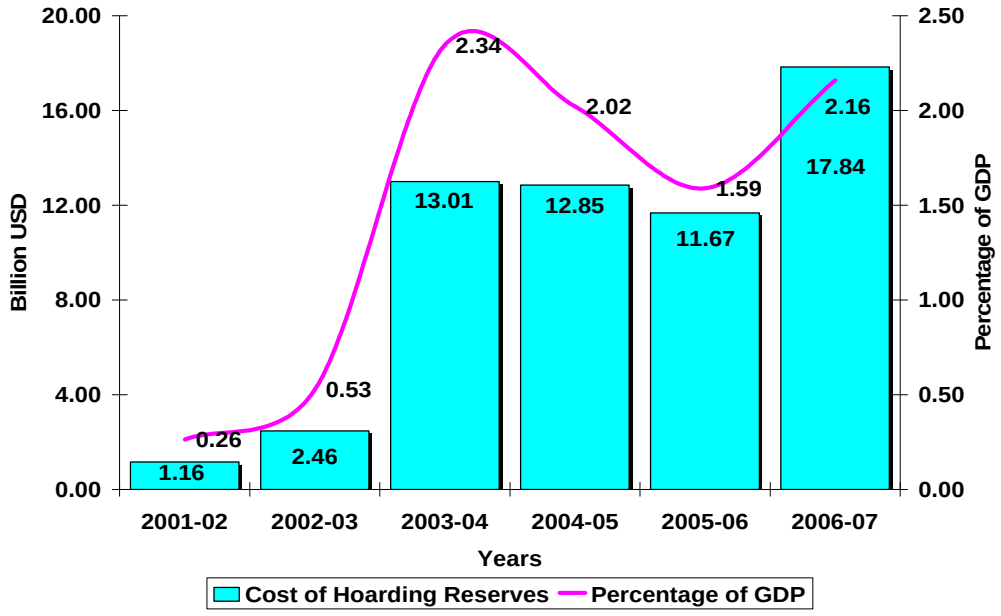
$$y = \frac{1}{Y}\frac{I}{ICOR} \tag{19}$$

Thus the marginal product of capital, which is the inverse of the ICOR, is given by

$$MP_K = \frac{y}{\frac{I}{Y}} \tag{20}$$

Data on I and Y is obtained from Central Statistical Organization (CSO).

Figure 5: Cost in terms of Physical Investment Foregone



The opportunity cost of accumulating reserves is shown in Figure 5 By diverting resources from physical investment and employing them for reserve accumulation, India lost nearly $13 billion or 2.34% of the GDP in 2003-04. In the next couple of years the loss was slightly lower due to a higher return on the foreign currency assets. However, with a relatively low ICOR and hence a high marginal product of capital in 2006-07, the loss rose sharply to nearly $18 billion or 2.16% of GDP. Thus we find that in terms of physical investment foregone India is paying a substantial cost.

4.2 Cost in Terms of Excess External Commercial Borrowing

Another opportunity cost of holding reserves can be formulated in terms of short-term borrowings that the private sector has to undertake. A country living by the Greenspan-Guidotti-IMF rule will increase reserves by the same amount by which the private sector increases its external short-term liabilities. In a recent paper, Rodrik (2006) calculates the social cost of holding reserves based on this idea.

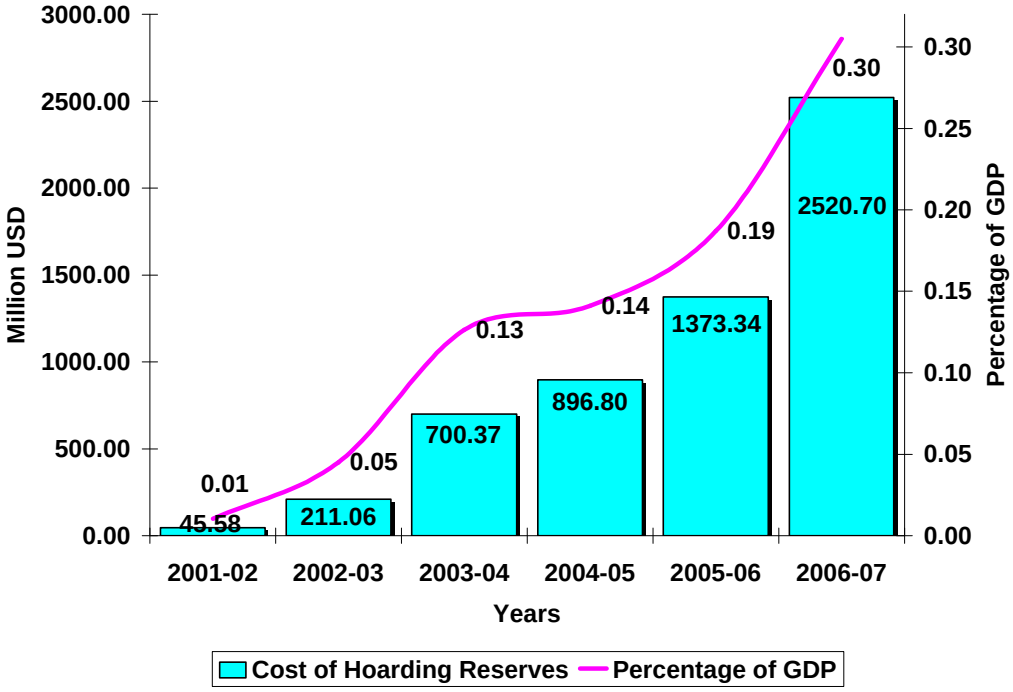
Consider an economy that is made up of the central bank and the private sector. Now suppose that this country is abiding by the Greenspan-Guidotti-IMF rule. The private sector takes a short-term loan from abroad of X dollars. The central bank has to increase its reserves by an equivalent amount. The central bank will purchase foreign currency worth this amount in the domestic market to invest in short-term foreign securities. Thus its stock of international reserves will go up by X dollars. By selling domestic currency worth X dollars to the private sector, the overall money supply has gone up by X dollars. To sterilize the effect of this intervention on the money supply, the central bank will sell some of the private sector domestic bonds it holds back to the private sector. Thus it sells back X dollars worth of domestic bonds issued by the private sector so its stock of domestic bonds decreases by X dollars. Similarly, due to this sell back, the value of domestic bonds outstanding for the private sector decreases by X dollars.

Rodrik (2006) points out three consequences of such transactions. Firstly, there is no net resource transfer from abroad as the increase in private sector's liability is matched by an increase in central bank's international reserves. Secondly, the short-term borrowing does not increase the availability of liquid resources available to the private sector for investment. The decline in total amount of debt issued by the private sector through domestic bonds is equivalent to the rise in short-term foreign debt. Finally, aggregating the balance sheets of the various sector, it can be seen that the economy has borrowed short-term abroad (at the domestic private sector's cost of foreign borrowing) and has invested the proceeds in short-term foreign assets.

In such a setting, the cost of holding reserves would be measured by the interest rate spread between the private sectors' cost of short-term borrowing abroad and the yield that the central bank earns on its liquid assets. Generally, there is no direct source of information on costs of short-term borrowing. Most of the short-term borrowing takes the form of commercial bank lending, information on which is generally not publicly available. In a recent article, Bhagwati (2006) pointed out that the average cost of short-term external commercial borrowings for the India private sector is roughly about 3-

month LIBOR+2.5%. Figure 6 shows the cost of hoarding excess reserves using this measure.

Figure 6: Cost in terms of Excess External Commercial Borrowing

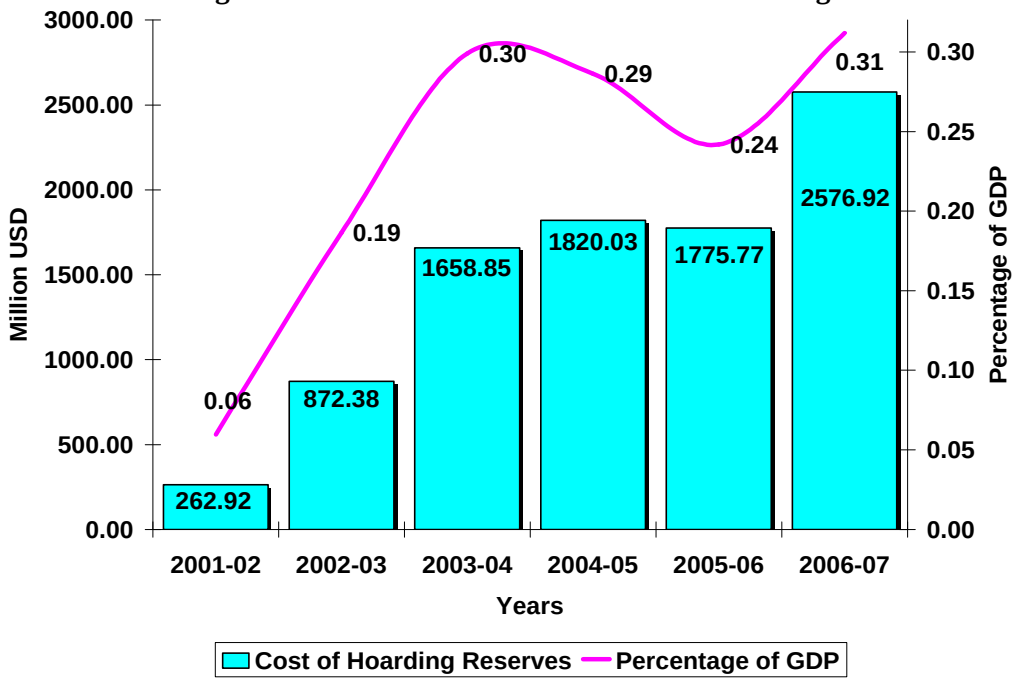


It can be seen that the cost of excess reserves has been increasing steadily and in 2006-07 stood in excess of $2.5 billion or 0.30% of GDP. The sharp increase in the cost in 2003-04, compared to previous year, is largely because of the low return on foreign currency assets that year. On the other hand, the increase in cost in 2005-06 and 2006-07 is largely explained by a sharp rise in the average 3 month LIBOR rate to 4.11% and 5.36%. As a result of monetary tightening in several industrialized countries, there was been a sharp increase in the cost of borrowing. On the other hand, during this period the dollar had become marginally stronger thereby providing some boost to the returns on international reserves.

4.3 Cost in Terms of Public Sector Borrowing

The rising burden of public debt and gross fiscal deficit should be an issue of serious concern for the Indian economy. The combined domestic liabilities of Centre and States have increased from 40.52% of GDP in 1980-81 to 77.25% in 2006-07. Ahluwalia (2002) points out that the growth of public debt in India has equaled or exceeded that in Russia, Turkey and Argentina before these countries hit a crisis. Using yields on public debt issued domestically to evaluate debt sustainability, Kletzer (2004) provides a strong argument for a fiscal adjustment. Following Kletzer (2004) and Mohan (2002), we use the weighted average yield on central and state government securities to calculate the opportunity cost of hoarding reserves. The results are shown below in Figure 7.

Figure 7: Cost in terms of Public Sector Borrowing



It can be clearly seen that using the spread between interest rate on domestic government bonds and the yield on reserves, the cost is quite significant and in excess of $2.5 billion or 0.31% of GDP. Again, the sharp increase in the cost in 2003-04 is explained by the low yield on foreign assets. In contrast, the increase in cost by $1 billion between 2005-06 and 2006-07 is largely explained by significant increase in the volume of excess reserves as well as an increase in the cost of borrowing for the public sector. The extent of this cost has been mitigated to an extent by the ability of the government to borrow at concessional rates. Since 1995-96, there has been a steady decline in the yield of central government securities along with a rise in maturity. However, this trend was reversed in 2004-05 and 2005-06, when there was a sharp increase in interest rates. With global hardening of monetary policy, and opening up of the Indian economy to capital flows, domestic interest rates will have to align themselves with international rates. This would imply that the government's ability to borrow at concessional terms might get severely eroded in recent years, thereby increasing the cost of hoarding reserves.

4.4 Cost in Terms of Balance Sheet Risks

Another cost of holding international reserves arises when the exchange rate adjusts. The RBI has intervened actively in the currency market to keep the value of the rupee low vis-à-vis the US dollar, which has resulted in accumulation of the reserves. However, the central bank can only delay the inevitable process of appreciation and can not prevent it. This was also observed in the case of India. After trying to keep the value of the INR around Rs. 48 during 2001-02, the RBI allowed the INR to appreciate. As a result the value of dollar fell from Rs. 49.03 in May 2002 to Rs. 45.32 in October 2003. This adjustment would imply that there was a sharp fall in the rupee value of India's

international reserves. For e.g., international reserves worth $1 billion, which was valued at Rs. 490.3 crores in May 2002 was worth only Rs. 453.2 crores in October 2003 – a loss of Rs. 37 crores. Similarly, the recent appreciation of the Indian rupee has resulted in a significant fall in the valuation of reserves in domestic currency.

7. Conclusion

The primary objective of this paper is to evaluate the cost of holding excessive reserves. We present a model of a small open economy identifying the major determinants of international reserve holdings. Thereafter we test the prediction of the theoretical model using empirical methods. We formulate a comprehensive measure of reserve adequacy to calculate the volume of excess reserves in several emerging markets including India. This is in contrast to most of the existing literature, which generally uses a single measure to calculate excess reserves.

Using the comprehensive measure of reserve adequacy we find that overall emerging markets have outperformed in their reserve accumulation objective compared to the predictions of our model. This result is primarily driven by the Asian economies who have amassed far more reserves than suggested by our model. Among these the Asian emerging markets that suffered the adverse impact of the Asian crisis have significantly increased their reserve accumulation endevours compared to the predictions of the model. On the other hand, Latin American economies fall well short of the levels predicted by our model.

Looking at individual countries we find that Indonesia, Thailand and Philippines have accumulated reserves close to the amount predicted by our model. On the other hand Brazil's reserve accumulation efforts have fallen short of our model's prediction. Finally, China, India, Korea, Russia and Malaysia exhibited had accumulated significantly more reserves than compared by our model.

Next, focusing on India, we find that by end of 2007 India had accumulated more than $80 billion of excess reserves. We impute the costs of holding these reserves by considering various alternative uses of the resources employed in building up reserves. The cost is substantial across all specifications, both in terms of actual income foregone as well as loss in terms of percentage of GDP. India is loosing more than 2% of its GDP by accumulating reserves instead of employing resources to increase the physical capital of the economy. Even if the resources absorbed in reserve accumulation were utilized to reduce private sector's external commercial borrowing or public sector debt, India could gain more than 0.3% of the GDP.

References

Aghion, P., P. Bachetta, R. Ranciere, and K. Rogoff (2006). 'Exchange rate volatility and productivity growth: the role of financial development.' NBER Working Paper No.12117.

Ahluwalia, M. S. (2002). 'India's vulnerability to external crisis.' In M. Ahluwalia, S. Tarapore, and Y. Reddy, eds., 'Macroeconomics and Monetary Policy: Issues for Reforming the Economy,' Oxford University Press.

Aizenman, J. and J. Lee (2006). 'Financial Versus Monetary Mercantilism: Long Run View Of Large International Reserve Hoarding.' IMF Working Paper No. WP/06/280.

Aizenman, J., Y. Lee, and Y. Rhee (2004), "International Reserves Management and Capital Mobility In A Volatile World", NBER Working Paper No. 10534

Aizenman, J. and N. Marion (2004). 'International Reserve Holdings with Sovereign Risk and Costly Tax Collection.' *Economic Journal*.

Baker, D. and K. Walentin (2001). 'Money For Nothing: The Increasing Cost Of Foreign Reserve Holdings To Developing Nations.' CEPR Briefing Paper.

Ben-Bassat, A. and D. Gottlieb (1992a). 'On The Effect of Opportunity Cost on International Reserve Holdings.' *The Review of Economics and Statistics*, 74; pp. 329–332.

Ben-Bassat, A. and D. Gottlieb (1992b). 'Optimal International Reserves And Sovereign Risk.' *Journal of International Economics*, 33; pp. 345–362.

Bhagwati, J. (2006). 'Return on FCA.' Business Standard.

Burke, D. and P. Lane (2001). 'The Empirics of Foreign Reserves.' *Open Economics Review*, 12 (4); pp. 423–434.

Chinn, M. D. and H. Ito (2006). 'What Matters For Financial Development? Capital Controls, Institutions And Interactions.' *Journal of Development Economics*, 81 (1); pp. 163–192.

Dooley, M. P., D. Folkerts-Landau, and P. Garber (2003). 'An Essay on The Revived Bretton Woods System.' NBER Working Paper No. 9971.

Edison, H. (2003). 'Are Foreign Reserves In Asia Too High?' In 'World Economic Outlook and Staff Studies for the World Economic Outlook,'

Frenkel, J. A. and B. Jovanovic (1981). 'Optimal International Reserves: A Stochastic Framework.' *Economic Journal*, 91 (392); pp. 507–514.

Gosselin, M.-A. and N. Parent (2005). ‘An empirical analysis of foreign exchange reserves in emerging Asia.’ Bank of Canada Working Paper No. 38.

Higgins, M. and T. Klitgaard (2000). ‘Asia's Trade Performance after the Currency Crisis.’ Economic Policy Review, Vol. 6, No. 3

Iyoha, M. H. (1976). ‘A Distributed Demand For International Reserves In Less Developed Countries’, *The Review of Economics and Statistics*, 58; pp. 351–355.

Jeanne, O. and R. Rancière (2008). ‘The Optimal Level of Reserves For Emerging Market Countries: Formulas And Applications’ Unpublished

Kletzer, K. M. (2004). ‘Liberalizing Capital Flows In India: Financial Repression, Macroeconomic Policy And Gradual Reforms.’ Santa Cruz Center for International Economics Paper 04-16.

Lal, D., S. Bery, and D. K. Pant (2002). ‘The Real Exchange Rate, Fiscal Deficits and Capital Flows in India: 1981-2000.’ *Economic and Political Weekly*, 38 (47); pp. 4965–4976.

Levy-Yeyati, E. and F. Sturzenegger (2005). ‘Classifying Exchange Rate Regimes: Deeds vs. Words.’ *European Economic Review*, 49 (6); pp. 1603–1635.

Mohan, R. (2002). ‘Transforming Indian Banking: In Search of a Better Tomorrow.’ Speech Given at Reserve Bank of India.

Neely, C. (2000). ‘Are Changes In Foreign Exchange Reserves Well Correlated With Official Intervention.’ Economic Review of the Federal Reserve Bank of St. Louis.

RBI (2007). ‘Annual Report 2006-07: Reserve Bank of India.’

Reddy, Y. V. (2002). ‘India’s Foreign Exchange Reserves: Policy, Status and Issues.’ Special Lecture at National Council of Applied Economic Research.

Reinhart, C. M. and K. S. Rogoff (2002). ‘The Modern History of Exchange Rate Arrangements: A Reinterpretation.’ *Quarterly Journal of Economics*, 119 (1); pp. 1–48.

Rodrik, D. (2006). ‘The Social Cost of Foreign Reserves.’ *International Economic Journal*, 20 (3); Pp. 253–266.

Shinkai, Y. (1979). ‘Demand for International Reserves in Less Developed Countries: A Comment.’ *The Review of Economics and Statistics*, 61 (4); pp. 614–615.

Big Reforms but Small Payoffs: Explaining the Weak Record of Growth and Employment in Indian Manufacturing

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Prepared for Presentation at tbe Brookings-NCAER India Policy Forum 2008
New Delhi

July 15-16, 2008

Big Reforms but Small Payoffs:

Explaining the Weak Record of Growth in Indian Manufacturing

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This version June 23, 2008

Abstract

India has undertaken extensive reforms in its manufacturing sector over the last two decades. However, an acceleration of growth in manufacturing, and a corresponding increase in employment, has eluded India. Why have the reforms not produced the intended results? Using Annual Survey of Industries data at the three digit level for major Indian states, for 1980-2004, we analyze the effects of the reforms that liberalized India's industrial licensing regime on the performance of registered manufacturing. We find that the performance of the manufacturing sector is heterogeneous across states, as well as across industries. In particular, labor intensive industries and industries dependent on infrastructure have not benefited much from reforms. Industrial performance appears to be contingent on the state specific policy and economic environment. States with relatively inflexible labor regulations have experienced slower growth of labor-intensive industries and slower employment growth overall. Additionally, states with relatively competitive product market regulations and with better infrastructure have experienced larger benefits from reforms.

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I. **Introduction**

The promotion of the manufacturing sector and its exports has been a key pillar of the growth strategy employed by successful developing countries, especially labor abundant ones. In this context, India's recent experience is puzzling on two accounts. First, while India's economy has grown rapidly over the last one to two decades the Indian growth momentum has not been based on manufacturing. Rather the main contributor to growth has been the services sector. Second, the relatively lackluster performance of Indian manufacturing cannot be ascribed to a lack of policy initiatives to jumpstart the sector. India introduced substantial product market reforms in its manufacturing sector starting in the mid-1980s, but the sector never took off as it did in other high-growth countries. Moreover, in so far as subsectors within manufacturing have performed well, these have been the relatively capital- or skill-intensive industries, not the labor-intensive ones as would be expected for a labor abundant country like India.[2]

One of the main components of reforms in India was the liberalization of the industrial licensing regime, or "delicensing". Under the Industries Development and Regulatory Act of 1951 every investor over a very small size needed to obtain a license before establishing an industrial plant, adding a new product line to an existing plant, substantially expanding output, or changing a plant's location. Over time, many economists and policymakers began to view the licensing regime as generating inefficiencies and rigidities that were holding back Indian industry. The process of delicensing started in 1985 with the dismantling of industrial licensing requirements for a group of manufacturing industries. Delicensing reforms accelerated in 1991, and by the late 1990s virtually all industries had been delicensed. Large payoffs were expected in the form of higher growth and employment generation with this policy reform.

However, the payoffs till date have been limited. It can be argued that a lag between the announcement and implementation of the policy, and also a lag between implementation and the payoffs may be responsible. However, it has been as many as twenty years since the first batch of industries were delicensed and almost a decade since the last batch of industries was delicensed; the view that payoffs would occur with a lag is difficult to maintain.[3]

What then could be the reasons for the rather lackluster performance of the industrial sector? The following factors are usually offered: (i) strict labor laws have hindered growth, especially of labor intensive industries (see Krueger 2007; Panagariya 2006; Panagariya 2008); (ii) infrastructure bottlenecks have prevented industries from taking advantage of the reforms ; and (iii) credit constraints due to weaknesses in the financial sector may be holding back small and medium sized firms from expanding (see Banerjee and Duflo 2004; Nagaraj 2005; McKinsey 2006). More recently, two other factors have also been raised. First, it has been pointed out that the evolution of Indian industry may be influenced by path dependence or hysteresis so that despite the reforms of the mid-1980s and early 1990s, the relative profitability of capital-and skill-intensive activities remains higher than that of labor-intensive activities (Kochhar et al

[2] See Kochhar et al (2006).

[3] There have been two other major reforms in the Indian industrial sector—trade reforms and the abolition of policies which reserved certain sectors for small scale industries. We plan to examine these in future work.

2006). Second, the major reform initiatives undertaken so far -- focused mainly on product market reforms -- have been national ones. However, the working of product markets in a federal democracy such as India is influenced not only by regulations enacted by the central government, but also those enacted by individual state governments. Moreover, much of the authority on administration and enforcement of regulation also rests with state governments. Accordingly, it has been pointed out that regulatory and administrative bottlenecks at the state level may be blunting the impact of reforms undertaken at the central level (OECD 2007).

Even though the foregoing factors have been debated actively in academic and policy circles, the empirical evidence to support or negate these arguments is limited. Two prominent exceptions include Besley and Burgess (2004) and Aghion et al (2006). These papers have primarily looked at the effect that labor regulations have had on industrial growth in India using state-level amendments to the Industrial Disputes Act (IDA) to classify states as pro-worker, neutral, or pro-employer. While the first finds that industrial performance has been weaker in Indian states with pro-worker labor laws, the second finds states with pro-worker labor laws to have experienced limited benefits from delicensing reforms.

But these findings have been contested. First, it has been argued that the entire burden of regulatory weaknesses that might be constraining Indian manufacturing is placed on labor. In particular, neither of the papers accounts for other regulatory weaknesses. Second, the coding of state-level amendments to the IDA as pro-worker, neutral, or pro-employer has been criticized (see, especially, Bhattacharjea 2006).

In this paper, we attempt to address both of the criticisms. Thus, while this paper analyzes the impact of delicensing on industrial performance, as in Aghion et al, we pay attention to the role of factors other than just labor regulations in influencing industrial performance. In particular, we look at how weaknesses in infrastructure and cumbersome product market regulations at the state level may be affecting India's manufacturing sector.

Additionally, we deal with the criticism surrounding Besley and Burgess' coding of state-level labor regulations, and thus the robustness of their result that pro-worker labor regulations have undermined industrial performance, in two ways. First, we consider an alternative approach for classifying states' stance on labor regulations drawing upon the work of Bhattacharjea (2008), OECD (2007) and Ahsan and Pages (2007) in addition to that of Besley and Burgess. Second, we consider an altogether different approach to identifying the impact of labor regulations on industrial performance. Instead of relying solely on cross-state heterogeneity in labor regulations, we rely on heterogeneity in industry-specific characteristics as well. For example, to the extent that rigidities introduced by labor regulations are likely to have their greatest bite on labor-intensive industries, the performance of labor-intensive industries can be expected to be weaker than others, especially in states with pro-worker or inflexible labor regulations.

In this way, our empirical work attempts to answer the following questions in a way that builds upon the recent literature: Does the impact of policy reform vary across industries? Does the impact depend on the regulatory framework in place at the state level including concerning labor market regulations as well as product market regulations? Does infrastructure play a role in determining the payoffs from reforms? Could hysteresis be one reason behind the modest payoffs from reforms? We use state level data published by the Annual Survey of Industry (ASI) on registered manufacturing at the three digit level from 1980-2004. This data is used along with

a host of other data pertaining to industry and state level characteristics of various kinds. The main findings of the paper are as follows.

(1) The impact of delicensing has been highly uneven across industries. Industries which are labor intensive, use unskilled labor, depend on infrastructure (or are energy dependent) have experienced smaller gains from reforms.

(2) Regulation at the state level matters. States with less competitive product market regulations have experienced slower growth in the industrial sector post-delicensing, as compared to states with competitive product market regulations. States with relatively inflexible labor regulations experience slower growth of labor-intensive industries and slower employment growth.

(3) Infrastructure availability and financial sector development are important determinants of the benefits that accrued to states from reforms. If supportive regulatory conditions prevailed and infrastructure availability allowed it, businesses responded by expanding their capacity and grew and to that extent hysteresis does not seem to matter.

A few caveats are in order. First, due to lack of comparable data we only look at registered manufacturing (formal sector) in the paper. We do not consider this to be a serious limitation, however. On average, firms in the formal sector can be expected to be more productive, pay higher wages, and provide better working conditions than firms in the informal sector. Thus from several points of view, including the welfare of workers, the performance of the formal sector is important to monitor and analyze. Second, we do not consider reforms other than delicensing in the paper. Several other major reforms have been introduced in so far as Indian manufacturing is concerned, including reductions in barriers to trade and the dismantling of the policy of reserving particular industries for production by the small-scale sector. Finally, regulations can affect firms and industries in many different ways. For example, they may create incentives for firms to operate in the informal sector, stay relatively small, or adopt particular types of techniques. While the analysis of aggregate data can shed (indirect) light on some of these effects, a more complete analysis would require the use of a micro-based approach utilizing plant level data.

The rest of the paper is organized as follows. In Section II we highlight the performance of the industrial sector in India, including the heterogeneity in the industrial performance across industrial sectors and the regional variation in industrial growth. In section III we discuss the econometric methodology and the sources of data used in the paper. In Section IV we present and discuss our results. Section V concludes.

II. Performance of the Indian (Registered) Manufacturing Sector

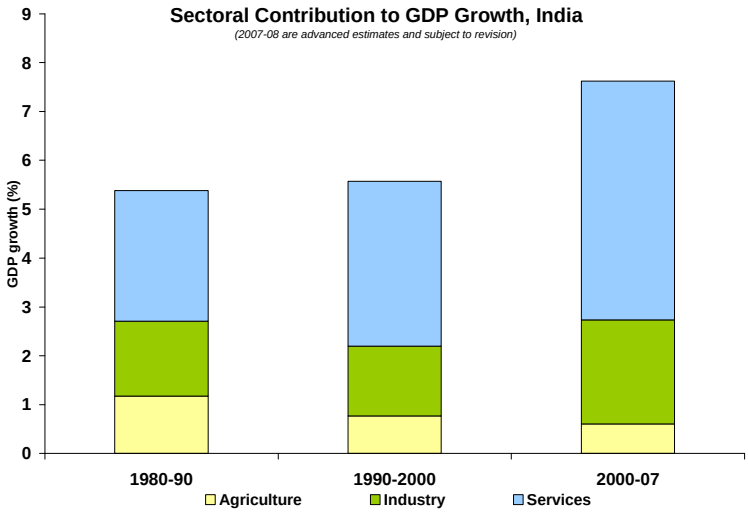
The Indian growth process in the past fifteen years (and some would argue in the entire post-independence period) has been rather lopsided. Indian growth has been more about services rather than industries. There have been modest payoffs to reforms in the industrial sector. This is despite the fact that the liberalization efforts were focused mostly on improving the regulatory environment faced by the industrial sector and reducing trade protection. Within industry, labor intensive sectors have gained much less from reforms than the capital intensive sectors. Growth has also been uneven at the regional level. Certain states—with higher per capita income and

higher initial share of industry – have done better than the rest. Let's first look at this heterogeneity in Indian industrial sector.

II A. Indian Growth Momentum is about Services

As has been documented in Gordon and Gupta (2004), the services sector has been the largest contributor to economic growth in India, and with services sector growth accelerating further in the post-liberalization period, its share in GDP and contribution to growth has been increasing. As Chart 1 shows it has contributed almost 2/3rd of GDP growth in India in recent years and currently constitutes close to 55 percent of GDP.

Chart 1: Sectoral Contribution to Growth



Source: Authors' calculation using the CSO data

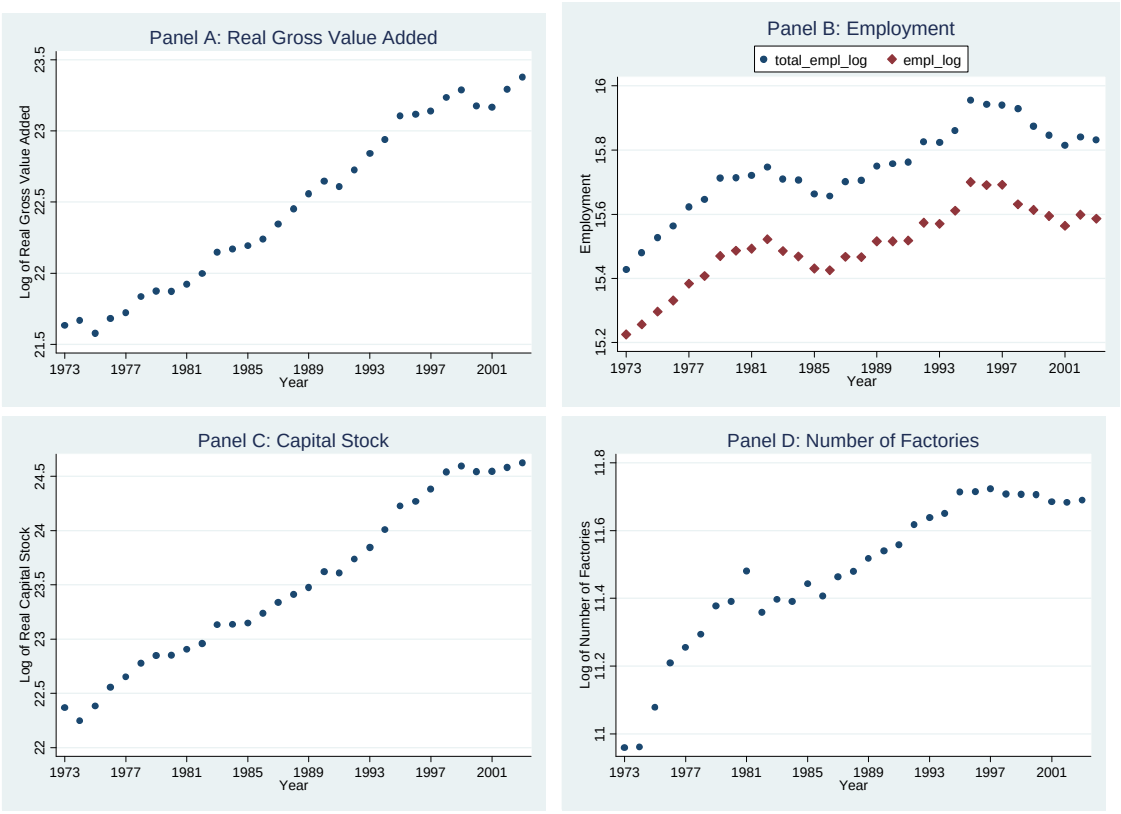
II B. Modest and Unstable Pick up in Industrial Performance post-delicensing

The growth of manufacturing value added has not necessarily accelerated in the post-delicensing period.[4] The aggregate value added in registered manufacturing has increased from about Rs 2.8 billion in 1980 to Rs 16.4 billion in 2004 (as measured in 1993-94 prices), which translates into 5.6 percent a year average growth rate in the sample period, with value added growing by an additional 15 percent between 1993 and 2004 (i.e. a little more than 1 percent a year). This modest pickup in value added has not been accompanied by additional growth in employment or

[4] The performance in the post-delicensing period has also not been consistent. It has been marked by a sharp deceleration from 1996 to 2001 when the average annual growth rate dipped to 3 percent, from 11 percent a year in 1991-1996, and a recovery in the ensuing period when the industrial growth recovered to an average 10 percent a year over the period 2001 to 2006 as per the CSO data.

in the number of factories.[5] When we compare this performance with the pace of growth in the manufacturing sector of many East Asian countries including China, we realize that, especially in terms of value added, the performance of Indian manufacturing has not been close to that of East Asian countries. For example, manufacturing value added in South Korea grew at an average annual real growth rate of approximately 17 percent between 1960-1980; and China's manufacturing sector grew at an average rate of 12 percent per year between 1990-2005.

Chart 2: Performance of Indian Manufacturing (Registered)



Source: Gupta, Hasan, and Kumar(2008)

In addition we note below that the performance has been uneven across states and industries. As can be seen from Chart 3 below, there has been a divergence in the performance of the labor intensive and capital intensive industries in India. The labor intensive industries have grown relatively slowly post delicensing. Different panels below depict the industrial sector growth

[5] As highlighted in Gupta, Hasan and Kumar (2008), performance varies across different sectors: the industries which depend more on infrastructure on average experienced lower growth in value added post-delicensing, as compared to the industries which are less reliant on infrastructure. Similarly, the industries more dependent on the financial sector or the labor intensive industries have fared much worse than the industries that do not rely as much on the financial sector and capital intensive industries.

across different industries and across states characterized by different regulatory framework, and different infrastructural developments. First, in Panel A, we see that the industrial performance is similar across states with different labor market regulations; in Panel B we see that the industrial output grew faster in states with flexible product market regulations post delicesning. Industrial performance is also seen to be better in states with more developed infrastructure or more developed financial sector in the next two panels. As can be seen in Panel E below the growth seems to be broadly similar in labor intensive and capital intensive industries before the liberalization, but has accelerated in the capital intensive industries, post delicensing. Finally the last two panels show that the performance of labor intensive industries is in particular better in the states with labor regulations that are considered to be "flexible"(pro employer).

