The Political Economy of Late Development:

Industrial Policy in the Information Technology and Banking Sectors in India

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Abstract

To inform the policy debate in developing countries over strategies for economic development, this paper uses the tertiary sector in India—in particular, the information technology (I.T.) services and banking sectors—as a case study of economic governance. This paper uses a new dataset on the I.T. sector collected from the paper archives of the Software Technology Parks of India (STPI) in New Delhi during July 2013, and a dataset of the 72 largest banks in India collected from public documents at the Reserve Bank of India in Mumbai. Socioeconomic indicators, specifically wage level, higher education and urban agglomeration, only partially account for the growth of these sectors. In both the banking and I.T. sectors, government ownership promoted stability and geographical agglomeration but reduced performance. Government investment in a shared infrastructure commons through STPI was critical for the growth of the I.T. sector after 1991. Gradual deregulation following state ownership resulted in significant gains for both sectors. The paper concludes with a theory for the growth of technologically advanced sectors in India, which promotes gradual liberalization in sequence with government promotion of infrastructure and domestic competition.

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0 Author's Note

If the ultimate goal of economic growth is human freedom, then we should measure economic development on the basis of this standard. My initial interest in the role of the government's interventions in the information technology and banking sectors was to understand how these sectors could promote welfare and freedom for the poorest Indians. Access to computers and finance can improve the choices available to low-income Indians and improve the capabilities of governments and businesses. Yet the polarization of the labor market that results from these sector – between a well-paid elite class of educated engineers, and everyone else – can contribute to a dual economy with limited linkages to slum dwellers who lack basic housing, education and sanitation infrastructure in cities across the subcontinent. As I embarked on this research, I was motivated by the question: how has the government's promotion of the information technology and banking sectors contributed, if at all, to the human, economic and political development of Indian citizens?

It eventually became clear that firm or district-level statistics of the I.T. and banking sectors were not available. An alternative was to find aggregated production at the state-level: time-series of socioeconomic indicators relevant to these sectors are only available at intervals through the Census, and a collage of other sources that do not correspond consistently over time. Therefore, this paper limits its scope more narrowly to the following: how has government policy affected the contemporary growth of the banking and information technology services industry in India? I leave it to future research to determine how the success of these sectors can translate into better standards of living for people in India living in poverty today.

1 Introduction

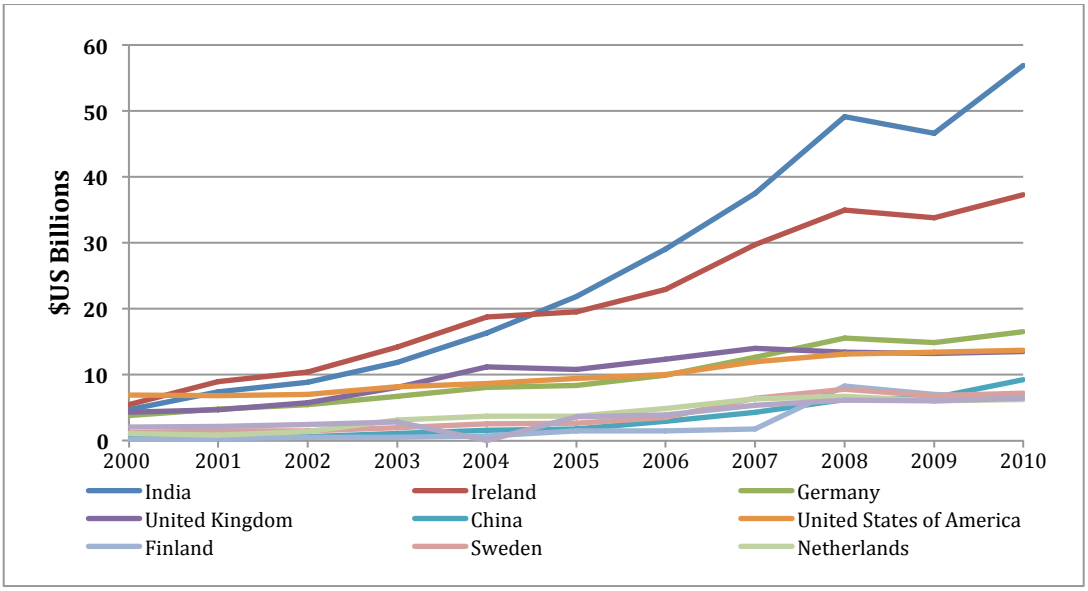
In 2012, India's GDP grew at 9%, with an average per capita income of Rs. 3000, or approximately US $600. Many have argued that this is the outcome of the country's gradual deregulation of the private sector in the 1980s, culminating in 1991 with forced liberalization after a balance of payments crisis (for example, Bhagwati and Panagariya 2013). However, evidence from the information technology (I.T.) services and banking sectors suggests that liberalization was necessary but not sufficient for the growth of the tertiary sector.

The banking and information technology sectors provide a useful case study for understanding the impact of government policy on the tertiary sector. Banking facilitates the flow of savings and investments in the country, and was at one time considered a public utility tasked with providing credit in rural and underinvested areas between 1969 and 1991; today it has expanded that role to allow private and foreign banks to compete and facilitate the flow of capital in a rapidly growing economy.

India's information technology services sector is one of the most successful in the world. Though at one time I.T. was exclusively the domain of 'public sector champions,' mandated to create the Indian computer as a source of national autonomy and pride, today India dominates the share of computer services in the international economy. And while the compound annual growth rate of the tertiary sector has grown steadily since 1950 – from 1.7% in 1900 to 1950; 4.5% in 1960 to 1980; 6.6% in 1980; and 8.9% in the past decade (see Table 1, page 12) – I.T. service exports have grown up to 52% per year in the 2000s.

This paper finds that an entrepreneurial government *and* gradual liberalization were essential for the I.T. and banking sectors' contemporary growth. In the early stage of India's information technology sector (1950-1980), the government abolished most practical imports and local tech enterprises and established major state-run industries with a focus on defense technologies. In the late stage (1980 – 2000), the government invested heavily in technology infrastructure for public use and reduced labor regulations. Today, India has the highest share of computer-related service exports in the world.

Figure 1. Computer-related service exports, by top exporters, 2000-2010



Source: U.N. COMTRADE

To evaluate the effect of industrial policy on the productivity of the banking and information technology sectors in India, I combine econometric data with personal interviews and historical research. Section 2 reviews the literature on the political economy of industrial policy. Section 3 provides an overview of the history of each sector in India. Section 4 analyzes whether we can predict the state-level growth of each

sector on the basis of socioeconomic and urban agglomeration indicators. Section 5 analyzes the role of industrial policy and regulation in promoting each sector. Lastly, Section 6 offers policy suggestions for each sector.

2 Literature Review

The rapid industrialization of East Asian economies challenged economists who advocated for rapid liberalization in late developing countries. While the World Bank and IMF's free market policies and structural adjustment programs promoted throughout the 1980s had the potential to promote growth under certain circumstances, their reforms had unintended and often negative consequences. While 40% of developing countries that liberalized in the past five decades have had a rapid expansion of exports, half of them de-industrialized (Shafaeddin 2005). Industries that were near maturity before liberalization, such as the aerospace sector in Brazil, accelerated in growth once they were able to compete with the rest of the world economy (Shafaeddin 2005). Instead, industries that were less technologically advanced and faced a surge in import competition, such as labor-intensive industries, declined. The evidence on liberalization from the past four decades, and the argument this paper will make, suggests that effective sequencing of active state support and liberalization is key for successful industrial development.

East Asian economies managed the most successful development programs in history. South Korea, for example, created some of the most "efficient steel plants in the world," resulting from a government-mediated and export-based industrialization strategy with incentives for competition, supported by a well-regulated financial sector (Stiglitz 2005). As a foundation to study the growth of banking and information in technology, I use insights from the liberal economics school (Bhagwati and Panagariya 2013, Panagariya 2008) and the state-facilitated development school (Sen 2013, Rodrik 2005,

Evans 1995, Wade 1990). Below I synthesize two primary schools of thought that seek to explain the shift in economic growth.

2.1 Liberal economics school

Bhagwati and Panagariya offer the dominant liberal economic view of India's development, summarized in their recent book, *Why Growth Matters* (2013). These economists argue that just after independence, there were too many controls over private production, the public sector had too much monopoly power, and goals for self-sufficiency—and an aversion to foreign companies—defined trade policy. The socialist, central planning model of development that India tried to emulate was consistent with the anti-foreign sentiment that swept the country following independence from British colonialism.

Bhagwati and Panagariya point to the fact that growth did not keep up with increasing rates of investment between 1950 and 1990. The four primary reasons for this, they argue, were, first, an extensive system of control over private investment and production; second, monopoly power of the private sector in areas beyond utilities; third, protection of domestic manufacture; and fourth, restriction on foreign investment.

This school of thought opposes economists from the state-led development school on the grounds that "there is no compelling case where such policies led to significant growth over a sustained period" (Bhagwati et al. 2013). To explain rapid development in East Asia, the authors point to technology transfers and high literacy rates. Still, they do not endorse the East Asian approach to development: "the mix of political and economic features that characterizes China is hardly a role model for other nations to adopt for their development," because the political regime is not sustainable in the long term (Bhagwati

et al. 2013). To explain increasing growth rates in the 1980s, liberal economists argue that policies after 1975 retreated gradually from the "license raj" before full economic liberalization. Panagariya also cites evidence that import licenses were gradually phased out between 1975 and 1985.

2.2 State-facilitated development school

As economic models that prove trade increases welfare are well established under conditions of perfect competition and constant returns to scale, the burden of proof in the debate often falls on the state-facilitated development school. These economists attribute growth in India to the active support of the state, rather than to the deregulation of the state. These authors argue that it is misleading to attribute the country's growth rates only to deregulation and liberalization. Rodrik (2004) and others suggest that growth began taking place a decade before the 1991 reforms (Table 1). Bosworth et. al. (2007) document an acceleration in GDP per capita and TFP in the 1970s and 1980s (Table 1).

Structural breaks in economic growth around 1980 give evidence that suggests India's upward growth trajectory began before liberalization. Rodrik and Subramanian (2004) find a structural break in 1979 using data on per-capita GDP (constant dollars and PPP), GDP per worker, and TFP. Sen (2007) and Basu (2008) show that without the 1979-1980 observation, when GDP fell 5.2% due to an oil price shock and drought, the trend breaks in 1976; in fact, average annual growth rate is 5.8% in 1975-1978, which corresponds with India's growth in the 1980s (see Kotwal 2010 for a complete discussion).