Chart 3 A: Labor Market Regulations

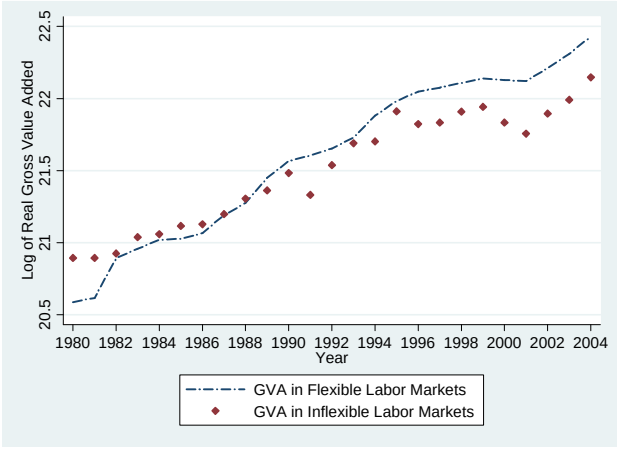


Chart 3 B: Product Market Regulations

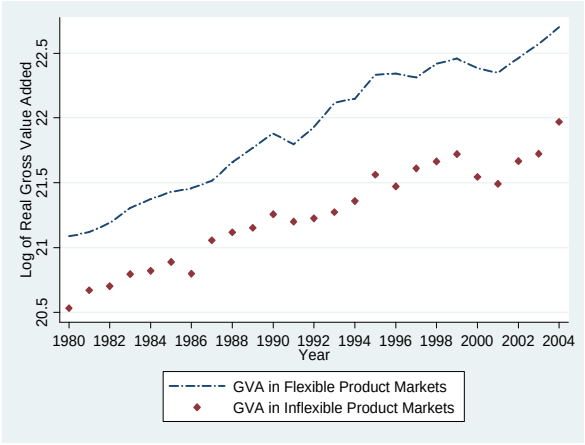


Chart 3 C: Infrastructure

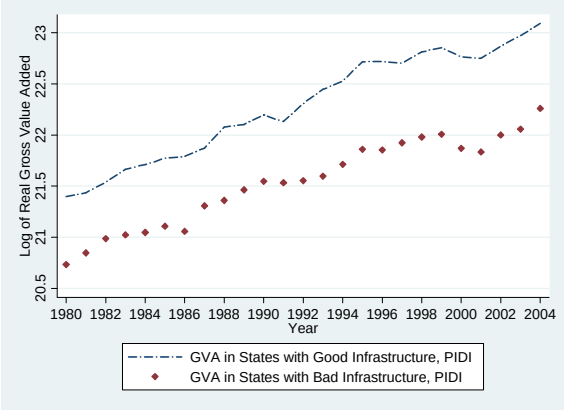


Chart 3 D: Financial Sector Development

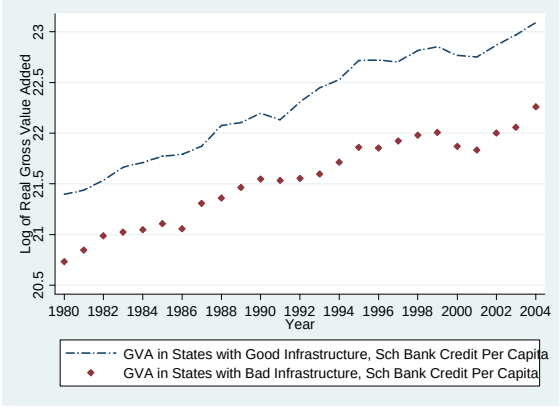


Chart 3 E: Industrial Sector and Labor Intensity

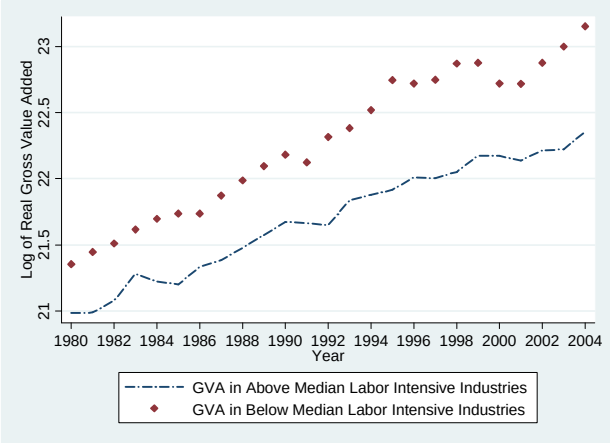


Chart 3 F: Labor Intensive Industries and Labor Market Regulation

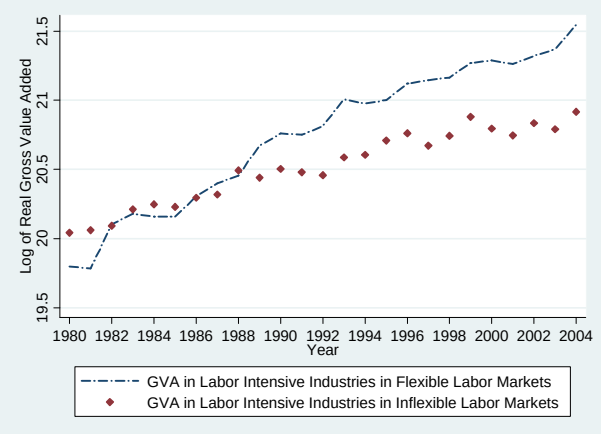
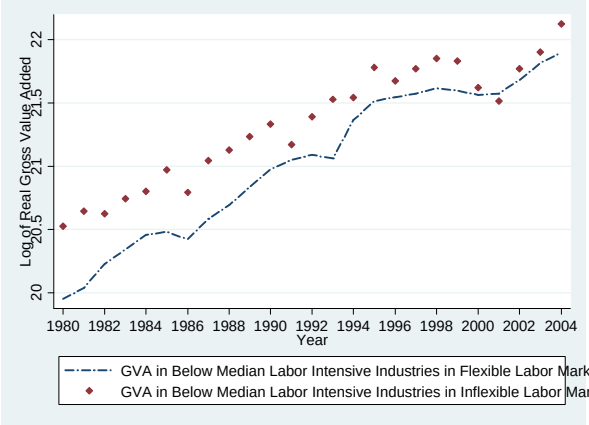


Chart 3 F: Capital Intensive Industries & Labor Market Regulation



Source: Authors' own calculations using the ASI data.

III. Data and Methodology

Our analysis is based on the ASI data for 42 three-digit manufacturing industries for the period 1980-2004 for 15 major states of India. We utilize variation in industry and state characteristics in order to identify how factors such as labor regulations, product market regulations, availability of physical infrastructure, and financial sector development may have influenced the impact of delicensing on industrial performance. Below we discuss methodological issues in more detail,

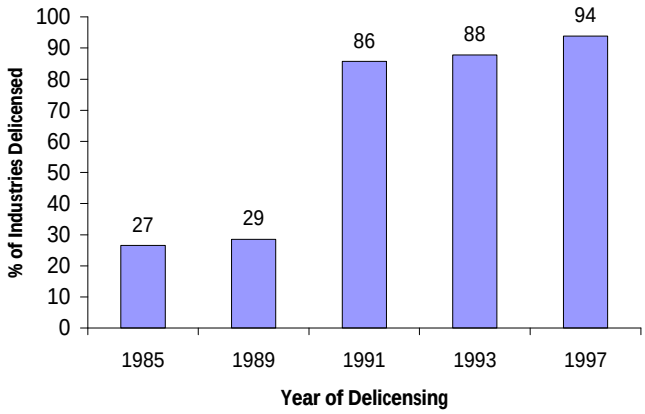
including how we measure delicensing and pertinent industrial-and state-specific characteristics for our econometric analysis.

III A. Delicensing, Industry Characteristics, and State Characteristics

Delicensing: From the early-1950s up until the early-1980s the evolution of India's manufacturing sector was guided by industrial and trade policies that protected domestic industry and gave the state a central role in investment decisions. While a strict regime of import and export controls defined trade policy, industrial policy worked through an elaborate system of industrial licensing. Under the Industries Development and Regulatory Act of 1951 every investor over a very small size needed to obtain a license before establishing an industrial plant, adding a new product line to an existing plant, substantially expanding output, or changing a plant's location.

Industrial stagnation since the mid-1960s – increasingly blamed on the policy framework – led to some tentative steps aimed at liberalizing these regimes in the late 1970s and early-1980s (see Ahluwalia 1987, 1991). Relaxations of the industrial licensing system were introduced and import licensing requirements were eased. Serious liberalization efforts began in 1985 with delicensing—the exemption from the requirement of obtaining an industrial license—of 25 broad categories of industries, which maps into 13 industries in our three digit level data. The next major reform of the licensing regime came in 1991 when industrial licensing was abolished except in the case of a small number of industries (see Chart 4 and Appendix A for the time path of delicensing).

Chart 4: Cumulative Share of Industries Delicensed



Source: Based on Aghion et al (2006) and extended by the authors.

Thus delicensing is one of the most comprehensive reform programs undertaken by the Government of India and this is the reform variable that we work with. Information on it is also readily available (see Aghion et al (2006) and Gupta, Hasan, and Kumar (2008)). Additionally,

there is good reason to believe that the specific timing of delicensing of particular industries was unanticipated by firms. Further, it is unlikely that the industries that were delicensed were chosen on the basis of expected future performance (see Aghion et al (2006)). In other words, delicensing represented an unanticipated reform, and also a reform measure that is unlikely to be subject to endogeneity concerns. To the extent that implementation of delicensing may have lagged its announcement, we lag the date of delicensing by a year.

Industry characteristics: For technological reasons, industries need different inputs in different combinations, with specific industries often relying more heavily on certain inputs. For example, some industries may rely more on labor, some on skilled labor, and some may make more extensive use of physical infrastructure such as roads, electricity, ports etc. As a result, the size and growth of industries can be expected to depend on the cost and availability of inputs that are used most intensively in their production. Here we look at industries which are labor intensive, unskilled labor-intensive, spend more heavily on energy and other infrastructure, or export a larger share of their total output, and examine whether the payoffs from reforms differ across these industries. If industries requiring a certain input have gained less from reforms, it could be because of the limited availability of that input and its price being too high.[6]

For example, if industries dependent on infrastructure have not grown much post-reforms, it may well be an account of the unavailability of adequate infrastructure. A similar finding for labor intensive industries would be hard to reconcile in the same way, however. Given the large size of India's labor force and the level of wages, a more natural explanation for the relatively weak performance of labor intensive industries could lie in appealing to issues such as the quality of labor and/or regulations on employment which make the effective price of hiring labor too high.

We construct indicators of industries' reliance on labor and infrastructure inputs using data from several different databases, as well as using data for the US. The idea behind using these is that input needs are sufficiently technical in nature and specific to an industry (or a small group of industries), and not to countries. Also, the *relative* need of industries of various inputs is unlikely to change over time. Thus, for example, while all industries may be becoming more capital-intensive over time, the set of industries that can be characterized as relatively labor-intensive at any given point of time will be more or less unchanged.

In order to get around the concern that these input related industry characteristics would reflect the equilibrium conditions between the demand and supply of the respective inputs, we use the data from an earlier year rather than contemporaneous data. Furthermore, to smooth out the noise in the data we use five year averages of the relevant variables to calculate the industry indicators. We also confirmed, where possible, that the relative industry rankings across various characteristics do not change over time. This robustness check gives credence to the belief that there are perhaps external technological reasons for why an industry uses more labor per unit of capital or depends more on infrastructure than others. We also find that these characteristics are highly correlated when calculated using different databases; and that the various characteristics

[6] We are presuming, of course, that the production of these goods is not constrained by inadequate demand, but due to supply-side constraints imposed on their growth.

are not highly correlated with each other, thus there is independent variation in these characteristics, see Appendix B for details.

State Characteristics: Have all states benefited equally from the delicensing reforms? If not, what factors can explain why some states were better positioned to gain from the reforms than others?

Given its importance in production and the fact that it varies across states, physical infrastructure is certainly one such factor. Another factor that many observers point to concerns the regulatory environment faced by manufacturing firms. Importantly, this environment can vary by states. This is because India's constitution distinguishes areas of regulatory responsibility in terms of whether authority rests with the central government, the state government, or both. For example, bankruptcy procedures and "exit policy" are under the exclusive purview of the central government; inspections and compliance with regulation come under the purview of the state government; labor regulation and "entry" are areas of joint responsibility (Conway and Herd, 2008).

We consider two types of regulations that can vary across states in this paper: labor market regulations and product market regulations.

While India's labor regulations have been criticized on many counts including, for example, the sheer size and scope of regulations, their complexity, and inconsistencies across individual pieces of regulation, a few specific pieces of legislation are the controversial ones. The key ones involve Chapter VB of the Industrial Disputes Act (IDA) and Section 9A of the IDA and the Industrial Employment (Standing Orders) Act. The first of these makes it necessary for firms employing more than 100 workers to obtain the permission of state governments in order to retrench or lay off workers -- permission which some analysts argue is rarely forthcoming and thereby ends up raising the effective cost of labor usage in production.[7] As for the second and third, these pertain to the terms and conditions of work. While they seek to make labor contracts complete, fair, and legally binding they can constrain firms from making quick adjustments to changing conditions, especially in view of weaknesses in collective bargaining mechanisms.[8]

It is important to note that not all analysts agree that India's labor laws have made for a rigid labor market. In particular, a counter-argument to the views above is that the rigidity inducing regulations have been either ignored (see Nagaraj (2002)) or circumvented through the increased

[7] Until 1976, the provisions of the IDA on retrenchments or layoffs were fairly uncontroversial. The IDA allowed firms to layoff or retrench workers as per economic circumstances as long as certain requirements such as the provision of sufficient notice, severance payments, and the order of retrenchment among workers (last in first out) were met. An amendment in 1976 (the introduction of Chapter VB), however, made it compulsory for employers with more than 300 workers to seek the prior approval of the appropriate government before workers could be dismissed. A further amendment in 1982 widened the scope of this regulation by making it applicable to employers with 100 workers or more.

[8] See Anant (2000) for a discussion on this.

usage of temporary or contract labor (see Datta (2003) and Ramaswamy (2003)).[9] Ultimately, whether India's labor laws have created significant rigidities in labor markets or not is an empirical issue.

Unfortunately, quantifying differences in labor market regulations across states -- a critical step in evaluating whether labor regulations have been a dampener on industrial performance -- has proved to be contentious. For example, Besley and Burgess (2004) exploit state-level amendments to the Industrial Disputes Act (IDA) – arguably the most important set of labor regulations governing Indian industry -- and code legislative changes across major states as pro-worker, neutral, or pro-employer. While, in principle, the approach of Besley and Burgess has considerable merit, it is not without controversy. Bhattacharjee (2006), in particular, has argued that deciding whether an individual amendment to the IDA is pro-employer or pro-worker in an objective manner is quite difficult. Even if individual amendments can be so coded, the actual workings of the regulations can hinge on judicial interpretations of the amendments. Moreover, if noncompliance with the regulations is widespread, then even an accurate coding of amendments which takes into account the appropriate judicial interpretation loses its meaning.

We take the following approach in this paper. We start with the various attempts by different researchers at quantifying differences in labor regulations across India's major states. In addition to Besely and Burgess (2004), this includes Ahsan and Pages (2007), OECD (2007) and Bhattacahrjea (2008). We calculate the labor market regulation variable by using a simple majority rule across different indicators.[10] Based on this rule we code the states as pro labor, pro business, or neutral if the majority of the studies in the literature which have calculated these codes do so. The advantage of calculating our variable in this way is that if a particular methodology or data source used by a researcher is subject to measurement error, then it will be weeded out in the rule. So unless several different sources systematically make a mistake in coding the states, we would not pick it up in our coding. Full details, including our final composite coding of states' labor regulations based on the different studies is given in Appendix D.

Notwithstanding the delicensing reforms, regulation in the product market remains fairly high relative to other countries. For example, based on the World Bank's Doing Business surveys, starting a business in India is found to take a considerable amount of time due to the nature of regulations and administrative procedures involved. Similarly, the time taken to close a business is one of the longest in the world. While some of these aspects of product market regulations are on account of regulation at the central-level as noted above, certain aspects of regulation, including its enforcement, are determined at the state-level. Thus, product market regulations can be expected to vary across states.

[9] For a detailed review of Indian labor regulations and the debate surrounding the issue of rigidity, see Anant et al (2006).

[10] This is based on an approach used in Gupta, Mishra and Sahay (2007) to find the currency crisis dates for different countries which differ across various studies in the literature. Rather than relying on a particular study or approach, they use the majority rule to find the currency crisis dates.

Appendix D provides details on the classification of India's major states into those having competitive, neutral, or cumbersome product market regulations based on an OECD study on regulations across Indian states and results from surveys of enterprise managers carried out as part of World Bank's investment climate studies. As described in the appendix, we create a composite classification of states for use in our econometric work using the same majority rule as for labor market regulations. In addition to capturing the nature of product market regulations at the state level, the classification can be used to capture the willingness of states to implement delicensing reforms undertaken at the central level.

In Appendix D we also show the correlations between various state level characteristics. We observe that the labor market regulations at the state level are not correlated with other state level indicators of regulation or infrastructure, whereas the product market regulations, the infrastructure variables, financial development variables and per capita income are correlated highly with each other. In our regressions, therefore, when we include more than one of the latter characteristics simultaneously the coefficients of individual variables are less significant.

III B. Econometric Framework

The basic specification we use to analyze industrial performance is similar to the one used by Aghion et al (2006). However, we extend this basic specification using the approach of Rajan and Zingales (1998). That is, in addition to exploiting variation in state characteristics, we also exploit variation in industry characteristics. The most general specification used in our paper is given below:

$y_{ist} = a_{is}\, d_{is} + ß_{st}\, d_{st} + ?_i\, trend_i + ? (delicensing_{it}) + d (industry\ characteristic_i * delicensing_{it}) + p (state\ characteristic_s * delicensing_{it}) + t\ (state\ characteristic_s * industry\ characteristic_i * delicensing_{it}) + µ\ other\ controls + e_{ist}$ (1)

In equation 1, y_{it} is an industrial performance outcome (gross value added or employment) measured in logs. The first three right hand side terms include fixed effects of various types and industry specific time trends. The d_{is}'s are industry-state fixed effects and d_{st}'s are state-year fixed effects. In lieu of industry-year fixed effects, which we cannot include in the regressions since the delicensing variable varies over industry and year, we include industry specific time trends. The state-year fixed effects account for any omitted variables which might vary over states or over state and year, such as developmental spending. The state-industry fixed effects can account for variables that are specific to state and industry combinations, e.g. if a state has a comparative advantage in certain industries because of geographical or historical reasons. Finally, industry specific trends can account for different rates of technological change in different industries.

The next term in equation 1 is the delicensing dummy which varies over time and industry. The dummy takes the value one for the year when the delicensing requirement for a particular industry was removed and remains one for the rest of the sample period. Since we are including state-industry and state-year fixed effects in the regressions, the only additional variables we can include are the ones that vary over state, industry, and year; or over industry and year.

The next term is an interaction of various industrial characteristics with the delicensing dummy. How do we interpret the coefficient of the interaction term involving the delicensing dummy and a particular industry characteristic? Consider the case where the particular industry characteristic is the labor intensity of industries and the coefficient for the interaction term is negative and significant. The coefficient then indicates that the industries which use labor more intensively have grown less post-delicensing as compared to the industries which use labor less intensively. This could be due to the fact that labor-intensive industries are constrained by the unavailability of certain inputs specific to these industrious; alternatively, there may be regulatory barriers which inhibit their growth.

The next term in equation 1 is an interaction between the delicensing dummy and either the state level regulatory variables, or the state-level infrastructure related variables; or financial development. The coefficient p measures the impact of state regulations/infrastructure on the payoffs from reforms. State level regulatory variables include state specific measures of labor market regulations and product market regulations. The next term involving the delicensing dummy is an interaction of it with both industry characteristics and state characteristics. A particular combination for this interaction term which is of special interest to us involves the dummy for labor-intensive industries and a variable capturing labor market regulations at the state level. The results from this equation can shed further light on the effect of labor market regulations on industrial performance post-delicensing.

Finally, equation 1 includes various control variables including initial per capita income of states interacted with delicensing, where initial per capita income can account for omitted variables which might vary across states and may affect the payoffs from reforms. Thus per capita income could proxy for geographical, cultural and institutional factors. We also include a variable initial share of industry *i* in state *s*, interacted with delicensing. This variable accounts for initial comparative advantage which might affect regulation, e.g. an initial comparative advantage of a state in labor intensive industries might imply that the state develops pro labor regulations and these sectors might be growing more slowly—thus erroneously attributing the slow growth of labor intensive industries to labor market regulations. These other control variables can also help us test for regional convergence and hysteresis.

The variable e_{ist} is an error term. To allow for heteroskedasticity and deal with possible serial correlation in the error term, the standard errors are clustered by state-industry combinations.[11] We start our analysis in an exploratory way and first establish the heterogeneity in industrial performance post delicensing by estimating a more parsimonious specification given by equation 2.

$$y_{ist} = a_{is} d_{is} + ß_{st} d_{st} + ?_i trend_i + ? (delicensing_{it}) + d (industry\ characteristic * delicensing_{it}) + \mu\ other\ controls + e_{ist} \quad (2)$$

[11] The results are robust to clustering by state and year of delicensing.

Next we look at the effect of state level regulations on the payoffs from reforms by estimating specifications based on equation (3)

$$y_{ist} = a_{is} d_{is} + ß_{st} d_{st} + ?_i trend_{i+} ? (delicensing_{it}) + p (state\ characteristic_s * delicensing_{it}) + \mu\ other\ controls + e_{ist} \quad (3)$$

Then we estimate the full specification in equation 1 to test whether the states with strict labor regulations affect labor intensive industries in particular.

IV. Empirical Results and Interpretation

IV A. Effect of Delicensing on Different Industries

Aghion et al (2006) find that delicensing had an uneven effect on the industrial performance of different states. They looked at this issue from the perspective of differences in the policies related to labor market at the state level. Here we first establish that post-delicensing performance varies across different industrial sectors as well.[12] We look at the labor intensity of industries, unskilled labor intensity of industries, infrastructure dependence of industries (and separately the dependence on electricity and fuel and distribution) and the extent to which an industry exports its products.

Did Labor Intensive Industries Benefit less from Delicensing?

A common concern with the industrial performance in India has been that labor intensive industries, and the industries which can absorb the unskilled labor, have not performed well post reforms and consequently employment generation has been sluggish as well. Hence we first look at the labor intensive industries.

In Table 1 we include the initial size of each industry interacted with delicensing, to account for convergence at the industry level. In column II-IV we include a dummy for labor intensive industries interacted with delicensing. In column III we also include intensity of industries for low skilled labor interacted with delicensing. In column IV we include the size of the establishment (average fixed capital required per factory) to account for the fact the labor intensive industries might be capturing some other characteristic of industries such as size. Results show that the effect of delicensing does differ significantly for labor and capital intensive industries. There is weak evidence to show that in addition to labor intensive industries, industries which use unskilled labor intensively grew less.[13]

[12] In Gupta, Hasan and Kumar (2008) we establish these patterns using the data aggregated at the All India level.

[13] Results on size and low skilled labor intensity variables are stronger if we drop the industry Railway Locomotives, which seems to be an outlier.

Table 1: Did Labor Intensive Industries Benefit less from Delicensing?

	I	II	III	IV
	Dependent Variable: Log Real Value Added			
Delicense	-0.001	0.07	0.17**	0.26
	[0.02]	[1.27]	[1.97]	[0.59]
Share of industry i in VA in 1980*Delicense	0.003	0	0.002	0.001
	[0.47]	[0.08]	[0.31]	[0.13]
Size (log of fixed capital)*Delicense				-0.018
				[0.43]
Labor Intensive Industry*Delicense		-0.15**	-0.13**	-0.18**
		[2.24]	[1.98]	[1.97]
Low Skill Labor Intensive* Delicense			-0.69	
			[1.58]	
State-Ind FE	Yes	Yes	Yes	Yes
State-Year FE	Yes	Yes	Yes	Yes
Ind-Year FE	No	No	No	No
Ind-Trends	Yes	Yes	Yes	Yes
Observations	13257	13257	13257	13257
Number of state-industry	579	579	579	579
R-squared	0.87	0.87	0.87	0.87

Note: Robust t statistics in brackets. * Significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors are clustered by State-Industry pairs in all specifications.

Which Other Industries Benefited Less from Delicensing?

Next we test whether other kinds of industries also benefited less from reforms. The results of this exercise also ensure that the results on labor intensive industries are not driven by the fact that these industries might be relying on some other factors of production which affects the gains from reforms that accrue to these industries. We, in particular, consider the industries that spend more on energy, or energy and distribution (a broader measure of infrastructure). We also include indicators of share of exports in industries' value of output, and as before indicators of labor intensity and unskilled labor intensity of industries.

These results are reported in Table 2. As seen from the table, industries that use more energy or rely on distribution channels (roads, ports etc.) grew less post delicensing (relative to industries that spend less on energy and distribution and thus have less infrastructural needs).

Even after controlling for the infrastructure intensity of industries, labor intensive industries have a negative coefficient. We also find that unskilled labor intensive industries benefited less from delicensing, and that unlike in the previous table, this effect is significant. These results are robust to several different indices of infrastructure needs of the industries. Thus after controlling for many other characteristics, including the average size of enterprises in industries and the initial size of the industry, we still find that the labor intensive industries have experienced smaller output growth post-delicensing.

Table 2: Did Delicensing have a Uniform Effect on Industries?

	I	II	III	IV
	Dependent Variable: Log Real Value Added			
Delicense	0.09*	0.17**	0.06	0.22**
	[1.68]	[2.52]	[0.94]	[2.51]
Share of industry i in VA in 1980*Delicense	0.006	0.003	0.007	0.007
	[1.06]	[0.50]	[1.22]	[1.14]
Infrastructure Intensive Industry*Delicense	-0.32***	-0.33***	-0.31***	-0.28**
	[2.70]	[2.76]	[2.59]	[2.33]
Labor intensive Industry*Delicense		-0.16**		-0.13*
		[2.32]		[1.93]
Exporting Industries*Delicense			0.06	0.09
			[1.11]	[1.59]
Low Skill Labor Intensive* Delicense				-0.83*
				[1.78]
State-Ind FE	Yes	Yes	Yes	Yes
State-Year FE	Yes	Yes	Yes	Yes
Ind-Year FE	No	No	No	No
Ind-Trends	Yes	Yes	Yes	Yes
Observations	13257	13257	13257	13257
Number of state-industry	579	579	579	579
R-squared	0.87	0.87	0.87	0.87

Note: Robust t statistics in brackets. * Significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors are clustered by State-Industry pairs in all specifications.

IV B. Is there Divergence across Indian States in Industrial production? And does hysteresis matter?

Next we turn to performance of the industries at the state level. As has been well established elsewhere, the regional income disparities have been increasing in India--the richer states have been growing faster than the poorer states. Here we first see whether the same pattern of regional divergence exists in organized Indian industries as well. Continuing to look at the three digit ASI industrial data we estimate the regression equation given by (4):

$$Y_{ist} = Sa_{is}\, d_{is} + S\ss_{st}\, d_{st} + S?_{i}\, Trend_{i} + ? (delicensing_{it}) + d (\text{initial share of state s in industry I} * delicensing_{it}) + p\ (\text{initial per capita income of state s/or initial per capita income originating in the Industrial sector in state s}) * delicensing_{it} + e_{ist} \qquad (4)$$

In Equation 4 we include states share in each industry at the beginning of the period—as a proxy for the inherent comparative advantage of the state in a particular industry given the factor endowments; and either the per capita state domestic product, or per capita income in the industrial sector; both interacted with delicensing.

Table 3: Divergence Across Indian States in Industrial Production

	I	II	III	IV	V
	Dependent Variable: Log Real Value Added				
Delicense	0.09*	-0.01	-0.016	0.11**	-0.01
	[1.86]	[0.23]	[0.35]	[2.32]	[0.11]
Share S,I in 1980*Delicense	-0.015***	-0.016***	-0.016***	-0.004	-0.01
	[3.40]	[3.43]	[3.44]	[1.14]	[1.44]
Initial PCY in state s*Delicense		0.016**			0.02***
		[2.38]			[2.79]
Initial Industrial Output per capita in state s*Delicense			0.01**		
			[2.54]		
Initial output share*Income level *Delicense				-0.02***	-0.02***
(income level=2 lowest; 1 medium, 0 highest)				[4.02]	[4.07]
State-Ind FE	Yes	Yes	Yes	Yes	Yes
State-Year FE	Yes	Yes	Yes	Yes	Yes
Ind-Year FE	No	No	No	No	No
Ind-Trends	Yes	Yes	Yes	Yes	Yes
Observations	13257	13257	13257	13257	13257
R-squared	0.87	0.87	0.87	0.87	0.87

Note: Robust t statistics in brackets. * Significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors are clustered by State-Industry pairs in all specifications.

We find that the states with higher initial per capita income or higher per capita income originating in the industrial sector have experienced faster growth in industrial output post delicensing. Thus the divergence in industrial production has increased post delicensing. One apparently anomalous result is that the states with higher levels in particular industries pre-delicensing experienced slower growth in those industries. At first blush this results seems to convey that the diversification in industrial structure across states has increased. But when we dig deeper it turns out to be primarily because industrial production growth has been slower in the poorer states even in industries in which these states had a higher initial share (perhaps because of comparative advantage, e.g. Bihar in extractive industries; or because of the presence of public sector units). This is captured by the interaction term between the initial share of each state in particular industries and the income group that the state belongs to (we divide states in to three groups based on their per capita income).

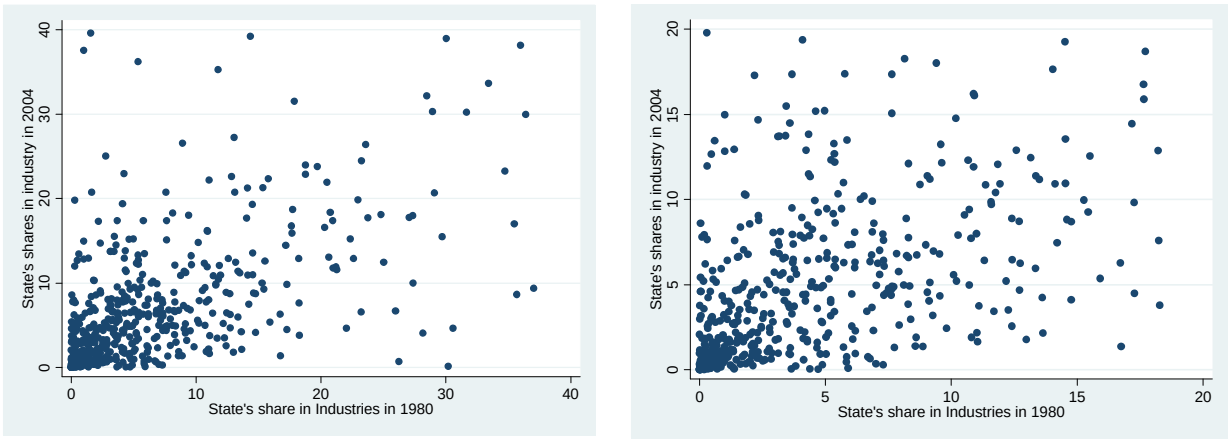
The variable income level takes three different values. It takes a value 2 if the state belongs to the lowest per capita income level; 1 if it has the medium per capita income level and 0 if it belongs to the highest per capita income level. The coefficient of this variable is negative and significant and when we include it, the coefficient for the initial share of states in industries becomes insignificant. This interpretation would then point to increasing divergence at the aggregate level, as well as at the specific industries level. Post-delicensing, richer states have experienced higher industrial growth and the growth has been higher in richer states even in industries in which they had a small share in 1980.

Does Hysteresis (Path Dependence) Matter?

Though not systematically documented, one explanation for the slow response of Indian industries to reforms has been an appeal to hysteresis. The argument is as follows. Post-independence, Indian states inherited an industrial structure which was primarily determined by the government, either through setting up of state enterprises or through encouragement of particular industries in particular states. The earlier set of interventions and policies ended with the policy reforms undertaken since the mid-19 80s. Yet, the industry specific capabilities that they created have persisted so that states have not been able to break away from earlier industrial patterns by either entering new industries or existing old ones.

In our results in Table 3, a positive and significant coefficient on the initial share of state s in industry i would have implied hysteresis. But this coefficient is either negative and significant, or insignificant. In either case it does not seem to be the case that industrial growth is determined by inherited capabilities. Further Chart 4 below depicts the evolution of shares of industries across states overtime—though still highly correlated with initial shares, states shares in specific industries have diverged substantially from the initial levels. thus industrial performance does not seem to be charactertized by path dependence.

Chart 4: Evolution of States Shares in Industries



IV D. Does Infrastructure and Financial Development Matter for Benefits from Liberalization?

In Table 4 below we include indicators of infrastructure availability at the state level in the regression specification given by Equation 3, where other controls are the same as before, i.e. per capita income and initial share of state s in industry i, both interacted with delicensing. We include several different indicators of infrastructure and use data from many different sources. These include indicators of physical infrastructure, overall infrastructure and human capital, and financial development. These measures are highly correlated with each other (see Appendix

Table D3) as well as with per capita income. Hence, when we include more than one indicator of infrastructure these are individually not significant (due to lack of space we do not report all the results here). In order to avoid reverse causality we include the availability of infrastructure at the beginning of the period. Besides, at least for some of the indicators of financial development, we use variables such as number of scheduled bank branches per capita and credit by nationalized banks, the concern of reverse causality is less serious. In the Indian banking sector, which is largely publicly owned these variables are determined more by the objectives of social equity rather than expected economic performance of states (Burgess and Pande (2005)).

In different columns in Table 4 we include indicators of physical infrastructure, such as the composite indices for physical infrastructure constructed by Kumar (2002); as well as indices for more specific aspects of infrastructure, including roads, and electricity generation. We include literacy rate as an indicator of human capital. For indicators pertaining to the financial sector we use the data put together by Purfield (2006), and include indicators of credit per capita by scheduled banks; number of branches per capita; and credit per capita by nationalized banks.

Table 4: Infrastructure and Payoffs from Delicensing

	I	II	III	IV	V	VI	VII
	Dependent Variable: Log Real Value Added						
Delicense	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	[0.13]	[0.16]	[0.11]	[0.19]	[0.13]	[0.14]	[0.13]
Share S,I in 1980*Delicense	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***
	[3.50]	[3.44]	[3.58]	[3.52]	[3.66]	[3.55]	[3.70]
Initial PCY in state s*Delicense	0.013*	-0.24*	-0.11*	-0.018	-0.18**	-0.02	-0.11**
	[1.95]	[1.95]	[1.96]	[0.81]	[2.00]	[1.10]	[2.08]
Physical infrastructure*Delicense	0.12**						
	[2.25]						
Roads*Delicense		0.32**					
		[2.09]					
Electricity*Delicense			0.22**				
			[2.26]				
Literacy*Delicense				0.006*			
				[1.66]			
Credit by Scheduled Banks*Delicense					0.25**		
					[2.19]		
Branches*Delicense						0.008**	
						[2.03]	
Credit by national banks*Delicense							0.25**
							[2.40]
State-Ind FE	yes	yes	yes	yes	yes	yes	yes
State-year FE	yes	yes	yes	yes	yes	yes	yes
Ind-year FE	no	no	no	no	no	no	no
Ind-trends	yes	yes	yes	yes	yes	yes	yes
Observations	13257	13257	13257	13257	13257	13257	13257
Number of state-industry	579	579	579	579	579	579	579
R-squared	0.87	0.87	0.87	0.87	0.87	0.87	0.87

Note: Robust t statistics in brackets. * Significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors are clustered by State-Industry pairs in all specifications.

The results indicate that infrastructure does matter for the payoffs from reforms. Although since the alternative series are correlated highly it is difficult for us to say what kind of infrastructure is more important for industrial growth. Moreover, there seems to be variation independent of per capita income, because when we include the indicators of infrastructure with per capita income (both interacted with delicensing) the infrastructure variable remains significant and with several of these infrastructural variables the per capita income variable either becomes insignificant or becomes negative and significant. This result could be interpreted to imply that infrastructure availability might be one factor behind increasing regional divergence.

IV C. Does Regulatory Framework Across States Matter for Growth?

In order to assess the impact of regulatory burden on growth we include indexes pertaining to labor market regulations (LMR) and product market regulations (PMR), either one at a time or together in the regression specification given by equation 3. As explained in Appendix D, both regulatory variables can take three values. In the case of labor regulations, the index takes a value of 1 if regulations are pro-employer, 0 if they are neutral, in a relative sense, and -1 if they are pro-worker. Similarly, the product market regulation index takes a value of 1 if regulations are supportive of competition, 0 if they are neutral, and -1 if they impede competition.

Table 5: Does the Regulatory Framework Across States Matter for Growth?

	I	II	III	IV	V	VI	VII
	Dependent Variable: Log Real Value Added						
Delicense	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	[0.23]	[0.16]	[0.15]	[0.14]	[0.13]	[0.13]	[0.15]
Share S,I in 1980*	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***
Delicense	[3.38]	[3.56]	[3.55]	[3.65]	[3.48]	[3.42]	[3.65]
Initial PCY, State s*	0.02**	0.02**	0.02**	-0.11**	0.01*	0.01*	-0.15
Delicense	[2.23]	[2.38]	[2.35]	[2.06]	[1.88]	[1.92]	[1.49]
LMR*Delicense	0.01		-0.03	0.02	-0.01	-0.01	0.04
	[0.09]		[0.33]	[0.26]	[0.10]	[0.18]	[0.50]
PMR*Delicense		0.11*	0.12*			0.03	-0.06
		[1.69]	[1.85]			[0.31]	[0.50]
Bank Credit *				0.25**			0.33*
Delicense				[2.39]			[1.66]
Infrastructure*					0.12**	0.10	
Delicense					[2.30]	[1.31]	
State-Ind FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind-Year FE	No	No	No	No	No	No	No
Ind-Trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13257	13257	13257	13257	13257	13257	13257
Number of state-industry	579	579	579	579	579	579	579
R-squared	0.87	0.87	0.87	0.87	0.87	0.87	0.87

Note: Robust t statistics in brackets. * Significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors are clustered by State-Industry pairs in all specifications.

Results, in Table 5, show that the states with different labor regulations did not experience different increases in output post-delicensing (we revisit this result shortly). States with a more liberal business environment experienced faster growth post-delicensing. The product market regulation variable can also be interpreted as a measure of the willingness of states to carry out product market reforms initiated at the center. Hence, states with a higher score on product market regulations are likely to be the ones where delicensing – which was a reform measure passed by the center -- was implemented either more effectively or earlier as compared to other states. Interpreted this way the results indicate that the benefits from liberalization accrued to the states if their willingness to reform matched those of the center. In column III we include labor regulations and product market regulations simultaneously in the regression; indicators of infrastructure with regulatory variables are included in columns IV-VII. Results on labor regulations do not change, and since product market regulations and infrastructure are correlated strongly, when we include them together their individual coefficients are smaller and less significant.

Next we explore the possibility that delicensing affected labor intensive and capital intensive industries differently across states with different labor regulations. Thus we include the following two variables in our base specification: a dummy for labor intensive industries interacted with delicensing; and a three way interaction between labor intensity of industries, labor market regulation and delicensing.

Results indicate that while labor intensive industries grew less post delicensing and states with different labor regulations do not show any specific patterns post delicensing, but labor intensive industries have performed particularly worse in states with pro-labor regulations. Thus it seems that the pro-labor regulations hurt where it matters the most—industries which employ more labor. In various columns in Table 6 we check the robustness of this key result by changing the sample and by including other controls in the regressions. Thus in Column II we only look at the states where the labor market regulations are either considered to be pro labor or pro business, and drop the states with neutral labor regulations. In Column III we drop tobacco, and petroleum industries, and in Columns IV-VI we respectively include product market regulations, infrastructure and financial sector variables, interacted with delicensing.[14]

The results are robust as the coefficient and significance of our key variable of interest does not change.

[14] Other robustness tests conducted but not shown here include clustering by state-delicense; and by including the full set of fixed effects: state-Industry, Industry Year and State year instead of other control variables which vary along these dimensions alone. Results are found to be robust.

Table 6: Labor Market Regulations and Labor Intensive Industries

	I	II	III	IV	V	VI
			Dependent Variable: Log Real Value Added			
Delicense	-0.01	-0.06	-0.02	0.00	0.00	0.00
	[0.11]	[0.94]	[0.38]	[0.04]	[0.02]	[0.03]
Share S,I in 1980*Delicense	-0.02***	-0.01**	-0.02***	-0.02***	-0.02***	-0.02***
	[3.30]	[2.21]	[3.53]	[3.46]	[3.40]	[3.57]
Initial PCY in state s*Delicense	0.02***	0.02*	0.03***	0.02***	0.02***	-0.10*
	[2.97]	[1.94]	[3.58]	[3.07]	[2.64]	[1.88]
Labor intensive Industry *Delicense	-0.18**	-0.21**	-0.20***	-0.18**	-0.18**	-0.18**
	[2.57]	[2.27]	[2.79]	[2.54]	[2.54]	[2.55]
LMR*Delicense	-0.07	-0.05	-0.04	-0.10	-0.08	-0.05
	[0.74]	[0.50]	[0.48]	[1.13]	[0.93]	[0.57]
LMR*Labor Intensive*Delicense	0.16*	0.16*	0.15*	0.15*	0.16*	0.15*
	[1.77]	[1.71]	[1.69]	[1.75]	[1.77]	[1.75]
PMR*Delicense				0.12*		
				[1.81]		
Infrastructure*Delicense					0.12**	
					[2.28]	
Bank credit *Delicense						0.25**
						[2.38]
State-Ind FE	Yes	Yes	Yes	Yes	Yes	Yes
State-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Ind-Year FE	No	No	No	No	No	No
Ind-Trends	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13257	7540	12728	13257	13257	13257
Number of state-industry	579	322	550	579	579	579
R-squared	0.87	0.87	0.87	0.87	0.87	0.87

Note: Robust t statistics in brackets. * Significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors are clustered by State-Industry pairs in all specifications.

One concern remains and this is that our results might be driven by omitted variables. There can be two kinds of omitted variables - those related to states and those related to industries. For example, there could be another set of industries, correlated with labor intensity, which has performed poorly in states with inflexible labor regulations post-delicensing and our interaction term involving labor regulations, labor intensive industries, and delicense could be picking up the effect on value added due to these industries. Similarly there could be another state characteristic correlated with labor regulations which is associated with poor performance of labor intensive industries post-delicensing. However, we think that omitted variables are not a problem for our results since labor intensity is not correlated with most other industry characteristics and labor regulation is not correlated with other state features that we have considered in the paper. Nevertheless we conduct robustness tests where starting with our base specification in column I in Table 7, we include other industry characteristics and other state characteristics.

Table 7: Labor Market Regulations and Labor Intensive Industries, Robustness

	I	II	III	IV	V
	Dependent Variable: Log Real Value Added				
Delicense	-0.01	0.00	0.00	-0.06	-0.01
	[0.11]	[0.08]	[0.02]	[0.92]	[0.29]
Share S,I in 1980*Delicense	-0.015***	-0.015***	-0.016***	-0.012**	-0.018***
	[3.30]	[3.26]	[3.49]	[2.36]	[3.75]
Initial PCY in state s*Delicense	0.024***	0.03***	0.02***	0.02**	0.03***
	[2.97]	[3.40]	[2.98]	[1.99]	[3.59]
Labor intensive Industry*Delicense	-0.18**	-0.19***	-5.9***	-6.82	-5.7***
	[2.57]	[2.73]	[2.85]	[1.55]	[2.74]
LMR*Delicense	-0.07	0.07	-0.07	-0.05	-0.04
	[0.74]	[0.74]	[0.77]	[0.54]	[0.49]
LMR*Labor Intensive*Delicense	0.16*	0.15*	0.22**	0.22*	0.21**
	[1.77]	[1.71]	[2.34]	[1.95]	[2.22]
Infrastructure Industry*Delicense		-0.12*			
		[1.71]			
LMR* Infrastructure Industry*Delicense		-0.22***			
		[2.82]			
PCY*Labor Intensity*Delicense			0.67***	0.77	0.64***
			[2.77]	[1.51]	[2.65]
State-Ind FE	Yes	Yes	Yes	Yes	Yes
State-Year FE	Yes	Yes	Yes	Yes	Yes
Ind-Year FE	No	No	No	No	No
Ind-Trends	Yes	Yes	Yes	Yes	Yes
Observations	13257	13257	13257	7540	12728
Number of state-industry	579	579	579	322	550
R-squared	0.87	0.87	0.87	0.87	0.87

Note: Robust t statistics in brackets. * Significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors are clustered by State-Industry pairs in all specifications.

In column II we report the results where along with labor intensity we include the infrastructure variable. Results for variables involving labor regulations and labor intensity of industries are unchanged. In the second robustness test we include per capita income interacted with delicensing and interacted with labor regulations and delicensing. Again, the results on variables involving labor regulations and labor intensity are preserved and are somewhat stronger. We also include variables pertaining to infrastructure and the financial sector in a similar fashion and find the results to be robust (these are not shown here for brevity). In the last two columns we experiment with different samples for the specification in Column II—in Column IV we drop states with neutral labor regulations and in the last column we drop petroleum and tobacco industries.

Looking at the role of labor regulations in determining the payoffs from reforms we consider another key variable where labor regulations are supposed to be making the biggest dent—i.e.

employment. For employment we use a slightly different specification: since employment would move closely with output, in order to get the movements in employment which are independent of output movements, we include gross value added in the regressions. Results show that post-delicensing employment generation has been higher in the states with flexible labor regulations.

Table 8: Labor Market regulations and Employment

	I	II	III	IV	V
	Dependent Variable: Log Real Value Added				
Delicense	-0.03	-0.03	-0.03	-0.03	-0.03
	[1.30]	[1.26]	[1.25]	[1.27]	[1.25]
Share state in industry i in 1980*Delicense	0.00	0.00	0.00	0.00	0.00
	[0.19]	[0.33]	[0.24]	[0.31]	[0.18]
Initial PCY in state s*delicense	0.00	0.00	0.00	-0.01	0.01
	[1.16]	[1.20]	[1.01]	[0.62]	[1.54]
Gross Value Added (log)	0.45***	0.45***	0.45***	0.45***	0.45***
	[29.9]	[29.9]	[29.9]	[29.9]	[29.8]
LMR*delicense	0.09**	0.08**	0.08**	0.09**	0.08**
	[2.45]	[2.26]	[2.34]	[2.50]	[2.26]
PMR*delicense		0.03			
		[1.02]			
Physical infrastructure*delicense			0.02		
			[1.22]		
Bank Credit *delicense				0.03	
				[0.78]	
Labor intensive Industry *delicense					-0.04
					[1.18]
LMR*Labor Intensive*delicense					0.01
					[0.22]
State-Ind FE	Yes	Yes	Yes	Yes	Yes
State-Year FE	Yes	Yes	Yes	Yes	Yes
Ind-Year FE	No	No	No	No	No
Ind-Trends	Yes	Yes	Yes	Yes	Yes
Observations	13257	13257	13257	13257	13257
Number of state-industry	579	579	579	579	579
R-squared	0.92	0.92	0.92	0.92	0.92

Note: Robust t statistics in brackets. * Significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors are clustered by State-Industry pairs in all specifications.

We include several other state characteristics in Columns II-IV, to see whether these are associated with similar patterns in employment, but unlike in value added, we do not find state level product market regulations, infrastructure and financial development variables to be associated with any specific patterns in employment gains from delicensing. Interestingly, unlike on value added, the effect on employment does not seem to differ across labor intensive and capital intensive industries as well, as seen in the last column in the table.

V. Conclusion

In this paper we analyze the effects of the reforms that liberalized India's industrial licensing regime on the performance of registered manufacturing using Annual Survey of Industries data at the three digit level for major Indian states, for 1980-2004. Following the existing literature we use the date of delicensing, a policy whose timing varied across industries but was national in scope, as our measure of policy reform. We highlight the heterogeneity in industrial performance across Indian states as well across industries. In particular we find that the impact of delicensing has been highly uneven across industries. Industries which are labor intensive, use unskilled labor, depend on infrastructure (or are energy dependent) have experienced smaller gains from reforms. Regulations at the state level matter. States with less competitive product market regulations have experienced slower growth in the industrial sector post-delicensing, as compared to states with competitive product market regulations. States with relatively inflexible labor regulations have experienced slower growth of labor-intensive industries and slower employment growth. Infrastructure availability and financial sector development are found to be important in determining the benefits that accrued to states from reforms.

The results imply that promoting industrial growth is a complex issue and would require a complete package of labor market reforms, product market reforms, infrastructure and financial development. In addition, in a federal democracy like India, reforms at the center need to be complemented by reforms at the state level especially those related to labor; and matched by business friendly environment at the state level.

References

Aghion, P., R. Burgess, S. Redding, and F. Zilibotti. 2006. “The unequal effects of liberalization: Evidence from dismantling the License Raj in India.” CEP Discussion Paper no. 728.

Ahluwalia, I. 1987. *Industrial Growth in India: Stagnation since the Mid-Sixties*. Delhi: Oxford University Press.

_____. 1991. *Productivity and Growth in Indian Manufacturing*. Delhi: Oxford University Press.

Ahluwalia. M. 2002. “Economic reforms in India since 1991: Has gradualism worked?” Journal of Economic Perspective, 16 (3): 67-88.

Ahsan, A. and C. Pagés. 2007. “Are all labor regulations equal? Assessing the effects of job security, labor dispute and contract labor laws in India.” Policy Research Working Paper no. 4259. World Bank.

Anant, Krishna and Roychoudhry. 1999. “Study on Inter-State Differentials in Infrastructure”, Background paper for The Eleventh Finance Commission, Government of India.

Anant, T.C.A. (2000), “Reforming the Labour Market,” in S. Gangopadhyay and W. Wadhwa (eds.), *Economic Reforms for the Poor*. Delhi: Konark.

Anant, T.C.A., R. Hasan, P. Mohapatra, R. Nagaraj, R. and S.K. Sasikumar. 2006. “Labor markets in India: Issues and perspectives.” in J. Felipe and R. Hasan (eds), *Labor Markets in Asia: Issues and Perspectives*. London: Palgrave Macmillan for the Asian Development Bank. 205-300.

Banerjee, A. and E. Duflo. 2008. “Do firms want to borrow more? Testing credit constraints using a directed lending program." Working Paper no. 5. Bureau of Research and Economic Analysis of Development. Available at http://www.cid.harvard.edu/bread/abstracts/005.htm.

Banerjee, A., S. Cole, and E. Duflo. 2004. “Banking reform in India.” Policy Paper no. 6. Bureau of Research and Economic Analysis of Development.

Bertrand, M., E. Duflo, and S. Mullainathan. 2004. “How much should we trust Differences-in-Differences Estimates?” The Quarterly Journal of Economics, 119 (1): 249-75.

Besley, T. and R. Burgess. 2004. “Can regulation hinder economic performance? Evidence from India.” Quarterly Journal of Economics, 119(1): 91-134.

Bhattacharjea, A. 2006. “Labour market regulation and industrial performance in India: A critical review of the empirical evidence.” The Indian Journal of Labour Economics, 49(2): 211-32. Available at http://ssrn.com/abstract=954908.

_____. 2008. "How do Indian firms respond to employment protection legislation?" Mimeo.

Burgess, R. and R. Pande. 2005. “Do Rural Banks Matter? Evidence from the Indian Social Banking Experiment," American Economic Review, vol. 95(3), 780-795, June

Conway, P. and R. Herd. 2008. “Improving product market regulation in India: An international and cross-state comparison.” Economics Department Working Paper no. 599. Organization for Economic Co-operation and Development.

Conway, P., R. Herd, and T. Chalaux. 2008. “Product market regulation and economic performance across Indian states.” Economics Department Working Paper no. 600. Organization for Economic Co-operation and Development.

Datta-Chaudhuri, M. 1996. “Labor markets as social institutions in India.” IRIS-India Working Paper no. 10. University Of Maryland at College Park.

Dutta, R. 2003. “Labor market, social institutions, economic reforms and social cost.” in S. Uchikawa (ed), *Labour Market and Institution in India, 1990s and Beyond*. New Delhi: Manohar.

Ghosh, B. and P. De. 2004. “How Do Different Categories of Infrastructure Affect Development? Evidence from Indian States”, Economic and Political Weekly, October 16, 2004: 4645-4657

Gordon, J. and P. Gupta. 2004. “Understanding India’s services revolution.” Working Paper no. WP/04/171. International Monetary Fund.

Gupta, P., R. Hasan, and U. Kumar. 2008. “What constrains Indian manufacturing?” Working Paper no. 211. Indian Council for Research on International Economic Relations. March.

Gupta, P., D. Mishra and R. Sahay. 2007. Output Response to Currency Crises, Journal of International Economics, 72(2): 428-450

Haltiwanger, J. S. Scarpetta, and H. Schweiger. “Assessing job flows across countries: The role of industry, firm size, and regulations.” Working Paper no. 13920. National Bureau of Economic Research.

Hasan, R., D. Mitra, and K.V. Ramaswamy. 2007. “Trade reforms, labor regulations, and labor-demand elasticities: Empirical evidence from India.” Review of Economics and Statistics, 89(3, August): 466–81.

Kochhar, K., U. Kumar, R. Rajan, A. Subramanian, and I. Tokatlidis. 2006. “India’s pattern of development: What happened, what follows?” Journal of Monetary Economics, 53: 981-1019.

Krueger, A.O. 2007. “The missing middle.” Available at http://scid.stanford.edu/pdf/SCID343.pdf.

Kumar, T. Ravi. 2002. “The Impact of Regional Infrastructure Investment in India”, Regional Studies, 36(2): 194-200

McKinsey Global Institute. 2006. *Accelerating India's Growth through Financial System Reform*. San Francisco: McKinsey&Company.

Nagaraj, R. 2002. "Trade and labor market linkages in India: Evidence and issues." Economic Series Working Paper no. 50. East West Center, Hawaii.

Organization for Economic Co-operation and Development. 2007. OECD Economic Surveys: India. Volume 2007, Issue no. 14.

Panagariya, A. 2006. "Transforming India." Paper presented at the conference *India: An Emerging Giant*. Columbia University, October 2006

Panagariya, A. 2008. *India: The Emerging Giant*. USA: Oxford University Press.

Purfield, Catriona. 2006. "Mind the Gap—Is Economic Growth in India Leaving Some States Behind?", Working Paper No. 06/103, International Monetary Fund

Rajan, R. and L. Zingales. 1998. "Financial dependence and growth." American Economic Review, 88(3): 559-86.

Ramaswamy, K.V. 2003. "Liberalization, outsourcing and industrial labor markets in India: Some preliminary results." in S. Uchikawa (ed), *Labour Market and Institution in India, 1990s and Beyond*. New Delhi: Manohar.

Topalova, P. 2005. "Trade liberalization: Evidence on poverty and inequality: Evidence from Indian districts." Working Paper no. 11614. National Bureau of Economic Research.

World Bank. 2004. *India Investment Climate Assessment 2004: Improving Manufacturing Competitiveness*.

Appendix A: Delicensing

Year of Delicensing	Industry Code	description
1985	151,191,210,252,261,281,300,311,319,321,322,331,341 Total number of industries delicensed: 13	meat, fish, fruit, vegetables etc.; leather; paper; plastic products; glass; metal products; office/computing machinery; electric motors; other electric equipment; electronic components; television; radio transmitters; medical appliances and motor vehicle.
1989	251 Total number of industries delicensed: 14	rubber products
1991	152,153,154,155,171,172173,181,182,192,202,221,222,233,241,269,271,272,289,313,314,332,333,351,352,359,361,369 Total number of industries delicensed: 42	dairy products; grain mill products; other food products; beverages; spinning, weaving; other textiles; knitted fabrics; weaving apparel; articles of fur; footwear; wood products; publishing; printing; processing of nuclear fuels; basic chemicals; non-metallic; iron and steel; basic precious/non-ferrous metals; fabricated metal products; insulated wire and cable; accumulators, cells/batteries; optical and photographic equipment; watches; ships and boats; railway locomotives; transport equipment nec; furniture; and manufacturing nec.
1993	293 Total number of industries delicensed: 43	domestic appliances
1997	201,223,232 Total number of industries delicensed: 45	saw milling; recorded media; and refined petroleum products.

Source: we use the data from Gupta, Hasan and Kumar (2008) where we used the data provided in Aghion et al (2006), mapped into our 3 digit classification, and updated up to the year 2003.

Appendix B: Industry Characteristics

Labor intensity: (employment/real invested capital)*1000, where deflator used is the WPI for the NIC classification 319 (other electrical equipment, to proxy for the capital goods), using the All-India ASI data averaged over the years 1980-84

Infrastructure Dependence (distribution intensity): Ratio of distribution and power & fuel expenses to gross value added using the Prowess data (ratio of distribution expenses to gross value added). It is the average of the ratio over the period 1994-1998

Energy Dependence: Ratio of power & fuel expenses to gross value added using the ASI data, averaged for 1980-84 as well; for the US using the EUKLEMS database.

Export Intensity: Ratio of total foreign exchange earnings to GVA using the Prowess data averaged over the period 1989-1994

Unskilled labor intensity: Share of labor compensation to low-skilled workers in GVA for USA

Appendix Table B1: Correlations Between Different Industry Characteristics

	Labor Intensity	Low skilled Labor	Infrastr-ucture Intensive	Fuel Intensity	Distrib ution Intensity	Energy depend Ence (ASI)	Energy Intensive, US (EUKLEMS)
Low skilled Labor	0.08	1					
Infrastructure Intensive	-0.13	0.17	1				
Fuel Intensity	-0.11	0.14	0.95***	1			
Distribution Intensity	-0.13	0.15	0.60***	0.31**	1		
Energy dependence	-0.22	0.14	0.73***	0.76***	0.24	1	
Energy dependence--US	-0.31**	-0.12	0.31***	0.21	0.35***	0.45***	1
Exporting Industries	0.18	0.29***	-0.15	-0.22	0.14	-0.20	-0.18

*,**,*** indicate that the correlation coefficients are significant at 10, 5 and 1 percent levels of significance respectively.

The table above shows that the correlation of industry characteristics calculated using different sources is high; correlation across different characteristics is not high; and also that correlation of the characteristics is very high over time (not shown here).

Appendix C: Infrastructure Indices for States

Various researchers have developed infrastructure indices at the state level which aggregate information on different kinds of infrastructure into one indicator. We use the infrastructure index developed by three different researchers. First set of infrastructure indices, using the same methodology, is by Ghosh and DE, 2004 (GD) and Kumar, 2002 (TRK). Both the studies construct different sub-components of infrastructure, i.e. physical infrastructure development index (PIDI), social infrastructure development index (SIDI), financial infrastructure development index (FIDI). TRK also constructs an overall infrastructure development index (OIDI). Using principal component analysis, GD and TRK construct the different infrastructure indices for the major Indian states and at different points in time.

	Ghosh and De, 2004 (GD)—	Kumar, 2002 (TRK)
Physical infrastructure development index	Transport facilities, irrigated area, consumption of electricity, telephone mainline	Villages electrified, electricity consumption, railways and surfaced roads, post offices, telecommunication, irrigation extent.
Social infrastructure development index	Literacy rate, infant mortality rate, people living in 'pucca' (concrete structure) houses	Population with primary education, literacy rate, educational institutions, public health institutions, registered doctors per capita
Financial infrastructure development index	credit/ deposit ratio in nationalised banks, the state's own tax effort (tax revenue/ NSDP) and number of post offices per 10,000 population	Bank offices per unit area, per capita bank deposits, per capita bank credit
Overall infrastructure development index	Not constructed	Village electrified, railways and surfaced roads, post offices, irrigation extent, educational institutions, public health institutions, bank offices

In a background paper for the Eleventh Finance Commission, Anant, Krishna and Roychoudhry (1999) develop an infrastructure index at the state level. The different infrastructure series are correlated highly across different series, across different sources as well as across different points in time. The correlation between different infrastructure series in 1980 is quite high.

Appendix D: Labor Market and Product Market regulations

As noted in the text, India's constitution gives its states control over various areas of regulation. In these areas, states have the authority to enact their own laws and amend legislations passed by the center. Typically, states also have the authority to decide on the specific administrative rules and procedures for enforcing legislations passed by the center (Conway 2008). Labor market regulations and product market regulations are two areas in which states have such control over regulation and enforcement. Accordingly, various studies have attempted to codify state level differences in regulation.

In what follows, we describe these studies' approach for characterizing states' stance on labor regulations and product market regulations. We also describe our attempt at combining the information from different studies, reconciling major differences when they come up, and coming up with a composite classification of regulatory regimes at the state level.

Labor Market Regulations

Besley and Burgess (2004): Besley and Burgess work with state-level amendments to the Industrial Disputes Act between 1958 and 1992.[15, 16] Each amendment is coded as a 1, -1, or 0 depending on whether the amendment in question is deemed to be pro-worker, pro-employer, or neutral. The scores are then cumulated over time with any multiple amendments for a given year coded to give the general direction of change.

Since the actual time-series variation in the cumulated amendments within states is quite limited for the period we are interested in (1980 and beyond), we compute the average value for each state over 1980-1997. These averages range from a high of 3.17 in West Bengal to a low of -2.28 in Andhra Pradesh. Next, we use the following rule to assign to each state a particular stance on labor regulations: pro-worker (or inflexible), neutral, pro-employer (or flexible). States with an average greater (less) than zero are deemed to have inflexible (flexible) labor regulations; states with an average of zero are treated as having a neutral stance on labor regulations. Thus, for example, Andhra Pradesh would be classified as having flexible labor regulations while West Bengal would be classified as having inflexible labor regulations.

Ahsan and Pages (2007): A recent extension of the Besley and Burgess coding has been carried out by Ahsan and Pages. They first classify amendments to the IDA in terms of: (i) whether or not these reduce the power of workers or employers to initiate and sustain an industrial dispute or expedite the resolution of disputes; and (ii) whether an amendment reduces, raises, or leaves

[15] The IDA lays down procedures for settlement of disputes, as well as the conditions under which layoffs, retrenchment, and closure of an establishment can take place and the appropriate level of compensation in each case. The IDA also prescribes the terms under which employers may change the 'conditions of service' of workers.

[16] Given very limited amendment activity in the 1990s and beyond, the original Besley and Burgess coding can be treated as applicable up to the present period considered in this paper. As noted in OECD (2007), only eight amendments have been recorded since 1990. All of these can be accounted by three states. Most importantly, only one amendment -- passed in 2004 -- appears "to be of any consequence to labor market outcomes" (OECD 2007).

unchanged the capacity of firms to adjust employment.[17] Next, they code the two sets of amendments, i.e., those relating to either industrial disputes or job security, as pro-worker, pro-employer or neutral and cumulate these over time as in Besley and Burgess. We convert these state and time-varying cumulative amendments into state-specific indicators of the stance of industrial disputes or job security related regulations as we did with the Besley-Burgess cumulative amendments above.

We make two important changes to the original coding. Gujarat has been designated as pro-worker by Besley and Burgess and Ahsan and Pages (in relation to the resolution of disputes). As noted by Bhattacharjea (2006), this is on account of a "solitary amendment passed in 1973, allowing for a penalty of 50 rupees a day on employers for not nominating representatives to firm level joint management councils". Given the fairly inconsequential nature of this amendment, we modify Besley and Burgess' and Ahsan and Pages' (disputes related) coding of labor regulations in Gujarat as neutral. Similarly, in the case of Madhya Pradesh, the average of the Besley and Burgess cumulative amendments is very mildly negative over 1980-1997. Since it is so close to zero, we treat it as effectively zero, or in other words, neutral. This is exactly how the state tends to appear based on a majority of the other studies.

Bhattacharjea (2008): Bhattacharjea focuses his attention on characterizing state level differences in Chapter VB of the IDA (which relates to the requirement for firms to seek government permission for layoffs, retrenchments, and closures). In a fairly radical departure from the work of Besley and Burgess, Bhattacharjea considers not only the content of legislative amendments, but also judicial interpretations to Chapter VB in assessing the stance of states vis-à-vis labor regulation. Moreover, Bhattacharjea carries out his own assessment of legislative amendments as opposed to relying on that of Besley and Burgess.[18] He considers two types of regulatory changes: those pertaining to the employment threshold beyond which permission for retrenchments, layoffs, or closures is required; and those to the requirement of obtaining permission -- for example, whether permission is needed for closure or for both closure and retrenchment.

Bhattacharjea's detailed account of legislative and judicial interventions affecting Chapter VB enables him to identify points at which one or more states has diverged from the rest of the country. Based on this account, the following characterization appears to emerge. In so far as the employment threshold is concerned, West Bengal has the most pro-worker regime (a threshold of 50 workers since 1980) while UP has the most pro-employer regime (a threshold of 300 applies throughout the period under consideration). Maharashtra emerges as more pro-worker than the average state because of the lower threshold of 100 introduced in 1982 instead of 1984 as in

[17] They also isolate the latter set of amendments which stem from amendments to Chapter VB of the IDA.

[18] Bhattacharjea (2006) argues that Besley and Burgess' coding of state level amendments to the IDA as pro-worker, neutral, or pro-employer were flawed on several accounts, including misinterpretation of various amendments, assignment of identical scores to both minor procedural amendments as well as major changes in job security norms, and the use of a "misleading" cumulation of coded amendments over time.

most other states. Orissa emerges as slightly more pro-worker than the average state on similar grounds.

We accordingly classify UP as having a flexible regime and West Bengal, Maharashtra, and Orissa as having an inflexible regime vis-à-vis the employment threshold. Admittedly, it may seem rather strong to treat Maharashtra and Orissa as inflexible on account of employment thresholds on the basis of two years (1982 and 1983). But, the fact that a certain state passes a legislative amendment or judicial interpretation one way or the other probably suggests something meaningful about a state's stance on labor regulation over a non-trivial period of time.

States have also differed in terms of the requirement for government permission for retrenching and closures. Maharashtra and Orissa emerge as having required permission on more counts than the typical state at various points of time in the early 1980s (two years for Maharashtra and one year for Orissa). We classify both states as inflexible in so far as the requirement for permission are concerned. Karnataka, UP, West Bengal, and Tamil Nadu emerge as having had less stringent requirements on permission than the typical state over various years (3, 13, 11, and 3 years, respectively, between the mid-1980s and 2001). We classify these four states as flexible.

OECD (2007): A recent OECD study on state-level labor reforms in India uses a survey to identify the areas in which states have made specific changes to the implementation and administration of labor laws. In particular, the survey scores progress in 21 states in introducing changes in recent years to not only regulations dealing with labor issues, but also the relevant administrative processes and enforcement machinery. The regulations covered by the state specific survey go well beyond the IDA and include the Factories Act, the Trade Union Act, and Contract Labour Act among others. Within each major regulatory area, a number of issues is considered. Scores are given on the basis of whether or not a given state has introduced changes. A higher score is given for changes that are deemed to be pro-employer.

The OECD study aggregates the responses on each individual item across the various regulatory and administrative areas into an index that reflects the extent to which procedural changes have reduced transaction costs vis-à-vis labor issues. The reduction in transaction costs can come about for different reasons including reductions in the scope of regulations, removing ambiguities in their application, and simplifying compliance procedures.

Based on the values of the index, we partition the states that are the concern of this paper into three groups. States with a flexible labor related regime include: Andhra Pradesh, Gujarat, Haryana, Madhya Pradesh, Rajasthan, and Uttar Pradesh. States with an inflexible labor related regime include: Bihar, West Bengal, Kerala, and Assam. The remaining are treated as having a neutral stance.

A Composite Measure of Labor Regulations across States

As noted in the text, labor market regulations can be notoriously hard to quantify. However there do seem to be certain patterns that are common across the various studies of state-level labor regulations. We next create a composite classification of states' stance on labor regulations based on the different studies (and our modifications noted above).

Appendix Table D1: Labor Regulations Across States

State	BB*	AP-disputes*	AP-adjustment	AB-permission	AB-threshold	OECD Lr2	Our LMR
Andhra Pradesh	Flexible	Flexible	Inflexible	0	0	Flexible	1
Assam	0	0	0	0	0	Inflexible	0
Bihar	0	0	0	0	0	Inflexible	0
Gujarat	0*	0*	0	0	0	Flexible	0
Haryana	0	0	0	0	0	Flexible	0
Karnataka	Flexible	Flexible	Inflexible	Flexible	0	0	1
Kerala	Flexible	Flexible	0	0	0	Inflexible	0
Madhya Pradesh	0*	Flexible	Inflexible	0	0	Flexible	0
Maharashtra	Inflexible	0	Inflexible	Inflexible	Inflexible	Inflexible	-1
Orissa	Inflexible	0	Inflexible	Inflexible	Inflexible	0	-1
Punjab	0	0	0	0	0	0	0
Rajasthan	Flexible	Flexible	Inflexible	0	0	Flexible	1
Tamil Nadu	Flexible	Flexible	0	Flexible	0	0	1
Uttar Pradesh	0	0	0	Flexible	Flexible	Flexible	1
West Bengal	Inflexible	Inflexible	Inflexible	Flexible	Inflexible	Inflexible	-1

Note: * Original coding was changed on the basis of narrative/evidence from other studies. In the last column 1 refers to flexible, 0 to neutral and -1 to inflexible regulations. The coding is robust to dropping AP- disputes; as well as to dropping both AP-disputes and AP-adjustment.

Product Market Regulations

Unlike the case of labor market regulations, studies characterizing product market regulations across Indian states are much fewer. In fact, only one study appears to have dealt with this issue in a systematic manner (OECD, 2007). Below, we describe briefly two measures of product market regulations based on OECD (2007). However, we also consider a third indicator based on the World Bank's investment climate study (ICS) for India (World Bank 2005).

OECD (2007): OECD (2007) uses a survey instrument in order to assess the regulatory environment facing businesses across Indian states. The survey collects data from state government officials belonging to various regulatory departments as well as from a law firm on the state specific requirements for setting up two different types of businesses. The information gathered pertain to two sets of issues: the extent of "state-control" and "barriers to entrepreneurship". The former covers such issues as public ownership of enterprises, the scope of the public enterprise sector, its size, and the extent of direct control over business enterprises. Barriers to entrepreneurship covers administrative burdens on startups and administrative rules and procedures for obtaining clearances and approvals of various types among other things. The information collected is used for constructing indicators of product market regulation (PMR).

In our analysis, we consider both the overall OECD PMR indicator, as well as the indicator based on the "barriers to entrepreneurship" component of the overall indicator. A higher value on the indicator represents a regulatory regime that imposes more burdens on businesses. Out of the 15 states we consider, we consider the 4-5 states with the highest scores as having a weak regulatory climate for business. Four to five states with the low scores are treated as having a

good regulatory climate for business. The remaining are deemed to have a neutral regulatory climate.

Investment climate study (World Bank, 2005): Although, the ICS does not present a ready measure of product market regulations across states, it records the perceptions of managers in Indian manufacturing firms across the major states regarding various aspects of the "investment climate". A particularly robust question across various rounds of the ICS is one in which firms' managers are asked their opinion on which state, other than that in which they are located, has the "best" investment climate. We assign to each state the percentage of respondents choosing that state as having the best investment climate. States with relatively large (low) proportion of votes for best investment climate are deemed to have business friendly (business unfriendly) product market regulations. Though this procedure is clearly crude, it does have the benefit of simplicity. More importantly, there is a considerable robustness in the response to this question over years.

A Composite Measure of Product Market across States: The first three columns of Table D2 reports how states are classified according to the various indicators of product market regulations. As may be seen, the classifications are fairly similar across columns. In other words, classifications based on a reading of actual regulations are fairly similar to perceptions of managers manufacturing enterprises. The main exception is the case of Gujarat. As noted in Conway, Herd, and Chalaux (2008), the low score of this state on the OECD indicators arises from a very large public enterprise sector and relatively high administrative burdens on firms. Why managers perceptions are very different for this state is unclear. While it could be because of the manner in which regulations are enforced – perhaps in a light manner in Gujarat as speculated by Conway et al -- managers perceptions may also be influenced by the quality of public infrastructure.

Appendix Table D2: Product Market Regulations Across States

State	ICS* best votes	OECD PMR	OECD-barriers	Our PMR
Andhra Pradesh	0	0	0	0
Assam	Cumbersome	Cumbersome/0	Cumbersome	-1
Bihar	Cumbersome	Cumbersome/0	Cumbersome	-1
Gujarat	Competitive	Cumbersome	Cumbersome	0
Haryana	0	Competitive	Competitive	1
Karnataka	Competitive	Competitive/0	Competitive	1
Kerala	0	0	0	0
Madhya Pradesh	Cumbersome	0	Cumbersome/0	-1
Maharashtra	Competitive	Competitive	Competitive	1
Orissa	Cumbersome	Cumbersome	0	-1
Punjab	0	Competitive	Competitive	1
Rajasthan	Cumbersome	Cumbersome	Cumbersome	-1
Tamil Nadu	Competitive	Competitive	Competitive	1
Uttar Pradesh	0	0	Cumbersome/0	0
West Bengal	0	Cumbersome	Cumbersome	-1

In the last column 1 refers to competitive, 0 to neutral and -1 to cumbersome regulations. Given the ambiguity in coding Gujarat, we code it as neutral.

Appendix Table D3: Correlation Between Regulatory and Infrastructure Variables

	LMR	PMR	PCY	Infrastructure	Roads	Electricity	Bank Credit
PMR	0.23	1					
PCY	-0.21	0.71***	1				
Infrastructure	0.10	0.78***	0.72***	1			
Roads	0.34	0.82***	0.71***	0.70***	1		
Electricity	-0.08	0.73***	0.83***	0.71***	0.81***	1	
Bank Credit	-0.08	0.82***	0.86***	0.80***	0.72***	0.77***	1
Bank Branches	0.05	0.78***	0.73***	0.86***	0.73***	0.73***	0.89***

*,**,*** indicate that the correlation coefficients are significant at 10, 5 and 1 percent levels of significance respectively.

Appendix E: Sources of Data and Construction of Dependent Variables

The primary data used in this paper comes from the Annual Survey of Industries (ASI) for 1980-81 to 2004-05. ASI is the principal source of industrial statistics in India and the survey is undertaken by the Ministry of Statistics, Planning, and Implementation (Government of India). Aggregated tables at the All-India and the State level based on 3-digit National Industrial Classification for India are used. There are four different classifications (NIC 1980, NIC 1987, NIC 1998, NIC 2004) in use over this 25 year period. The first step in developing a comparable data over time was to prepare a concordance matching industries across the four different classifications. The concordance exercise leaves us with 49 industries. This is a unique database on industrial statistics in India in terms of its coverage at the state-industry level and for a 25 year period. Data seems good and comparable pre and post 1998, when there was a change in the sampling framework. The following industries were excluded from the analysis. The first three (dressing and dyeing of fur, saw milling, and publishing) were excluded because of lack of data on infrastructure dependence from CMIE. The others that were dropped included processing of nuclear fuels and reproduction of recorded media. In addition, following Aghion et al (2007) we drop "other manufacturing" (NIC-98 code 369) as this industry category is a grouping of different activities, and the activities are likely to vary from one state to the other rendering this industry category incomparable across states. Following Aghion et al we further restrict the data. For the purposes of this paper, since we are working with aggregated data, the sampling unit is the state-industry pair and the data are representative at that level. We observe repeated entry and exit of various state-industry pairs in the data, to minimize the role played by these observations we further restrict the data. We use only state-industry pairs with at least 10 years of data and further use only those industries that exist in at least eight states in each year. We further restrict ourselves to "major" Indian states only. The list of states included in the analysis is : Andhra Pradesh, Karnataka, Punjab, Assam, Kerala, Rajasthan, Bihar, Madhya Pradesh, Tamil Nadu, Gujarat, Maharashtra, Uttar Pradesh, Haryana, Orissa, West Bengal. The remaining states/Union Territories either have poor time series data or have very few industries or there share in manufacturing GVA is less than 1 percent. Newly formed states of Chattisgarh,

Jharkhand and Uttarakhand were added to the respective states they were carved out from to create old states of Madhya Pradesh, Bihar, and Uttar Pradesh respectively and make the data comparable over time. The state characteristics of the original states in these cases have been used as if they would apply to the old state.