Table 1. Aggregate Growth Accounting in India

	1960-70	1970-80	1980-90	1990-99
Bosworth-Collins				
Output	3.84	2.98	5.85	5.59
Output per worker (Q/L)	1.87	0.69	3.90	3.27
Capital per worker	0.83	0.61	1.06	1.32
Education	0.29	0.58	0.32	0.34
Total factor productivity	0.74	-0.50	2.49	1.57
IMF (in Rodrik 2004)				
Output	3.75	3.16	5.64	5.61
Output per worker	1.77	0.86	3.69	3.30
Total factor productivity[1]	1.17	0.47	2.89	2.44
Total factor productivity[2]	-0.94	-2.07	1.28	0.94

Source: Rodrik (2004); Bosworth and Collins (2003)
1 – Based on labor force
2 – Based on average years of schooling in population above age 15

These findings suggest events or policy before the 1991 liberalization of the economy influenced the economy's growth trajectory. Of course, the attribution of these breaks to any particular policy is ambiguous at best. For example, the 1976 break could be the result of Indira Gandhi's declaration of a constitutional Emergency, which gave her dictatorial power and coincided with GDP growth of 9%. Or, greater output could have been a result of an increase in India's savings rate from 12.2% in 1968 to 21.5% in 1978 (Basu 2008). Sen and Athukorala (2007) attribute the increases in savings to bank nationalizations in 1969 that, among other things, mandated branches in rural areas for the first time (see Section 3). Sen (in Kotwal 2010) shows that a 1% increase in bank density is associated with a 0.03% increase in the private savings rate; and during the 1970s, the number of bank branches increased three times. It is not plausible that a similar increase would have occurred without a nationalized banking sector, as expansion was heavily subsidized by the central government.

If a country liberalizes and specializes, as a result of comparative advantage, in sectors that do not have dynamic scale or other benefits, it might find itself at a lower growth rate for an indefinite period of time. If the government is capable of promoting sectors that have multiple dimensions for growth, such as positive complementarities with the rest of the economy and higher total factor productivity, trade can lead to higher growth trajectories. TFP explains most of the difference in output between countries (Hall and Jones 1999). For example, the average output for the top five countries in 1988 was 31.7 times higher than average output of the bottom five countries as a result of difference in productivity, instead of traditional factor inputs of labor, capital and education.

Total factor productivity can come from improvements in technology, organization of production, reduction of distortions and also government policies. Quality-adjusted TFP growth calculations show that TFP accounts for 20% to 50% of growth in developed countries (Jorgenson et. al 2001). Klenow et al. finds that productivity differences account for approximately 67% in differences in income per worker, or as high as 90% for information-based sectors (1997). The growth is therefore contingent on how capital in a given industry is organized. While technology transfers are key to productivity – as Panagariya (2008) and others note in the case of China's growth in manufacturing, for example – so is the role of government in promoting how capital is used.

The literature on political economy provides insights into *how* state intervention can facilitate rapid development. Evans (1995), building on previous work by Gershenkron (1962), argues the role of the state in late development is not simply to

provide a stable environment for markets. In an account of late development in South Korea and Brazil, Evans shows how entrepreneurs require capital in excess of what they are able to obtain on their own. The state, he argues, "plays role of an investment banker by bringing together necessary funds and encouraging their application in transformative activities," a risk that capitalists and private institutions do not take (Evans 1995). We see the state following a similar logic in the U.S., too: during the recovery from the 2008 recession, the U.S. government instituted loan guarantee programs for small businesses to promote the entry of new entrepreneurs into the market, taking on the role of India's nationalized banking sector without the burden of running a monopoly.

South Korea's growth also followed heavy state intervention. By imposing performance standards on private companies receiving public support, the South Korean government became part of a "joint project of industrial transformation" rather than a neutral arbiter of macroeconomic stability (Evans 1995). Using a similar approach, the Taiwanese government "governed market processes of resource allocation to produce different production and investment outcomes than would have occurred with either free market or simulated free market policies" (Wade 1990). State leadership and entrepreneurship can help bring about new social and capital organization that is useful for industrial development.

Evans calls the political capacity of a state to lead late industrialization "embedded autonomy." This term refers to a bureaucratic arm that has autonomy from private political interests, while maintaining ties to firms that can implement a development project through various subsidies and incentives. For industrial policy to be effective, Evans argues state agencies must be embedded with the private sector and

autonomous from it. One of the primary reasons why the Indian government was historically ineffective at industrial policy relative to other rapidly developing countries is that it opted for explicit ownership of monopoly firms without strict oversight of production or growth targets.

2.3 Agglomeration economies

In the case of information technology services and production, agglomeration economies are commonly cited as an important explanatory factor for the sector's growth. Once industrial policy, or historical accident, encourages the development of an industry in a geographic region, agglomeration economies may continue to sustain its growth (Hall and Jones 1999, Krugman 2012). This concept extends and complements the primary arguments of the liberal economics and state-facilitated growth schools. The growth of the Indian I.T. sector was not simply a matter of infrastructure, human capital and trade, but also the physical structure of "highly decentralized and localized production networks… with close ties to users, to foster innovation" that permitted increasing economies of scale (Parthasarathy 2000). These concentrations of production emerge from market-driven development or state-sponsored projects, such as industrial parks, which can attract well-paid technicians and semi-skilled jobs (Heitzman 2004). In fact, labor and capital are less important when predicting where tradable industries will locate, because these resources are mobile within countries (Krugman 2012). Instead, firms may decide to locate in a given place because similar firms are already located there. Centralized government planning can play an important role in determining where a particular industry will locate.

To find the effect of agglomeration in the growth of developing countries, Combes et al. (2007) and Rosenthal and Strange (2004) regress sectoral productivity on city measures of economic activity within the sector. There is evidence of localization economies – agglomeration within sectors, fostering specialized cities – in Brazil, traditional Korean industries and in India (Henderson 1988, Henderson 2001, Lall 2004 in Duranton 2008); and of urbanization economies – agglomeration effects between sectors, fostering diversified cities – in India, Indonesia, and China (Lall 2001, Deichmann 2005, Au 2006 in Duranton 2008).

The factors that lead to clustering are difficult to identify because agglomeration and convergence pressures occur simultaneously. With convergence, the coefficient on the initial level of economic activity as a predictor of growth is negative: there are diminishing returns, a mean to reversion, or both (Porter 2011). For example, numerous firms in one region can create more local demands for inputs, reducing profit margins and incentives to expand. If the price of specialized inputs – such as technical skills for specific software – increases with the number of local firms, there could be diminishing returns, too (Porter 2011). Glaesar et al. (2009), Henderson (2003) and Delgado et al. (2011) argue that when agglomeration economies are larger than convergence factors, there is more rapid learning, innovation and entrepreneurship. In Silicon Valley, for example, early start-ups and venture capital firms were able to engage with the electrical engineering resources at Stanford University in Palo Alto; government contracts during the Cold War were critical for financing many of these firms. The service industries encouraged 'social capital networks' that built trust and rewarded innovation, with a horizontal coordination across firms (Cohen and Fields 2000). The idea of a research park

was also successful in the Soviet Union, Japan and Taiwan, where the central government intervened in local real estate markets to allocate investments.

Sophia Antipolis, in southern France, is another recent example of state-facilitated development with strong agglomeration economies. The French government invested in superior communication and transportation networks and an attractive living environment for professionals and technicians. It aimed to encourage inter-firm cooperation, circulation of information and links with venture capital (Fouich 1997 in Heitzman 2004). The center took off in the 1990s with a rapid growth of enterprises, and by 2000 it had the largest concentration of I.T. and communications industries in Europe, with optical fiber connections, a concentration of French communication facilities, and government-funded R&D (Heitzman 2004). The evidence on agglomeration economies suggests that government activism combined with openness to trade can result in increasing returns to scale and sustained growth.

3 Banking and I.T. in Transition: An Overview, 1800 – 1990

3.1 History of information technology in India

Prior to the growth of the information technology sector in India after 1991, the public and private sectors had invested in necessary physical and social infrastructure for over a century. The history of Bangalore, Karnataka is closely related to that of the I.T. sector in India: the city has produced over 40% of the country's computer service exports in the past twenty years. From the 1800s (if not earlier) through the 1990s, Bangalore was the recipient of national public works. While subsidies, followed by liberalization, appear to be important explanatory factors for the industry's success today, an account of the city's history provides more nuanced insight into how the city developed prior to its growth in I.T.[1]

In the early 1800s, Bangalore was a center for state government offices and an economic zone for silk weaving, bankers, and cloth merchants. By the 1850s, non-mechanized production in Bangalore faced competition from Britain. The Indian government, controlled by the colonial British government, mandated that India import silk and machine-made goods, resulting in the decline of local production (Heitzman 2004). Subsequently, entrepreneurs from England set up steam-powered factories to produce textiles starting in 1877. This approach—of outside entrepreneurs setting up export factories taking advantage of local labor—is similar to China's industrialization through special economic zones in the 1980s (Naughton 2006). These plants required heavy loads of electricity, and by 1890 Bangalore became the first electrified city in India (Heitzman 2004).

[1] For a more detailed account of Bangalore's complex history in relation to the I.T. industry, see Heitzman 2004 and Evans 1995.

In 1909, under the leadership of Indian planner Visvesvaraya, the Government of Mysore pursued a vision of state-led industrial development through "a technically educated workforce" (Heitzman 2004). Borrowing technology from Japan, Europe, and the United States, the government established the Mysore Iron and Steel Works, the Krishnarajasagara dam near Mysore, and the first Engineering College in Bangalore. Visvesvaraya's work coincided with that of Jamsetji Tata, who founded the Indian Institute of Science in Bangalore to promote new industry in India (Heitzman 2004).

The high-technology sector in Bangalore was also transformed by British investments in the aeronautics industry during World War II. In particular, the geopolitics of the region was a factor that contributed to Bangalore's transition from a manufacturing center to a high-technology, research and telecommunications center (Parthasarathy 2013). It seems Bangalore was chosen in part because it was beyond the range of potential air raids from Pakistan (Parthasarathy 2013, Heitzman 2004). The largest companies during this era that supported the defense industry were government-run. The Hindustan Aircraft Pvt. Ltd. (HAL), one of the largest public enterprises, was founded in 1940 as a public enterprise. The local government transferred 200 acres of public land in Bangalore and purchased 800 acres from private owners to establish the new company. The enterprise created 21 villages to house workers, and arranged a fleet of buses to bring them to work. HAL manufactured vehicles, jet aircrafts and helicopters; new technical and service industries formed near the city to supply radio parts, motors and telecom switches (Heitzman 2004).

Meanwhile in the United States, researchers at the Electrical Numerical Integrator and Calculator at the University of Pennsylvania built the world's first computer in 1946

with 70,000 vacuum tubes (Parthasarathy 2000). The transistor replaced the vacuum tube in 1954, which enabled the computer to become smaller, less expensive, and more powerful. In the 1960s, computers were still only affordable to large organizations, and IBM controlled two thirds of the world market (Parthasarathy 2000). IBM's strategy to maintain a monopoly position in the market was to undercut the development of third-party software developers: the company developed FORTRAN, the first programming language, and gave away its software and tools freely with its hardware. Since software was incompatible between manufacturers, switching away from IBM was expensive. In 1968, after an anti-trust lawsuit by the U.S. Justice Department, IBM began selling software separately. This decision set the stage for the development of a software market and independent software industry (Parthasarathy 2000).