However, ASI suffers from the limitation that it covers only the registered manufacturing sector, and the unregistered manufacturing sector is not covered by the ASI. Further, the data on the informal manufacturing sector is not available with the same frequency as the ASI data. The survey on the unregistered sector is carried out by the National Sample Survey Organization (NSSO) and the survey is done every 5-7 years.

ASI frame is based on the list of registered factories/units maintained by the Chief Inspector of Factories in each State/Union Territory (UT). Factory (those falling under the registered manufacturing sector) is the primary unit of enumeration in the survey for the case of manufacturing industries. Factory for the purposes of ASI is defined as the one which is registered under sections 2m (i) and 2m (ii) of the Factories Act, 1948. Broadly, according to these sections. Premises whereon 10 or more workers with the aid of power or 20 or more workers without the aid of power is referred to as a factory.

Variables

Value added: increment to the value of goods and services that is contributed by the factory.

Total employment: is defined to include all blue collared workers and persons receiving wages and holding clerical or supervisory or managerial positions or engaged in administrative office, store keeping section and welfare section, sales department etc.

Delicense: Dummy that takes a value 1 from when an industry was delicensed.

Share of industry i in VA in 1980: Share of each industry in total industrial value added in 1980

Size (log of fixed capital): Average fixed capital per factory in each industry in 1980.

Labor Intensive Industry: Dummy that equal one when the industry has labor intensity above median.

Low Skill Labor Intensive: Dummy that takes a value 1 if the share of compensation to low skilled workers in total value added exceeds the median for industries, in 1980

Infrastructure Intensive Industry: Dummy that takes a value 1 if the share of expensiture on fuel and distribution is above median, by industry.

Share S,I in 1980: Share of state S, in Industry I's value added in 1980.

Initial PCY in state s: Per capita state domestic product in each state in 1980.

Initial Industrial Output per capita in state s: Total Industrial value added/population in each state in 1980

Income level: Takes a value 2 if the state belong to the bottom 1/3rd of the states on the basis of per capita income in 1980, value 1 if the state belongs to middle 1/3rd of states and 0 if the state belongs to the top 1/3rd of the states.

Physical infrastructure: Index of physical infrastructure at state level in 1980 by Kumar (2002)

Roads: Log, length of roads per capita (or per sq km) in each state in 1980.

Electricity: Log electricity generated per capita in each state in 1980

Literacy: Literacy rate in 1980

Credit by Scheduled Banks: Log credit per capita in each state by scheduled banks in 1980.

Branches: Bank branches per capita in 1990 in each state.

Credit by national banks: Log credit per capita in each state by nationalized banks in 1980.

Labor Market regulations (LMR): Take three values: =1 if the state is considered to have pro business labor regulations, -1 if the state is deemed to have pro labor regulations and 0 if it has neutral regulations.

Product market regulations (PMR): take three values:=1 if the state has competitive regulations, =-1 if the state has cumbersome regulations, and 0 if the state has neutral product market regulations.

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What Explains India's Real Appreciation?

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Prepared for Presentation at tbe Brookings-NCAER India Policy Forum 2008
New Delhi

July 15-16, 2008

What Explains India's Real Appreciation?

Renu Kohli & Sudip Mohapatra[1]

We examine the evolution of prices in the nontradable and tradable sectors of the Indian economy over 1980-2006 and find widening inflation differentials between the two sectors: the real exchange rate has been appreciating. This might seem unsurprising, since India's per capita income has been growing rapidly, suggesting the trend is in line with the predictions of the Balassa-Samuelson hypothesis. However, this theory cannot be the sole explanation, since after 1990, the tradable-nontradable labor productivity gap, the driver of a real appreciation according to Balassa-Samuelson, has virtually disappeared. In that case, what explains the real appreciation? We assess the role of both demand and supply factors. Our results indicate that higher real per capita income growth in the 1990s accounts for much of the faster growth of nontradable prices during the post-reform period. Falling import prices were also an important contribution to the relative price increase, along with an expansion in tradable output.

JEL Classification Numbers: E3, E6, F4
Keywords: Tradable, nontradable, inflation, real exchange, appreciation, exchange rate policy, productivity, macroeconomic policy

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The price of nontradable goods in India has been growing much more rapidly than the price of tradable goods. This change is significant because the ratio of nontradable to tradable goods prices is a critical relative price – it is a measure of the real exchange rate. An increase in the relative price of nontradable goods therefore, corresponds to a real exchange rate appreciation. Our earlier work identified major structural changes in India's economy that might be driving the real appreciation (Kohli & Mohapatra, 2006). Amongst other things, export growth has been robust since 1990 and the share of tradables in aggregate output has expanded to almost 31 percent in 2006-07 as against 18 percent in 1980. Productivity in the tradable sector has risen after 1990, while real per capita income growth has accelerated to an average 5.2 percent in 2000-06 from an average of 3.8 and 3.7 percent respectively in the previous two decades. In summary, India is *catching up* with other countries, an ineluctable process where faster productivity growth in the tradable sector may be leading to resource shifts away from the nontradable sector, a higher inflation rate for nontradables and a real appreciation of the exchange rate.

At first blush, this result seems unsurprising. For Balassa (1964) and Samuelson (1964) argued that real exchange rates typically appreciate as countries develop – and India has been developing rapidly. This hypothesis has been empirically documented in numerous cross-section studies. However, it does not fit the Indian case, or rather, does not fit it completely. For after 1990, precisely when the economy was opened up to foreign competition, we find that the tradable-nontradable productivity gap virtually disappeared. So then what explains India's real appreciation? This paper attempts to answer this question, which is critically important for the framing and conduct of macroeconomic policy.

One may well ask – why define the real exchange rate as the relative price of nontradables instead of the familiar PPP based definition? Indeed, the bilateral real exchange rate (or the external RER), computed as the relative domestic to foreign currency price levels expressed in a common currency, is preferable for its availability, frequency and resultant empirical utility. Nevertheless, the two measures differ from a conceptual perspective because one refers to competitiveness in terms of relative price levels, domestic and foreign, while the

other refers to the relative price of two different categories of goods, tradable and nontradable. The relative nontradable-tradable price therefore is an indicator of the incentives for production and consumption of the two categories of goods in an economy. Most recent theoretical works on real exchange rates (e.g. Obstfeld and Rogoff, 1996) refer to the relative price of nontradables (also referred as the internal RER) and this definition is in the widest use for analytical purposes in a developing country context (Hinkle and Montiel, 1999). It not only identifies the incentives that guide resource allocation in an economy but is also a key relative price determining the external current account position of the economy.[2] Characterizing the real exchange rate as the relative price of nontradables thus allows us to examine competitiveness in terms of the factors that drives these price trends, making this definition a useful tool for analyzing competitiveness issues, an important area of concern for a country like India. Currently, no such framework of analysis exists for India.[3] This paper contributes by providing such a framework: it constructs a tradable-nontradable price series for India, traces relative price developments and analyzes their determinants, the post-reform triggers of relative price changes and the implications of these shifts for macroeconomic policies.

The empirical literature research on the subject of real appreciation has grown rapidly in recent years, though much of it relates to industrialized countries (De Gregorio, Giovannini & Wolff, 1993, 1994; Canzoneri, Cumby & Diba, 1999, amongst others). As cross-country productivity levels among industrial countries have begun to converge, however, divergent inflation rates in the tradable and nontradable sectors in emerging and developing countries has inspired more empirical interest. A sizeable literature has emerged in the case of transition and accession countries in Central and Eastern Europe, where inflation divergence

[2] A rise in the prices of tradable goods, for example, induces resources to move out of the nontradable to the tradable sector. It also creates incentives for consumers to reduce consumption of tradable goods through substitution with nontradable goods. The switching of production from tradable to nontradable and of expenditures from tradable to notnradable will therefore, improve the external current account position (Hinkle and Montiel, 1999: pp 9).

[3] Lal, Bery and Pant (2003) use the nontraded to traded goods definition of the real exchange rate to analyze macroeconomic developments in India.

is an important issue for accession to the European Union.[4] Productivity growth-induced real exchange rate appreciation trends for some Asian and APEC economies have been analyzed by Chinn (2000) and Ito, Isard and Symansky (1997), while Choudhri and Khan (2004) have focused on a panel of 16 developing countries. Nonetheless, the non-industrialized country sample remains limited, with a lack of country-specific, longitudinal studies. In part, the gap is due to the lack of disaggregated information on prices and productivity, which is a major drawback to research on the subject.

This paper aims to fill this gap by analyzing the increase in the relative price of nontradables in India over 1980-2006. Using the integrated theoretical framework developed in Bergstrand (1991) and De Gregorio, Giovannini and Wolf, (1994), we examine the role of both demand and supply factors. Our findings reveal that both demand and supply factors are relevant in explaining relative price developments. *After 1991, demand pressures originating from per capita income growth have been the key driving force behind relative nontradables inflation.* Fiscal and import price trends have also played an important role. Finally we find a small Balassa-Samuelson effect, which we suspect to be underestimated due to data reasons.

The paper is organized as follows. Section II takes a preliminary look at the data, Section III discusses the theoretical frameworks for explaining relative price developments and Section IV formally analyzes the role of different factors in relative price changes. Section V discusses the implications for nominal exchange rate and fiscal policies.

2. The Evidence: A First Look

This section takes a preliminary look at relative price trends and the relevant demand and supply indicators through descriptive statistics. In the absence of a traded/nontraded goods price index, as is the case for India, it is a difficult task to compute this measure of the real exchange rate. Computing tradable and nontradable prices poses several conceptual and

[4] See Backe, 2002 for a review.

practical problems (See Hinkle & Montiel, 1999, for an extensive discussion). Defining tradability is a major conceptual issue, necessarily subjective in the absence of concrete and specific information on what goods might potentially be traded versus those that are absorbed domestically. Traditionally, 'services and construction' have been assigned to the nontradable category, a notion that has changed with some services being traded. Many researchers also draw a distinction between tradable and traded: traded goods are defined as items *actually* entering into international trade (exports and imports) and subject to the law of one price', while items that have the *potential* to be traded (either at 'an appropriate relative price' as with improvement in competitiveness, or become transportable, e.g. technological innovation, as with some services) are called tradable. Then there are methodological issues in determining the size and composition of export and import sectors as distinct subsets of the tradable and nontradable sectors.

The problem is compounded for India, which also lacks a services' price index.[5] Though an attempt has been made by Lal, Bery and Pant (2003) to compute a traded/nontraded price series by classifying the components of the existing wholesale price index (WPI) into traded and nontraded goods, yet more than half of aggregate output is excluded in such a classification. To overcome these constraints and obtain a comprehensive price series for traded and nontraded sectors we compute the relative price of nontradables by deriving an implicit price series from the nominal and real output data (Box 1).[6] The implicit price series are then classified by their tradability. To remove subjectivity attached to *a priori* reasoning in determining *potentially* tradable items, we determine our tradable and nontradable sectors on the basis of *actual* trade.[7] Further to reduce aggregation bias, we compute tradable/nontradable sectors using disaggregated data on GDP by sector of origin.

[5] See T. N. Srinivasan (2008) " Some Aspects of Price Indices, Inflation Rates and the Services Sector in National Income Statistics" for an up to date discussion on these issues.

[6] Two direct methods, *viz*, expenditure method, using expenditure data from the national accounts, and the production method, splitting sectors of production into tradable and nontradable categories have been used in the literature. Valued added in current and constant prices are then used to derive implicit price deflators for the two sectors.

[7] The two terms, tradable and traded, are used interchangeably throughout in this paper.

Box 1: Implicit Price Series in Services Sector in India

The implicit price deflators represent farmgate prices of goods and services and are producer price inflation proxies in the case of goods. India currently lacks a services' price index, which complicates the task of deriving implicit price indices for services as services' output for some sub-categories is computed though extrapolation by wholesale and/or consumer price indices.

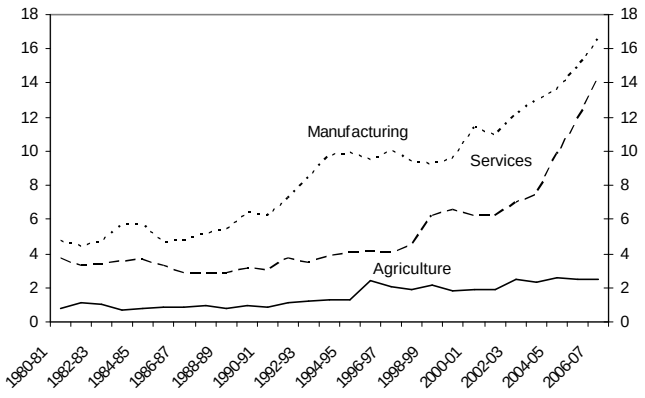
The implicit GDP deflators in the National Accounts Statistics (NAS) are derived as a ratio of Gross Value Added (GVA) at current prices to that of GVA at constant (base year) prices. The compilation of GVA at current and constant prices requires data on quantity of output as well as base and current year prices. These data are gathered by the Central Statistical Organization (CSO) through both *direct* and *indirect* methods. Approximately 54 percent of the services GDP (28 percent of aggregate GDP) is estimated through the *direct* method, while the balance is estimated *indirectly* (24 percent of aggregate GDP).

Under the *direct method* data are gathered separately on output as a quantum index (QI) and prices as a producer price index (PPI) to estimate GVA at current and constant prices. The implicit GDP deflator derived through this methodology is thus statistically a fair approximation to the producer price trend observed in the sector. Service activities like banking and insurance, public administration and defense, railways and all public sector as well as some private sector activities in trading, transport, storage, communication, education, medical and media are estimated directly. In sectors where data on both quantities and prices are not available, the *indirect method* is used to estimate nominal output. Each service activity is extrapolated with respect to its relevant benchmark indicator. The GDP estimation for each item at current prices is extrapolated by an indicator of current prices while constant price items are extrapolated similarly by an indicator of constant prices. The relevant consumer price index (CPI) is used as deflator in a majority of the cases, exceptions being trade (index of gross trading income), some transport (implicit price indices of road, air and transport), ownership dwellings (index of house rent), recreation/ entertainment (tax rate and collections), etc.

The derived implicit GDP deflator using the indirect method is therefore a mix of producer and consumer prices; since producer and consumer prices in services are usually identical, the use of the CPI as price deflator in most cases is a fair approximation to the actual prices level for the sector. Potential circularity arising from the use of WPI/CPI as deflators is limited to 23 percent o f services' GDP (12 percent of aggregate GDP).

We then use the allocation criterion proposed by De Gregorio, Giovannini, and Wolff (1994), which is based upon the degree of participation in foreign trade. Thus, if an average of 5 per cent or more of total production of a sector is exported, the category is considered tradable.[8] Compared to the convention of classifying manufacturing as traded and services as nontraded, this method allows a more accurate tradable-nontradable characterization for some services might be traded while some agricultural and manufacturing goods might not. It thus reduces the bias in the measured relative price of nontradables, which could be potentially quite large for India, a significant exporter of services (see below). The classification is also dynamic as it allows for changes over time. We do not consider imports in defining the tradable sector because it involves identifying the degree to which domestic production of each industry is substitutable with imports, over and above which the production share could be considered import competing. This implies potential tradability rather than actual tradability, increasing the subjectivity in the determination.

Figure 1 Export/Value of total production, 1980-2006 (percent)



Source: WITS Database and CSO, India.

The trends in sectoral export shares in the total value of production (agriculture, manufacturing and services) show that the share of tradables in the value of total manufacturing output in India started rising in the mid-eighties, accelerating in the next two decades (Figure 1). The disaggregate sectoral trends in Table 1 uncover further interesting features. Between 1980 and 2006, at least 7 of the 15 manufacturing sub-sectors more than trebled their export shares, with non-metallic products, textiles, other manufacturing, chemicals, electrical and

[8] De Gregorio, Giovannini, and Wolff (1994) used a 10 per cent share of exports in production as the threshold level for defining tradability of a sector. Export/production ratios for India are far lower though, with few manufacturing sub-sectors exporting more than 10 per cent of their total value of output.

non-electrical machinery and basic metals as the primary drivers of export growth in the manufacturing sector.

In contrast to manufacturing, the share of tradable services in total value of its output changed little between 1980 and 1995, but almost doubled between 1993 (3.9) and 2003 (7.4) and then again in the following three years to reach 14.3 percent in 2006. Almost three-quarters of business services were tradable in 2006. Still, only three of the eleven categories classified as services under the *National Accounts Statistics* are tradable, *viz*. transportation, insurance and business, legal and communication services. Finally, the export/production ratio of agriculture almost doubled between 1990 and 2000, after remaining stagnant in the previous decade. With an average export share of 1.5 per cent in total production over the

Table 1. Tradable-Nontradable Classification by Total Export/Total Production Ratios

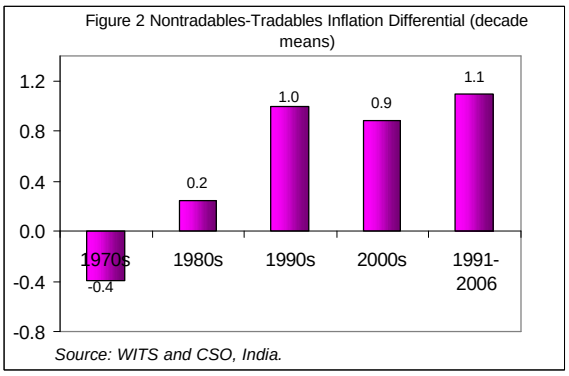
	1980	1990	2000	2006	1980-2006	1990-2006	T/NT
Agriculture	**0.8**	**0.9**	**1.9**	**2.5**	**1.5**	**1.9**	**NT**
Mining	**14.5**	**8.1**	**6.8**	**16.9**	**9**	**9.6**	**T**
Manufacturing	**4.7**	**6.2**	**11.3**	**16.6**	**8.6**	**10.7**	
food products	2.3	2.7	5.8	5.7	4.2	5.1	**T**
beverages, tobacco, etc.	31	18.7	17.9	10.7	20.6	16.8	**T**
Textile group sub-total	8.6	16.3	35.6	36.5	20.3	26.6	**T**
wood, furniture, etc.	2	0.5	1.4	8.2	1.9	2.4	**NT**
paper & printing, etc.	0.2	0.2	2.1	2.9	1	1.5	**NT**
leather & fur products	8.6	14.4	18.8	24.1	14.7	16.3	**T**
chemicals, etc.	2.7	6	9.9	15.8	7.3	9.8	**T**
rubber, petroleum, etc.	0.9	3.5	5.4	16.3	5.7	6.6	**T**
non-metallic products	15.1	33.4	48.9	42.7	37.5	46.3	**T**
basic metal industries	3.4	3.4	7.6	12.6	5.6	7.1	**T**
metal products & machinery	3.4	3.4	7.6	12.6	5.6	7.1	**T**
transport equipments	2.9	2.1	4.3	7.1	3.3	4.2	**T**
other manufacturing	4.7	3.7	12.1	20.7	9.5	12.1	**NT**
Services	**3.7**	**3**	**6.2**	**14.3**	**5.1**	**6.2**	
-Travel & transportation	33.6	22.1	26.6	39.2	28.1	29.7	**T**
-Insurance	8.8	6.7	9.6	13.5	8.5	9.1	**T**
-Business (incl software), legal and communication services[1]	56.7	43.8	45.8	71.4	52.9	51.1	**T**

Staff calculations from CSO National Accounts data, RBI Handbook of Statistics and WITS database.[1] The three services have been clubbed together as the export data (miscellaneous exports) indicates export values in aggregate for these services.
Export and GDP values in US dollars used for computation of the ratios.

sample period, however, agriculture lies much below the threshold value and is classified as nontradable. It can be seen that were a more aggregate classification or a higher threshold, e.g. 10 percent, used to define tradability, the only tradable sector would be manufacturing. A

lower threshold of 5 percent and disaggregated export shares in output allow us to include emerging export industries that increased their export/total production ratios substantially in the nineties, e.g. chemicals, metal products, non-electrical machinery, rubber, etc. Likewise, our choice affects insurance in the services sector; at an average export share of 8.5 percent in its total output over the sample period, it falls between a 5 or 10 percent benchmark and is classified as tradable.

2.1 Rising relative nontradable prices: Utilizing this classification, implicit inflation rates were derived for the tradable and nontradable sectors of the economy. The mean divergence in the nontradable-tradable inflation rate, or the relative nontradables' inflation rate, is plotted in Figure 2 for every decade from 1970. The inflation differential turns positive in the 1980s and exceeds one percentage point from the 1990s till the end of the sample period, 2006-07. In the post-1991 period, it averages 1.10 percent, indicating that the relative nontradables' inflation rate accelerated in this period. The inflation divergence is robust to an alternate tradable-nontradable classification. To test whether the result is driven by an arbitrary threshold, we relaxed it to a 10 percent export share of each sub-sector in the total value of its production. The recomputed sectoral inflation rates confirm the robustness of the divergence trend (Fig 1A, Appendix); nontradable inflation rate exceeded the tradable inflation rate from the 1980s, crossing the one percent bar in the post-reform period.

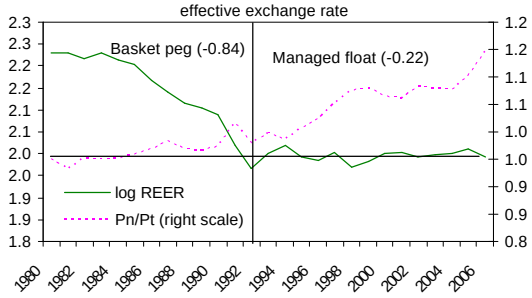


2.2 Relative nontradable prices and other measures of the real exchange rate: Since the relative price of nontradables is a measure of the real exchange rate and an increase in it corresponds to a real appreciation, how does its evolution compare with the bilateral REER, the commonly used real exchange rate measure in India? While in theory, the relationship between the external and the internal measure of the real exchange rate is clear, empirical

movements of the two measures need not necessarily be similar simply because of the role of domestic-foreign country prices of traded goods and that of the internal real exchange rate of the foreign country. A lot depends upon whether the law of one price holds for tradable goods; if this does not hold for long periods of time then the two series will diverge as the effects of external real exchange rate movements upon the internal exchange rate are muted.[9]

Figure 3 shows the nontradable-tradable price ratio and the 36 country, trade-weighted real effective exchange rate moving in opposite directions before 1991 (correlation -0.84). After 1991, the negative correlation between the two measures is considerably diluted (-0.22). How can this difference be explained? Quite easily, it turns out.

Figure 3 Nontradable/tradable price ratio and the real effective exchange rate



Figures in parentheses are correlations.
Source: RBI, CSO and author's calculations

Consider a simple, two country formulation of the real effective exchange rate,

$$r = \frac{p}{e.p^*} \qquad (1)$$

where r is the real exchange rate, p is the domestic price level and p^*, the foreign price level. Now consider the case where tradable and non-tradable shares, a and $(1-a)$, are the same in both countries. Then we can write

$$r = \frac{P_T^a \, P_N^{1-a}}{(E.P_T^*)^a \, (E.P_N^*)^{1-a}} = \left[\frac{P_T}{E.P_T^*}\right]^a \left[\frac{P_N}{E.P_N^*}\right]^{1-a} \qquad (2)$$

[9] See Hinkle, L & F. Nsengiyumva "The Two Good Internal RER for Tradables and Nontradables" in Hinkle & Montiel (1999).

where P_T and P_N are the prices of tradable and nontradable goods respectively. It is then clear from inspection that the real effective exchange rate can appreciate if a) there is a deviation from purchasing power parity in the traded sector, or b) the price of non-traded goods rises faster in the home country. Either or both of these conditions can hold, irrespective of the relative price of nontradables in the domestic country. In India's case, there is some indication that pre-1991, the first case was applying. From the mid-1980s, an active policy of nominal depreciation produced a real depreciation, correcting an earlier overvaluation. But starting in 1993 the shift to a more flexible exchange rate regime weakens the strong, negative association of the earlier pegged exchange rate regime.

Apart from change in exchange rate regime, an important role is played by trade taxes - when taxes on international trade or administered price effects are significant, the internal and external real exchange rates will diverge. *Ceteris paribus*, a decline in protection will appreciate the internal real exchange rate by lowering the domestic price of tradables. Table 2 presents evidence on the role of trade tariffs in explaining differences in movements of the two exchange rate measures. Tariff rates in India fell sharply after 1991 as trade liberalization gathered momentum and their likely effect upon domestic prices was to reduce the divergence between the two measures of the real exchange rate. In fact, the steepest cuts in tariff rates are during 1992-96, which is coincident with a spurt in the nontradable-tradable price ratio (Figure 3). Last of all, different rates of productivity growth in the tradable and nontradable sectors are one of the most important empirical factors affecting the relationship between internal and external real exchange rates. We again observe an empirical regularity in Figure 3. The two phases of strong GDP growth, 1994-96 and 2003-2006 are associated with a spurt in the nontradable-

Table 2 Weighted Average Import Duty Rates in India *(Per cent)*

	All Commodities	Peak Customs Duty 1/	No. of Basic Duty Rates 2/
1991-92	72.5	150	22
1992-93	60.6	110	20
1993-94	46.8	85	16
1994-95	38.2	65	16
1995-96	25.9	50	12
1996-97	24.6	52*	9
1997-98	25.4	45*	8
1998-99	29.2	45*	7
1999-00	31.4	40	7
2000-01	35.7	38.5	5
2001-02	35.1	35	4
2002-03	29	30	4

Source : Report of the Task Force on Employment Opportunities, Planning Commission, years indicated by *. Government of India, July 2001. Estimates for 2002-03 from Ahluwalia, 2002. 1/ Includes the impact of surcharges in the In 2000-01, duties for many agricultural products were raised above the general peak in anticipation of the removal of QRs. This explains why the average for all commodities exceeds the peak rate in 2001-02. 2/ Refers to ad valorem duty rates.

tradable price ratio; both these periods saw relatively faster productivity growth in the tradable sector, when it exceeded nontradable sector productivity growth by an annual average of 3 percentage points.

The next section discusses the various theoretical explanations offered in the literature.

3. What Explains the Increase in Relative Price of Nontradables – Theory?

Several theories explain the secular increase in the prices of nontradable goods as an economy develops. Supply-side models (Balassa, 1964; Samuelson, 1964) describe it as a part of cross-country convergence in productivity levels. Under the assumption of perfect integration of goods and capital markets, which sets tradable goods prices and interest rates, faster technological progress and productivity growth in the tradable sector leads to an increase in the relative price of nontradables, where productivity growth is slower. Productivity gains in the tradable sector are accompanied by rising wages, and the assumption of labor mobility between the two sectors equalizes nominal wages across the two sectors. The relative price of nontradable goods then rises because the wage increase is not accompanied by matching productivity growth in the nontradable sector. Differential productivity growth rates thus translate directly into sectoral inflation differentials, which, in turn, correspond to a real exchange rate appreciation.

The Balassa-Samuelson effect is essentially a long-term phenomenon, based on productivity trends. In conjunction with this supply-side impact, transitory demand disturbances could add to the relative price increase. For example, shocks like a rise in government spending could induce a temporary increase in the relative price of nontradables (Obstfeld and Rogoff, 1996). The role of government spending has also been the focus of recent models of equilibrium exchange rate determination, which show government expenditure falling exclusively (Rogoff, 1992; De Gregorio, Giovannini and Krueger, 1994) or disproportionately (relative to private spending, Froot and Rogoff, 1991) upon nontradable goods.

Demand pressures originating from income growth could also induce an increase in the prices of nontradable goods (Kravis and Lipsey, 1983; 1988; Bergstrand, 1991). Assuming nonhomothetic tastes, i.e. income elasticity of demand for services (goods) exceeds (is less than) unity, a rise in per capita income will induce an expenditure shift towards nontradables, as the latter are luxuries in consumption. This expenditure shift translates into a higher relative price of nontradables (particularly services) as resources shift towards the production of nontradable goods. A demand-induced relative price increase will thus be reflected in the rising share of nontradables in aggregate output. Similar demand influences could prevail due to shifts in technologies (Dornbusch, 1988).

Theoretical frameworks combining the supply and demand approaches can be found in several works. Bergstrand (1991) integrates the productivity growth and relative factor endowment (Bhagwati, 1984) models with the demand-oriented hypothesis, real income growth, for a cross-section of 21 countries. DeGregorio, Giovannini and Wolf (1994) incorporate demand shocks alongside productivity-growth induced supply shocks by relaxing the assumptions of perfect capital mobility and purchasing power parity in the Balassa-Samuelson models. Another strand of literature extends the framework to include terms of trade shocks, identified as a major determinant of the relative price of nontradables (Edwards, 1989; De Gregorio and Wolf, 1994).

Empirical evidence endorses both supply and demand side influences upon relative price movements. De Gregorio, Giovannini and Wolf's (1994) study reveals income growth and higher productivity growth in the tradable sector as key sources of the increase in relative nontradables' prices for 14 OECD economies over 1970-1985. Canzoneri, Cumby and Diba (1999) confirm that the relative price of nontraded goods reflects the relative labor productivities in their panel study of 13 OECD countries. These results are reinforced by Chinn and Johnston's (1996) panel estimates for 14 OECD countries that identify productivity measures, government spending and terms of trade as significant determinants of real exchange rate movements.

For emerging and developing countries, Chinn (2000) estimates a productivity-based model of relative prices and real exchange rates for 9 East Asian economies and finds conflicting results. The hypothesis of productivity-driven real exchange rate appreciation is supported for Japan, Malaysia and Philippines but not for fast growing countries like China and Thailand in the time-series samples; the panel estimates support the productivity effect with government spending and terms of trade emerging as insignificant factors. Ito, Isard and Symansky (1997) find that rapid growth is associated with real exchange rate appreciation only for some APEC and ASEAN economies, viz. Japan, Korea, Taiwan, and to some extent, Hong Kong and Singapore, while countries like Indonesia, Malaysia and Thailand did not experience any real appreciation. They point out three factors that might explain the lack of exchange rate appreciation - high productivity growth in service sectors, divergences in domestic-foreign tradable prices and economic reforms that promote export and growth through nominal depreciation.

Only one study, Choudhri and Khan (2004), focuses solely upon developing countries. In a panel sample of 16 countries, they find the traded-nontraded sector productivity growth differential to be a significant determinant of the relative price of nontraded goods, which, in turn, exerts a significant influence upon the real exchange rate. Empirical research on sectoral inflation differentials and, more broadly, on factors driving real exchange rate appreciation in the transition and accession countries of the European Union has also grown rapidly in recent years;[10] many cross-section studies establish the Balassa-Samuelson phenomenon as a driving force of inflation divergence (De Grauwe and Skudelny, 2000; Halpern and Wyplosz, 2001; Jazbec, 2002, amongst others) and country studies confirm this feature.[11]

[10] Backe (2002) reviews the empirical literature for transition and accession countries of the European Union.
[11] Recent work by Altissimo et al (2005) also identifies the role of productivity shocks affecting the non-tradable sector, and to a lesser extent, mark-ups' shocks in driving the euro area inflation differentials.

Changes in economic structure due to reforms in economic policies can also be a driving force for divergent inflation rates. This is particularly true for economies in transition, like India where the post-991 period is characterized by fundamental structural changes in price and production structures. Following the macroeconomic crisis of 1991, liberalization policies were pursued in almost every economic sphere from trade to prices. Trade liberalization accelerated after 1991: the average effective tariff rate was reduced steadily, non-tariff barriers were eased with removal of licensing restrictions on raw materials, intermediate and capital goods , while a tariff line-wise import policy was introduced in 1996 (Table 2). These changes obviously impacted import prices, through lowered input costs, lower prices of tradable goods and consequently, relatively higher inflation in nontradables.

Deregulation of administered prices and liberalization or the adjustment of regulated prices to cost-recovery levels during transition can also impact relative prices, a process experienced by the European transition economies where initial adjustments of relative prices (specifically in the tradables' sector) were associated with rapid price and trade liberalization in the early phase of transition (Backé, 2002b). This was followed by a moderation of inflation, a relatively faster increase in nontradables' prices and a trend appreciation of the real exchange rate. Competition and labor market segmentation may also play a role in driving up the relative price of nontraded goods: since the nontradable sector is typically sheltered from competition as opposed to the tradable sector, inflation pressures tend to be higher in the former sector.[12]

In India, price deregulation in the nontradable (services) sector has been fairly recent, confined so far to banking, insurance and communication sectors, and is yet to reach an advanced stage. Competition and interest rate deregulation were initiated in the banking

[12] Differences in wage bargaining patterns in the two sectors (Canzoneri et al, 1998), or government regulation or support of inefficient firms (De Gregorio, Giovannini and Krueger, 1994) could also give rise to divergent inflation rates.

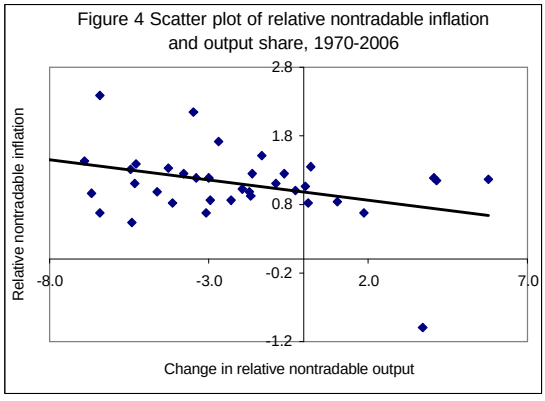
sector from 1990 onwards and is complete, save for the administered interest rate on savings' accounts. The insurance sector was deregulated in 1998–99, although insurance premia are set by the insurance regulatory body. Price liberalization in telecommunications followed the insurance sector in 1999–2000. Between 1998-99 and 1999-2000, the share of services with administered prices fell from 28.4 per cent in to 13.9 per cent. The transition to market-based pricing is thus spread out over many years in India, making it difficult to identify the transition-related price dynamics. As prices still have to be freed in many sectors, it is reasonable to expect that price liberalization will continue to impact relative prices for quite some time.

The next two sections explore the relevance of these factors in explaining relative price movements.

4. What is driving the Relative Price Increase - Demand or Supply?

4.1 Relative nontradable prices and nontradable-tradable sectors' output shares: How does the relative price of nontradables relate to changes in relative nontradable-tradable output shares? The Balassa-Samuelson hypothesis predicts that a rise in relative nontradable prices will be accompanied by falling shares of nontradables in aggregate output, as resources are reallocated towards the tradable sector. Preliminary examination shows that the annual increase in the relative price of nontradables is associated with a fall in the share of nontradable output (Figure 4).

Figure 4 Scatter plot of relative nontradable inflation and output share, 1970-2006



The expanding share of tradables in the economy, from an average 20.1 percent (1980-89) to 25.1 per cent during 1990-2006 undoubtedly reflects the post-reform trade, investment and

price liberalization effects (Section 3). Though resource allocation towards tradables is observed in both manufacturing and services sectors, the traded component of services increased relatively more. Traded services doubled from an average 6 percent share in GDP (1980-89) to an average 12 percent in the current decade (2000-06), while corresponding shares of traded manufacturing rose marginally from 12 to 14.2 percent of GDP.[13] The output shares of fast-growing export sectors increased significantly during this period (Tables 5-8, Annexure). Figure 2A (Appendix) shows that most sub-sector inflation rates correlate negatively with respective changes in output.

4.2 Relative nontradable prices and labor productivity growth: Table 3 presents average labor productivity growth differentials between the tradable-nontradable and manufacturing-services sectors (Table 9, Annexure, gives the disaggregated time series by sub-sectors). These estimates need to be interpreted with caution due to conceptual, measurement and data problems. First, since these are partial productivity measures, changes in input proportions can influence these measures (e.g. a rise in average productivity of labor due to substitution of capital for labor). The second problem relates to measurement of productivity in services sector; data quality of output measures, including the price deflators necessary for obtaining real output from nominal magnitudes, are key issues here.[14] Third, since the only information on services is confined to numbers employed, productivity measurement is based upon

[13] There is some suspicion of overstatement of services sector output. Acharya (2006) has suggested that the shift to a new series with 1999-2000 as base might be responsible for the services' output expansion after 1996-97, while Bosworth, Collins and Virmani (2006) suspect underestimation of price trends in services resulting in overstatement of output. Rajaraman (2007) contends that service sector growth in the new series starting 1999-2000 removed the earlier downward bias in measurement of services due to improvements in measurement methodology; the estimation of output in services for which no formal data collection mechanism exists was more closely aligned to the growth indicator of the corresponding service in the new GDP series of 1999-2000.

[14] Measurement issues in services' productivity have posed a challenge as changes in the nature of production, i.e. increased role of services, have outpaced changes in the statistical system that were traditionally geared towards collection of data on the goods sectors. Real output in most service sector industries is not very well measured and is also difficult to measure. Measurement problems in finance and insurance sectors are particularly severe where the concept of output is unclear, making measurement of its price change and productivity difficult (See Bosworth and Triplett, 2004, for a review of measurement issues in services' productivity).

output and input quantities alone.[15] Last, data aggregation constraints prevent strict correspondence between the tradable-nontradable distinction used for computing productivity estimates and prices respectively. Thus the inclusion of tradable services in the nontradable sector biases labor productivity growth estimates for that sector upwards.[16] All these factors render the labor productivity estimates considerably noisy.

These caveats noted, the data shows the tradable-nontradable sector productivity growth gap narrowing steadily after the mid-1980s until 2000 (Table 3). Column 2 of the table presents the gap computed with the conventional tradable-nontradable distinction of manufacturing and services. Both definitions indicate that labor productivity growth in the services sector (including tradable services) narrowed the gap vis-à-vis manufacturing in the 1990s. The annual average labor productivity growth of the services sector increased from 4.2 to 7.6 percent between 1982-90 and 1992-2004 while that of manufacturing sector increased only marginally from 7.0 to 8.1 percent. Consequently, the tradable-nontradable labor productivity growth gap shrunk to an average 1.6 percent in 1992-2004 from a wider 4

Table 3 – Relative Labor Productivity growth differentials: Tradable-Nontradable & Manufacturing-Services, 1982-2002

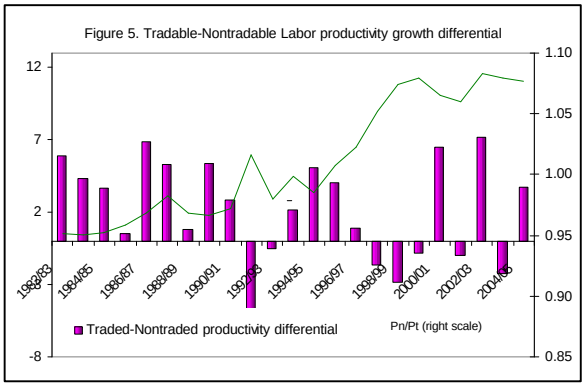
Year	**Tradable***(manufacturing only)* - **Nontradable** *(agriculture & services, including tradable services)*	**Manufacturing - Services** (*including tradable services)*
1982-86	4.23	2.77
1987-90	3.59	2.84
1992-95	2.71	1.92
1996-99	-1.12	-3.03
1982-90	3.95	2.8
1992-2004	1.58	0.46
2000-04	2.84	2.08

Note: Figures are period averages. Labor productivity estimates are confined to 1982-2004 due to data availability constraints. Labor productivity for the tradable sector is proxied by manufacturing sector while services and agriculture clubbed together for computing labor productivity in the nontradable sector (See Box 2, Appendix B). Source: NAS, CSO and CEIC Database.

[15] Labor productivity calculated as output per worker and is based upon total employment figures for agriculture, services and manufacturing sectors, drawn from the CEIC Database. These, however, are unadjusted for quality changes over time and to that extent pose a limitation.

[16] The tradable component of services cannot be extracted from the employment shares data, which is disaggregated across categories different from the sub-sectors used to classify tradability; non-traded manufacturing employment shares similarly cannot be separated from overall manufacturing employment estimates. Services and agriculture are therefore clubbed together to arrive at productivity estimates of the nontradable sector. Cross-sector biases arising from gaps in formal-informal sector employment estimates are also likely to affect productivity measurement; as the extent of informal employment is larger in services like construction, transport, personal services, etc. the size of the traded-nontraded productivity differential is likely to be smaller.

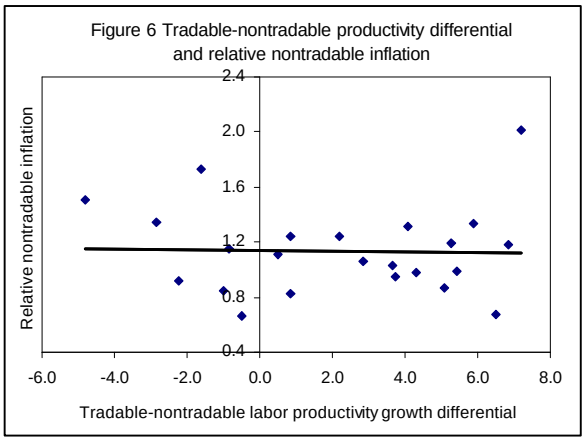
percent in the previous decade (1982-90). Excluding agriculture, the manufacturing-services productivity growth gap almost disappears in the latter half of the sample (Column 2). Disaggregate analysis shows that labor productivity growth in the services sector was significantly driven by the category 'transport, storage and communications'; average productivity growth almost trebled to 11.2 percent in 1992-2004 against the 4.3 percent clocked during 1982-90 (Table 9, Annexure). It is worth noting that communication services were rapidly deregulated in the mid-nineties (Section 3). Further, transportation and communication services are categorized as tradable in our classification, but the lack of further disaggregation in employment data prevents separation of the tradable-nontradable components thereby biasing labor productivity growth estimates of nontradables upwards. This constrains pinpointing the exact location of the extraordinary labor productivity growth observed in the services, i.e. it is not possible to determine whether it originated from the tradable or nontradable component of the sector. For services like communications, insurance and banking, liberalization and deregulation of administered prices were a likely source of labor productivity growth as communications and information technology prices fell as a consequence. [17]



The virtual disappearance of the relative labor productivity growth differential from almost 3 percentage points in the 1980s to almost zero during 1992-2004 is striking because the relative price of nontradables increased at a faster pace at the same time. Figure 5 depicts this paradox: accelerating productivity growth in nontradables closes

[17] The empirical evidence on productivity growth trends in the post-reform period is inconclusive, though trends in recent years show significant increases in productivity (See RBI, 2004; Reddy, 2005 for recent summaries). There is some evidence to show relatively faster total factor productivity growth, particularly in the export-oriented industries. All these studies however, focus on the manufacturing sector, which, as our classification shows, is an incomplete representation of the tradable sector.

the gap vis-à-vis tradable sector productivity growth, while the relative nontradable-tradable price ratio climbs at the same time. Adding to the puzzle is the negative (but weak) association observed between the relative productivity differential and relative nontradables inflation (Figure 6), which *prima facie*, neither supports a Balassa-Samuelson effect nor is consistent with the rising share of tradables in aggregate output. What then explains the increase in relative nontradable prices when the relative productivity differential actually narrowed in the 1990s? Did demand factors dominate during this period? We explore this next.



4.3 Relative nontradable prices and Demand Indicators: Table 4 uncovers a major demand shift, public as well as private, in the eighties. Real government consumption expenditure growth averaged 6.9 percent of GDP in this decade, an increase of more than 2 per cent over the 1970s. At the same time, real per capita income growth jumped to an average 3.7 percent from a minuscule 0.61 percent the previous decade. The post-

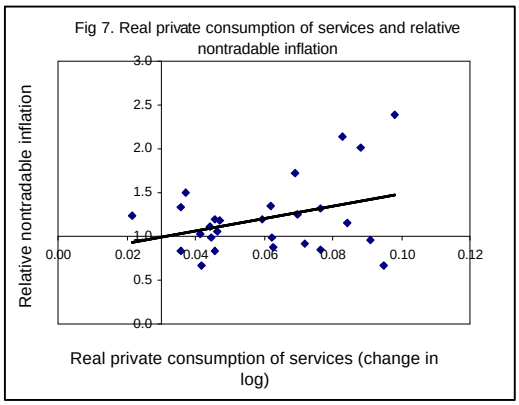
Table 4 – Evolution of Demand indicators, 1970-2006 *(decade averages, percent)*

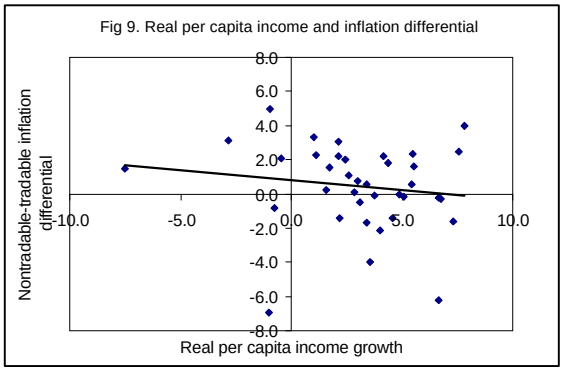
Year	Real govt. consumption expenditure growth	Real per capita income growth	Growth in private consumption of services
	1	2	3
1970s	5.04	0.62	3.97
1980s	6.92	3.46	4.73
1990s	6.3	3.57	5.89
2000-06	4.12	5.17	9
1992-2006	5.9	4.63	7.56

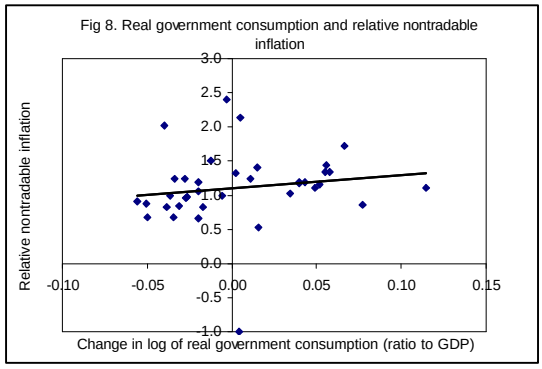
Source: Authors' calculations with data from NAS, CSO and Handbook of Statistics, RBI.
Col. 3, row 4 average for 2000-06.

reform decade of 1992-2006 shows private demand accelerating further to average 4.6 percent even as fiscal growth slowed to average 5.9 per cent in this period. Private demand accelerates further in the current decade, 2000-06, averaging close to 6 percent.

Column 3 shows that growth in the share of services in private final consumption expenditure, a closer indicator of the nonhomothetic preferences hypothesis, spurted to 7.6 percent during 1992-2006 and a further 9 percent between 2000-06. This trend suggests that private consumption growth has been biased towards services/nontradable goods after 1990, a familiar enough trend associated with rising per capita incomes. Bivariate regressions of each of the demand indicators upon the relative nontradables inflation rate (Figures 7-9) reveal that growth in real private consumption of services and government consumption expenditure are positively associated with the change in relative nontradable prices. But the negative association with real per capita income growth contradicts theoretical priors[18].







Preliminary evidence thus suggests the following.

- Since the 1980s, there has been a divergence between nontradable and tradable prices.
- Relative to the prices of tradables, nontradable price changes accelerated after 1991, exceeding one percentage point per year, on an average, during 1991-2006.
- The relative nontradable price (with an increase implying a real appreciation) becomes broadly consistent with the 36-country trade weighted real effective exchange rate during the liberalization phase of the economy. In the 1980s, however, the two measures actually move in opposite directions. This indicates that the post-1991 reforms – correction of an overvaluation, which kept the domestic price of tradables unsustainably higher relative to the foreign price, change of exchange rate regime, import liberalization and faster productivity growth in tradable sector – played a significant role in the alignment of internal and external real exchange rate measures.
- The share of the tradable sector, defined as those exporting at least 5 percent of their total value of production, rose from an average 20 percent between 1980-89 to 25 per cent during 1990-2006. In the current decade, the tradable sector's share averages 28 percent. This trend is contrary to the commonly held perception that the share of nontradables in output is rising in India; our disaggregate analysis of changes in respective output shares shows that it is actually the opposite. The confusion arises from equating services with nontradability; close to a quarter percent (23 percent) of services' output was traded in 2006 and the share of traded services in total production, driven by communication and business services, averaged 9 percent in 1990-2006.
- On average, tradable-nontradable labor productivity growth differentials widened in the 1980-89 period, but narrowed significantly during 1992-2004. Relative nontradable prices, on the other hand, rose throughout the sample period. The narrowing of the tradable-nontradable productivity growth gap in 1992-2004 along

[18] 1979 and 1991 are years of oil shock and macroeconomic crisis when per capita income is negatively impacted. Likewise, labor productivity growth is adversely affected during exchange rate depreciation episodes

(continued)

with acceleration in relative price of nontradables at the same time is inconsistent with the Balassa-Samuelson hypothesis.

- The increase in the relative price of nontradables is positively associated with change in the share of tradables in total output, suggesting classic Balassa-Samuelson effects via widening productivity growth differentials between the tradable-nontradable sectors. However, the labor productivity growth gap narrowed in the 1990s, possibly reflecting liberalization and deregulation effects.
- Both private and public demand show big increases in the 1980s. Though growth in public demand slows down in the post-reform phase, private demand accelerates. Preliminary trends reveal increased demand for services (nontradable) after 1990, which ought to reflect in an expansion of the nontradable sector. However, the tradable sector actually expands during this period! This suggests a role for liberalization effects in the economy - increased competitiveness via lower import (input) prices, exchange rate correction (overvaluation) that possibly made some individual sectors more tradable and competition and deregulation effects upon prices.

Initial evidence thus suggests that both supply and demand factors might play a role in the observed increase in the relative prices of nontradables since the 1980s. The evidence that productivity growth gap between tradable-nontradable sectors actually narrowed in the 1990s but relative nontradable prices rose throughout the two decades suggests a real appreciation via Balassa-Samuelson effect in the 1980s and through demand channels in the 1990s. The next section examines these aspects econometrically.

5. Determinants of the Relative Price of Nontradables: Formal Evidence

Based upon the theoretical discussion of Section 2, the relative price of nontradables is posited as a function of both supply and demand factors. The estimated equation takes the

(1991, 1997, 1998 and 2001) through increases in the price of imported inputs.

form of Equation 1, where the dependent variable, P_{nt}/P_t, is the relative price level of nontraded goods. The explanatory variables are, g_t, the log of government consumption

$$P_{nt}/P_t = a + b_0(g_t) + b_1(a_t - a_{nt}) + b_2(y_t) + e_t \quad (1)$$

expenditure as share of GDP (both in real terms); $a_t - an_t$, the labor productivity growth differential between the traded and nontraded sectors and y_t, real per capita income growth. e_t is the error term. As in De Gregorio and Wolf (1994), Chinn & Johnston (1996) and Chinn (2000), Equation 2 augments the standard productivity model to incorporate terms of trade fluctuations, allowing additional supply influences upon the relative price of nontradables.

$$P_{nt}/P_t = a + b_0(g_t) + b_1(a_t - a_{nt}) + b_2(y_t) + b_3\left(P_x/P_m\right) + e_t \quad (2)$$

where P_x/P_m is the ratio of export prices to import prices. The expected values of respective coefficients on these variables, b_0, b_1, b_2 and b_3, are greater than zero. The sample length, 1980-2006, is guided solely by data availability on sectoral employment shares. A full description of the data sources and variables is provided in the Data appendix. All variables are in logs and the equation is estimated in first differences.[19] Table 1 in the annexure presents different versions of the benchmark equations 1 and 2 through both ordinary least squares and instrument variables methods to control for possible endogeneity and collinearity of the independent variables.[20]

[19] All variables were tested for unit roots and found to be level nonstationary and I (1).

[20] The correlation coefficient between changes in log real per capita income and log import prices is 0.37. Productivity growth is also positively correlated with real per capita income growth, but at 0.10, the correlation coefficient is weak.

The estimated regular productivity model (regressions 1 and 2, Table 1, Annexure) with real government expenditure and per capita income growth capturing the demand influences, shows only fiscal growth exerts a significant impact in both OLS and IV versions, while both real income and productivity growth enter with a wrong sign. A scan of recursive residuals of the regression reveals 1991, a crisis year, is an influential outlier; the recursive residuals stray outside the two standard error bounds, rejecting the hypothesis of parameter constancy (*p-value* less than 0.05). Regression 2 controls for the 1991 outlier, resulting in overall improvement in the goodness-of-fit measures with all coefficients correctly signed. b_1, the coefficient upon relative labor productivity $(a_t - a_{nt})$ is now significant; in terms of magnitude, a 6 percent increase in the tradable-nontradable labor productivity growth differential results in a one percent increase in the relative nontradable inflation rate. Both regressions indicate that *ceteris paribus*, a one percentage point rise in fiscal growth, g_t, is matched by a little over a one-fifth percentage point rise in the relative nontradable inflation rate. Thus a 5 per cent fiscal expansion in real terms leads to a one percentage point rise in the relative rate of inflation in nontradable goods. Private demand influence (b_2) is equally strong– a 7 percent increase in real per capita income results in a percentage point increase in the relative inflation rate via demand pressures.

Regressions 3-4 allow for additional supply shocks to determine relative price changes by including relative price shifts of tradables. Terms of trade, $\left(\Delta P_x / \Delta P_m\right)$, enters with a negative sign and is insignificant (Regression 3). All other variables remain unchanged in size and significance, pointing to the robustness of the benchmark specification. To examine the effects of changes in tradable goods' prices, export and import price fluctuations were also entered as separate variables (not reported here), but the coefficient upon change in export prices is wrongly signed and insignificant. The import prices' coefficient (Regression 4) however, is insignificantly different from unity: a price increase in imported goods corresponds to a decline in the relative price of nontradables, implying that the income effect dominates. Regression 4 is the final augmented productivity model; the insignificant export price variable is dropped, retaining only the supply-side impact of import price changes. The

coefficient on annual change in import prices implies a pass-through between 0.05-0.07, suggesting that a very small portion of a positive (negative) external shock is absorbed into the economy through changes in domestic nominal prices. Both fiscal growth and relative labor productivity are robust across all specifications and estimation methods.

The estimated magnitude of the Balassa-Samuelson impact, 0.06-0.15, for India is smaller than the panel regression estimates obtained for the OECD[21] and East Asian economies.[22] Estimates for the transition and accession countries of the European Union are also generally higher,[23] though these mask wide, within-group variation.[24] The relatively small magnitude of the Balassa-Samuelson impact for India could be due to several reasons. First, problems in the measurement and quality of data on labor productivity may be affecting the results. In particular, the Balassa-Samuelson hypothesis also refers to total factor productivity whereas the lack of data on sectoral capital stock limits our relevant measure to labor productivity. Two, the assumption of open capital markets is strained for much of the sample period; capital account restrictions were relaxed only after 1991 and the process has been slow, qualified and still incomplete. Similarly, rigidities in inter-sectoral resource allocation question the assumption of labor mobility in the model.[25]

[21] These range between 0.10-0.76 with the labor productivity measure (See Chinn & Johnston, 1996, for a summary of empirical estimates). De Gregorio, Giovannini and Wolf (1994) estimates range between 0.10-0.26, with the total factor productivity measure. Rogoff (1992) estimates a manufacturing labor productivity shock of -0.6 to -0.7 for the yen/dollar real exchange rate.

[22] Chinn's (2000) estimates for a panel of East Asian economies lie between 0.21-0.63.

[23] Jazbec (2002) panel estimates range from 0.86-1.33 for a panel of 19 EU transition economies over 1990-1998.

[24] Backe (2002) reviews the important empirical literature, pointing out that the annual Balassa-Samuelson effects estimated across these studies varies from a low 0.8 percent for the Czech Republic to 3.5 percent for Slovenia, 5.6 percent for Hungary and 9.4 percent for Poland.

[25] Recent empirical work on the impact of trade liberalization on poverty in India, finds no evidence of labor reallocation after 1991, confirming a sluggish labor market response (Topalova, 2004). Consistent with low structural reallocation, employment labor shares remained constant with returns to factors (wages and industry premia) responding to the adjustment.

The significant role of demand factors uncovered in the exercise supports the imperfect capital mobility assumption for India.[26] The demand influence originating from a shift in preferences towards nontradables lies in the range of 0.15-0.19 which, in conjunction with the coefficient of 0.20 for fiscal growth, reveals a pronounced role of demand factors in determining domestic relative price changes. The supply side influences, represented by relative labor productivity growth and change in import prices, are relatively smaller, though it would be reasonable to assume a stronger effect were more accurate productivity growth measures available.

Stability: Accounting for post-1991 reforms/liberalization effects:

The equations fitted above assume that no relevant factors other than public and private demand, productivity growth differentials and tradable prices were changing over the period considered. But this assumption is violated in the latter half of the sample, which is characterized by changing production and price structures due to economic reforms instituted after the 1991 crisis. The discussion in Section 3 mentioned trade liberalization, deregulation of prices and increased competition in some sectors. These reforms possibly impacted relative prices, in which case the non-inclusion of this factor in the estimated equation could possibly overestimate the importance of demand and supply factors.

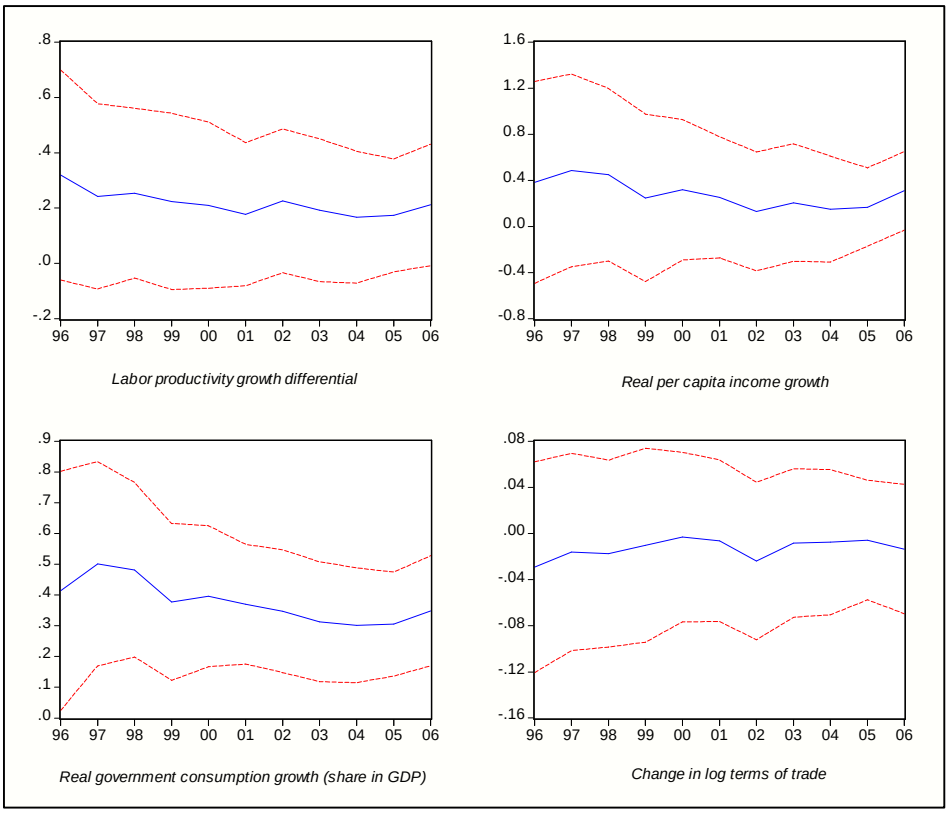
Regression 5 therefore, re-runs the augmented productivity specification with a post-reform binary variable to capture structural changes during the transition process. The coefficient on the reforms dummy is statistically significant suggesting that post-1991 changes contributed towards the higher rate of inflation in nontradables. The dummy size estimates the increase in relative price of nontradables to be at a higher rate of 0.82 percent in the post-reform period. The result is robust to different specifications of the benchmark specification. To push the stability investigation further, the full specification was re-estimated through recursive least

[26] DeGregorio, Giovannini and Wolf (1994) argue that demand side factors will affect relative prices only if the assumptions of perfect competition in goods and factor markets, purchasing power parity for traded goods and perfect capital mobility are relaxed.

squares, where the equation is estimated repeatedly, using ever larger subsets of the sample data.

Figures 10-13 trace the evolution of coefficient estimates for all feasible recursive estimations of $(a_t - a_{nt})$, g_t, y_t and Δp_m (change in log import prices), along with the two standard error bands. The recursive coefficient estimates indicate no evidence of parameter instability for any of the explanatory variables. However, fiscal growth impact tends to weaken after 1996 and private demand influence acquires greater significance towards the end of the sample period, which is unsurprising as per capita income growth has been extraordinarily strong, averaging more than 7 percent annually (2003-2006).

Figures 10-13 Recursive coefficient estimates *(dotted lines are +/- 2 SE bands)*



Sensitivity Analysis: Apart from robustness to different estimation methods and stability checks, the above regressions were also subjected to sensitivity analysis of the explanatory variables to substitution with other proxy measures.[27]

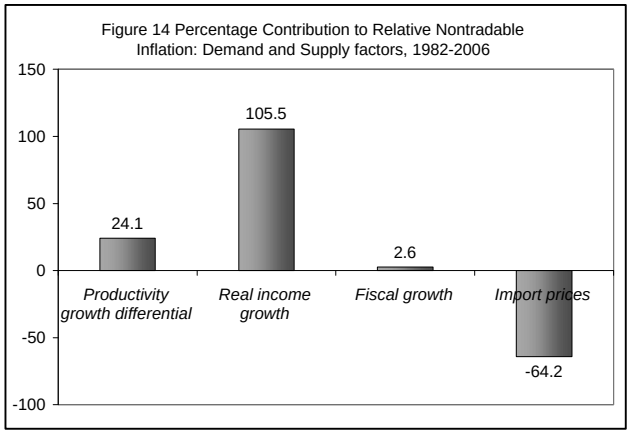
- Productivity growth in the tradable and nontradable sectors was entered as separate variables to test whether productivity gains in nontradable services' categories played a role in inflation divergence. The result confirms that productivity growth in the tradable sector is the source of supply side influence with a mean point estimate of 0.15. The coefficient on nontradables' productivity growth is correctly signed but insignificant across all estimations. Both fiscal and income growth variables are robust to this substitution.
- Real government consumption was entered as two separate variables –compensation to employees and purchases - to test the proposition that government expenditure falls more heavily on nontradable goods. The results from these regressions are slightly ambiguous: the wages' impact is always significant in all versions of the regression equation with a coefficient size of 0.10, while the coefficient on government purchases is inconsistent. All other explanatory variables are robust to the substitution except the coefficient on real per capita income growth, which turns totally insignificant in this version. The results suggest that the aggregate consumption measure g_t is a better indicator of fiscal growth.
- Real per capita income growth was substituted by the growth in the real share of services in private final consumption expenditure (ratio to GDP), using a closer measure of the 'preferences' hypothesis. Though this definition of 'preferences' is upheld in the basic specification, where the significant coefficient is estimated between 0.18-0.21, the hypothesis is rejected in the augmented specification with import price changes. All other variables are robust to this definition.

The Relative Contribution of Demand and Supply Factors

[27] These regressions are not reported here but obtainable from the authors on request.

To further disentangle the relative contribution of demand and supply factors, the coefficient estimates from the regression results (Regression 4) are used to decompose the mean relative price change over the sample period. Figure 14 displays the approximate contributions of each independent variable to the mean of the dependent variable. The decomposition shows that demand factors, income and fiscal growth, accounted for almost the entire average relative price increase over the sample period, but for the offsetting impact of lowered import prices. Accounting for 64.2 percent of the average increase in relative prices during the sample period, their role in widening inflation differentials is not inconsiderable. Noting that import policy reforms were pursued almost throughout the sample period, this result underscores the role of convergence in tradable prices and its contribution to the divergence in sectoral inflation rates. In contrast, supply side influences stemming from labor productivity growth in the tradable sector account for only a quarter percent of the mean of the dependent variable.

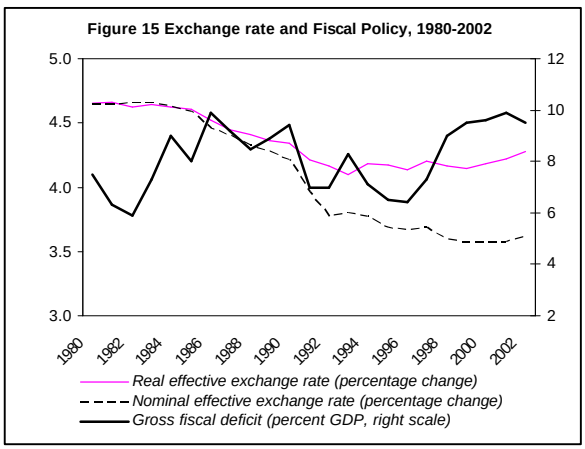
Figure 14 Percentage Contribution to Relative Nontradable Inflation: Demand and Supply factors, 1982-2006



An Application to Macroeconomic Policies

The prominent role of demand factors in driving the relative price of nontradables uncovered in our empirical exercise serves to illuminate the evolution of exchange rate and fiscal policies during much of the sample period. Between 1980 and 1998, the nominal exchange

Figure 15 Exchange rate and Fiscal Policy, 1980-2002

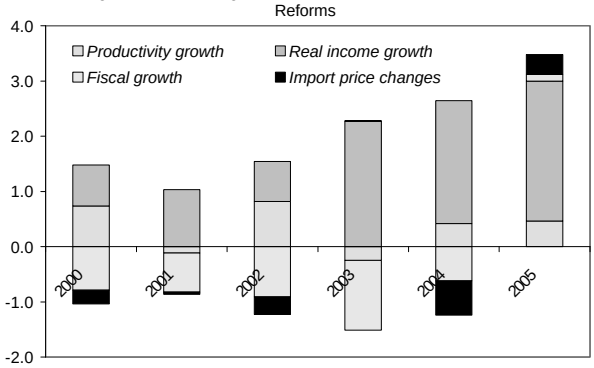


rate depreciated by an average 5 percent annually, including an 'active' devaluation phase (1986-90) of an annual average of 9.7 percent,[28] which slowed to 2.8 percent between 1993-98. Fiscal policy, on the other hand, was expansionary throughout this period (Figure 15).

Corresponding to the depreciation episodes, the consolidated fiscal deficit to GDP ratio averaged 9.2 and 7.4 percent respectively. The extent of internal real appreciation implied by the change in the relative price of nontradables during these nominal depreciation episodes is 1.03 percent (1986-90) and 1.29 percent (1993-98) annually. Our results demonstrate that along with productivity and income growth, this fiscal expansion added considerably to the relative price increase throughout the eighties and the early nineties. As fiscal support was absent in correcting relative price distortions, nominal exchange rate policy was actively deployed to recover competitiveness and offset the impact of fiscal expansion during this period. The scrutiny of past macroeconomic policies thus illustrates how the exchange rate regime is determined to adjust the real exchange rate when fiscal imbalances are persistent and reforms are delayed.

Structural reforms to restore fiscal balance were initiated only after the macroeconomic crisis in 1991; after a brief phase of correction from 1992 to 1996, fiscal reforms were again delayed until 1998-99.[29] Our results can be used further to endorse the role of fiscal policy in correcting relative price changes induced by

Figure 16 Accounting for Relative Price Levels: Role of Fiscal Reforms



Source: Author's calculations

[28] Joshi and Little, (1994) point out that the rupee was devalued to keep the real exchange rate constant between 1983-85, followed by an active nominal devaluation policy between 1986-90 to produce a real depreciation that helped export growth (Joshi and Little, 1994: pp. 277).

[29] Commitment to fiscal reforms has become binding with the rule based Fiscal Responsibility and Budget Management Act, 2003. Under this, fiscal deficit is to be brought down to 3 per cent of GDP and revenue deficit to be completely eliminated by March 2009.

structural factors in a fast-growing economy. For each year since 2000, the stacked columns (adding up to the fitted values from the regression) in Figure 16 trace the dynamics of each variable (column portions) in explaining the relative price level. This shows that on average, private demand and productivity growth have contributed the most to the relative nontradable price level in the recent period of strong GDP growth that averages 8.7 percent during 2003-06. Simultaneous fiscal correction, leading to a decline in the gross fiscal deficit of magnitudes ranging from 0.3-1.1 percentage points every year, restrained relative prices from accelerating more than they might have during this period rapid growth. Figure 16 traces the dynamic contribution of fiscal reforms in this process, underlining the role of fiscal policy in reducing appreciation pressures.

6. Policy Implications and Conclusion

This paper examines the evolution of prices in the nontradable and tradable sectors of the Indian economy over 1980-2006 and finds widening inflation differentials between the two sectors. After 1990, the nontradable sector is characterized by acceleration in the rate of inflation that is coincident with narrowing relative labor productivity growth differentials and expanding tradable sector output. Our results show that both demand and supply factors have contributed to this real appreciation. For the period as a whole, real income growth and fiscal expansion along with a relatively faster labor productivity growth in the tradable sector have been the key drivers of the relative price increase. After 1990, real per capita income growth has been the major source of the higher rate of inflation observed in the nontradable sector. The simultaneous increase in the share of tradables in total output indicates that demand influences did not, however, result in a resource shift away from the tradable sector. By increasing competitiveness and rendering some sectors more tradable through correction of overvaluation, reforms like import liberalization and change in exchange rate regime played an important part in this process.

The research draws particular attention to the importance of relative price shifts within the tradable sector, i.e. reduction in import prices, in changing domestic relative prices. As goods

and services markets get integrated, structural factors such as convergence in domestic-foreign price levels due to progress in trade reforms will contribute significantly to inflation divergence. So the real appreciation may well continue. In the light of the beneficial impact of import liberalization[30] and an increasing share of imported inputs in domestic production, the necessity of continuing trade reforms deserves emphasis with the use of other policies, i.e. fiscal policy, to achieve inflation convergence.

This conclusion is reinforced when the picture is extended beyond our study period. Emerging trends in the economy strongly point towards an acceleration of forces impacting relative price movements. These are, *inter alia*, a strong GDP growth rate averaging 8.8 percent over 2003-07, an average export growth of 24.1 percent during the same period, an above average 7.0 per cent real per capita income growth along with sizeable productivity gains in export-oriented industries.[31] A steadily rising inflow of portfolio capital, which averaged 8.8 billion dollars over 2003-06, adds force to these trends. Though our results do not include the impact of capital inflows, we recognize that the tendency for real appreciation induced by relative price changes is reinforced by capital inflows which impact the real exchange rate via the nominal rate and through the foreign direct investment channel. Last of all, an economy undergoing structural changes, as India is, will experience relative price shifts due to factors like liberalization, adjustment of regulated prices and competition mentioned earlier in the paper.

What do these trends signify for future macroeconomic policy? To the extent that a real exchange rate appreciation (increase in the relative prices of nontradable goods) is productivity driven, it is an equilibrium phenomenon and reflects a natural evolution of the economy. This trend appreciation will also be reinforced by the associated increases in

[30] At the firm level, trade liberalization has been particularly beneficial to total factor productivity growth in industries close to the technological frontier (Aghion et al., 2003; Siddharthan and Lal, 2004), firms located in regions or sectors with a more flexible labor environment and those that were privately managed (Topalova, 2004).

[31] Reddy (2005) points out that productivity and per capita income growth induced pressures have grown considerably since 2000, particularly in manufacturing (Also see Dholakia and Kapur, 2001, Unel, 2003).

incomes, particularly if demand is biased towards services as living standards rise to converge towards those in more advanced economies.[32] As these evolutionary processes cannot be restrained and must be absorbed, they bring to the fore the necessity of freeing the exchange rate regime to absorb these effects through a nominal appreciation. In this context, a welcome development in recent times is a more flexible exchange rate regime From 1998 to 2003, nominal devaluation against the US dollar has been only 0.03 percent; since 2003, both the nominal and real exchange rate have appreciated by 0.8 and 1.6 percent respectively, signifying some absorption of appreciation pressures.

Real appreciation arising from persistent fiscal deficits, however, is not an equilibrium phenomenon. Our results suggest a 0.20 percent cut in real government expenditure to GDP ratio could result in a one percent real depreciation through a decline in the inflation rate in the nontradable goods sector. In addition, fiscal consolidation that reorients spending towards education and infrastructure would boost the productivity of the nontradable sector, further reducing the relative gap vis-à-vis the tradable sector. Thus continuing fiscal reforms could significantly facilitate absorption of equilibrium shifts induced by productivity and income growth.

Finally, our research contributes by providing a tradable-nontradable characterization of the economy, which to the best of our knowledge, has not been attempted so far. With the growing openness of the economy in every sphere, this distinction provides a useful framework of analysis. In addition, our paper raises a number of critical data issues, not the least of which is the absence of a services' price index in India. Our implicit price series strongly suggest an understatement of generalized inflation through the current inflation indicator, the wholesale price index (WPI), which can be misleading. It also identifies gaps in

[32] Illustratively, strong demand pressures originating from rapid income growth could affect competitiveness if it leads to wage pressures in the tradable sector. In a competitive environment, a strong and persistent demand bias towards nontradable goods (many services) could induce productivity growth and consequent wage increases in the nontradable sector.

data on sectoral employment shares, emphasizing the need for sufficiently disaggregated information to enable fruitful analysis and informed policy-making.

References

Acharya, S. (2006) "If Growth were Slower…?" *Business Standard*, December 28, 2006.

Aghion, P., R. Burgess, S. Redding and F. Zilibotti, 2003, "The Unequal Effects of Liberalization: Theory & Evidence from India," mimeo.

Ahluwalia, M. S., 2002, "Economic Reforms in India since 1991: Has Gradualism Worked?," *The Journal of Economic Perspectives*, Vol. 16, No. 3 (Nashville, Tennessee: American Economic Association).

Altissimo, F. P. Benigno and D. R. Palenzuela (2005) "Long run Determinants of Inflation in a Monetary Union, NBER Working Paper 11473, Cambridge, MA, June.

Backé, P., 2002, "Disinflation in Central and Eastern European EU Accession Countries," Background paper for the *Conference of the National Bank of Poland on Economic Policy Directions in the OECD Countries and Emerging Markets: Analyzing the Experiences*, Warsaw, March 21–22.

Balassa, B. (1964) "The Purchasing Power Parity Doctrine: A Reappraisal" *Journal of Political Economy*, Vol. 72, pp. 584-96.