In India, the government continued to create public enterprises in Bangalore with the goal of creating an indigenous computer industry: the Indian Telephone Industries (ITI) was founded in 1948 had a monopoly over telephone equipment and services; Bharat Electronics Ltd (BEL) was founded in 1954 within the Department of Defense's mandate to produce transistors, receivers, and communications equipment. It became the largest producer of electronic goods in India and served as a training ground for engineers (Evans 1995). BEL's presence of 20,000 employees in the outskirts of Bangalore created a strong network of engineers and social infrastructure for the city's future technology district. By 1960, BEL and ITI were the largest electronics manufacturers in India. To supplement local capacity for computer production, the government also founded the Electronics Corporation of India Limited (ECIL) in 1967 under the Atomic Energy Commission in Bangalore (Evans 1995). ECIL was given the mandate to build a

computer as a public sector champion. “Let us work up the embers of national pride latent in all of us and build up our morale so that we can confidently aim high and achieve greater goals,” said A.S. Rao, a founding managing director of ECIL (ECIL 2013). Just as the other public sector champions, ECIL was a matter of national pride; in the two decades after Independence the government sought to encourage autonomy from foreign powers, which until recently had kept India under painful and extractive colonial rule.

In 1977, IBM, which had early on established operations in Bangalore, decided to leave following the Foreign Exchange Regulation Act of 1974, which mandated that foreign firms could not hold more than 40% equity in Indian companies (Evans 1995). The next year the Indian government set up the Hindustan Computers Limited to manufacture its own mainframes. The government also formed the Computer Maintenance Corporation (CMC) in 1975 to service computers not manufactured in India. By the end of the 1980s, CMC serviced hardware made by 40 different firms; its achievements included computerizing the Mediterranean Games of 1987 and coding the railway reservation system in India (Evans 1995).

Despite a few accomplishments, such as the production of digital switches for Indian telephones, the domestic industry lagged with cumbersome regulation and the lack of incentives for competition. The license requirements meant that the “purpose of installing a computer had to be established before permission would be given for installation” (Purkayastha 1985 in Parthasarathy 2000). These blockages to the development of the industry were not lifted until November 1984, when Prime Minister Rajiv Gandhi took steps to liberalize the electronics sector with the New Computer

Policy of 1984 and the Computer Software Export Policy of 1986 (Heitzman 2004). These policies simplified import procedures to a single window clearance, lowered import duties and allowed duty-free imports for the government and research facilities. These policy changes were closely associated with rapid growth in the sector: across the country, production rose from 800 computers in 1981 to 160,000 in a decade later; exports of computer equipment grew from $200,000 to $4.8 million in the same time period (Heitzman 2004).

Demand for packaged software in Europe and the United States grew tremendously with the standardization of the computer in the late 1980s. The number of software manufacturers worldwide increased from 2992 to 6001 between 1987 and 1992, while the average employees per firm changed minimally, from 16.4 to 18.4 (Parthasarathy 2000). Older systems that had accumulated information could not be easily replaced, and maintenance remained labor intensive. Mayall (1991) writes

> "such companies operate what can only be regarded as software museums: collection of systems that incorporate or exemplify all the significant developments in computing… including some of the blind alleys. The result is the systems equivalent to a medieval city, a hotchpotch of dissimilar buildings and winding lanes where only the locals can find their way around" (in Parthasarathy 2004).

In the United States, hiring computer scientists to write code for legacy systems was expensive. Firms started to look elsewhere, especially to India. That year, 80% of bandwidth in Bangalore was used for projects in the United States, and the rest for projects in Europe (STPI Annual Report, 1993). The growth of the banking sector after

1990 is documented in Figure 2 in the Appendix, and is more closely analyzed in Sections 4 and 5.

3.2 History of banking in India

A brief history of the Indian banking system provides context for its rapid internationalization and development in the past two decades. The first joint stock banks in India were started in the 1860s, the most notable of which were Allahabad Bank founded in 1865 and the Punjab National Bank founded in 1895. In the early 1900s, the number of banks swelled as Indian entrepreneurs participated in and were inspired by the Swadeshi Movement, whose aim was to bring economic development to India (Basu 1965). Industrial houses made their way into the banking business, as did some foreign banks. A few powerful families owned joint stock banks and made preferential loans to themselves and their favored organizations (RBI 2011). Rapid growth of new banks led to a banking crisis: 108 banks failed between 1913 and 1917. More than 1000 failed between 1922 and 1938! According to Basu (1965), an economic historian of India's banking system, these rate of failures were exacerbated by favoritism and vested industrial interests in lending, insufficient reserves and liquidity, ignorance about banking, mismanagement, speculation and lack of centralized banking regulation.

In, 1921, the creation of the Imperial Bank of India established the country's modern national banking system. The Imperial Bank was a consolidation of the three largest banks in India, known as the Presidency banks, which were founded between 1806 and 1843 (Basu 1965). In the wake of independence from the British, the government-owned Imperial Bank was renamed the State Bank of India (SBI). In 1935,

the Reserve Bank of India (RBI), India's central bank, was given the authority to regulate commercial banks (Banerjee 2004). The Indian government would leverage the banking system achieve social and economic objectives by expanding credit to underserved districts, curb abuse of credit by industrial entrepreneurs, and prevent systemic bank failures from re-occurring.

Between 1960 and 1990, the Indian government nationalized almost all private banks in the country. First, in 1969, the government nationalized each of the 14 major commercial banks with deposits greater than Rs. 500 million. Then, in 1980, more banks were nationalized until 90% of bank branches were under government ownership (Banerjee 2004). The RBI's actions may be understood under a context of great public apprehension over private bank ownership. In a recent report, the RBI writes

> Even though industrial and businesses houses are already permitted in other [non-deposit-taking] areas of financial services, banks are special as they are highly leveraged fiduciary entities central to the monetary and payment system. There are several deep-rooted fears in allowing industrial and business houses to own banks. Mainly these relate to the fact that such an affiliation tends to undermine the independence and neutrality of banks as arbiters of the allocation of credit to the real sectors of the economy… The Japanese experience with Keiretsu, the Korean experience with *Chaebols* and the Indian experience prior to nationalization are strong reminders of the pitfalls of commercial interests promoting and/or controlling banks (RBI 2011)

India's nationalized banks have had success at expanding financial access: since 1969, nearly 60,000 new bank branches have opened in India, garnering most deposits held by Indian banks (Banerjee 2004). However, because nationalized banks were large

and deprived of competition over the course of 20 years, their performance deteriorated, which jeopardized sustainable economic development of the country.

The major causes of deteriorating bank performance can be summarized as (a) a lack of incentives to allocate credit based on the profitability or creditworthiness of the borrower, (b) regulatory burdens, and (c) political abuse. In the early years of nationalization, "ministers organized loan fairs in which money was distributed without the … expectations of repayment… not surprisingly, the banking system was soon reeling under bad loans" (Wharton 2009). For example, banks were required to hold government securities, to follow set interest rates, and, after 1985, to allocate 40% of loans to the priority sector. The priority sector, which still exists today, includes small-scale industry and agricultural projects. It has been adapted in recent years to serve microfinance organizations as well.

The concentration of wealth and power in a few public banks in 1990, coupled with the country's current account crisis, threatened the sustainability of the banking system. Starting in 1991, India allowed foreign banks and new private banks to enter commercial banking. These private and foreign banks faced large competitive disadvantages due to their small market share, but still initially outperformed state-owned banks. New banks had to be well capitalized, technologically advanced, and not be owned by or associated with industrial houses (Shirai 2001). The RBI also decided to reduce the reserve requirements and institute more prudential norms. At this time, there were 140 foreign bank branches in India and 60,000 domestic banking branches (Shirai 2001). In 1994, the government recapitalized public sector banks and allowed them to raise up to 49% of their capital from the private sector. In 2004, new regulations allowed

foreign investors to own up to 74% of private banks (Shirai 2001). The growth of the banking sector following liberalization is more closely analyzed in Sections 4 and 5.

4 Political Economies of Growth: Education and Urbanization

This section tests education, wage, and external economies of scale as drivers of growth for in information technology and banking sectors using cross-sectional growth regressions in two time periods. As the regressions are across states, the indicators in the sample are more comparable than cross-country regressions. States in India are also bound to the same federal laws for I.T. and banking, providing a basis for comparing other indicators across states. This enables us to find more reliable coefficients for differences in education or literacy, despite the limited sample size. The regressions presented in this section aim to suggest whether robust correlations exist between dependent and independent variables. Section 5 builds on this section by building a theory of sequential industrial policy for the information technology and banking sectors.

4.1 Data Description

- *Dependent Variables*
    - **Information Technology Services Exports.** Data on information technology used in this section was obtained from field research I conducted in July 2013 in the archives of the Software Technology Parks of India (STPI) offices in New Delhi. The data has aggregate state-level exports from 1991 to 2012 for I.T. service firms that were participating in the STPI incentive scheme. As the STPI incentive scheme imposed no taxes on firm profits during from 1993 to 2010, most exporting firms are covered by these statistics (Rai 2013 and Omkar 2013). This is the first paper that, to my knowledge, contains annual data on I.T. exports from

India segmented by state since 1993. Data on the information technology sector in India are not otherwise made public.

- **Banking Sector Value Added**. Data on the banking sector for this section was obtained from a value added time-series of the sector provided by the McKinsey Global Institute. I use the same covariates as in the I.T. sector as a point of comparison. This banking data is supplemented by indicators of financial stability and profitability in Section 5 obtained by the Reserve Bank of India.

- *Independent variables.* Data on education, urbanization, and literacy indicators was obtained from the Census, Indiastat (an aggregator of statistics) and the websites of Indian Ministries. Data on higher education enrollment is not regularly published on a state-level. As this is the key socioeconomic driver of I.T. growth, and I obtained two observations—in 2000 and 2007—cross-sectional regressions were only conducted in these two years. As a result of their sample size and specification, these regressions are necessarily descriptive; they provide useful context for the otherwise mainly qualitative literature on drivers of information technology growth in India.

4.2 Analysis

The correlation matrix (Table 2, appendix) summarizes the cross-correlation of key socioeconomic drivers for the growth of the I.T. sector. A higher urban ratio is associated with higher literacy, education, and wages. States with more students in higher education have stronger levels in I.T. exports. The ordinary-least-squares specification I use to estimate the level of I.T. exports is

$$Ex_i = B_0 + \beta_1 h_i + \beta_2 p_i + \beta_3 w_i + \beta_4 r_i + \beta_5 l_i + u_i \text{ (Eq. 1)}$$

where Ex is the level of exports in Rs. crores from 2005 CPI levels[2]; *h* is the number of students enrolled in institutions of higher education in thousands*; p* is the population in millions; *w* is the average hourly wage for firms with 50+ employees or 100+ employees without electricity supply; *r* is the percentage of people living in urban areas (0 to 100)*,* and *l* is the urban literacy rates (0 to 100) for state *i* with an error term *u.*

Tables 3 and 4 (appendix) suggest higher education in significant for explaining the growth of the I.T. sector. In particular, when higher education is removed from Regression 3 to Regression 4, the R-squared value drops from 61% to 16%. This indicates that without information on college enrollment, we can explain *almost none* of the variance in information technology services growth between states. Higher education is also the only statistically significant value, with $p<0.01$, even after controlling for levels of urbanization and population. Investments by the government in tertiary education decades earlier created a flow of engineers who could be employed or start their own companies if given the capital and infrastructure to do so.

The most compelling part of these results emerges when we plot the predicted value of exports against the actual values (Figures 3 and 4). In both figures, Karnataka (KNT), where Bangalore is located, has approximately *double* the actual exports than predicted. In 2007, other states are consistent with predicted values. First, these figures suggest the conditional distribution of u_i is not zero, and therefore the coefficients are biased in indeterminate direction as a result of missing variables. Second, and critically,

[2] 1 crore is equivalent to ten million. The exchange rate in January 2010 and January 2005 was Rs. 45 / $. Beginning in August 2011, the rupee depreciated and in December 2013 trades at Rs. 61 / $.

that actual exports are far higher than predicted in only Karnataka suggests there are other major drivers of growth that are not included in the cross-sectional regression in Table 2. These drivers are not possible to test at this level of aggregate data, but field interviews with experts can give insight into what the possibilities are:

The STPI General Director, Dr. Rai, the STPI-Bangalore Director, Mr. Das, and Professor at the Institute of Information Technology in Bangalore, Dr. Parthasarathy, suggest two hypotheses for why Karnataka is an outlier in this growth regression: (1), it was the recipient direct industrial policy compared to other states, and (2), the types of I.T. services in Bangalore are higher in the value chain compared to other cities, and therefore less elastic to local wages and educational institutions. Parthasarathy noted in an interview that "companies in Bangalore are not as wage sensitive because they are developing new products, not running call centers… they want the best engineers at any cost" (2013). Both hypotheses are supported by Figures 3 and 4, and will be explored in more detail in Section 5.

Figure 3. Predicted vs. Actual Values, 2007 Exports (Table 3, Regression 6)

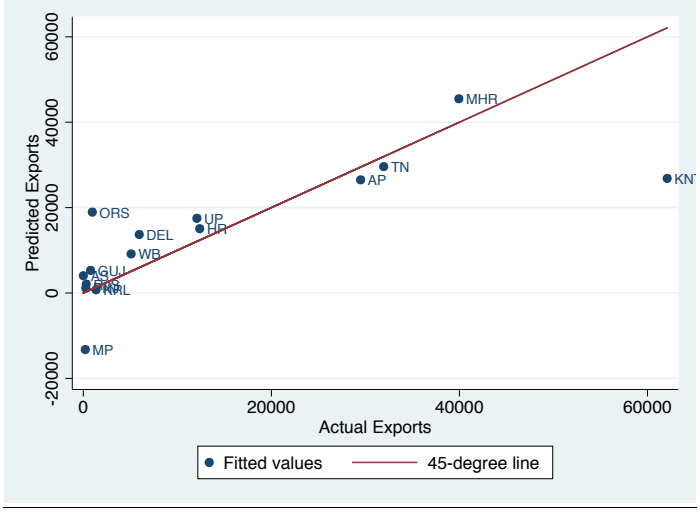
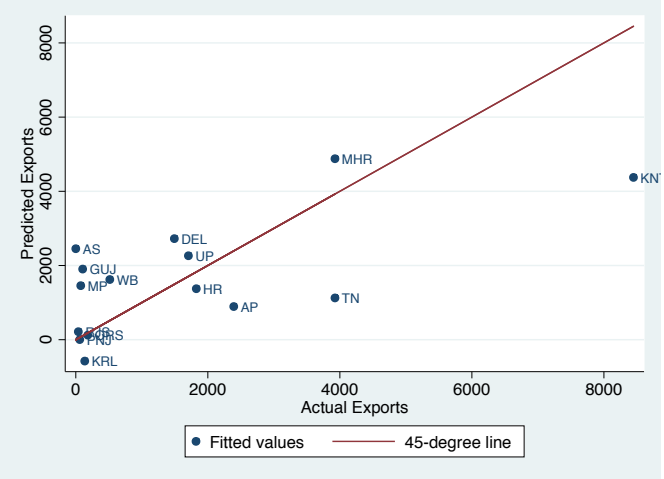


Figure 4. Predicted vs. Actual Values, 2001 Exports (Table 4, Regression 6)



Other values in Tables 3 and 4, while not statistically significant, do reveal characteristics of the I.T. sector. For example, while urbanization and population levels are positively correlated to exports when higher education is not considered, these values are negative when higher education is included. Therefore, the economies of scale in the I.T. industry seem to be driven by education agglomeration, rather than urban agglomeration. This observation is consistent with other I.T. parks described in the literature review, such as Sophia Antipolis in France or Silicon Valley in the U.S., which benefit from the agglomeration economies of skilled workers rather than large-scale urbanization. The tables also suggest urbanization and wage levels predict I.T. exports more strongly as time passes from 2001 to 2007, a period that saw a 10x increase in the level of output. The R-squared levels for identical regressions reach a maximum of 43% in 2001, versus 60% in 2007, suggesting non-measureable effects in access to computing power and capital investment may have had more influence in the earlier period.

I conduct a similar regression analysis on the banking industry:

$$VA_i = B_0 + \beta_1 h_i + \beta_2 p_i + \beta_3 w_i + \beta_4 r_i + \beta_5 l_i + u_i \text{ (Eq. 2)}$$

where *V* is the level of value added per year in state *i,* and the covariates are equivalent to those in the I.T. sector. The value added of the banking system in India includes domestic growth, which is linked to business development and access to foreign capital. From Table 5 (see appendix) we should note that the key drivers of banking value are a combination of urbanization, urban literacy and wage levels. In Regression 5, a 1 percentage point increase in urban literacy levels is associated with Rs. 29 thousand crores more value added by banks. In Regression 4, a 1 percentage point increase in urbanization is associated with 15 thousand crores of additional value added. Urbanization and urban literacy, proxies for business growth and better general education levels, predict the growth of the banking sector more strongly than specialized education.

Figures 5 and 6 suggest that on the basis of socioeconomic indicators, Maharashtra is a strong outlier, as Karnataka is in the information technology sector. Just as Karnataka was the beneficiary of heavy government investment in information technology, Maharashtra is also the location of the State Bank of India (SBI), the largest financial institution in the country with 20% of all of India's deposits and outstanding loans. That the only major outliers for the I.T. sectors and banking sectors were the recipients of extraordinary government intervention suggests industrial policy has been a significant factor in supporting the growth of these industries.

5 Political Economies of Growth: Industrial Policy and Regulation

Higher education and urbanization are only two factors that drive the development of the tertiary sector. This section analyzes the role of government policy and deregulation in the period of growth following 1991 for the information technology and banking sectors.

5.1 Industrial policy and deregulation in the information technology sector

5.1.1 The Software Technology Parks of India program

Though India tops the charts of I.T. exports, this is not necessarily only the result of low wages, strong higher education and English language proficiency. Table 7 shows Andhra Pradesh and Tamil Nadu (#3 and 4 producers in 2010) growing at approximately Rs. 4400 crores per year between 2001 and 2007, and Haryana and Uttar Pradesh (#5 and 6) growing at approximately Rs. 1800 crores per year in that same time period. The growth trajectories of Maharashtra (Rs. 5800 crores per year) and Karnataka (Rs. 9370 crores per year) are unrivaled.

Table 7. Average annual growth in I.T. service exports, selected states, 2001 - 2007

State	Average annual growth
Karnataka	Rs. 9370 crores
Maharashtra	5820
Andhra Pradesh	4360
Tamil Nadu	4475
Haryana	1820
Uttar Pradesh	1700

The early differences in growth trajectories between Uttar Pradesh and Karnataka suggest that heavy state intervention set the two states on different growth trajectories. In 1992, these were the only two states in India with I.T. service exports that had reached Rs.

10 crores – all other states were below Rs. 1 crore. Andhra Pradesh would not export more than Rs. 10 crores until 1994, and Maharashtra not until 1995. Uttar Pradesh and Karnataka are a useful point of comparison, as they both began with Rs. 10 crores of exports in 1992. By 1993, Karnataka had a 24% export advantage over Uttar Pradesh (see Table 8). This advantage grew to 39% in 1994, and by 1995 it was over 100%.

Table 8. Comparing exports from Bangalore and Noida, 1992 – 2000

Year	Exports, Karnataka (Bangalore)	Exports, Uttar Pradesh (Noida)	Bangalore's advantage
1992	Rs. 10 crores	Rs. 10 crores	0%
1993	26	21	24
1994	64	46	39
1995	232	114	104
1996	669	259	158
1997	1101	535	106
1998	2183	1018	114
1999	3418	1938	76
2000	6152	3580	72

Source: STPI export data

Evidence of growth divergence in Table 7 and 8 suggests that liberalization did not apply to all states evenly—that agglomeration economies and state investments in the economy had significant impacts on their growth trajectories. These tables corroborate evidence from Figures 3 and 4 (see Appendix), which show Karnataka as consistently below its predicted value of exports using only socioeconomic indicators. These factors strongly corroborate the evidence from India's history in information technology, and my field research on the role of government intervention in these sectors.

In this section, I argue that key government investments in 1992 allowed Bangalore to capture a majority of the industry's growth in the 1990s. By the 2000s, this growth was not propelled by active government intervention, but by the combination of trade liberalization and agglomeration economies. The analysis suggests that state-

facilitated development and liberalization are both necessary in the tertiary sector, but must be sequenced properly.

Consistent with the state-facilitated development school, early government investments in the defense sector during World War II contributed to the necessary research institutions and development of engineers that initially encouraged IBM and public enterprises to locate in Bangalore. The defense sector had located in Bangalore because it was distant from Pakistan and China and had an established electric grid as a result of the city's 19th-century mercantile past (Section 3). A combination of private sector growth combined with heavy government mobilization of resources set Bangalore up for its growth in information technology services after 1980. Government investments in Bangalore's communications capability were crucial for early entrepreneurs in the sector.

The government's relaxation of import license requirements was critical for the growth of the I.T. sector. In the early 1980s, 95% of capital goods and 98% of intermediate inputs across the economy were subject to non-tariff barriers such as licenses across the economy (Table 9). In 1984, the government abolished import licenses and requirements for computers. Exports of computers increased from $200,000 in 1981 to $4.8 million by the end of the decade. India did not complement import licensing requirements with efforts to increase inter-firm competition, as the Japanese or Korean government had done while protecting heavy manufacturing (Evans 1995).