Bergstrand, J. H. (1991) "Structural Determinants of Real Exchange Rates and National Price Levels: Some Empirical Evidence", *American Economic Review*, Vol. 81 (1), March, 325-33

Bhagwati, J. (1984) "Why are Services Cheaper in the Poor Countries?" *Economic Journal*, June 1984, 94, 279-86.

Bosworth, B., S. Collins & A. Virmani (2006) "Sources of Growth in the Indian Economy", Paper prepared for Indian Policy Forum, New Delhi, July 31-Aug.1, 2006.

Bosworth, B. and J. Triplett (2004) *Productivity in the US Services Sector: New Sources of Economic Growth*, Brookings Institution, 2004.

Canzoneri, M. B., R. E. Cumby & B. Diba (1999) "Relative Labor Productivity and the Real Exchange Rate in the Long Run: Evidence for a Panel of OECD Countries *Journal of International Economics*, Vol. 47, pp. 245-66.

Choudhri, E. U. & M. Khan (2004) "Real Exchange Rates in Developing Countries: Are Balassa-Samuelson Effects Present?" *IMF Working Paper*, WP/04/188, October 2004.

Chinn, M. and L. Johnston (1996) “Real Exchange Rate Levels, Productivity and Demand Shocks: Evidence from a Panel of 14 countries” *NBER Working Paper* 5709, August, 1996.

Chinn, M. (2000) “The Usual Suspects? Productivity and Demand Shocks and Asia-Pacific Real Exchange Rates”, *Review of International Economics*, 8 (1), 20-43

De Grauwe, P. and F. Skudelny (2000) “Inflation and Productivity Differentials in EMU” University of Leuven, Discussion Paper N 00/15, June 2000.

De Gregorio, J. A. Giovannini & H. C. Wolff, (1993) “International Evidence on Tradables and Nontradable Inflation, NBER *Working Paper*, 4438, August 1993.

De Gregorio, J. A. Giovannini & H. C. Wolff, (1994) “The Behavior of Nontradable-Goods Prices in Europe: Evidence and Interpretation, *Review of International Economics*, 2(3) pp. 284-305.

De Gregorio & H.C. Wolf, 1994 “Terms of Trade, Productivity and the Real Exchange Rate”, NBER *Working Paper* 4807, July.

Dholakia, R.H. and D. Kapur (2001) "Economic Reforms and Trade Performance: Private Corporate Sector in India*", Economic and Political Weekly*, Volume 36, No. 49, 2001.

Dornbusch, R. (1988) “Purchasing Power Parity in Eatwell et al (eds.), *The New Palgrave Dictionary of Economics*, London, Macmillan, 1075-85.

Edwards, D. (1989), *Real Exchange Rates, Devaluation and Adjustment: Exchange Rate Policy in Developing Countries* (MIT Press, Cambridge, MA).

Froot, K. and K. Rogoff (1991) ‘Government Spending and the Real Exchange Rate: The Empirical Evidence” Mimeo, Harvard University.

Halpern L. and C. Wyplosz (2001) “Economic Transformation and Real Exchange Rates in the 2000s: The Balassa-Samuelson Connection” Paper commissioned by United Nations Economic Commission for Europe and published as Chapter 6 in Economic Survey of Europe, 2001, No. 1, UN/ECE, Geneva, September.

Hinkle, L. E. and P. J. Montiel (1999) *Exchange Rate Misalignment: Concepts and Measurement for Developing Countries* World Bank Research Publication, Oxford University Press.

Ito, T., P. Isard and S. Symansky, (1997) “Economic Growth and the Real exchange Rate: An Overview of the Balassa-Samuelson Hypothesis in Asia” NBER *Working Paper*, 5979, March (Cambridge, Massachusetts, National Bureau of Economic Research).

Jazbec, B. (2002) “Real Exchange Rates in Transition Economies” William Davidson *Working Paper* Number 482, July.

Joshi, V. and I. M. D. Little (1994), *India: Macroeconomics and Political Economy: 1961–91*, Washington, DC: World Bank.

Kato Atsushi, (2005) "Product Market Competition and Productivity in Indian Manufacturing Industry", *Working Paper Series* No. E/263, Institute of Economic Growth, New Delhi.

Kohli and Mohapatra, 2006 “Inflation and the Services Sector in India” *India: Selected Issues*, IMF Country Report No. 06/56, February.

Kravis, I. B and R. Lipsey, (1983) *Toward an Explanation of National Price Levels*, Princeton Studies in International Finance No. 52, Princeton, NJ: International Finance Center, Princeton University, 1983.

Kravis, I. B. and R. Lipsey (1988) “National Price Levels and the Prices of Tradables and Nontradables” American Economic Review, May 1988 (Papers and Proceedings), 78, 474-8.

Lal, D., S. Bery and D. Pant (2003), “The Real Exchange Rate, Fiscal Deficits and. Capital Flows: India: 1981-2000”, Economic and Political Weekly, Vol. 38. (No. 47, November 22-28) pp 4965- 4976

Obstfeld, M. and K. Rogoff (1996) *Foundations of International Macroeconomics*. Cambridge, MA: MIT Press.

Rajaraman, I. (2007) “Service Sector Growth” *Economic Times*, January 9, 2007.

Reddy, Y. V. (2005) ‘Importance of Productivity in India’, Inaugural address by Dr. Y.V. Reddy, Governor, Reserve Bank of India, at the Annual Conference of Indian Economic Association, December 27, 2005, Andhra University, Visakhapatnam.

Reserve Bank of India, "Report on Currency and Finance, 2002-03", 2004.

Rogoff, Kenneth. 1992. “Traded Goods Consumption Smoothing and the Random Walk Behavior of the Real Exchange Rate.” *Bank of Japan Monetary and Economic Studies*, 10: 1–29.

Samuelson, P. A. 1964 “Theoretical Notes on Trade Problems, Review of Economics and Statistics, Vol. 46, pp. 145-54.

Siddharthan, N. S., and K. Lal, 2004, “Liberalization, MNE and Productivity of Indian Enterprises,” *Economic and Political Weekly*, Vol. 39, No. 5, pp. 448–52.

Topalova, P., 2004a, “Trade Liberalization and Firm Productivity: The Case of India,” IMF Working Paper No. 04/28 (Washington: International Monetary Fund).

Unel, Bulent, "Productivity Trends in India's Manufacturing Sectors in the last Two Decades", IMF Working Paper No. WP/03/22.

Data Appendix

Variable Name	*Definition/Construction of Variable*	*Source*
P_{nt}/P_t	Sectoral gross value added deflator, classified as described in the text	CSO, National Accounts Statistics
g_t	Government Final Consumption Expenditure/GDP at Constant prices	CSO, National Accounts Statistics
y_t	Per capita Income	World Development Indicators (WDI)
$a_t - a_{nt}$	Relative Labor Productivity growth in Manufacturing and services (plus agricultural sector)	CSO, National Accounts Statistics & CEIC data base
P_x/P_m	Unit value of Exports & Unit value of Imports	International Financial Statistics

Appendix

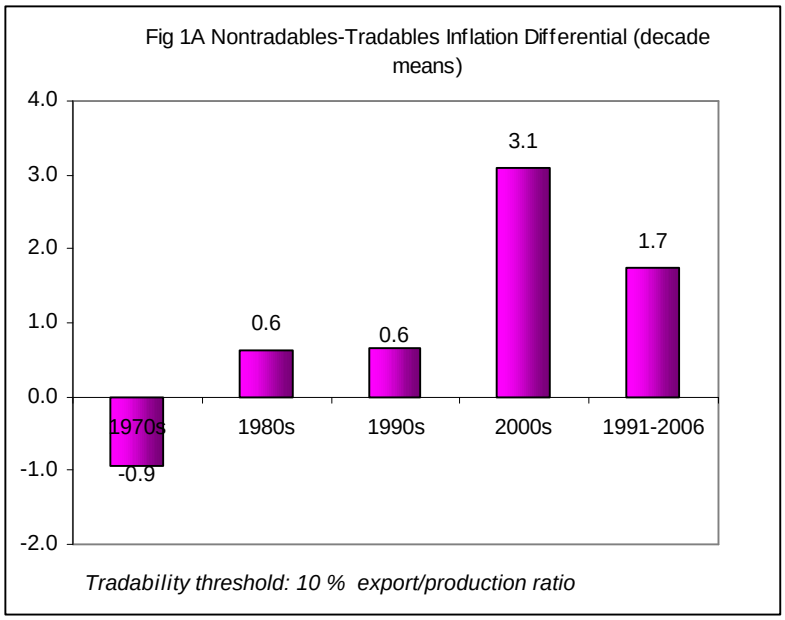


Fig 1A Nontradables-Tradables Inflation Differential (decade means)
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
3.1
1.7
0.6
0.6
-0.9
1970s
1980s
1990s
2000s
1991-2006
Tradability threshold: 10 % export/production ratio

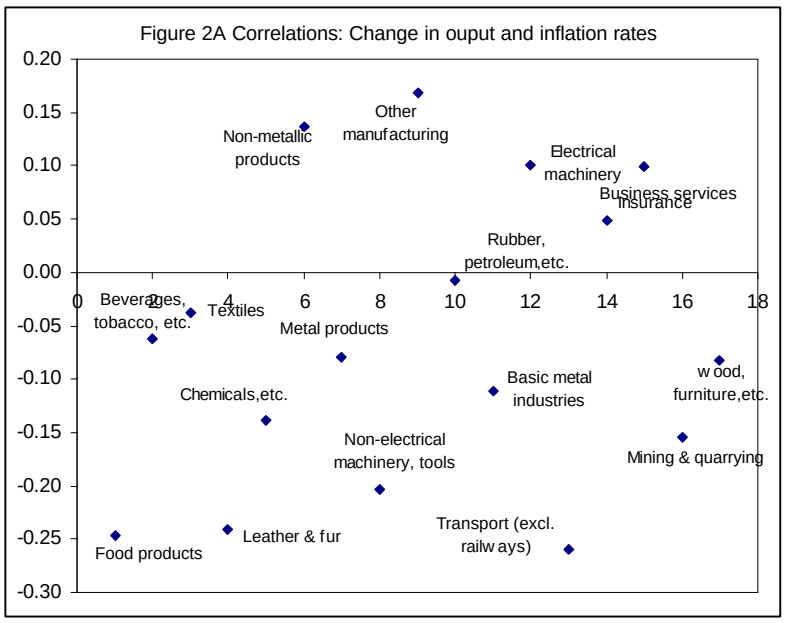


Figure 2A Correlations: Change in ouput and inflation rates
0.20
0.15
0.10
0.05
0.00
-0.05
-0.10
-0.15
-0.20
-0.25
-0.30
0
2
4
6
8
10
12
14
16
18
Other manufacturing
Non-metallic products
Electrical machinery
Business services
Insurance
Rubber, petroleum,etc.
Beverages, tobacco, etc.
Textiles
Metal products
Basic metal industries
w ood, furniture,etc.
Chemicals,etc.
Non-electrical machinery, tools
Mining & quarrying
Transport (excl. railw ays)
Leather & fur
Food products

Annexure

Table 1 Basic and Augmented productivity model estimates, 1981-2006

	Basic productivity model				Augmented productivity model					
	(1)		(2)		(3)		(4)		(5) With Reforms	
Dependent Variable $\Delta P_{nt} / \Delta P_t$	**OLS**	**IV**	**OLS**	**IV**	**OLS**	**IV**	**OLS**	**IV**	**OLS**	**IV**
Productivity growth differential	-0.07 (0.67)	-0.07 (0.67)	0.15* (1.67)	0.06* (1.92)	0.13 (1.39)	0.07* (1.72)	0.11 (1.13)	0.09* (1.70)	0.17* (1.78)	0.16* (1.78)
Real govt. consumption (share of GDP)	0.18*** (2.57)	0.22** (1.81)	0.30*** (3.30)	0.25*** (3.83)	0.29*** (4.10)	0.26*** (3.42)	0.26*** (3.02)	0.21*** (3.04)	0.30*** (3.51)	0.27*** (2.44)
Real per capita income (share of GDP)	-0.03 (0.12)	0.21 (0.43)	0.35** (1.90)	0.15* (1.70)	0.008 (0.08)	0.19* (1.71)	0.19 (1.50)	0.18** (2.68)	0.17 (1.35)	0.27* (1.75)
Terms of Trade					-0.03 (1.23)	-0.03 (1.30)				
Price of Imports							-0.01 (0.57)	-0.07** (2.85)	-0.0002 (0.02)	-0. 04 (1.83)
1991 Dummy			4.74*** (4.73)	5.76*** (16.1)	6.28*** (10.1)	6.08*** (12.1)	6.79*** (4.58)	7.00*** (9.45)	6.70*** (4.29)	8.04*** (3.60)
Reforms dummy									0.90* (1.90)	0.60* (1.80)
Adj. R2	0.17	-0.04	0.52	0.38	0.49	0.37	0.44	0.33	0.47	0.47
DW	2.30	2.71	1.85	1.72	1.84	1.72	1.99	2.20	2.13	2.13
S.E.	1.81	1.92	1.41	1.47	1.31	1.50	1.30	1.44	1.27	1.27
Obs.	25	23	25	23	25	23	25	23	24	24

OLS and IV specifications with heteroskedasticity consistent errors. ***, ** and * indicate 1, 5 and 10 % significance levels respectively.

Table 2 Implicit inflation rates – Tradable manufacturing sub-sectors

	Food products	Beverages, tobacco, etc.	Textile products	Leather, fur products	Rubber, petroleum, etc.	Chemicals, etc.	Non-metallic products	Basic metal industries	Metal products & machinery	Electrical machinery	Other mfg	Total traded mfg
1980-81	10.5	-5.4	5.7	-3.0	27.3	19.7	24.8	5.5	18.4	8.2	20.5	12.3
1981-82	-1.4	3.6	1.9	-3.7	22.0	13.5	13.0	19.7	11.8	6.1	3.7	8.0
1982-83	-7.9	0.4	4.4	-1.5	5.0	0.1	22.6	12.3	6.8	5.3	0.4	4.7
1983-84	27.2	16.4	8.4	6.7	5.5	5.6	9.0	8.1	7.3	4.3	2.9	8.5
1984-85	3.6	3.0	9.9	8.2	3.5	3.9	7.2	5.9	5.2	7.0	6.0	6.9
1985-86	5.7	14.5	1.9	17.6	10.0	6.8	5.0	14.8	11.2	7.7	6.5	8.1
1986-87	8.6	19.7	0.7	4.7	2.8	5.9	-0.7	1.3	2.8	5.6	5.2	4.7
1987-88	6.4	3.4	12.8	5.1	7.4	8.0	2.3	12.7	6.6	2.7	3.0	8.2
1988-89	2.9	6.8	7.3	14.0	0.8	6.9	4.0	21.5	13.8	14.6	2.3	7.6
1989-90	13.8	14.2	16.3	13.0	1.1	3.7	10.9	11.9	18.9	9.7	7.0	11.8
1990-91	14.0	17.7	8.3	20.2	11.6	6.3	12.2	6.9	10.6	7.4	4.3	9.9
1991-92	13.2	10.5	9.7	4.2	9.7	14.4	17.2	6.5	12.0	13.5	8.8	10.9
1992-93	6.9	11.0	9.9	-3.1	12.5	16.4	7.1	9.6	13.2	6.7	13.6	10.4
1993-94	9.3	4.5	9.6	8.7	6.3	8.6	9.7	8.3	1.6	9.8	1.7	6.9
1994-95	13.4	19.4	15.6	8.1	6.5	17.2	12.0	10.2	7.6	6.1	12.3	12.8
1995-96	3.8	8.3	13.0	9.3	9.0	10.9	17.3	12.9	9.0	4.5	10.2	9.8
1996-97	5.7	6.6	-1.2	1.7	9.4	3.8	3.0	5.1	7.1	-0.4	2.6	4.1
1997-98	10.4	12.5	-0.7	7.0	5.6	4.5	-1.7	3.8	1.8	-3.8	3.2	3.0
1998-99	17.4	11.8	3.5	3.7	1.2	7.5	2.4	1.7	2.4	-1.5	4.8	5.1
1999-00	1.3	5.1	-0.7	17.1	5.9	6.6	-2.9	1.8	1.4	-1.3	3.8	2.6
2000-01	-4.0	2.0	4.6	-3.5	37.1	6.4	5.0	4.0	4.2	8.7	3.5	5.9
2001-02	-0.8	5.4	-0.5	-6.1	5.6	2.9	7.6	0.5	5.1	3.6	1.9	2.7
2002-03	7.4	5.2	2.6	-7.4	6.5	3.0	-0.4	3.7	3.0	-0.9	2.8	3.1
2003-04	11.3	-0.7	7.6	12.3	7.1	2.1	3.5	18.3	3.5	0.2	6.1	6.6
2004-05	4.6	8.9	3.5	6.5	13.2	2.9	6.4	23.1	8.9	4.4	7.1	7.9
2005-06	0.4	8.7	-5.0	6.9	13.2	3.9	8.7	8.6	7.7	3.3	3.7	4.8
2006-07	7.3	11.8	2.4	-4.4	8.7	3.3	14.4	8.6	4.0	9.0	4.9	6.8
Means												
1980-89	6.9	7.7	6.9	6.1	8.5	7.4	9.8	11.4	10.3	7.1	5.7	8.1
1990-2006	7.1	8.8	4.8	4.8	9.9	7.1	7.1	7.8	6.1	4.1	5.6	6.7

Table 3 - Implicit inflation rates – Tradable services sub-sectors

	Transport (excl. railways)	Insurance	Communication services	Legal services	Business services
1980-81	1.0	21.8	-2.1	12.3	11.8
1981-82	12.5	5.3	7.0	14.0	7.8
1982-83	13.2	2.8	17.2	14.4	9.7
1983-84	12.3	10.8	12.3	15.9	18.1
1984-85	10.5	19.2	3.4	9.0	11.8
1985-86	9.8	-2.6	7.9	7.8	10.1
1986-87	11.4	15.7	17.4	9.2	11.6
1987-88	10.8	10.6	36.2	9.9	10.3
1988-89	13.9	19.5	23.0	10.0	10.7
1989-90	10.5	-11.1	6.0	7.9	9.8
1990-91	13.6	25.7	13.7	12.1	12.6
1991-92	12.4	-0.7	15.7	15.0	13.2
1992-93	14.4	22.7	16.6	11.9	12.0
1993-94	11.1	9.8	14.8	8.0	8.2
1994-95	8.1	32.3	10.9	11.0	11.3
1995-96	5.4	-7.1	3.4	10.1	11.7
1996-97	14.1	15.1	9.3	9.2	10.7
1997-98	12.6	-33.5	-2.0	6.3	8.7
1998-99	13.5	4.0	1.0	11.8	15.0
1999-00	6.4	18.7	-16.6	4.8	2.9
2000-01	5.3	10.8	-15.1	3.0	5.6
2001-02	4.4	34.3	-0.4	3.8	5.2
2002-03	3.4	-7.3	-28.9	4.1	4.8
2003-04	6.3	8.6	-6.6	3.9	4.7
2004-05	5.3	-10.8	-5.3	3.9	5.0
2005-06	3.7	-3.2	-8.6	4.3	5.3
2006-07	3.2	-2.4	-6.7	7.2	8.3
Means					
1980-89	10.6	9.2	12.9	11.0	11.2
1990-2006	8.4	6.9	-0.3	7.7	8.5

Table 4 - Implicit inflation rates – Nontradable sub-sectors

	Mining & quarrying	Agriculture, allied sector	Wood, furniture, etc.	Paper & printing, etc.	Transport equipment	Elect. gas & water supply	Construction	Trade, hotels & restaurant	Railways, transport & storage	Banking, insurance, real estate, etc.	Community, social & personal services
1980-81	12.5	12.9	21.6	-36.4	14.0	9.9	16.9	17.9	0.4	8.5	13.0
1981-82	64.6	8.1	14.6	8.3	15.0	6.7	8.8	16.5	29.0	10.3	11.5
1982-83	11.5	8.1	4.7	6.1	4.1	11.7	20.4	5.3	23.7	4.9	8.4
1983-84	9.1	9.2	11.7	9.9	-0.5	11.2	9.6	10.4	14.5	4.5	10.1
1984-85	11.3	6.3	4.0	13.7	5.7	10.1	13.9	11.8	3.3	6.1	8.1
1985-86	1.5	6.9	3.9	3.9	13.7	12.9	11.0	8.2	11.2	5.1	7.4
1986-87	4.3	7.7	-0.1	4.7	5.4	3.4	12.7	5.1	9.1	3.1	7.5
1987-88	1.0	12.8	4.0	3.5	5.8	4.5	12.8	7.0	10.7	5.8	8.7
1988-89	14.6	7.9	11.5	6.9	14.7	6.6	9.6	11.4	10.1	5.2	9.9
1989-90	2.8	9.3	0.7	17.9	11.5	9.9	9.0	9.4	12.4	6.8	6.7
1990-91	2.8	12.7	0.9	7.3	11.3	13.5	9.7	11.7	9.9	8.4	10.9
1991-92	6.2	18.8	1.6	18.5	11.6	12.7	10.3	13.3	6.7	12.1	13.6
1992-93	14.4	5.5	94.6	16.0	7.2	19.3	10.6	10.6	16.5	3.3	10.2
1993-94	14.9	12.7	20.2	6.3	2.9	10.4	9.9	10.4	15.0	9.8	7.8
1994-95	3.5	10.4	10.8	6.7	8.8	16.1	9.5	9.3	12.4	7.2	9.6
1995-96	5.6	9.4	8.8	25.3	11.9	9.7	11.6	8.2	4.2	13.1	10.8
1996-97	9.1	10.3	2.9	-0.1	6.0	2.5	12.0	9.8	3.3	3.0	10.7
1997-98	10.8	8.7	24.2	-3.1	3.7	9.9	13.7	5.7	10.8	3.1	7.7
1998-99	3.9	8.5	29.2	3.5	2.5	16.7	12.1	5.9	-0.4	8.3	12.5
1999-00	12.5	3.5	-2.2	14.3	3.8	-8.6	6.5	4.2	2.4	11.3	3.7
2000-01	7.5	0.9	-7.4	9.8	5.8	1.3	3.6	5.4	-2.2	4.7	3.2
2001-02	3.0	2.0	-2.8	4.6	2.5	1.4	3.9	1.8	-2.1	6.4	3.8
2002-03	22.2	4.3	2.2	0.7	0.5	10.1	3.9	4.0	4.7	5.2	3.7
2003-04	-1.3	2.8	0.2	-0.5	-0.1	-0.8	4.0	3.8	3.1	7.1	3.4
2004-05	24.6	3.8	0.1	0.8	4.9	-2.2	19.6	9.0	3.0	0.7	3.9
2005-06	6.2	5.6	7.9	2.2	4.1	2.9	7.9	7.3	4.0	-0.4	4.2
2006-07	2.4	9.2	7.8	7.4	1.8	3.6	8.8	8.6	7.9	1.1	6.4
Means											
1980-89	13.3	8.9	7.7	3.9	9.0	8.7	12.5	10.3	12.4	6.0	9.1
1990-2006	8.7	7.6	11.7	7.0	5.3	7.0	9.3	7.6	5.8	6.1	7.4

Table 5 Tradable Manufacturing – Within-sector output shares (% Total output)

	Food products	Beverages, tobacco, etc.	Textile products	Leather, fur products	Rubber, petroleum, etc.	Chemicals, etc.	Non-metallic products	Basic metal industries	Metal products & machinery	Electrical machinery	Other mfg	Total traded mfg
1980-81	1.47	0.48	2.34	0.30	0.50	1.19	0.53	1.31	1.73	0.38	0.48	10.71
1981-82	1.62	0.50	2.19	0.31	0.54	1.32	0.55	1.33	1.77	0.37	0.61	11.12
1982-83	1.73	0.49	2.15	0.31	0.63	1.33	0.61	1.21	1.87	0.45	0.67	11.45
1983-84	1.82	0.60	2.12	0.31	0.65	1.50	0.62	1.19	1.89	0.45	0.55	11.71
1984-85	1.74	0.54	2.13	0.31	0.74	1.51	0.67	1.19	2.01	0.53	0.63	12.00
1985-86	1.74	0.46	2.18	0.28	0.69	1.52	0.67	1.24	1.92	0.47	0.75	11.93
1986-87	1.70	0.49	2.22	0.28	0.88	1.49	0.66	1.12	1.86	0.50	0.91	12.10
1987-88	1.70	0.44	2.09	0.29	0.95	1.59	0.69	1.14	2.06	0.63	0.98	12.58
1988-89	1.93	0.53	1.91	0.27	0.98	1.63	0.70	1.36	1.93	0.61	0.82	12.68
1989-90	1.96	0.48	2.06	0.26	1.00	1.81	0.75	1.21	1.95	0.69	0.89	13.06
1990-91	1.76	0.48	2.12	0.27	1.07	1.92	0.78	1.38	1.87	0.72	0.80	13.16
1991-92	1.72	0.51	2.04	0.27	1.04	1.95	0.81	1.44	1.78	0.62	0.67	12.86
1992-93	1.61	0.51	2.02	0.33	1.03	2.16	0.69	1.30	1.72	0.63	0.72	12.73
1993-94	1.79	0.49	2.33	0.37	1.07	2.21	0.66	1.31	1.66	0.60	0.78	13.26
1994-95	1.99	0.49	2.31	0.29	1.05	2.15	0.68	1.50	1.71	0.82	0.77	13.76
1995-96	1.90	0.46	2.12	0.29	1.11	2.51	0.79	1.65	1.94	0.77	0.84	14.36
1996-97	1.74	0.53	2.35	0.27	1.28	2.57	0.91	1.65	1.93	0.73	0.83	14.79
1997-98	1.87	0.55	2.38	0.29	1.11	2.40	0.81	1.57	1.74	0.82	0.92	14.44
1998-99	1.74	0.57	2.08	0.30	1.05	2.66	0.73	1.51	1.81	0.84	0.90	14.18
1999-00	1.64	0.61	2.08	0.29	0.95	2.56	0.92	1.51	1.76	0.76	0.85	13.92
2000-01	1.75	0.57	2.17	0.31	1.03	2.64	0.87	1.47	1.75	0.84	0.88	14.29
2001-02	1.66	0.52	1.97	0.31	1.08	2.62	0.83	1.46	1.49	0.92	0.89	13.74
2002-03	1.80	0.56	2.04	0.29	1.10	2.62	0.84	1.53	1.61	0.79	0.89	14.08
2003-04	1.73	0.53	1.85	0.25	1.06	2.61	0.81	1.54	1.60	0.87	0.87	13.72
2004-05	1.62	0.54	1.94	0.26	1.00	2.79	0.76	1.51	1.65	1.03	0.90	14.00
2005-06	1.51	0.61	1.95	0.22	0.96	2.76	0.77	1.60	1.61	1.06	1.02	14.07
2006-07	1.49	0.62	1.98	0.20	0.99	2.76	0.79	1.79	1.63	1.12	0.99	14.36
Means												
1980-89	1.74	0.50	2.14	0.29	0.76	1.49	0.64	1.23	1.90	0.51	0.73	11.93
1990-2006	1.72	0.54	2.10	0.28	1.06	2.46	0.79	1.51	1.72	0.82	0.85	13.87

Table 6 Tradable Services – Within-sector output shares (% Total output)

	Transport (excl. railways)	Insurance	Communication services	Legal services	Business services	Total traded services
1980-81	3.59	0.55	0.66	0.13	0.42	5.35
1981-82	3.60	0.59	0.68	0.14	0.43	5.43
1982-83	3.68	0.63	0.69	0.14	0.45	5.59
1983-84	3.66	0.67	0.67	0.15	0.55	5.71
1984-85	3.76	0.59	0.70	0.17	0.58	5.80
1985-86	3.85	0.66	0.68	0.17	0.62	5.98
1986-87	3.90	0.70	0.70	0.17	0.67	6.14
1987-88	4.09	0.62	0.71	0.18	0.63	6.23
1988-89	3.96	0.57	0.68	0.17	0.60	5.98
1989-90	4.00	0.90	0.69	0.17	0.61	6.37
1990-91	3.97	0.62	0.70	0.17	0.68	6.14
1991-92	4.14	0.86	0.75	0.18	0.70	6.62
1992-93	4.16	0.68	0.81	0.18	0.71	6.54
1993-94	4.24	0.74	0.88	0.18	0.74	6.79
1994-95	4.39	0.42	0.96	0.18	0.80	6.75
1995-96	4.49	0.56	1.03	0.19	0.92	7.19
1996-97	4.52	0.49	1.05	0.18	0.99	7.24
1997-98	4.58	0.77	1.21	0.17	1.24	7.98
1998-99	4.55	0.77	1.36	0.17	1.44	8.29
1999-00	4.55	0.64	1.57	0.17	0.95	7.87
2000-01	4.71	0.61	1.91	0.17	1.38	8.77
2001-02	4.64	0.66	2.18	0.17	1.57	9.21
2002-03	4.93	0.96	2.68	0.17	1.78	10.52
2003-04	5.08	0.88	3.12	0.16	2.09	11.33
2004-05	5.30	0.94	3.61	0.15	2.42	12.43
2005-06	5.24	0.89	4.17	0.14	2.75	13.18
2006-07	5.22	1.09	4.86	0.14	3.05	14.36
Means						
1980-89	3.8	0.6	0.7	0.2	0.6	5.9
1990-2006	4.6	0.7	1.9	0.2	1.4	8.9

Table 7 Nontraded manufacturing/agriculture – Within-sector output shares (% Total output)

	Mining & quarrying	Agriculture & allied sector	Wood, furniture, etc.	Paper & printing, etc.	Transport equipments	Total non-traded manufacturing
1980-81	2.01	37.80	2.21	0.52	0.66	3.39
1981-82	2.16	37.41	2.14	0.52	0.70	3.36
1982-83	2.35	36.23	1.87	0.48	0.76	3.11
1983-84	2.24	36.99	1.87	0.52	0.77	3.17
1984-85	2.18	36.14	1.53	0.58	0.82	2.93
1985-86	2.20	34.80	1.62	0.56	0.71	2.88
1986-87	2.37	33.21	1.48	0.63	0.80	2.91
1987-88	2.37	31.54	1.44	0.61	0.73	2.78
1988-89	2.50	33.12	1.13	0.60	0.71	2.44
1989-90	2.54	31.55	1.10	0.67	0.74	2.51
1990-91	2.66	31.12	1.01	0.68	0.78	2.47
1991-92	2.70	30.01	0.93	0.71	0.76	2.40
1992-93	2.59	30.42	0.87	0.56	0.68	2.11
1993-94	2.48	29.67	0.84	0.62	0.71	2.16
1994-95	2.55	29.22	0.78	0.64	0.79	2.21
1995-96	2.52	27.08	0.89	0.63	1.11	2.64
1996-97	2.34	27.54	0.90	0.61	1.00	2.51
1997-98	2.46	25.70	0.82	0.54	0.93	2.30
1998-99	2.37	25.60	0.75	0.55	0.76	2.06
1999-00	2.30	24.65	0.60	0.53	0.90	2.03
2000-01	2.26	23.63	0.59	0.46	0.85	1.90
2001-02	2.18	23.78	0.50	0.45	0.86	1.81
2002-03	2.28	21.26	0.40	0.46	0.95	1.81
2003-04	2.17	21.54	0.39	0.49	1.02	1.91
2004-05	2.18	20.03	0.33	0.51	0.99	1.83
2005-06	2.09	19.38	0.29	0.46	1.02	1.76
2006-07	2.02	18.33	0.34	0.45	1.07	1.86
Means						
1980-89	2.3	34.9	1.6	0.6	0.7	2.9
1990-2006	2.4	25.2	0.7	0.5	0.9	2.1

Table 8 Nontraded Services – Within-sector output shares (% Total output)

	Electricity gas & water supply	Construction	Trade, hotels & restaurant	Railway transport & storage	Banking, real estate, dwellings & business services	Community, social & personal services	Total non-traded services
1980-81	1.61	6.57	11.41	1.73	6.36	13.06	39.14
1981-82	1.66	6.56	11.41	1.79	6.48	12.62	38.85
1982-83	1.72	5.93	11.75	1.77	6.90	13.20	39.55
1983-84	1.71	5.79	11.46	1.63	6.90	12.70	38.48
1984-85	1.82	5.76	11.50	1.60	7.21	13.06	39.14
1985-86	1.88	5.84	11.94	1.72	7.56	13.25	40.32
1986-87	1.99	5.73	12.10	1.79	8.00	13.65	41.28
1987-88	2.07	5.85	12.19	1.80	8.46	14.13	42.42
1988-89	2.06	5.69	11.80	1.61	8.51	13.61	41.21
1989-90	2.13	5.73	11.99	1.58	8.74	13.82	41.85
1990-91	2.16	6.07	11.96	1.56	9.03	13.67	42.30
1991-92	2.33	6.10	11.84	1.64	9.71	13.80	43.08
1992-93	2.37	6.00	11.92	1.52	9.90	13.90	43.24
1993-94	2.40	5.69	12.05	1.42	10.38	13.71	43.24
1994-95	2.47	5.64	12.50	1.36	10.35	13.18	43.04
1995-96	2.46	5.58	13.40	1.38	10.20	13.21	43.76
1996-97	2.40	5.26	13.40	1.32	9.99	13.20	43.18
1997-98	2.48	5.56	13.82	1.28	10.29	13.69	44.65
1998-99	2.48	5.54	13.95	1.22	10.22	14.08	45.01
1999-00	2.46	5.63	14.03	1.24	11.14	14.72	46.77
2000-01	2.41	5.75	14.18	1.25	10.74	14.81	46.73
2001-02	2.32	5.66	14.73	1.26	10.71	14.61	46.96
2002-03	2.35	5.89	15.17	1.27	10.73	14.64	47.70
2003-04	2.26	6.08	15.39	1.24	10.14	14.22	47.06
2004-05	2.27	6.57	15.41	1.24	9.90	14.13	47.26
2005-06	2.17	6.99	15.41	1.24	9.87	13.84	47.34
2006-07	2.10	7.13	15.23	1.23	9.90	13.48	46.98
Means							
1980-89	1.9	5.9	11.8	1.7	7.5	13.3	40.2
1990-2006	2.3	5.9	13.8	1.3	10.2	13.9	45.2

Table 9 Labor Productivity Growth in Agriculture, Mining, Manufacturing and Services, 1982-2006:

						Services				
	Agriculture	**Mining & Quarrying**	**Manufacturing**	**Electricity, Gas & Water**	**Services**	**Construction**	**Wholesale & Retail Trade, etc.**	**Transport, Storage & Communication**	**Finance, Insurance, Real Estate etc.**	**Community, Social and Personal Services**
1982/83	-0.83	5.27	2.52	1.04	-1.15	-9.14	5.70	-1.15	-3.43	0.95
1983/84	10.81	-0.88	11.87	5.11	3.57	5.58	3.43	2.84	5.21	1.70
1984/85	1.71	-2.96	6.70	7.94	3.14	0.91	2.27	5.82	1.84	2.27
1985/86	-2.47	6.50	2.59	4.93	6.36	2.78	8.20	6.01	5.90	8.06
1986/87	-4.68	18.36	6.81	10.00	4.71	2.97	5.00	4.84	8.35	4.48
1987/88	-0.84	1.85	7.48	0.28	4.67	3.98	1.62	5.64	4.47	5.65
1988/89	13.68	14.67	9.12	8.74	5.71	11.35	3.35	5.31	9.43	3.58
1989/90	1.13	6.00	10.16	8.03	7.06	8.19	6.55	5.23	9.70	6.54
1990/91	2.52	7.26	6.10	6.48	4.06	10.05	2.95	4.42	3.65	1.88
1991/92	-4.07	4.15	-5.06	9.12	3.35	1.40	0.02	4.97	9.58	1.59
1992/93	6.29	1.25	4.64	5.59	4.24	3.65	7.23	4.91	2.47	3.50
1993/94	7.77	-0.62	8.19	-1.74	5.58	1.40	3.86	6.15	11.22	2.19
1994/95	4.64	8.90	11.12	9.75	6.32	5.51	8.79	8.99	4.15	2.84
1995/96	-2.63	7.76	9.41	5.37	9.55	6.66	12.28	11.40	7.48	7.20
1996/97	10.67	3.29	7.85	4.38	5.33	4.08	7.22	8.12	4.90	4.30
1997/98	-1.68	14.32	2.27	8.09	9.70	10.80	6.75	8.42	10.80	11.47
1998/99	9.88	4.34	4.27	6.25	7.52	6.66	7.34	7.95	5.92	9.60
1999/00	-1.95	4.15	6.04	6.94	10.02	10.73	5.70	11.27	10.46	12.24
2000/01	-1.29	7.86	10.32	4.33	5.39	7.69	2.14	13.28	3.65	4.57
2001/02	13.98	5.23	7.40	6.02	7.79	9.39	11.30	10.39	6.47	5.86
2002-03	-11.17	10.92	10.31	3.18	8.07	17.02	-1.98	15.10	-2.28	4.92
2003-04	8.90	-11.65	13.02	8.65	11.32	8.33	11.23	21.73	3.31	8.85
2004-05	-3.64	5.49	10.33	6.63	8.41	7.41	3.16	17.57	3.80	5.76
Means										
1982-90	2.34	6.23	7.04	5.84	4.24	4.07	4.34	4.33	5.01	3.90
1992-2004	3.06	4.71	8.09	5.65	7.63	7.64	6.54	11.17	5.57	6.41

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Private Schooling in India: A New Educational Landscape

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Prepared for Presentation at the Brookings-NCAER India Policy Forum 2008
New Delhi

July 15-16, 2008

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June 2008

Views presented in this paper are authors' personal views and do not reflect institutional opinions.

The results reported in this paper are based primarily on India Human Development Survey, 2005. This survey was jointly organized by researchers at University of Maryland and the National Council of Applied Economic Research. The data collection was funded by grants R01HD041455 and R01HD046166 from the National Institutes of Health to University of Maryland. Part of the sample represents a resurvey of households initially surveyed by NCAER in 1993-94.

Private Schooling in India: A New Educational Landscape

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Abstract

Private schooling in India has expanded rapidly in the past decade. However, few studies have looked at its implications for educational quality. Using data from the recently collected India Human Development Survey, this paper seeks to provide a description of private schooling in India and examine the effects of private school enrollment on educational quality. The results suggest that controlling for the endogeneity of school choice, children in private schools have higher reading and arithmetic skills than those in government schools. While overall gains are modest in size, about one fourth to one third of a standard deviation, the gains for students from lower economic strata are higher than those for upper income students. The paper explores this relationship by examining the treatment of students from different economic strata in government and private schools and finds that while students from lower economic strata are more likely to be physically punished in government schools than their better off peers, the relationship between parental economic status and physical punishment is negligible in private schools.

Introduction

Although the growth of private schooling in India is quite visible, even in rural areas, the contours of this change remain poorly understood because of data limitations. Official statistics

often tend to underestimate private school enrollment (Kingdon 2007). Moreover, little is known about the effectiveness of private education in India. If parents know what is best for their children and if they are voting with their feet, we might assume that private schools must be of good quality. Two considerations suggest a need for deeper reflection: (1) There is a long history of school quality research in different contexts, particularly in the United States, which suggests that much of the apparent differences in schools are due to parental choices that propel children from certain backgrounds into certain types of schools (Hanushek 1997) and, (2) the panorama of Indian private schools is dotted with small, unrecognized and unregulated schools, frequently with poorly trained teachers. Anybody who has observed some of these schools would not automatically assume that private schools are better than government schools. Hence, it is important to empirically examine the impact of private school enrollment on educational outcomes

So far, lack of appropriate data has made it difficult to explore this issue. However, a new survey, the India Human Development Survey 2005 (IHDS), jointly organized by researchers from the University of Maryland and National Council of Applied Economic Research, makes it possible to explore some of the linkages between private school growth and school quality. Using data from IHDS, this paper will provide a description of public and private schools in India as well as some of the considerations that guide parents in seleecting private schools. In addition to providing descriptive information, it will examine whether private school enrollment is associated with higher student performance and whether this relationship, if any, is concentrated in certain sections of the population.

The School Effects Debate:

The rising tide of private education in developing countries and the recognition that many private schools seem to deliver education at considerably lower costs than public education (Pritchett and Murgai 2007) has given rise to calls for increasing the involvement of the private sector in education and even public-private-partnership in the form of state provision of vouchers for private schools. These calls represent a reversal in the trend seen throughout the 20th century in which public provision of education expanded dramatically and most states believed that education is one of the core functions of any mature civil society (Meyer et al. 1977).

It appears that the policy interest in private schooling has far outpaced the available knowledgebase and while a few studies have tried to examine the determinants and consequences of private schooling in developing countries, we have yet to scratch the surface to examine the effectiveness of the private schooling and to explore the possibility of substantial scaling up without quality dilution. Three streams of research may have important contributions to make in this debate.

School Inputs and Educational Outcomes:

The school effects debate in the United States began with the Coleman report of 1966. This report is most remembered for what it did *not* find, rather than what it did find (Coleman et al. 1966). It failed to find a relationship between school level inputs such as expenditures and teacher quality and children's performance and concluded that children's educational trajectories are determined by their home environments and parental education rather than school level inputs. A small industry has developed in the United States which has tried to address this

counterintuitive finding (Hanushek 1997). [1] Emerging literature on developing countries is also a patchwork of results with weak to negligible relationship between school inputs and child outcomes (Banerjee et al. 2007; Hanushek 1995) although one of the most interesting contributions to this debate emerged with the observation from a study focusing on cross national data that school effects are far more important to children in low income countries (Heyneman and Loxley 1983) where parental characteristics play a less important role than school characteristics (Fuller 1987).

Private Schooling and Education:

A second strand of this discourse centers around the role of private schools. Coleman and his colleagues went on to explore the determinants of children's schooling attainment and observed that enrollment in Catholic schools lead to better performance and a lower chance of dropping for American children than enrollment in public schools (Coleman, Hoffer, and Kilgore 1982). In this precursor to the modern public/private school debate, the improvement in student performance was attributed to the "social capital" arising out of Catholic schools which creates a supportive environment that supersedes the influence of the family and encourages better performance on the part of all students, but particularly disadvantaged students (Hoffer, Greeley, and Coleman 1985). This line of research has given rise to another small industry trying to compare achievement in Catholic schools, other private schools and public schools in the United States. There are considerable debates around whether higher performance of children in catholic schools is a function of school environment or of the characteristics of parents who opt for Catholic schools (Marks 2002).

[1] One influential aspect of the Coleman report was the argument that peer influences play an important role in children's educational outcomes, consequently black children in integrated schools do better than black children in segregated schools with little decline in the performance of white students. This finding had far reaching impact in creating an impetus for court ordered busing of children to create racially integrated schools.

The public/private school considerations in a developing country context rarely focus on the "social capital" inherent in private schools but instead focuses on efficiency (Glewwe and Patrinos 1999). Public schooling is seen as being inefficient in terms of how it uses resources and particularly in ensuring teacher presence (Chaudhury 2006; Muralidharan and Kremer 2006). Studies in India have found considerable absenteeism among school teachers in rural areas (ranging from 11 to 25%) and found that private school teachers are 2-4 percentage points more likely to be present in school than government school teachers. While the impact of private school attendance on student performance remains poorly explored, existing studies find that on the whole, children from private schools perform better on various measures of cognitive skills than those from public schools (Jimenez and Lockheed 1995; Jimenez, Lockheed, and Paqueo 1991; Pratham 2005)

Causal Mechanisms

Expansion of private schools in developing countries would have drawn little policy attention were it not for the frustration with which the quality and efficiency of public education is seen. Increasingly, public policy attention is shifting to utilizing the private sector to deliver high quality primary and secondary education, while recognizing that equity considerations can be met through publicly funded but privately operated schools, particularly through the use of vouchers. However, the moment we start considering the use of public funds to support private education, standards of proof for the effectiveness of such an intervention must become far more rigorous.

To date, reasons for the greater effectiveness of private schools are poorly understood and concern with identifying causality continues to plague even well designed experiments. In particular, it is difficult to draw the conclusion that private schooling per se, caused the observed

improvement in educational outcomes (if any) and not the characteristics of the parents of who chose to send their children to private schools or some other processes associated with private school enrollment. Voucher experiments in Colombia and Chile provide interesting examples.

Colombia began experimenting with school vouchers in 1991 and provided vouchers to students entering grade 6 by randomly assigned lottery. This allows for a comparison of lottery winners and losers and the comparison indicates that the winners have lower dropout rate and somewhat higher tests scores than losers (Angrist et al. 2002). However, while random assignment controls for the endogeneity of school choice, it is difficult to use this experiment to conclude that private schooling increases educational attainment because students were at a risk of losing vouchers for poor performance, moreover, since vouchers were disproportionately given to students at vocational institutes, the lottery losers actually went on to attend ostensibly higher quality academic schools. So it is difficult to conclude that the higher quality of these vocational schools led to better student performance (Bettinger 2005), although it may lead to better longer term economic possibilities.

Chile undertook one of the largest experiment in public funding of private schools beginning in the 1980s. Governments provided vouchers to students to attend private schools that were completely privately run and managed. Consequently, about 53% of the students study in municipal schools while 34% study in subsidized private schools with the remainder in unsubsidized private schools. A review of test scores of children in 4^{th} grade from 10 studies notes that private school students have a slight advantage in test scores in five out of 10 studies, four show little difference between the two and in one study the municipal schools students perform slightly better than the private school students (Bellei 2008). This review goes on to note that private school admissions are selective and a poorly performing student can be easily

expelled so the slight advantage in scores for private school students could easily be due to selectivity.

The above review of variety of debates surrounding school effects suggests that growing private school enrollment in India needs to be better understood – both theoretically and methodologically – before any conclusions can be drawn about how growing private school enrollment should be interpreted and its implications for public policy.

India Human Development Survey 2005

India Human Development Survey of 2005 was jointly organized by researchers from University of Maryland and National Council of Applied Economic Research (NCAER). This survey was funded by grant from the U.S. National Institute of Health and builds on a prior survey by NCAER. This is a nationally representative survey of 41,554 households located in both urban and rural areas of 33 states and union territories of India with the exception of Lakshadweep and Andaman Nicobar.

A major innovation of this survey was to conduct short assessments of reading, writing and arithmetic skills for children aged 8-11. Conducting educational assessment in developing countries – particularly India -- is difficult for a variety of reasons: children's abilities vary tremendously and an instrument must capture children at both ends of the distribution; tests must be translated in many different languages with similar difficulty levels; the instrument must be simple and intuitive so that interviewers can administer it easily and it would not frighten children who are not used to standardized tests. Luckily, we were able to work with *Pratham*, a non-governmental organization that has worked in the field of elementary education for many years. They have developed simple assessment tools to measure the effectiveness of their

training programs. These tools had been pretested on more than 250,000 children and similar tools were subsequently used in Pratham's large survey ASER 2005 (Pratham 2005). Working in collaboration with Pratham, we were able to develop simple tests to measure whether a child is not able to read at all, or is able to read letters, words, sentences, paragraphs or stories. Simple addition, subtraction, multiplication and division problems were also developed. English version of the test is reproduced in Appendix.

Interviewers were trained extensively by Pratham volunteers using specially developed films so that they could differentiate between a child's shyness and inability to read. They were also taught how to develop rapport with children. Tests were developed in 12 Indian languages as well as English and children were asked to take the test in whichever language they were most comfortable in.

In all the IHDS sample consists of 17,117 children aged 8-11. Reading and arithmetic tests were administered to 72% of the children aged 8-11. Children may not be tested for two reasons: (1) Interviewers were explicitly instructed to obtain parental consent as well as assent from children for testing and were asked not to pressurize children who were reluctant; and, (2) Since the household survey was the main focus of this study, the administration of the reading and arithmetic skills was left to the end. We suspect that household fatigue as well as interviewer fatigue may have played a role in missing skill testing. Appendix Table 1 shows the proportion of children tested by a variety of household and background factors. Results suggest that children who are currently not enrolled are the least likely to be tested. Beyond this, while there is a mild difference in test completion rate between different social and economic groups, this difference is not large. There is little difference in test completion for children in private and government schools. While instruments for test completion are difficult to find, a Heckman selectivity

correction relying on probit-linear regression combination was not statistically significant nor did it change any other coefficients substantially.

The test data we have available to us are quite unique, particularly since they are combined with a wealth of household and contextual characteristics. Children are classified according to their ability to read, in one of the five categories: (1) Cannot read at all; (2) Can read letters but not form words; (3) Can put letters together to read words but not read whole sentences; (4) Can read a short paragraph for 2-3 sentences but not fluent enough to read a whole page; (5) Can read a one page short story. In all 12,394 children aged 8-11 were administered the reading test; excluding cases with missing data on independent variables as well as non enrolled students, the analytic sample for reading skills consists of 11,702 children.

Children's mathematical skills are classified in four categories: (1) Cannot read numbers above 10; (2) Can read numbers between 10 & 99 but not able to do more complex number manipulation; (3) Can subtract a two digit number from another; (4) Can divide a number between 100 and 999 by another number between 1 and 9. Note that we focus on 2 digit numbers to avoid calculations on fingertips and to get a better estimate of true understanding of subtraction and division. Also, given the Indian system of expecting children to memorize multiplication tables from 1 to 20, we chose to test children on division rather than multiplication skills. In all 12,345 children aged 8-11 were administered the reading test; excluding cases with missing data on independent variables as well as non enrolled students, the analytic sample for reading skills consists of 11,655 children.

In addition to the household module, the survey also included a primary school module where the interviewers were asked to conduct a school facilities survey for one public and one

private primary school in each village/urban block. When more than one facility was available in each block/village, interviewers were asked to select the facility which was predominantly used by the residents. The school facilities survey provides an interesting description of the schooling climate in India. However, given the differential use of private and public schooling in different parts of India, the results from this survey should be treated as being indicative of the schooling climate around different parts of India rather than providing a representative sample of primary schools.[2] However, this survey provides us with some interesting exclusions restrictions to handle the endogenity of choice of private schools.

Methodology:

The primary goal of this paper is to examine the relationship between enrollment in private schools and academic skills for children aged 8-11. In view of some of the methodological considerations outlined above, we rely on a variety of techniques to obtain a sense of the magnitude of this effect. Specifically we examine the impact of private school enrollment on children's verbal and mathematical skills using ordinary least squares regression, Heckman control function method based on exclusion restrictions (Heckman and Navarro-Lozano 2004) and family fixed effects models. Triangulation based on these three methods allows us to develop a range of estimates for the impact of private school enrollment on children's skills.

The Heckman control function method assumes that the underlying model is:

$$Yi = \beta X_i + \delta Z_i + \epsilon_i$$

[2] With appropriate weighting these data can provide a representative sample of public and private schools. However, the descriptive results in paper are unweighted.

Where Z_i is supposed to stem from an unobservable latent variable:

$$Z_i^* = \gamma W_i + u_i$$

The decision to send a child to private school or not is made according to the rule:

$$Z_i = \begin{cases} 1, & if\ Z_i^* > 0 \\ 0, & if\ Z_i^* \leq 0 \end{cases}$$

These equations are estimated in STATA using the TREATREG routine with full maximum likelihood. Instruments used in identifying the selection equation are discussed along with the characteristics of private and government schools in India below. Due to the reliance on probit-linear combination, the dependent variables – reading and arithmetic skills – are assumed to be continuous variables for this analysis.

Since results from this method are highly sensitive to the choice of exclusion restrictions (Stolzenberg and Relles 1997), we supplement this analysis with a highly restrictive family fixed effects model. Impact of private schooling on children is riddled with concerns about the fact that families which choose private schools are different from those that choose government schools and any observed relationship between private schooling and child outcomes could be due to these unobserved factors. One way of addressing this is to compare the achievements of children within the same family based on whether they go to private school or not, i.e. adding a dummy variable per household. We supplement the analysis using Heckman control function method with family fixed effects models to give us another estimate of school effect.

Growth of Private School Enrollment in India:

Primary education has been a priority for the Indian government for many decades. Successive Five Year Plans have emphasized the importance of investing in primary schooling with a plethora of government programs (Govinda 2002). Hence, the rapid rise in private school enrollment comes somewhat as a surprise. Even now, official statistics do not fully capture the growth of private school enrollment. Official data from The Seventh All India Survey of Education show that the share of private schools in primary enrollment is about 6% in rural areas and about 29% in urban areas. However, there are good reasons to believe that this is a substantial underestimate.

The Indian educational panorama consists of a variety of schools. While schools run by state and local governments comprise a clear "government" sector, the private sector consists of schools which receive government grant-in-aid but are privately run, schools which are recognized and are circumscribed by government rules and regulations and schools which are unrecognized and rarely regulated. Convent schools are usually recognized schools but madrasas could fall into any of the categories listed above. However, official statistics don't usually collect data on unrecognized schools and consequently tend to underestimate the size of the private sector (Kingdon 2007). The 1993-94 household survey by NCAER (Shariff 1999) found that about 10% of the primary school students in rural India were in private school while the comparable figures from the Sixth All India Survey by National Council for Educational Research and Training recoded only about 3% in private schools. The 2002 Seventh All India Educational Survey conducted by the National Council for Educational Research and Training found 5.8% enrollment in private schools in rural areas and 28.8% in urban areas. If aided private schools are included, this number swells to 9 and 45 percent respectively in rural and

urban areas. However, household based surveys – which presumably include both recognized and unrecognized schools – document a higher prevalence. Consequently The ASER survey conducted by Pratham in 2005 (Pratham 2005), found that private school enrollment for rural children was nearly 20%, the ASER survey was limited to rural areas. The India Human Development Survey of 2005 documents similar enrollments. Table 1 shows that at an all India level, about 68% children are enrolled in government schools with 42% and 76% of the urban and rural students in government schools. Private enrollment – combining enrollment in aided and unaided private schools, madrasas and convents forms 58% and 24% of the urban and rural enrollments respectively among children age 6-14. We combine aided and unaided schools into a single category -- "private schools"-- because parents may often not know the exact management of the schools their children attend, resulting in considerable measurement error. Moreover, private aided schools are similar to private recognized but not aided schools in many ways.

[Table 1 about here]

As Figure 1 indicates, private school enrollment rises in higher standards but even for primary schools, the proportion in private schools is substantial.

[Figure 1 about here]

Private Schools in India:

As we designed and fielded the India Human Development Survey 2005, we had the opportunity to talk to many parents. We heard two main themes in their explanations of why they sent their children to private school: (1) Government schools are not good around here; the teachers are often absent and don't work hard even when present; and, (2) We want our children

to learn English, and the private schools are English medium or teach English earlier than the government schools.

[Table 2 about here]

The parents' observations have good empirical support. As Table 2 indicates, the school facilities survey in the IHDS found that 14% of rural and 12% of urban teachers in government schools were not present in school on the day of the visit. While these estimates are below the 25% absenteeism found in more detailed studies using multiple unannounced visits, the data nevertheless reflect some of the same public/private differences (Chaudhury 2006; Muralidharan and Kremer 2006). While private school teachers are only 2-4% less likely to be absent overall, a within village fixed effects model shows that private school teachers are 1.39 times as likely to be present on the day of the visit as government school teachers. The within village results differ because private schools may be located more often in villages with low attendance rates by public school teachers. This correlation may result either from private schools prospering in areas with weak public schools or because the rise of private schools results in deterioration of public schools by removing civic pressure on the government schools system.

Our data also show that private schools have better facilities such as desks, flush toilets, and fans. The differences in teacher characteristics between private and government schools are striking. Private school teachers are more likely to have a college degree but less likely to have received teacher training than government schools. Part of this difference may be that employment in government schools is conditional on a training certificate.

Government and private schools also differ substantially in the provision of a mid-day meal. After Tamil Nadu introduced a successful mid-day meals program in its schools, the

National Program of Nutritional Support to Primary Education was launched across India in 1995. The mid-day meals program (MDM) aims to increase primary school attendance, as well as improve the nutritional status of school children. Generally, the program serves the 6-11 year age group. However, some upper primary schools run the MDM program as well, and in recent union budgets separate provision has been made for the upper primary school also. Under the mid-day meal scheme, cooked meals are to be served during the lunch time in the school, with calorie value equivalent to 100 gm of wheat or rice per student per school day. In some places, a dry ration is provided to be carried home based on a certain minimum level of school attendance.

The IHDS data report 60% of children up to standard five receive mid-day meals or free grains. Of these, 35% receive the full mid-day meal program; 8% get only dalia for the meal; and 16% are given grains in place of the meal. These programs are mainly found in government schools. Among private schools, only 8% of primary students participate compared to 80% at government schools. It would be reasonable to expect that a fully functioning mid day meal program would increase the likelihood that a child attends government school and one of the indicators for a functioning mid day meal program is the presence of a cook in the school (Dreze and Goyal 2003).

Similarly, IHDS data presented in Figure 2[3] show that private schools are more likely to teach English early. While only 5% of children in government schools are taught in English exclusively, nearly 37% of children in private schools are. When the initial medium of instruction is a vernacular language, English is introduced in earlier standards in private schools.

[Figure 2 about here]

[3] Table 2 is based on school data and not nationally representative of the experiences of students. Figure 2 is based on student data which are nationally representative.

The school facilities, teacher absenteeism, and English medium results suggest that parents send their children to private schools for good reason. This can be costly, of course. The average primary student in a private school pays Rs. 600 in fees and another Rs. 600 in expenses for book, uniforms, and transportation (compared to Rs. 20 and Rs. 200 for government schools). Furthermore, while only 17% of the children in government schools get private tutoring, nearly 27% in private schools do so.

[Figure 3 about here]

Figure 3 shows the distribution of total educational costs for students in private and government schools by standard in which they are enrolled. Obviously, private school students are a selected population coming from higher socioeconomic backgrounds. It will be important to control for this selectivity insofar as possible when examining the impact of private schools on student performance.

Characteristics of Private school Students:

Table 3 provides descriptive statistics for our sample, private school enrollment as well as children's ability to read a simple paragraph and do basic two digit subtractions. In recent decades, there has been a sharp increase in school enrollment, about 92% of the children aged 8-11 in IHDS are in school; of these, about 31% of the children aged 8-11 are enrolled in private schools. In keeping with generally preferential treatment of boys in Indian families, boys are somewhat more likely to be enrolled in private schools than girls. Private school enrollment seems clearly associated with higher income and education of the household. Interestingly, students in metro cities are about as likely to enroll in private schools as students in smaller cities and, controlling for income and education, enrollment in private schools is marginally lower in

metropolitan cities than in other urban areas. This is probably due to the presence of higher quality central government schools in major metropolitan areas, particularly Delhi.

[Table 3 about here]

Caste and religion seem associated with private school enrollment. Forward castes and other minorities groups such as Christians, Sikhs and Jains are far more likely to send their children to private schools than dalits and adivasis with Muslims with Other Backward Classes (OBCs) falling in the middle. Results from multivariate analyses (not reported here) indicate that even after controlling for parental income and education, dalit children are substantially less likely to be enrolled in private school.

[Table 4 about here]

State differences in private schools are interesting. Private school enrollment in one high education state Himachal Pradesh is low while it is high in Kerala, the other high education state. Uttar Pradesh has considerably higher private school enrollment than the neighboring Bihar. Some of these regional differences in private school enrollment may well be associated with socioeconomic background of its residents. Christians are substantially more likely to be in convent schools and the Christian population is high in the North East and in Kerala. However, history also plays a substantial role.

Exclusion Restrictions for Private School Enrollment:

The brief description of students in private schools as well the literature cited above clearly suggests that private school enrollment is a choice variable and while we expect to control for observable family background factors such as education, income and household size,

these controls may be inadequate due to omitted variables as well as measurement error in some of the included variables. In order to estimate the Heckman control function discussed above, instead of relying simply on distributional assumptions, we rely on theoretically motivated exclusion variables which are expected to be associated with the decision to enroll in private school as well as private school admission but are not expected to be independently associated with educational outcomes.

[Table 5 about here]

Private school enrollment is dependent on a complex interplay of supply and demand. Social composition of an area, history, and state policies all play an important role in shaping the availability of private schools. Hence, availability of private schools is an important instrument for private school enrollment which has been used in the literature (Jimenez, Lockheed, and Paqueo 1991). Given the IHDS's focus on school surveys, we also included a set of variables describing the characteristics of government schools in the village/urban block as factors which may motivate parents to favor or not favor government schools. These include English medium instruction for some academic subjects, early introduction to English language, and presence of a cook in the government school as a marker for the draw of the mid-day meal program. Private school enrollment is not simply a function of parental preferences. In urban areas, admission into quality private schools can be a highly competitive process in which parents with broader social networks gain an edge over less connected parents. Consequently, we also control for two markers of family social networks, whether the household members know anyone working in the

medical profession and whether they know anyone working for the government. These variables are described in Table 5.[4]

While switching regressions estimated with maximum likelihood are considered both unbiased and efficient, they are highly dependent on the validity of the exclusion criteria as well as their strength as predictors of private school. Table 6 shows the first stage regression with the exclusion variables listed above as predictors. The results show that with the exception of English medium instruction, each of the other variables is associated with private school enrollment in the direction expected and these relationships are statistically significant. Overall the model is highly significant with a Chi Square of 704 and 7 degrees of freedom.

[Table 6 about here]

Private School Enrollment and Child Outcomes:

As the brief overview of literature presented above suggests, it is important to be cautious about drawing inferences based any perceived relationship between private school enrollment and children's skill acquisition. Hence, in this section we first describe the basic relationship between private school enrollment and children's performance on reading and arithmetic tests while controlling for observable characteristics of their households; then we address the issue of endogeneity using a switching regression model in which school choice is captured by a set of theoretically motivated exclusion restrictions; finally, we examine the impact of private school enrollment on child outcomes within a highly restrictive framework, family fixed effects model.

[4] This analysis has been carried out with and without the two variables measuring social networks due to our concern that the network measures may not be truly exogenous. The coefficient for private schools in the regression with smaller set of instruments was similar in magnitude but had a greater standard error. The school variables are excellent instruments for rural India; for urban areas since parents have choices beyond the local school, having other instruments makes the results more robust.

[Figures 4 and 5 about here]

Figures 4 and 5 indicate basic differences in reading and arithmetic skills among children enrolled in government and private schools. Results seem to suggest that without controlling for family background, private school students have higher achievement on these tests. These differences are further analyzed by adding controls for parental socioeconomic background, place of residence and children's sex, age and current standard. In addition to private school enrollment, these regressions control for highest education level attained by any of the household adults, log of family income, a thirty item standard of living index consisting of ownership of various consumer durables (TV, refrigerator, telephone, car, cot etc.) and quality of housing (toilet, piped water etc.), household size, number of children under age 15, place of residence, state of residence, child's sex and age. Caste, ethnicity and religion are particularly important to control for since they are linked to private school enrollment, particularly enrollment in madrasas or convents, as well as having an independent impact on educational outcomes (Desai, Adams, and Dubey Forthcoming). Controls for state of residence are also included in each regression, although not presented in the tables.

[Table 7 about here]

In Model 1, the basic OLS model, students' reading and arithmetic skills are regressed on a set of independent variables including enrollment in private school. As might be expected, parental education, urban residence, household income and index measuring standards of living are all positively associated with student performance on these skill tests. However, while standard of living – a marker of long term economic status – is consistently statistically significant, log of household income is not. This may be because income contains considerable

year to year fluctuation while standard of living indicates permanent income, a variable with longer term impact on well being. While it is reasonable to see skills increase with age and current standard, the coefficient on sex is surprising. Holding age and current standard constant, girls have lower performance on both reading and arithmetic tests. In international studies, girls generally perform slightly above boys in verbal tests and slightly below boys in mathematical tests.

Enrollment in private school is positively related with higher performance on both verbal and mathematical skills. While the coefficient for verbal skills is slightly larger, it is important to remember that the skill levels range from 0 to 4 for the verbal skill and from 0 to 3 for mathematical skills. The second model corrects for the endogeneity of school choice by using a Heckman type correction, in which the binary choice of attending private school or not is modeled with the set of exclusions restrictions described above.

The results from this endogenous switching regime are presented in Model 2. The first stage probit model (presented in Table 6) suggests that our instruments are highly correlated with private school enrollment. Each is statistically significant and in the expected direction – with the exception of English medium instruction. The second stage regression includes the effect of private school enrollment on reading and arithmetic skills, correcting for the biases introduced due to endogeneity of school choice. As might be expected, the coefficients for private school are smaller in size than those from the naïve regression models; however the difference is not substantial. Nor is the lambda statistically significant. The Wald test for independence of regressions is not statistically significant suggesting that the possibility that selection equation and achievement equation are unrelated cannot be ruled out. This suggests that while omission of the endogeneous nature of school choice introduces some bias in the regression estimate the size

of this bias is not very large. The regression coefficient for private school from the uncorrected model for reading skill is 0.39 while in the model correcting for endogenity it is 0.36. The difference for arithmetic skills is similar in magnitude, 0.28 vs. 0.22. Since the standard deviation is 1.35 for reading skills and 1.03 for mathematical skills, the improvement associated with private schools is about one fourth to one third of a standard deviation.

Results from any models relying on instrumental variables are only as good as the instruments themselves. Hence, we compare these results with those from a strongly restrictive model – family level fixed effects model. Here we assume that all family influences – such as desire for education and parental encouragement – are shared by all children in the family. Children differ mainly in their personal characteristics such as gender, age, standard and private school enrollment. These family level fixed effects models continue to suggest that private school enrollment is consistently related to higher performance and the magnitude of these coefficients is similar to those obtained from the switching regression.

These results suggest three things: (1) Private school enrollment is associated with higher child outcomes, even after controlling for a variety of family factors; (2) Size of this effect is statistically significant but moderate with average improvement being about one fourth of a standard deviation; and, (3) The coefficients from these three models are not vastly different from each other.

Some caveats in interpreting these results are in order. While we have controlled for a variety of observable and unobservable factors, two main areas of omission remain. First, we have paid little attention to child specific unobservable attributes. Parents are constantly making decisions about which child should get which kind of investment. Parents of academically

talented children may spend money on sending them to private school; parents of business savvy children may save money for setting up their children in a small business. In particular when the family can send only one or two children to private school, child's academic talent may play an important role in this choice. The only way of addressing this would be via longitudinal data in which one would try to examine the differential growth in educational achievement between children in private and government schools, holding their initial talent constant. This may be particularly important because studies have also found that at times, educational innovations or programs, have a large initial impact with declines in magnitude over time (Banerjee et al. 2007). Cross sectional analyses like ours are unable to do this.

It is also possible that the very act of private school enrollment may spur a child to try harder and parents to focus more on academics. Hence, any observed increase in academic achievement could be due to factors that have nothing to do with school level inputs.

In spite of these caveats, the analysis presented above provides an interesting backdrop against which growth in private schooling in India can be examined. If we can provisionally accept the hypothesis that private school enrollment is associated with higher student achievements and that although endogeneity of school choice plays some part in shaping this relationships, it is only a minor part, we can turn to exploring other dimensions of private school enrollment which have considerable policy implications.

Who Benefits from Private School Enrollment?

The debate on the validity of evidence about the impact of private schooling, or lack thereof, has occupied the center stage in such a way that there has been little room for studying differences in potential benefits of private schooling. In this paper we focus on the interaction

between parental economic status and school type to explore the mechanism through which private schools may influence child outcomes. Research in the United States suggests (Hoffer, Greeley, and Coleman 1985) that benefits of private schools accrue disproportionately to disadvantaged students. In order to examine this, we interact private school enrollment with household standard of living in model 2 from Table 7, i.e. the Heckman switching regression. In this analysis private school enrollment is interacted with the 30 item standard of living index,[5] while controlling for the selection into private schools using the instruments discussed above.[6]

[Figures 6 and 7 about here]

This interaction term is highly significant and negative in sign and the coefficients are presented in Appendix Table 2. Results from this analysis are graphically presented in Figure 6 and 7 which suggests that benefits to private school enrollment for children from lower economic strata are far greater than those for children from upper economic strata and at upper income levels, the difference between private and government school narrows considerably. The lack of difference between private and government schools at upper income levels is not surprising; parent with the means to send their children to private school would only select government school if it is high quality. A good example may be university professors whose children attend central government schools located on campus and run with great deal of intellectual input from the campus community. However, the benefits of private schooling to poorer children are more intriguing and deserve greater attention to the mechanisms through which these benefits accrue.

[5] While not reported here, we obtain similar results for interaction between household education and private schooling and between place of residence and private schooling with children from lower education households and those from least developed villages benefitting the most from private school enrollment.

[6] The same analysis was conducted with the naïve regression model without taking into account endogeneity of private school enrollment and results were similar. This is not surprising given the similarity of results from models 1 and 2 in Table 7.

While the U.S. research has tried to understand the mechanisms through which experiences of students in private and government schools may differ, in the developing country context little attention has been directed to this issue. In the following analysis we attempt to provide some qualitative information on experiences of children in government and private schools. We note that this part of the analysis is suggestive rather than conclusive since it is difficult to determine the causal direction of the association. Nonetheless, this may well be the only data where even associations can be explored.

The IHDS interviewed parents about the schooling experiences of up to two children in the household. Two variables in this section are interesting: (1) Whether the parent reported that the child was praised in the month preceding the survey; and, (2) Whether the parent reported that the child was physically beaten or pinched in the month preceding the survey. On both of these variables, private school students fare better than government school students. About 25% of the government school students were praised compared to 42% in private schools and about 29% of the government school students were beaten compared to 25% in private schools. However, it is the interaction of school type with family's standard of living that is of greatest interest.

[Figure 8 about here]

Figure 8 shows the predicted probability of the child being praised by school type and parental economic status. This probability is calculated from a probit model which controls for the selection factors as well as the family background factors in Table 7 with the coefficients presented in Appendix Table 2. The results indicate that children from higher economic strata are more likely to be praised and the slope of this line does not differ considerably between

government and private schools. Positive reinforcement is really important in any setting but particularly in Indian classrooms where constant comparisons[7] and attendant humiliation are fairly common. Greater positive reinforcement in private schools may be a reflection of better learning environment in these schools, although social class clearly seems to play a role in both settings.

[Figure 9 about here]

Figure 9, however, shows a very different picture when it comes to the probability that the child was beaten or pinched. There is little difference in the likelihood of physical punishment by parental economic status for children in private school; however, there is a strong negative relationship between economic status and punishment in government schools. In government schools, children from poorer homes are far more likely to be punished than those from richer homes.

Many educational researchers have remarked upon the pervasiveness of physical punishment in Indian schools (The Probe Team 1999); indeed, our estimates suggest that nearly a quarter of the children were physically punished in the prior month. We suspect that this humiliation does not create an environment conducive to learning and if children (and their families) perceive this punishment to be unfairly meted out, it may lead to even greater alienation among students from poorer households. In contrast to government schools, in private schools parents may be able to demand fair treatment and although physical punishment remains rampant even in private schools, it does not seem to be associated with children's social class. It may be tempting to argue that the teachers who teach in private schools are more egalitarian than those

[7] Many schools rank students in a class explicitly in comparison to each other and ranking is clearly known to students and their families.

in government schools but the evidence from the likelihood of the child being praised contradicts this argument. When it comes to positive attention, richer students receive more attention in both settings, although the intercept is higher for private schools. However, the link between parental social class and negative attention is nonexistent in private schools.

These results suggest a need to pay greater attention to qualitative dimensions of classroom environment. While teacher presence and accountability may be one of the avenues through which private schools outperform government schools, hidden aspects of classroom environment such as positive reinforcement and reduced discrimination against disadvantaged children may be equally important.

Is Private Schooling a Panacea for Indian Education?

As we document modest but statistically significant improvements in reading and arithmetic skills of students in private schools and further note that these benefits are particularly concentrated among disadvantaged students, it may be tempting to argue that perhaps private schooling is the *amrit* or the elixir that will cure Indian education. If the reader were to come to this conclusion he or she would be in good company given the rising chorus of advocacy for private schools around the world (Kochar 2001; Chakrabarti and Petersen 2008; Glewwe and Patrinos 1999; Dixon and Tooley 2005). However, a number of considerations suggest caution before leaping to this conclusion. These fall in two categories: (1) Empirical results based on our data; and, (2) Theoretical issues raised in the literature.

Empirically, we find that while private school students perform somewhat better than their government school peers, these effects are modest compared to other structural effects. Table 8 provides an overview of the inter-state variation in reading skills across India based on

the model 2 from Table 7 with state of residence and private school interaction term added.[8] Column 1 shows unadjusted differences across states; column 2 shows the predicted scores for students in private schools, holding their family characteristics constant at all India means; column 3 shows the predicted scores for students in private schools and the final column shows the difference between predicted scores in private and government schools. The states are sorted from lowest difference to highest difference.[9]

The results show substantial inter-state variation in the scores of both government and private school students. Controlling for parental characteristics, government school students in states as diverse as Kerala, Himachal Pradesh, Chhattisgarh and West Bengal perform at a higher level than private school students in many other states. Within states, the performance of private school students is not consistently higher than government school students and in some states government school students do better than private school students. Most importantly, private school advantage seems to be located in states like Bihar, Uttar Pradesh, Uttarkhand, Madhya Pradesh – states known for poorly functioning public institutions. These results are consistent with the findings for Uttar Pradesh from other studies which find large differences in student outcomes for children from "best" schools in poorly performing districts and "worst" schools in better performing districts (Das, Pandey, and Zajonc 2006).

These results suggest that before a blanket embrace of private schooling, it may be worthwhile figuring out why some government schools function well and others don't. Blaming teacher absence may seem intuitive but the complete story may be more complex. While our school data become somewhat unreliable when we start comparing across states due to limited

[8] For brevity we do not present results for arithmetic skills but they present a similar pattern.

[9] Note that while all India sample is fairly large, about 11,700 children aged 8-11, the sample sizes at state level are considerably smaller and these results should be treated with caution.

sample size, we find that public school teacher absence is higher in states like Kerala (17%) than in states like Uttarkhand and Punjab (4% & 9% respectively), however gains to private schooling are only modest in Kerala but considerably larger in Uttarkhand and Punjab.

Theoretical considerations also suggest caution before a massive embrace of school voucher program. If classroom environment is affected by the demands paying parents – most of who are middle class – place on teachers, a voucher program which leads to an influx of poorer parents may dilute this effect. Kerala is an interesting example, 61% of the students in our sample in Kerala are in private schools[10] but as Table 8 indicates students in Kerala appear to have only a modest gain associated with private school enrollment. Students in Haryana and Tamil Nadu, other states with large private school enrollment, show a loss in skills for students in private schools compared to their government school peers. These observations are comparable to those from the voucher program in Chile where some studies evaluating Chile's massive voucher program record modest gains and others record a loss for students in private schools (Bellei 2008).