Table 9. % Imports of Manufactured Goods subject to Non-tariff Barriers

	1980-85	1986-90	1991-95	1996 - 2000
Intermediate inputs	98	98	42	28
Capital goods	95	77	20	8
Consumer goods	99	88	46	33

Source: Das (2007) in Kotwal (2010)

As a result of activism within the Department of Electronics to give preferential treatment to the computer technology sector, the government formed the Software Tech Parks of India (STPI) initiative. STPI was founded by the Department of Electronics in June 1991 to manage the operations of Software Technology Parks established in seven cities across India. The rationale for the scheme was promote an industry that could create mass employment for high-skilled talent. Software could be cross-utilized in other industries, leading to even greater economic growth. In the 1990s, STPI built necessary Internet and communications infrastructure so that Indian engineers could begin to do business with the United States and Europe.

These government investments (see Box 1), centered around Bangalore, Karnataka may explain why that state is far below its predicted value in Graphs 1 and 2. STPI's approach to investing realized a few key principles: first, the agency invested in a commons that did not favor specific firms over others. Second, the agency enabled many smaller firms, with no access to capital for communications infrastructure, to participate in information technology. The Indian government's investment in I.T. infrastructure, therefore, encouraged competition between local firms and with foreign firms without exclusively subsidizing specific firms. For the Government of India, this was a radical shift from traditional state-owned monopolies or oligopolies in the communications, manufacturing and banking sectors.

Box 1. Early investments by the Software Technology Parks of India

In its first annual report, published in 1994 and covering September 1991 to March 1993, STPI documents its earliest investments in I.T. In addition to permitting telecommunication infrastructure imports without custom duty and without export obligation, STPI made infrastructure investments in the following cities:

- **Pune:**
  - Acquired space of 320 square meters to rent out 30 units.
  - Software exports increased from Rs. 4.5 million in FY93 to 16.2 million in FY94.
- **Bangalore: "**All the physical and technical infrastructure required for software exporters have been created and is made available for their operations."
  - SoftNET installed to communicate with New York, London, Netherlands and Germany at 64 to 512 Kbps.
  - Created 25 member units using value added services, 94 units approved in total
  - Exports increased from Rs. 229 million in FY93 to Rs. 566 million in FY94.
- **Hyderabad. "**All physical and technical infrastructure required for software exporters made available."
  - 510 square meters of land made available.
  - LAN services were installed on a "shared basis" for firms operating in the jurisdiction.
  - Exports increased from Rs. 45.5 million in FY93 to Rs. 98.4 million in FY94.
- **Noida.**
  - 1800 square meters allotted for 50 units.
  - Exports increased from Rs. 236 million in FY93 to Rs. 457 million in FY94

In its second annual report (1993-1994), STPI documents expanded infrastructural investments

- Built-space and common amenities totaling 17,500 square meters for 87 firms.
- IBM AS-400 systems in Pune and Hyderabad.
- Completion of "international gateway facilities" as rated by INTELSAT in four cities: **Bangalore**, **Hyderabad**, **Thiruvananthapuram**, and **Gandhinagar**. Work underway to establish an Earth Station in **Bubaneswar** and **Noida**.

Source: STPI Annual Report, 1993, 1994

In its first annual report, STPI outlines five ways to encourage the development of the I.T. export industry: (1) tax incentives (2) infrastructure, (3) certifications (4) marketing support and (5) training. The first two incentives were perhaps the most important. Tax incentives waived all income tax requirements for I.T. exports and dramatically streamlined the import process. Infrastructure investments included "utility power, ready-to-use built-up space, centralized computing facilities, and data communication facilities" – key common amenities that the government treated as shared public goods for the I.T. sector.

The nexus of tax incentives and infrastructure platforms provided a foundation for increasing economies of scale in early investments, like Bangalore. These investments have since expanded to the rest of the country (see Box 3). Since infrastructure is accessible to over 100 firms, it encouraged the growth of a competitive private sector and ensured companies would compete on an even footing with engineers from developed countries. These investments gave firms in these locations competitive advantages and helped sustain early agglomeration economies. The government took on a risk that the private sector or banks could not afford; the agency acted as an investment banker for the industry (see Box 2). This strategy is similar to that used in Taiwan and South Korea (see Section 2).

Box 2. Promotion of smaller firms by STPI

The 2001 annual report discusses government efforts to promote entrepreneurs who do not have access to capital

- "Due to the weak central market for the India software industry, lending institutions including banks are reluctant in taking risks especially for new entrepreneurs. In these circumstances, the incubation centers give an indirect short-term shelter to Small & Medium Enterprises to establish themselves in the market by reducing the investment required for a start-up."
- "Smaller companies are unable to garner market share due to lack of market knowledge and ability to leverage their abilities… accordingly, STPI plans to increase its focus as Business Promotion through increased participation in Exhibitions, Trade Fairs and Delegations for the SME sector"

Source: STPI Annual Report, 2001

Box 3. Contemporary STPI investments

By 2008, STPI had helped build a new international communications infrastructure across India.

- STPI had HSDC links in 45 locations across India. These facilities act "as the backbone for the success of [offshore exporting] enterprises."
- Point-to-point radio and fiber networks across the country to address 'last mile connectivity' problems, where international bandwidth is available but not domestic.

And expanded its international presence:

- STPI began work on a cyber park in Bhutan, in partnership with the Royal Government of Bhutan and the World Bank, and completed the Ebene Cyber City in Mauritius, modeled on Bangalore.
- STPI built offices in Silicon Valley to provide assistant to Indian entrepreneurs, conduct market research and promote trade.

Source: STPI Annual Report, 2008, 2010

One major shortcoming of the government agency, in its role as an investment banker for the industry, is its failure to fund improvements to basic electric infrastructure. These investments are critical for the long-term growth of I.T. According to interviews with the Chief Risk Officer of Infosys and the Director General of the Software

Technology Parks of India, Bangalore's superior electricity grid attracted early information technology companies (Rai and Kanchinadham, 2013). In a survey by the World Bank, firms reported that electricity was also a significant challenge for their operations in India. Table 10 summarizes results from a countrywide stratified sample of 450 firms from a 2010 run of the Business Enterprise Survey. Firms are ranked in each column by how they self-rank average corruption, labor regulation, and electricity as an "obstacle to operations," with the type of firms facing the most obstacles on top. Even though Maharashtra, Andhra Pradesh and Tamil Nadu are the #2, 3, and 4 business owners for software and technology service companies, they still consistently rank electricity as a major obstacle relative to counterparts in other industries.

Table 10. Cross-industry comparison of firms in Gujarat, Tamil Nadu, Delhi, Andhra Pradesh, and Maharashtra

Rank	Corruption as Obstacle	Labor Regulations as Obstacle	Electricity as Obstacle
1	plastics	textiles	**it**
2	transport	other man	textiles
3	other man	food	plastics
4	textiles	construct	construct
5	retail	transport	machinery
6	construct	machinery	fabricated metals
7	fabricated metals	fabricated metals	other man
8	machinery	motor vehicle services	retail
9	wholesale	plastics	electronics
10	**it**	wholesale	wholesale
11	basic metals	**it**	garments
12	garments	retail	motor vehicle
13	motor vehicle	basic metals	food
14	electronics	electronics	basic metals
15	hotel/restaurant	garments	chemicals
16	food	chemicals	transport
17	chemicals	hotel/restaurant	hotel/restaurant

Source: 2010 Survey of Firms in India, World Bank Business Enterprise Survey. N = 450.

5.1.2 Labor deregulation in the 1990s

Following the establishment of communications infrastructure by STPI, the gradual deregulation of labor laws within the I.T. sector in the 1990s enabled companies to maintain strong early growth trajectories. This trend occurred in states with significant presence in the I.T. sector.

In Karnataka, legislation that would otherwise apply regularly exempts workers in the I.T. industry. It also provides exemptions for laws to limit working overnight for women and children:

> "The State is committed to simplify all the relevant enactments for the [Business Process Outsourcing] sector. The barriers including employment of women at night, flexi-working hours and mandatory weeks off have all been removed…to create an optimal environment for the growth of the…sector in the state" (Directorate of Industries and Commerce, State Government of Karnataka in Penfold 2005)

Other states developed similar policies. Andhra Pradesh created I.T.-specific labor policies, West Bengal allows employers the flexibility to self-regulate, and Uttar Pradesh exempts I.T.-related businesses from routine inspections (Penfold 2005). To prevent unionization, business process outsourcing, or BPO, was declared a 'public utility' in certain states, thereby preventing workers from striking.

Even when there are labor laws, evidence indicates labor inspectors gave preferential treatment to the I.T. sector: for example, 'unofficial payments' to inspectors can reduce the number of inspections by over 50 percent (Penfold 2005). Between the delays and corruption, I.T. service firms do not fear prosecution when violating legislation (Penfold 2005).

In practice, even where worker protection applies, employees do not remain in their jobs long enough to be entitled to benefits. Instead of trying to enforce rights such as maternity leave, employees leave their jobs (Penfold 2005). Highly skilled workers are in high demand and, based on demand, jobs are often available for them. Only 5 percent of India's 2 million graduates every year are employable by call centers and only 15-20% are trainable (Penfold 2005).

The gradual deregulation of labor laws in the I.T. sector throughout the 1990s enabled firms to maintain initially high rates of growth. Without the benefit of randomization, it is difficult to prove the causal effect of any of these single interventions. However, the evidence from Sections 4 and 5 points to a story where strong government investments in R&D, education, defense, combined with early protectionism and gradual deregulation, enabled local engineers to gain necessary skills to compete and take leadership in the global economy of I.T. services.

5.2 Industrial policy and deregulation in the banking sector

Most government intervention in the banking sector occurred prior to 1991, as documented in Section 3.2. After 1991, the Reserve Bank of India (RBI) allowed entrance of foreign and private banks, and was under to pressure to privatize its state-owned banking sector. Unlike investments by STPI in the I.T. sector, the banking sector was not a recipient of a similar "infrastructure commons" that enabled competitors to create a vibrant local market. Instead, most of the profits in banking sector had been concentrated in Mumbai, Maharashtra, as a result of the government ownership of the State Bank of India since 1956. The question that motivates this section is the extent to which the sequencing of state-facilitated development and liberalization was effective for

the performance of banks today; I find that it was. While we do not have a "control" group to test whether immediate liberalization would have been *more* effective, the data suggests that today's nationalized banks perform almost at the same standard as foreign banks on key profitability and stability indicators. Moreover, historical evidence on banking crises prior to the 1950s suggests that nationalization has been very important for financial stability and promoting broader savings across the country.

5.2.1 Methodology

Bank regulators in the United States use a version of CAMELS to assess the financial condition of banking institutions. CAMELS stands for Capital adequacy, Asset quality, Management, Earnings, Liquidity, and Sensitivity to market risk (Manoj 2010). In 1995, the Reserve Bank of India recommended that a modified version be used in India, as the RBI was in the process of granting licenses to new private sector banks. The Reserve Bank of India publishes PDF files of every scheduled (commercial) bank in India. I assemble statistics from 72 banks that have been in operation for at least five years in India as of FY 2011 and compile five-year panel data from a subset of the CAMELS framework. The capital to risk-weighted assets ratio (CRAR) is used to comment on capital adequacy, the ratio of non-performing assets to total assets is used to analyze asset quality, the return on assets is used to analyze earnings, and the change in the cost of funds of each bank during the 2008 macroeconomic crisis is used to analyze sensitivity to market risk.