These observations suggest that it may be worthwhile examining the differences in classroom environment between government and private schools and the processes through which these occur before shifting our attention to private schooling as the panacea for the ills of public education. The differential slope of parental social class on physical punishment between government and private schools provide an interesting illustration. If children from poor households in private schools benefit because their parents are able to ensure that they are not physically punished, would this benefit be diluted if parent were not paying the tuition but were

[10] Kerala has a substantial proportion of students in government aided schools – one version of voucher schools. These are included with private schools in this analysis.

relying on school vouchers? Are there other ways of ensuring that government school teachers do not resort to discriminatory behavior? To date, the discourse on benefits to private schooling in developing country context has focused on teacher absence and lack of accountability. While both are important, perhaps a better understanding of how parental social class operates in government schools and shapes student learning may be a useful contribution to this research.

References:

Chaudhury, Nazmul, Jeffrey Hammer,Michael Kremer, Karthik Muralidharan and F. Halsey Rogers. 2006. *Journal of Economic Perspectives* 20(Winter): 91–116.

Angrist, Joshua, Eric Bettinger, Erik Bloom, Elizabeth King, and Michael Kremer. 2002. Vouchers for Private Schooling in Colombia: Evidence from a Randomized Natural Experiment. *The American Economic Review* 92 (5):1535-1558.

Banerjee, Abhijit V., Shawn Cole, Esther Duflo, and Leigh Linden. 2007. Remedying Education: Evidence from Two Randomized Experiments in India. *Quarterly Journal of Economics* 122 (3):1235-1264.

Bellei, Cristian. 2008. The Private-Public School Controversy: The Case of Chile. In *School Choice International: Exploiting Public-Private Partnerships*, edited by R. Chakrabarti and P. Petersen. Cambridge, Mass.: MIT Press.

Bettinger, Eric. 2005. Private School Vouchers in Colobia. In *Harvard University and World Bank Conference on "Mobilizing Public Sector for Private Education"*. Cambridge: Massachussets.

Chakrabarti, Rajashri, and Paul Petersen, eds. 2008. *School Choice International: Exploiting Public-Private Partnerships*. Cambridge, Mass.: MIT Press.

Chaudhury, Nazmul, Jeffrey Hammer, Michael Kremer, Karthik Muralidharan and F. Halsey Rogers. 2006. Missing in Action: Teacher and Health Worker Absence in Developing Countries. *Journal of Economic Perspectives* 20 (Winter):91-116.

Coleman, James S., Earnest Q Campbell, Carol J. Hobson, James McPartland, Alexander M. Mood, Frederick D Weinfall, and Robert L. York. 1966. *Equality of Educational Opportunity*. Washington D.C.: Department of Health, Education and Welfare.

Coleman, James S., Thomas Hoffer, and Sally Kilgore. 1982. *High School Achievement: Public, Catholic and Private Schools Compared*. New York: Basic Books.

Das, Jishnu, Priyanka Pandey, and Tristan Zajonc. 2006. Learning levels and gaps in Pakistan. In *World Bank Policy Research Working Paper WPS 4067*. Washington, D.C.: The World Bank.

Desai, Sonalde, Cecily Darden Adams, and Amaresh Dubey. Forthcoming. Segmented Schooling: Inequalities in Primary Education. In *Blocked by Caste: Discrimination and Social Exclusion in Modern India*, edited by K. Newman and S. Thorat. New Delhi: Oxford University Press.

Dixon, Pauline, and James Tooley. 2005. The Regulation of Private Schools serving Low-Income Families in Andhra Pradesh, India. *The Review of Austrian Economics* 18 (1):29-54.

Dreze, Jean, and Aparajita Goyal. 2003. Future of Mid-Day meals. *Economic and Political Weekly* 38 (44):4673-4683.

Fuller, Bruce. 1987. What School Factors Raise Achievement in the Third World? *Review of Educational Research* 57 (3):255-292.

Glewwe, Paul, and Harry Anthony Patrinos. 1999. The Role of the Private Sector in Education in Vietnam: Evidence From the Vietnam Living Standards Survey. *World Development* 27 (5):887-902.

Govinda, R. 2002. India Education Report. New Delhi: Oxford University Press.

Hanushek, Eric A. 1995. Interpreting recent research on schooling in developing countries. *World Bank Research Observer* 10 (2):227-247.

———. 1997. Assessing the Effects of School Resources on Student Performance: An Update. *Educational Evaluation and Policy Analaysis* 19 (2):141-161.
Heckman, James, and Salvador Navarro-Lozano. 2004. Using Matching, Instrumental Variables, and Control Functions to Estimate Economic Choice Models. *Review of Economics and Statistics* 86 (1):30.
Heyneman, Stephen P., and William A. Loxley. 1983. The Effect of Primary-School Quality on Academic Achievement Across Twenty-nine High- and Low-Income Countries. *The American Journal of Sociology* 88 (6):1162-1194.
Hoffer, Thomas, Andrew M. Greeley, and James S. Coleman. 1985. Achievement Growth in Public and Catholic Schools. *Sociology of Education* 58 (2):74-97.
Jimenez, Emanuel, and Marlaine E. Lockheed. 1995. Public and Private Secondary Education in Developing Countires: A Comparative Study. In *World Bank Discussion Paper No. 309*. Washongton, D.C.: The World Bank.
Jimenez, Emanuel;, Marlaine E. Lockheed; Lockheed, and Vincente Paqueo. 1991. The Relative Efficiency of Private and Public Schools in Developing Countries. *The World Bank Research Observer* 6 (2):205-218.
Kingdon, Geeta Gandhi. 2007. The Progress of School Education in India. In *Global Poverty Research Group Working Paper No. 071*. London: London School of Economics.
Kochar, Anjani. 2001. Emerging Challenges for Indian Education Policy. In *Center for Research on Economic Development and Policy reform, Working paper No. 97*.
Marks, Helen M. 2002. School composition and peer effects in distinctive organizational settings. *International Journal of Educational Research* 37 (5):505-519.
Meyer, John W., Francisco O. Ramirez, Richard Rubinson, and John Boli-Bennett. 1977. The World Educational Revolution, 1950-1970. *Sociology of Education* 50 (4):242-258.
Muralidharan, Karthik, and Michael Kremer. 2008. *Public and Private Schools in Rural India* 2006 [cited 2008]. Available from http://www.people.fas.harvard.edu/~muralidh/Public_and_Private_Schools_in_Rural_India_032206.pdf.
Pratham. 2005. Annual Status of Education Report. New Delhi: Pratham Documentation Center: Pratham.
Pritchett, Lant, and Rinku Murgai. 2007. Teacher Compensation: Can decentralization to local bodies take India from the perfect storm through throubled waters to clear sailing? *India Policy Forum* 3:123-179.
Shariff, Abusaleh. 1999. *India Human Development Report*. New Delhi: Oxford University Press.
Stolzenberg, Ross M., and Daniel A. Relles. 1997. Tools for Intuition about Sample Selection Bias and Its Correction. *American Sociological Review* 62 (3):494-507.
The Probe Team. 1999. *Public Report on Basic Education in India*. New Delhi: Oxford University Press.

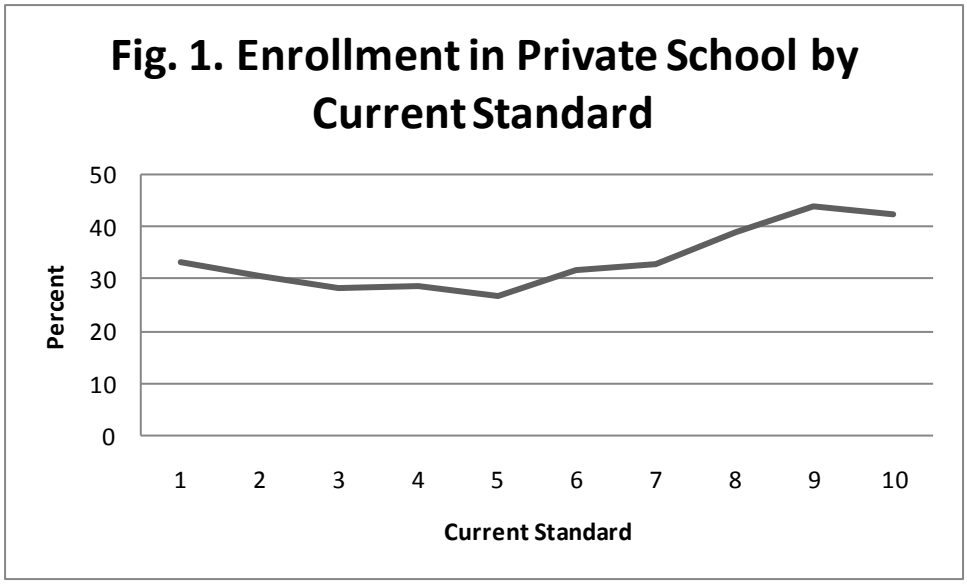


Fig. 1. Enrollment in Private School by Current Standard
Percent
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
Current Standard

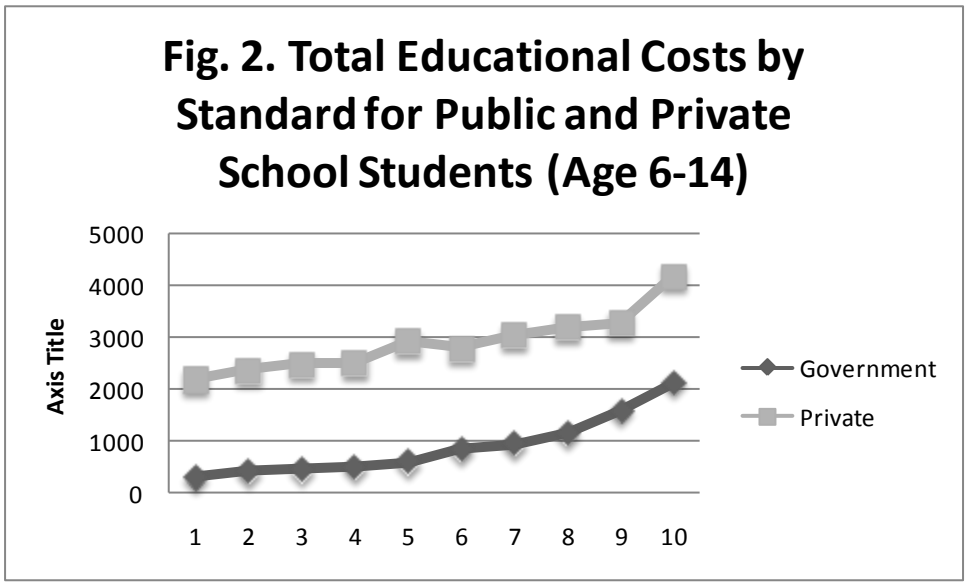


Fig. 2. Total Educational Costs by Standard for Public and Private School Students (Age 6-14)
Axis Title
5000
4000
3000
2000
1000
0
1
2
3
4
5
6
7
8
9
10
Government
Private

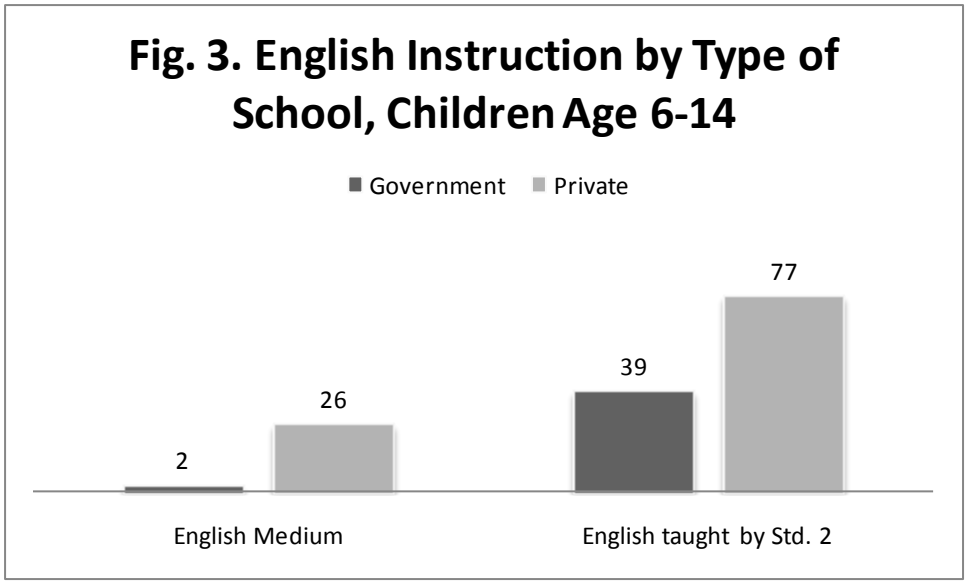


Fig. 3. English Instruction by Type of School, Children Age 6-14
Government
Private
2
26
39
77
English Medium
English taught by Std. 2

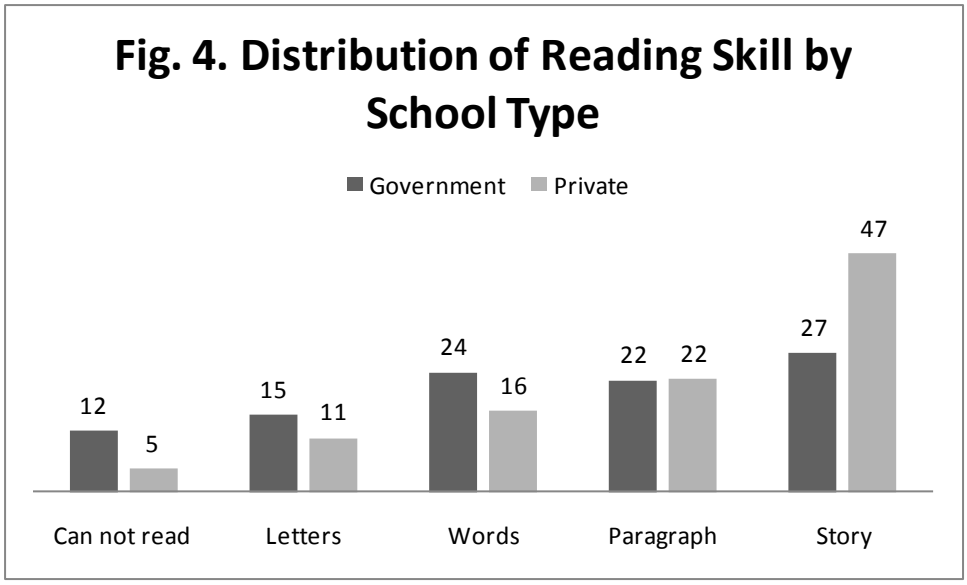


Fig. 4. Distribution of Reading Skill by School Type
Government
Private
12
5
15
11
24
16
22
22
27
47
Can not read
Letters
Words
Paragraph
Story

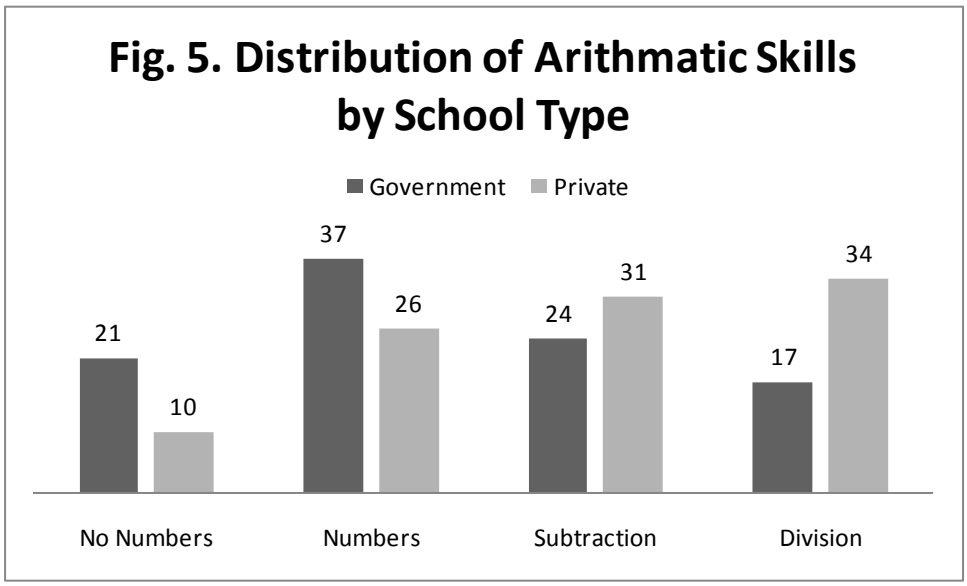


Fig. 5. Distribution of Arithmatic Skills by School Type
Government
Private
21
10
37
26
24
31
17
34
No Numbers
Numbers
Subtraction
Division

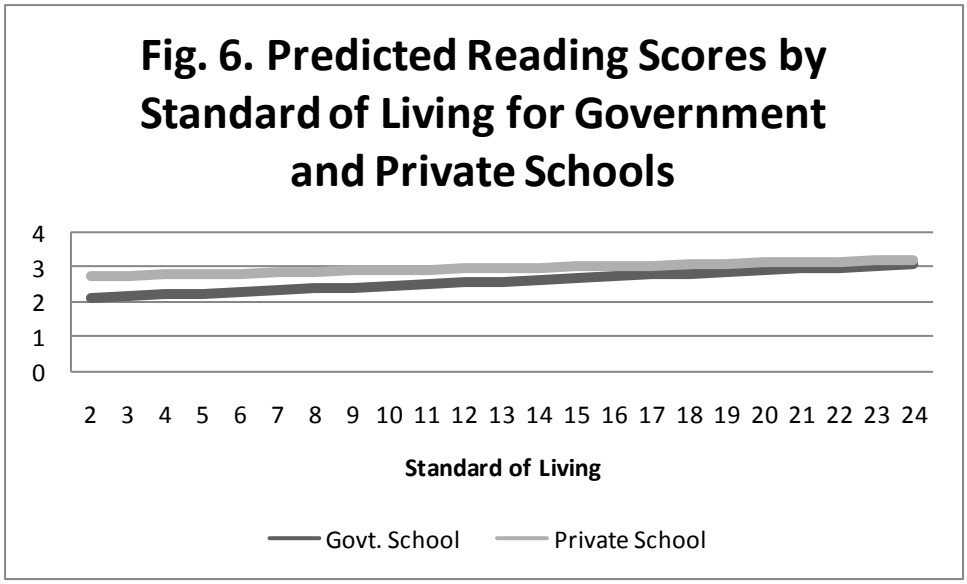


Fig. 6. Predicted Reading Scores by Standard of Living for Government and Private Schools
4
3
2
1
0
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Standard of Living
Govt. School
Private School

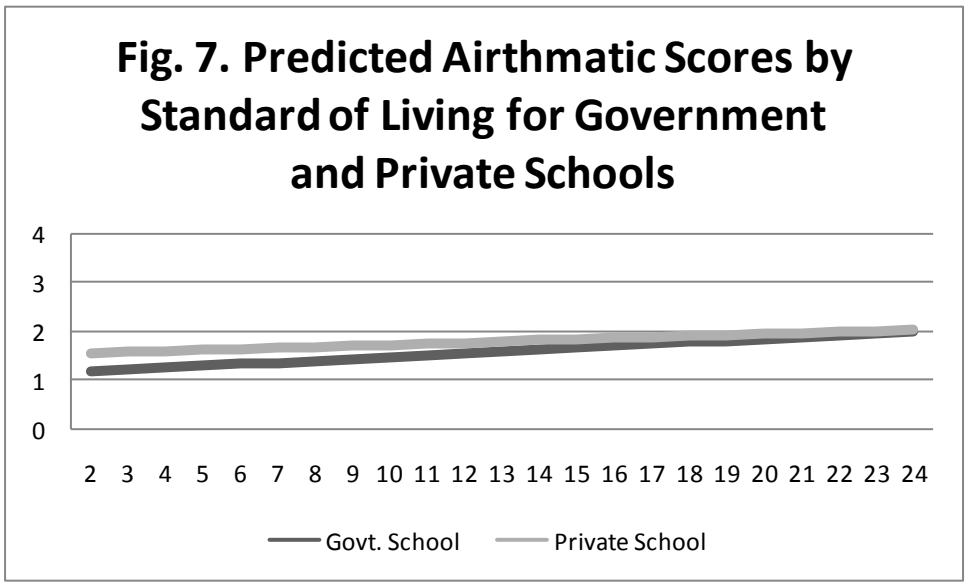


Fig. 7. Predicted Airthmatic Scores by Standard of Living for Government and Private Schools
4
3
2
1
0
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Govt. School
Private School

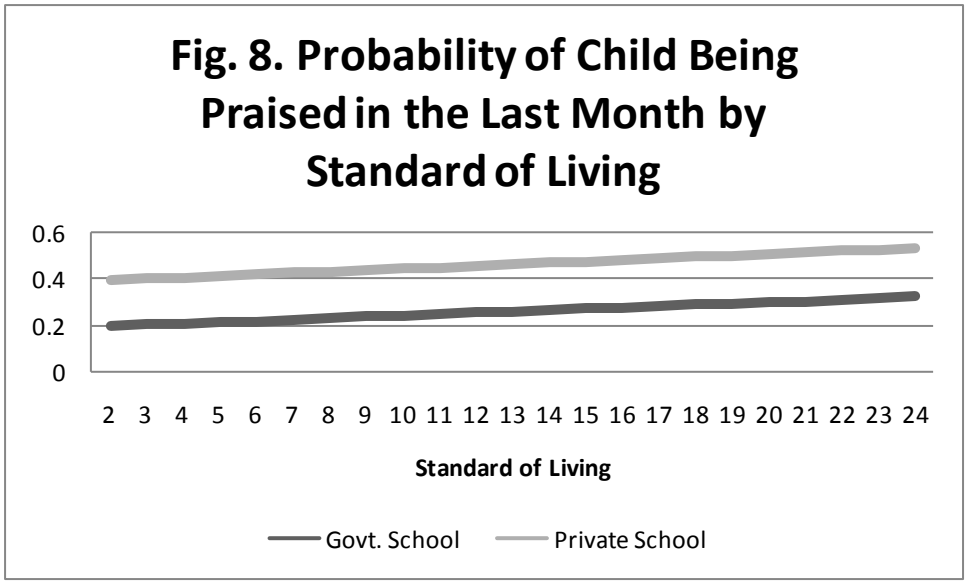


Fig. 8. Probability of Child Being Praised in the Last Month by Standard of Living
0.6
0.4
0.2
0
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Standard of Living
Govt. School
Private School

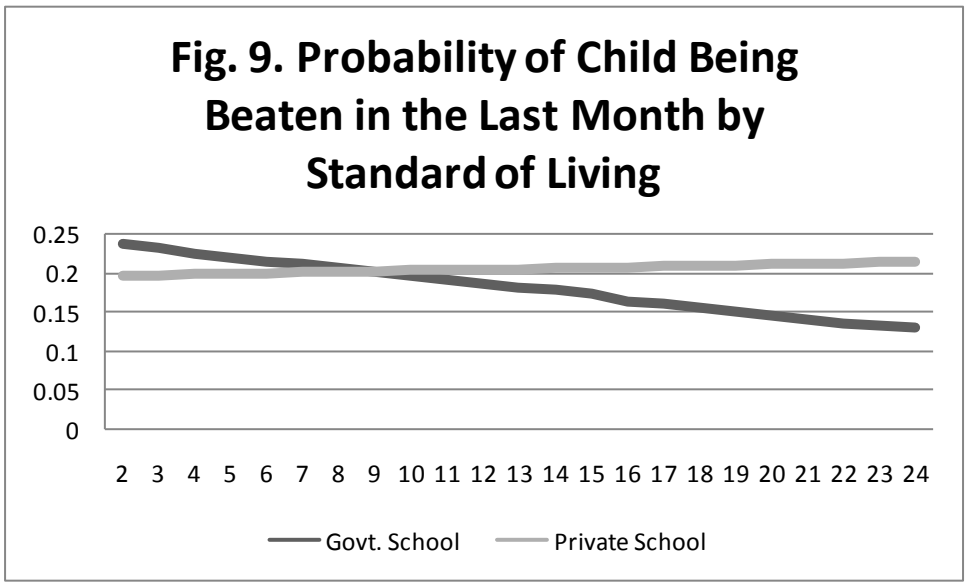


Fig. 9. Probability of Child Being Beaten in the Last Month by Standard of Living
0.25
0.2
0.15
0.1
0.05
0
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Govt. School
Private School

Table 1. Distribution of Type of Schools Attended for Enrolled Children 6-14				
	Rural	Urban	All	
School Type				
Government	**76**	**42**	**68**	
EGS	1	1	1	
Government	75	41	67	
Private	**24**	**58**	**32**	
Private Aided	4	8	5	
Private	17	45	24	
Convent	1	3	2	
Madrassa	1	1	1	
Other	1	2	1	
Sample Size	24949	11776	36725	

Table 2. Characteristics of Private and Public Schools in India		
	Government Schools	Private Schools
Percent teacher present in pchool	87.6	89.4
Percent teachers trained	85.9	43.8
Percent teachers with college degree	43.7	64.4
Percent students present In school	86.9	91.9
Some subjects taught in English+	26.8	51.1
English instruction begins in 1st standard	53.2	88.2
No. of classes meeting outside	0.7	0.3
No. of Mixed grade classrooms	0.9	0.6
Any toilet facility	60.9	78.3
Chairs/desk for all students	29.2	63.5
Blackboard in all classrooms	95.4	98.1
Computer available for student use	5.9	29.2
School has fans	28.4	63.3
Kitchen for cooked meals	41.3	10.8
Cook employed by school	74.9	11.1
Any teaching material on the wall	77.3	78.9
Children's work on the wall	67.6	73.9
N of Schools Surveyed	2034	1748
+ Many schools teach some subjects in English and others in vernacular languages		
* IHDS selected one predominant private and one government school per village/ urban block. The school sample is nationwide but not nationally representative.		

Table 3. Sample Distribution, Private Schooling and Skill Levels by Background Characteristics				
	Proportion of Sample	Prop. In Private School	Prop. Able to read a para.	Prop. Able to to Subtract
Gender				
Male	0.53	0.33	0.57	0.51
Female	0.47	0.29	0.54	0.46
Place of Residence				
Metropolitan	0.05	0.58	0.69	0.72
Other Urban	0.19	0.58	0.69	0.62
Developed Village	0.34	0.29	0.55	0.48
Less Developed Village	0.42	0.17	0.48	0.41
Household Income Quintile				
Poorest	0.18	0.16	0.45	0.38
Second	0.22	0.17	0.47	0.4
Third	0.22	0.26	0.51	0.45
Fourth	0.20	0.39	0.62	0.54
Affluent	0.18	0.59	0.73	0.69
Standard of Living Quintile				
Poorest	0.20	0.1	0.34	0.29
Second	0.22	0.16	0.47	0.37
Third	0.24	0.27	0.54	0.49
Fourth	0.20	0.44	0.69	0.6
Affluent	0.15	0.69	0.81	0.78
Socio Religious Group				
Forward Caste	0.19	0.43	0.71	0.64
Other Backward Classes (OB	0.36	0.29	0.57	0.5
Dalit (Hindu, Sikh, Buddhist)	0.24	0.21	0.45	0.39
Adivasi (Any religion)	0.06	0.15	0.48	0.38
Muslim	0.13	0.38	0.46	0.42
Minority Religions	0.02	0.74	0.8	0.79
Max. Adult Education in HH				
Illiterate	0.24	0.16	0.37	0.31
1-4 std	0.09	0.14	0.48	0.38
5-9 std	0.35	0.26	0.55	0.47
10-11 std	0.14	0.45	0.66	0.61
high sec & some coll	0.08	0.53	0.72	0.66
College graduate	0.09	0.63	0.8	0.75

Table 4. Private Schooling and Skill Levels by State			
	Proportion in Private School	Proportion able read a paragrapl	Proportion able to Subtract
All India	**0.31**	**0.55**	**0.49**
Jammu and Kashmir	0.46	0.41	0.61
Himachal Pradesh	0.18	0.84	0.69
Utttarkhand	0.34	0.63	0.47
Punjab	0.52	0.67	0.73
Harylana	0.44	0.66	0.63
Delhi	0.31	0.77	0.72
Uttar Pradesh	0.44	0.40	0.34
Bihar	0.18	0.47	0.48
Jharkhand	0.37	0.61	0.61
Rajasthan	0.32	0.57	0.44
Chhatisghar	0.19	0.62	0.37
Madhya Pardesh	0.29	0.47	0.33
North East	0.54	0.60	0.78
Assam	0.09	0.75	0.46
West Bengal	0.12	0.52	0.58
Orissa	0.08	0.59	0.51
Gujarat	0.20	0.65	0.43
Maharashtra/Goa	0.29	0.66	0.54
Andhra Pradesh	0.29	0.50	0.51
Karnataka	0.27	0.53	0.55
Kerala	0.61	0.82	0.60
Tamil Nadu	0.42	0.80	0.72

Table 5. Sample Distribution, Private Schooling and Skill Levels by Instruments for P				
	Prop. of Sample	Prop. in Priv. School	Prop. able to read a para.	Prop. able to subtract
Know any medical personnel				
No	0.67	0.27	0.52	0.45
Yes	0.33	0.39	0.61	0.56
Know any Govt. workers				
No	0.68	0.26	0.51	0.45
Yes	0.32	0.41	0.64	0.58
Private Primary School in Village/town (all towns=yes)				
No	0.50	0.15	0.51	0.43
Yes	0.50	0.47	0.6	0.55
Local Govt. School has a Cook				
No	0.37	0.4	0.57	0.53
Yes	0.63	0.26	0.54	0.46
Local Govt. School teaches English in KG/Std 1				
No	0.58	0.34	0.52	0.46
Yes	0.42	0.26	0.6	0.53
English as a Medium of Instr. In Local Govt. School				
No	0.83	0.31	0.54	0.47
Yes	0.17	0.28	0.63	0.56
School Survey Missing for Village/Block				
No	0.84	0.27	0.54	0.48
Yes	0.16	0.5	0.6	0.52

Table 6. Impact of Excluded Variables on Enrollment in Private Schools				
Results from the First Stage of Switiching Regression Model				
	Coef.		Z Value	
Know anyone in Medical Profession	0.24	**	5.6	
Know anyone in Government	0.27	**	6.61	
Private Schools Available in Village	0.92	**	21.69	
Cook in Local Govt. School	-0.08	*	-1.88	
Early English in local govt. school	-0.08	*	-1.94	
Instr. In English in local govt. school	0.07		1.56	
Missing school schedule	0.34	**	5.29	
Constant	-1.18		-19.65	
N of cases	11667			
Chi Square (7 df)	704			
*** p<0.01, ** p<0.05, * p<0.1				

Table 7. Impact of private school enrollment on reading and arithmatic skills						
	Reading Skills			Arithmatic Skills		
	1	2	3	1	2	3
	Basic	Switching	Family	Basic	Switching	Family
	OLS	Regression	Fixed Effect	OLS	Regression	Fixed Effect
Residence (Metro Omitted)						
Other Urban	0.163***	0.161***		0.112**	0.108**	
Developed Village	0.179***	0.171**		0.092*	0.078	
Less developed village	0.176**	0.167**		0.101**	0.082	
Socio Religious Group (Forward caste omitted)						
Other Backward Classes (OBC)	-0.051	-0.051		-0.054*	-0.055*	
Dalit	-0.222***	-0.222***		-0.222***	-0.222***	
Adivasi	-0.104*	-0.104*		-0.124***	-0.125***	
Muslim	-0.231***	-0.231***		-0.241***	-0.242***	
Other Minority Religions	-0.101	-0.102		-0.0602	-0.062	
Maximum Household Education (None omitted)						
1-4 std	0.147**	0.147**		0.037	0.038	
5-9 std	0.186***	0.187***		0.110***	0.111***	
10-11 std	0.338***	0.338***		0.252***	0.253***	
high sec & some coll	0.387***	0.389***		0.302***	0.305***	
College graduate	0.417***	0.419***		0.388***	0.390***	
Log of hh. annual income	0.001	0.001		0.006	0.006	
Score on Std. of Living Scale	0.034***	0.035***		0.031***	0.031***	
No of persons in the hh	-0.0237***	-0.024***		-0.019***	-0.019***	
No. of children < 15 in the hh.	-0.00504	-0.005		0.004	0.003	
Female Child	-0.100***	-0.100***	-0.07	-0.157***	-0.156***	-0.179***
Current Standard	0.341***	0.341***	0.229***	0.247***	0.247***	0.183***
Age of the child	0.025	0.025	0.164***	0.037***	0.037***	0.123***
In Private School	**0.392*** **	**0.362** **	**0.307*** **	**0.280*** **	**0.221** **	**0.224*** **
Constant	0.497**	0.513**	1.482***	0.148	0.179	0.879***
R-squared	0.337		0.286	0.355		0.287
Chi Square (42 df)		3954			4782	
Observations	11667	11667	11667	11619	11619	11619
*** p<0.01, ** p<0.05, * p<0.1		Regressions also include controls for states				

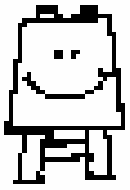
Table 8. Pred. reading scores for children in private and government schools by state						
	Unadjusted		Adjusted			Diff
	Reading Score		Govt.	Private		Priv-Govt
North East	2.57		2.78	2.49		-0.29
Maharashtra/Goa	2.83		2.77	2.55		-0.21
Tamil Nadu	3.17		2.03	1.84		-0.20
Delhi	3.09		2.79	2.69		-0.09
Harylana	2.88		2.73	2.65		-0.08
West Bengal	2.45		2.83	2.91		0.09
Gujarat	2.79		2.62	2.76		0.14
Kerala	3.29		3.70	3.87		0.17
Chhatisghar	2.81		2.91	3.10		0.19
Orissa	2.65		2.67	2.95		0.28
Karnataka	2.50		2.35	2.64		0.29
Himachal Pradesh	3.43		3.13	3.48		0.35
Rajasthan	2.52		2.43	2.89		0.46
Andhra Pradesh	2.40		2.21	2.68		0.47
Punjab	2.94		2.46	3.00		0.54
Jharkhand	2.58		2.73	3.27		0.55
Assam	2.84		2.97	3.52		0.56
Madhya Pardesh	2.31		2.36	2.99		0.63
Uttar Pradesh	2.02		2.03	2.72		0.69
Utttarkhand	2.74		2.53	3.24		0.72
Bihar	2.31		2.72	3.48		0.76
Jammu and Kashmir	2.37		2.03	2.85		0.82

App. Table 1: Proportion of 8-11 year olds tested	
All India	**0.72**
Place of Residence	
Metro City	0.69
Other Urban	0.76
More Developed Village	0.71
Less Developed Village	0.72
Socio Religious Group	
Forward Caste Hindu	0.78
Other Backward Classes	0.73
Dalits	0.74
Adivasis	0.66
Muslim	0.66
Christian	0.68
Maximum Adult Education in HH	
0 years	0.65
1-4 std	0.70
5-9 std	0.74
10-11 std	0.77
Higher Secondary/Some Coll	0.78
College Graduate	0.77
Household Income Quintile	
Poorest	0.71
Second	0.72
Third	0.73
Fourth	0.71
Affluent	0.75
Standard of Living Quintiles	
Poorest	0.67
Second	0.71
Third	0.75
Fourth	0.74
Affluent	0.76
Child Gender	
Male	0.73
Female	0.72
Type of School	
Not Enrolled	0.39
Government School	0.78
Private School	0.78

Appendix Table 2. Interaction effect of standard of living and private school enrollment on children's reading and arithmatic skills, likelihood of being praised and being beaten								
	Reading		**Arithmatic**		**Praised**		**Beaten**	
Standard of Living	0.043	***	0.035	***	0.022	***	-0.013	**
Private School Enrollment	0.654	***	0.364	***	0.628	***	-0.123	
Private * Standard of Living	-0.023	***	-0.012	***	-0.006		0.016	**
*** p<0.01, ** p<0.05, * p<0.1								
Regression includes all variables in Table 7, Model 2								

गणित

1	2	3
36 72 64 48 33 76 45 81 56 76	56 − 38 = ____ 74 − 56 = ____ 46 − 18 = ____ 75 − 37 = ____ 63 − 47 = ____ 94 − 65 = ____ 84 − 68 = ____ 84 − 46 = ____	7) 468 (5) 275 (8) 496 (3) 174 (
पाँच पूछो (4/5) संख्या 5 में से 4 पहचान होनी चाहिए।	दो करो। (2/2) 2 में से दोनों ही सही होने चाहिये।	एक करो। (1) किया हुआ भाग का सवाल सही होना चाहिए।



LEARNING TO READ LANGUAGE (Level 1)

Alphabets

k P r

S t

D h n

M b

Words

Cat Ball

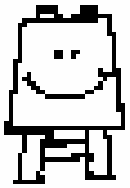
mat

water boy

road

Put my

Come make



LEARNING TO READ

LANGUAGE (Level 1)

Story

When Rita was going home it started raining. Her friend Minu saw her. Minu said to Rita, Rita it is raining hard. Come with me to my house. When it stops raining you can go home. Rita went to Minu's house.

Paragraph

Animals live in the forest. Lion is the king of the forest. But when the lion comes, they all run away.

Paragraph

Jaipur is a large city. It has a famous palace. Ajmer is another city near Jaipur. People go for vacation there.