5.2.2 Data Description

A summary of the banks, their weighted-average return on assets, and their total net worth is displayed in Table 11. A graphical display of the names of the domestic banks used in this study and key indicators can be found in the Appendix.

Table 11. Summary statistics of banks in India

Bank Type	No. of Banks	Return on Assets	Net Worth*
Foreign	26	1.74%	Rs. 80,972 crores
New Private	8	1.51	114,768
Old Private	13	1.12	23,821
State Bank of India and affiliates	7	0.79	84,394
Nationalized	20	1.03	205,857

Note: Rs. 1 crore corresponds to $193,125 with exchange rate of Rs. 51.78 : $1
Source: "2011 Trend and Progress of Banking in India", published by RBI
*Net Worth calculated by the sum of Capital, Reserves & Surplus

A central theme in these results is that the entrance of new, well-capitalized foreign banks motivates existing banks to improve services and management while also lowering interest rates, profitability and expenses of domestic banks. Claessens and Huizinga (2000) find that it is not the market share of new foreign banks that generates increased bank competition in developing countries, but instead the number of new foreign banks. My findings support these results. Competition in the 1990s led to improvements in the efficiency, accountability, and sustainability of both private and state-owned banks in India. The effects are especially visible in the statistics from the most recently available five years, 15 years after the 1991 regulatory reform. Foreign banks have a superior performance on several key indicators compared to domestic banks, which I will return to in my policy recommendations in the conclusion.

5.2.3 Analysis

Capital Adequacy Ratio

The capital to risk-weighted asset ratio (CRAR) represents the general financial position of banks and their ability to meet additional capital requirements in the event of unexpected losses. In India, the minimum CRAR for commercial banks is 9%. Figure 7 (appendix) shows that all banking categories safely exceed the 9% requirement. The State Bank of India is the least capitalized and most prone to risk, while other banks have a lower risk profile. The world's largest 100 banks have a capital adequacy ratio of 14.87%, according to Bloomberg. The high level of capital adequacy of banks in India explains in part why India was relatively sheltered from the macroeconomic shocks of the global financial crisis. On average, nationalized banks are the most leveraged. The two largest banks in India, State Bank of India and ICICI Bank, have a lower risk profile, with CRAR at 13.47% and 13.97%, respectively.

Asset Quality

Asset quality can be measured by looking at the ratio of non-performing assets (NPA) to total assets; the lower the share of NPAs, the higher the quality of the assets. The levels of NPAs in Figure 8 (appendix) are dramatically lower than they were a decade earlier. In 1992, the ratio of NPA to total assets of public-sector banks was 24% (Shirai 2001). By 1996, public-sector banks had 9.2% NPA and by 2000, 7%. Old private sector banks, also facing fresh competition in the early 1990's from foreign and new private banks, had approximately 7% NPA's. Non-performing assets in public banks dramatically fell from 1991 to today: they are in 1% to 2% range, on par with the top-

performing private and foreign banks. This suggests competition and opening of the banking sector had a powerful positive effect on the management practices and allocation of resources of state-owned banks.

Return on Assets

Figure 9 (appendix) shows that the profit margin of foreign banks exceeds that of all domestic banks in India, and Figure 10 (appendix) compares the return on assets of different domestic banks. Nationalized banks and the State Bank of India consistently had the lowest returns on assets, hovering at around 0.95%. In the years after the financial crisis, new private banks had increasing returns on assets, old private banks had decreasing returns on assets, and state-owned banks remained constant. This suggests that state-owned banks are more stable and sheltered from macroeconomic shocks. The low but stable levels of ROAs of state-owned banks is also explained by their requirements to purchase more government bonds than other banks, which limits diversification of their asset portfolio.

The returns on assets for public and nationalized banks have increased significantly over the past decade, suggesting they have adapted to the more competitive banking environment after the 1991 regulations. A 2001 IMF report shows that between 1995 and 2000, foreign and new private banks maintained ROA of 1% to 2%, while public sector and old private domestic banks had a ROA of 0.6% to 0.8%. In the past five years, public sector banks have had a ROA of 0.93% to 1.02%, a substantial increase of 25% to 40% from the previous decade. Foreign banks reached a return on assets of 1.68% to 2.45% between 2007 and 2011, which is 25% to 50% more than a decade before.

While all other banking sectors increased ROA, new private banks have consistently hovered between 1% and 1.4% returns, similar to their ROA a decade earlier.

Sensitivity To Market Risk

Figure 11 (appendix) shows that while private banks are more sensitive to price shocks than state-owned banks, foreign banks react far more rapidly to macroeconomic shocks. Foreign banks sold US $9.6 billion shares in the first 9 months of 2008, while the BSE Sensex dropped 50% over the course of the year. These reactions to price shocks are reflected in the rapid 37% drop in cost of funds paid out by foreign banks over the course of one year. Their disruptive impact on the Indian economy was mitigated by the stability of state-owned banks. State-owned banks were less sensitive to macroeconomic price shocks compared to foreign and new private banks.

Banerjee (2004) supports these findings with evidence that shows the Central Vigilance Commission discourages loan officers from taking risks. Banerjee (2004) also shows that neither private nor public banks were supplying loans to firms that were newly eligible for additional credit. Panagariya (2008) uses this as evidence to show that "government ownership has a detrimental effect on lending" compared to privately owned banks (239). He argues government ownership may create institutional inertia and promote risk-averse investment.

Discussion

My analysis suggests that restrictions on competition through regulatory and monopolistic barriers to entry, rather than ownership of the bank, limited bank

performance prior 1991. These restrictions to competition were similar in character to those placed on the technology sector during the 1970s (see Section 3). Once these restrictions were lifted, the nationalized sector gradually improved its performance and today is nearly at the level of private and foreign banks. The liberalization of the banking sector led to dramatic improvements in the efficiency. Its long-term effects have made both private and public banks more profit-oriented and competitive, and less prone to non-performing assets, thereby leading to lower intermediation costs over time. Chaudhary (2011) suggests stock price performance of banks in India today indicates that the market views public banks favorably.

Return on assets of state-owned and old private banks increased 30% between 2001 and 2011, closely following the performance of foreign banks, which increased their returns between 25% and 40% in the past decade. State-owned banks also had a rapid drop in non-performing assets. The high levels of NPAs of state-owned and old private banks in the 1990s decreased to the level of foreign banks in the span of a decade. While new private banks today perform marginally better than state-owned and old private banks, they still lag behind the performance of private foreign banks by around 1 percentage point (Figure 9, Appendix).

In recent years, the state used its monopoly position to pay out more than the equilibrium rate on deposits and charge less than equilibrium rates on advances. This forced private banks to pay a premium on their deposits (peaking at 6.8%, compared to 6.1% for nationalized banks, over the past five years) in order to remain competitive. The RBI should, then, encourage private banks to better compete with nationalized banks. This would improve both the management and efficiency of the private and state-owned

sector, encouraging more accountability even within the constraints of the social mandate of state-owned banks.

6 Conclusion and Policy Implications

6.1 Primary findings

This paper proposes that liberalization is effective when pursued in conjunction with state promotion for India, a late developing nation that today dominates the global hierarchy of production in the computer services sector. The analysis of India's banking and I.T. sector indicates three findings: first, the shortcoming of human capital and urban agglomeration in predicting the growth of a tertiary service sector; second, the importance of gradual liberalization after initial domestic investments in the sector; and third, the importance of government intervention to build a shared infrastructure that firms and entrepreneurs may use to compete internationally.

First, the evidence suggests that human capital and urban agglomeration economies are not sufficient to explain the growth of either the information technology or banking sectors. India is not entirely unique in its levels of urbanization or literacy in the developing world; its education, health and urbanization indicators are comparable to Bangladesh, Sri Lanka and Nepal, for example (Sen 2013 and Rodrik 2004). Instead, the high-technology sector required active industrial policy, where the state acts as an investment bank while promoting competition and/or agglomeration. A cross-state analysis suggests that states that received the greatest amount of industrial support had the most successful tertiary economy by international standards of growth, holding constant education, wages and urbanization levels.

Second, from the experience of the banking sector, this paper finds that gradual liberalization – or domestic competition – is more important than ownership in determining the strength of the sector. In the banking sector, the number of commercial

branches and access to savings accounts for Indians lasted after liberalization, while the performance levels of public banks approached those of the private sector. in loan allocations, the sector lagged until liberalization after 1991.

Third, this paper finds that the creation of an "infrastructure commons" that gave entrepreneurs similar access to communications infrastructure as others in developed countries was critical for the growth of the I.T. sector and can explain why Bangalore's growth in particular has been so rapid over the past 20 years. These findings suggest that state intervention is critical for growth in high-technology sectors, and most effective when it does not limit competition. Though heavy public ownership and investment both the I.T. sector and banking sector led to slow growth while these industries were monopolized between 1950 and 1980, their priority in the government also resulted in concentrations of skilled workers. This concentration of skilled engineers is a shared common good that can act as a catalyst for growth.

6.2 Policy Implications

The information technology sector in India has become mature and advanced enough in the world's hierarchy of trade that it does not require the same forms of government promotion that it did decades ago. The goals of the I.T. sector today are to shift from software maintenance and development to more creative forms of production driven by start-ups, more similar to the modern day version of Silicon Valley, which is the result of a culture of experimentation and risk-taking by both entrepreneurs and investors. The work done in Bangalore is less wage-sensitive and more creative than it was in the 1990s, and we should expect that with the proper promotion of common

infrastructure and close connections between firms, venture capitalists and angel investors will gradually become more confident in the potential of local entrepreneurs.

STPI's success in installing international communications portals is not matched by the country's performance in electricity infrastructure, limiting the potential growth of the industry. Electricity is critical for the reliable provision of international software services; while it might not be under the purview of the Department of Electronics to ensure access to electricity, this is an area where the government's collaboration with the private sector could provide enormous positive benefits to the I.T. and other sectors.

India's banking sector is, by necessity, more regulated than the I.T. sector and its performance is still in transition from the nationalized period. My findings suggest that RBI should lower barriers to entry for new private banks by revising license requirements, and that the Indian government should reduce its natural monopoly over the nationalized banking sector by allowing domestic banks to compete with foreign banks, and by charging market prices to customers that do not fall under its priority sector. These changes would encourage greater financial inclusion and better banking performance.

To lower barriers to entry, the government could relax its top-down control over the banking sector – currently, domestic banks must allocate 40% of their loans to the priority sector and locate 25% of their physical branches in rural and semi-urban areas (Shirai 2001) – in order to allow new, smaller, domestic banks to better compete with state-owned and foreign banks. These limitations discourages the growth of a domestic banking sector and also ignore the fact that the need for financial inclusion is not only an issue of geography. At least 80% of Indians living in urban areas, for example, do not have access to formal financial services (Ujjivan 2005). Instead, the government should

encourage private banks to pursue financial inclusiveness by allowing them to propose alternative business models, such as those that leverage mobile banking, have strong social programs, or replicate some of the successes of MFI's. This would give private banks more flexibility and choice, avoiding the large startup costs of opening branches in rural areas for new, smaller banks below certain capital requirements. Encouraging smaller mid-sized banks will help with delivery of local services that meet the needs of lower income households. It would also create positive synergies by encouraging more use of computerized technology across banks, instead of requiring physical ATM's and branches.

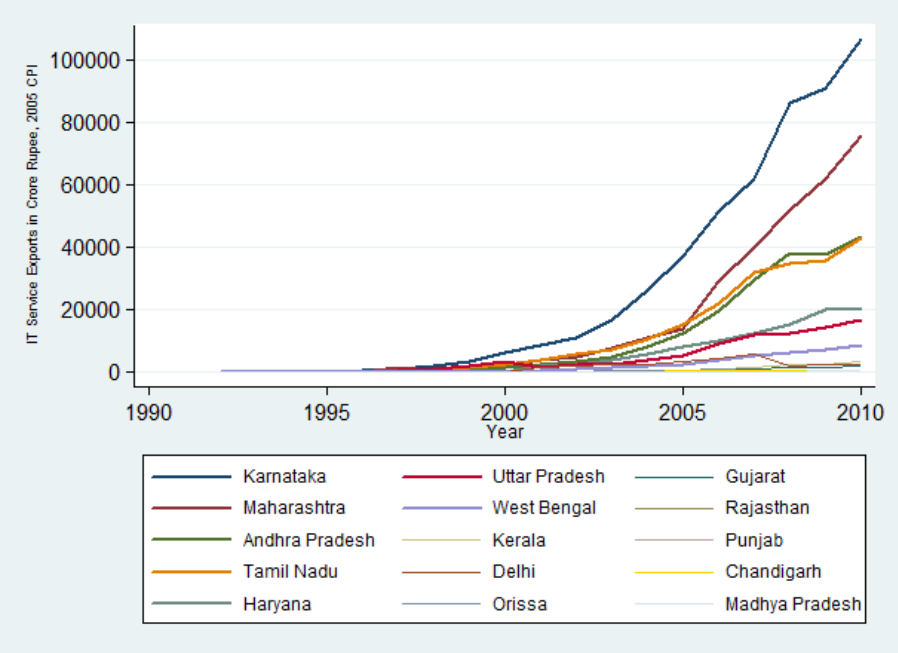
The Indian government should also consider reducing its natural monopoly position that results from its large ownership of the banking sector and preferential treatment of foreign banks, by narrowing its scope in the financial sector. My findings show that state-owned banks can give greater returns to investors and charge less for advances than private banks, making it difficult for private banks to attract new capital. This distorts the market and discourages new private banks from competing. The private sector has proven to be just as effective at providing loans to the priority sector as nationalized banks, by supplying even more to the agricultural sector and weaker sections compared to public banks. As the government has been successful at rural expansion but not at lending to public and private enterprises, the government should consider transforming some of its nationalized banks into narrow savings banks. As such, the banks would be able to continue satisfying deposit and payment services, while restricting their lending scope and giving private sector banks more opportunity to lend to public and private enterprises. These recommendations would help accelerate the positive

contributions of state-owned banks, promote financial inclusion by encouraging more small banks, and mitigate the monopoly position of state-owned banks in relation to private banks.

It is possible that a few of these recommendations will see the light of day beginning next month. The Reserve Bank of India, under the leadership of Raghuram Rajan, announced in November that it will issue new banking licenses for the first time in ten years as part of an effort to increase the competition and performance in the sector. In the new proposals by Mr. Rajan, foreign banks will be able to expand through wholly owned subsidiaries in India and compete directly with domestic private banks. In addition, all banks would be required to allocate less credit to the priority sector, and for the first time in decades, industrial houses like Reliance Group will also be allowed to apply for banking licenses. Mr. Rajan's goals are to find an expanded role for private and foreign banks, and to phase out the influence of state-backed lenders. This new RBI strategy should promote greater competition and gradual liberalization within the sector, consistent with the findings of this paper.

Appendix

Figure 2. I.T. Services Exports, by State, 1993 – 2010



Note: Legend is arranged by columns in decreasing magnitude of 2010 export levels
Source: Archive of STPI Annual Reports scanned by author. 1991 to 2010.

Table 2. Correlation Matrix

	I.T. Exports	% Urban	Students in Higher Education	Urban Literacy	Wage Index
I.T. Exports	-				
% Urban	0.13	-			
Students in Higher Education	0.62	0.29	-		
Urban Literacy	0.02	0.33	-0.24	-	
Wage level	0.31	0.20	0.15	0.17	-
Population	0.25	-0.30	0.67	-0.56	0.13

Note: Wage level is hourly wage for companies with 50+ employees (or company with 100+ and no access to power)

Table 3. Cross-sectional regressions on I.T. exports, by state (2007)

	Information Technology Exports					
	(1)	(2)	(3)	(4)	(5)	(6)
Higher Ed	9.23**	25.44**	38.62***		24.50**	38.64**
Population		-0.12	-0.32*	0.11	-0.12	-0.32
Wage Levels			90.04	66.93	62.75	89.5
Urbanization			-502	162		-502
Urban literacy					35.2	33.5
Constant	-2,937	-66.37	-5,641	-19,592	-20,552	-8,452
Observations	15	15	15	15	15	15
R-squared	0.38	0.43	0.61	0.16	0.49	0.61

Notes: *** p<0.01; ** p<0.05; * p<0.01.
Sources: Ministry of Human Resources (2007); Institute for Applied Manpower Research (2007); Census (2011); STPI Annual Report (2007)

Table 4. Cross-sectional regressions on I.T. exports, by state (2001)

	Information Technology Exports					
	(1)	(2)	(3)	(4)	(5)	(6)
Higher Ed	3.39*	4.53*	4.75*		4.37	4.59*
Population		-.014	-.02	.01	-.02	-.02
Wage Levels			11.87	13.82	16.26	13.18
Urbanization			30.9	20.0		35.9
Urban Literacy					-7.95	-32.04
Constant	-83.49	144.5	-3,759	-2,920	-2,878	-1,979
Observations	15	15	15	15	15	15
R-squared	0.23	0.26	0.43	0.19	0.38	0.44

Notes: *** p<0.01; ** p<0.05; * p<0.01.
Sources: Ministry of Human Resources (2000); Institute for Applied Manpower Research (1997); Census (2001); STPI Annual Report (2001).

Table 5. Cross-sectional regression on banking value added, by state (2001)

	Value Added in Banking Sector					
	(1)	(2)	(3)	(4)	(5)	(6)
Higher Ed	0.82*	0.56	0.52		0.55	0.57
Population (mn)		2.88	2.43	5.56*	3.46	3.68
Wage Levels			3.13	3.41	4.25**	3.15
Urbanization			16.32**	15.82**		11.51*
Urban Literacy					28.89**	19.02
Constant	168	134.9	-1,033**	-1,008**	-2,679***	-2,176**
Observations	18	18	18	18	18	18
R-squared	0.21	0.22	0.64	0.60	0.62	0.70

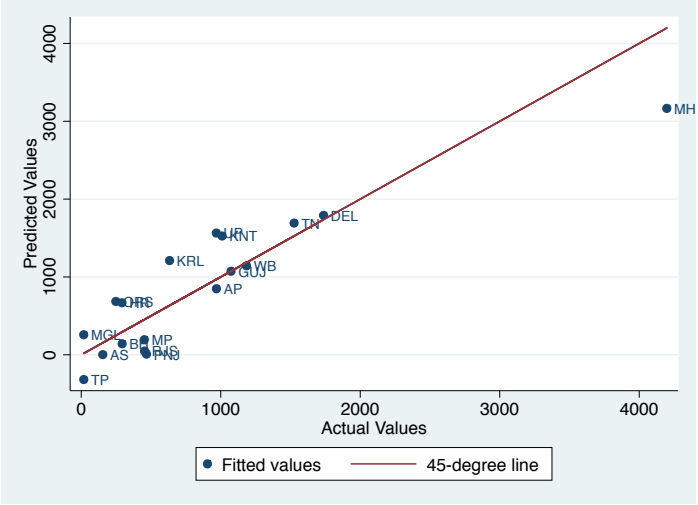
Notes: *** p<0.01; ** p<0.05; * p<0.01. Banking sector value added is in thousand crores, in 2005 constant prices.

Table 6. Cross-sectional regression on banking value added, by state (2007)

	Value Added in Banking Sector					
	(1)	(2)	(3)	(4)	(5)	(6)
Higher Ed	1.15***	1.40***	1.10**		1.12***	.93**
Population (mn)		-4.65	-4.00	7.78*	0.57	3.11
Wage Levels			5.18**	4.60*	5.36***	5.01**
Urbanization			5.76	25.10**		6.54
Urban Literacy					72.1**	72.9**
Constant	10.65	111.09	-1364**	-1770**	-7655**	-7856 **
Observations	18	18	18	18	18	18
R-squared	0.53	0.56	0.73	0.61	0.80	0.81

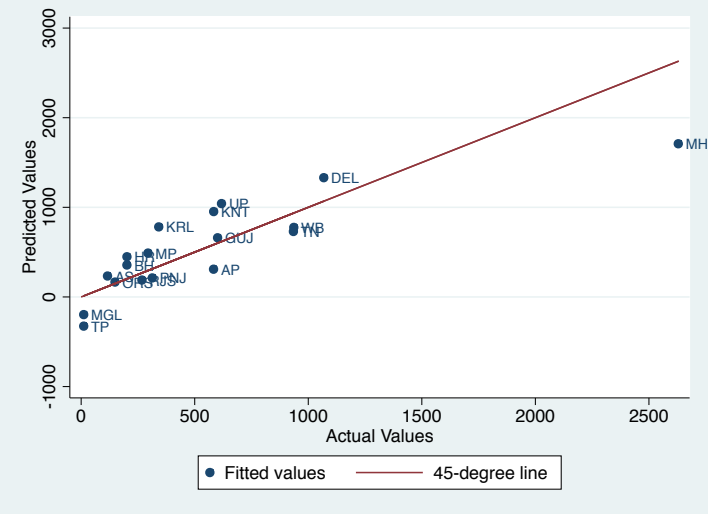
Notes: *** p<0.01; ** p<0.05; * p<0.01. Banking sector value added is in thousand crores, in 2005 constant prices.

Figure 5. Predicted vs. actual values, Banking Sector Value Added in 2007



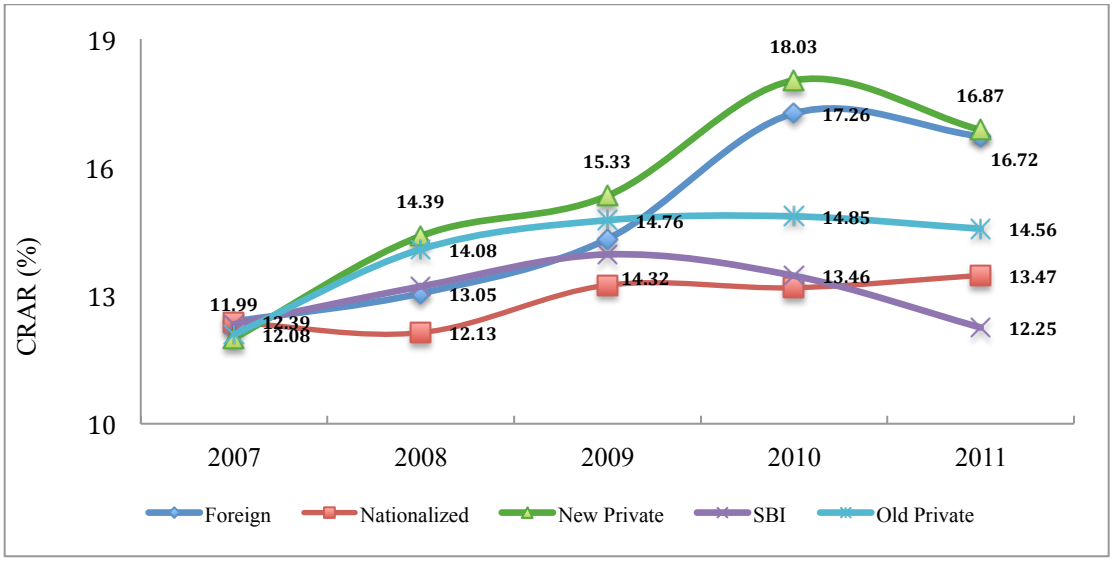
Note: data fitted to values from Table 5, Regression 6

Figure 6. Predicted vs. actual values, Banking Sector Value Added, in 2001



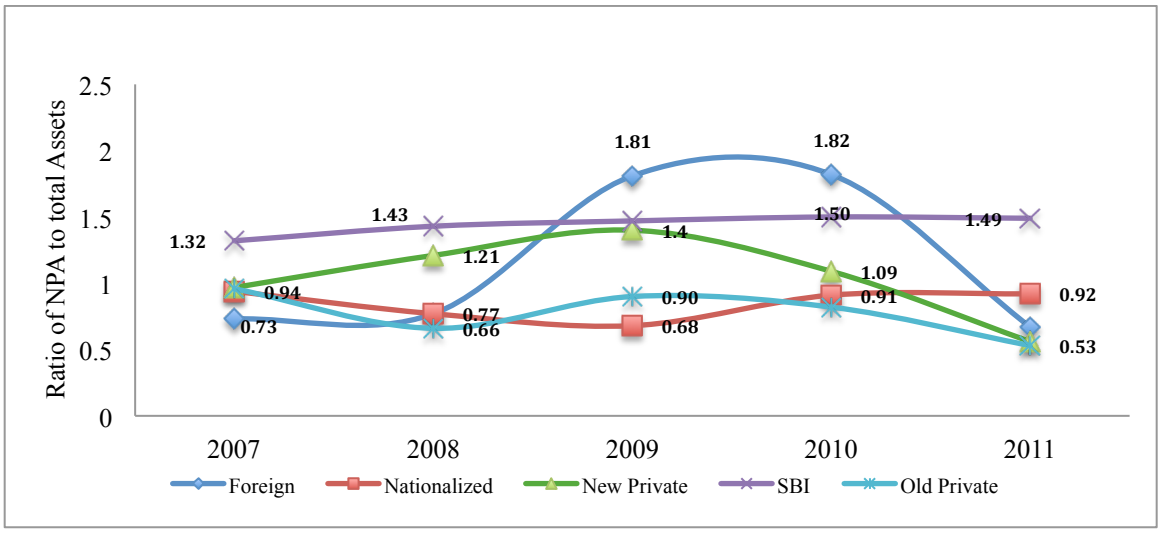
Note: data fitted to values from Table 6, Regression 6

Figure 7. Capital to Risk-Weighted Assets Ratio by Bank Type, 2007 – 2011



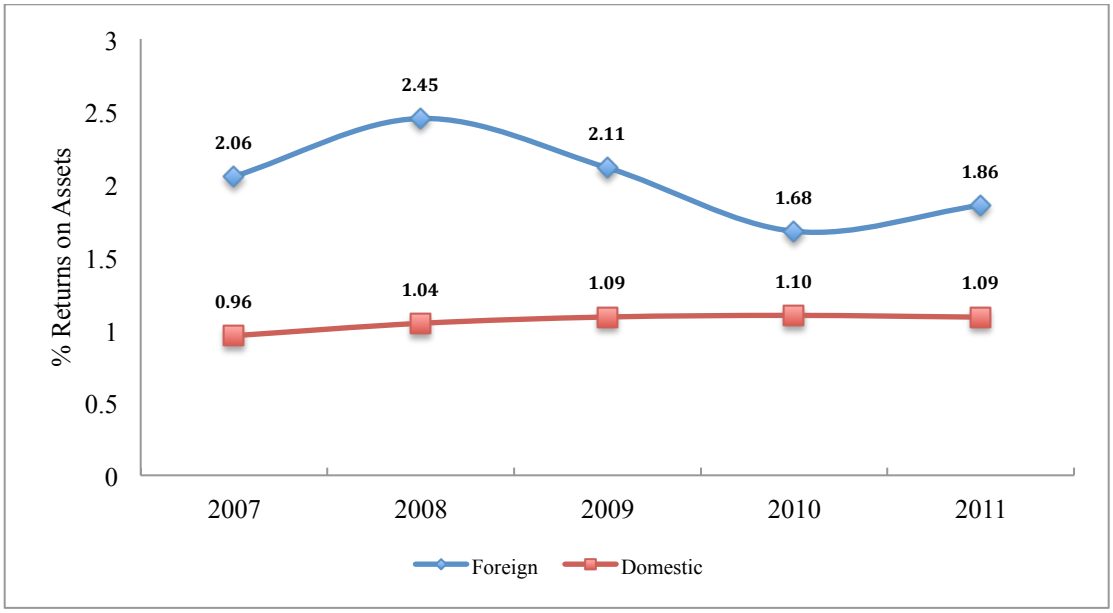
Source: RBI "A Profile of Banks," 2011

Figure 8. Non-Performing Assets by Bank Type, 2007 – 2011



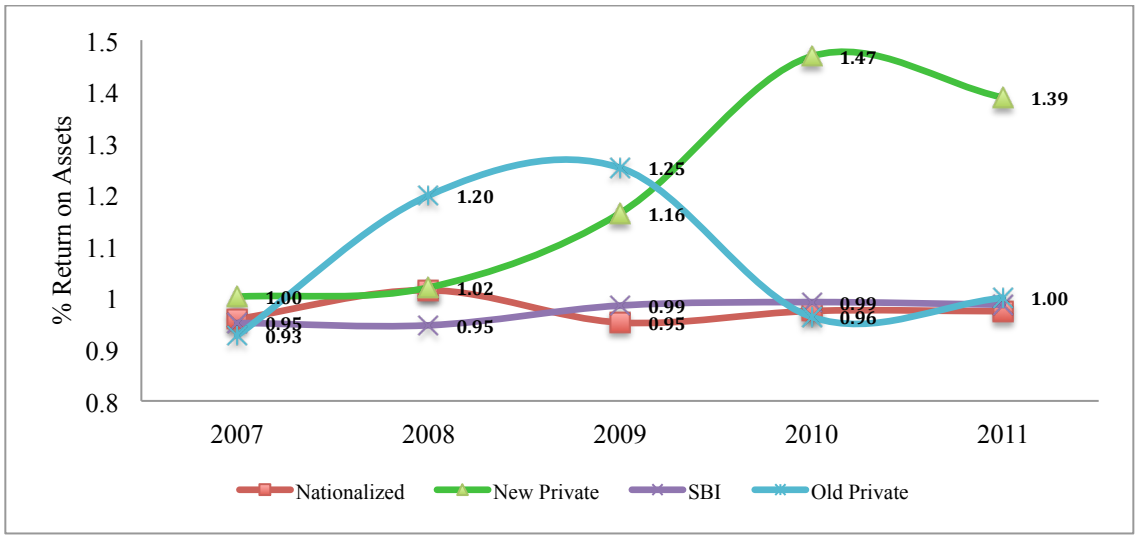
Source: RBI "A Profile of Banks," 2011

Figure 9. Return on Assets, Foreign and Domestic Banks, 2007 – 2011



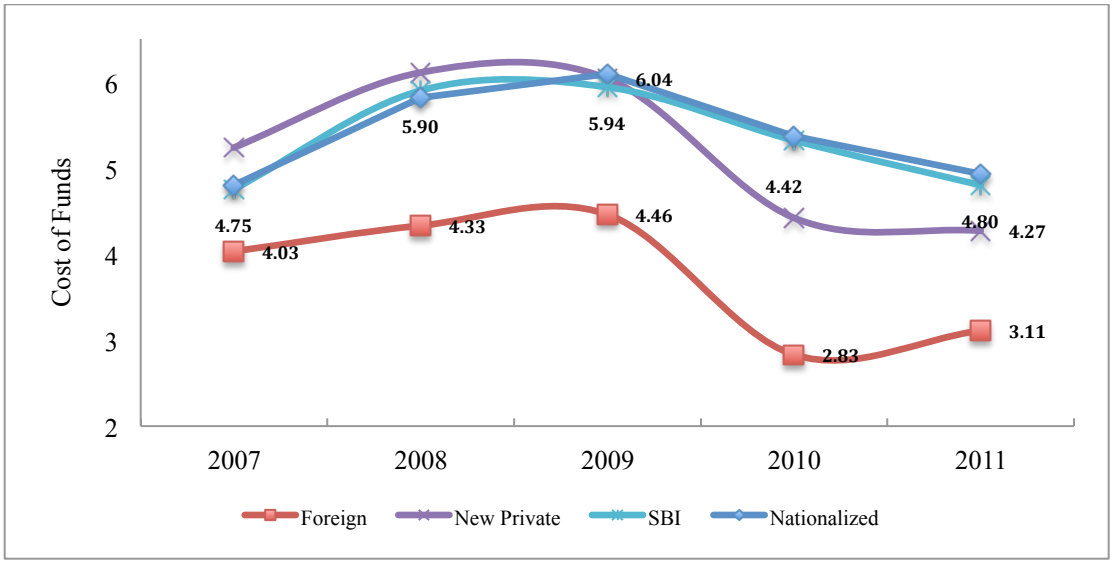
Source: RBI "A Profile of Banks," 2011

Figure 10. Return on Assets, Domestic Banks, 2007 – 2011



Source: RBI "A Profile of Banks," 2011

Figure 11. Cost of Funds (Return on Deposits) by Bank Type, 2007 – 2011



Source: RBI "A Profile of Banks," 2011

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