Report No. 44248-TH

Thailand
Investment Climate Assessment Update

June 2008

Poverty Reduction and Economic Management Sector Unit
East Asia and Pacific Region

Document of the World Bank

CURRENCY EQUIVALENTS

Currency Unit	=	Thai Baht
US$1	=	33.3 THB

ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
BOI	Board of Investment
BOT	Bank of Thailand
CEO	Chief Executive Officer
CPI	Consumer Price Index
DEP	Department of Export Promotion
EGAT	Electricity Generating Authority of Thailand
FDI	Foreign Direct Investment
FTPI	Foundation of Thailand Productivity institute
GDP	Gross Domestic Product
GMS	Greater Mekong Sub-region
GNI	Gross National Income
HS	Harmonized System
IC	Investment Climate
ICA	Investment Climate Assessment
ICD	Inland Container Depot
ICT	Information and Communication Technologies
IPP	Independent Power Producer
IT	Information Technology
KEI	Knowledge Economy Index
MEA	Metropolitan Electricity Authority
MWA	Metropolitan Waterworks Authority
MLR	Minimum Lending Rates
MNC	Multi-National company
NESDB	National Economic and Social Development Board
NRCT	National Research Council of Thailand
NSTC	National Science and Technology Policy Committee
NSTDA	National Science and Technology Development Agency
PEA	Provincial Electricity Authority
PICS	Productivity and Investment Climate Survey
PPP	Public-Private Partnerships
PWA	Provincial Waterworks Authority
R&D	Research and Development
RTG	Royal Thai Government
SAIDI	Standard Average Interruption Duration Index
SAIFI	Standard Average Interruption Frequency Index
SG	Sales Growth
SME	Small and Medium-sized Enterprise
SPP	Small Power Producer
TEU	Twenty-foot Equivalent Unit
TFP	Total Factor Productivity
VA	Value-Added
VAT	Value-Added Tax
VAL	Value-Added per Worker

Regional Vice President:	James W. Adams
Country Director:	Ian Porter
Sector Director and Acting Chief Economist:	Vikram Nehru
Lead Economist:	Mathew Verghis
Task Team Leader:	Xubei Luo

ACKNOWLEDGEMENTS

This report is the result of fruitful collaboration between Thailand's Ministry of Industry (MOI), Office of the National Economic and Social Development Board (NESDB), Foundation for Thailand Productivity Institute (FTPI), and the World Bank. The main data source for this report is the Thailand Productivity and Investment Climate Survey (PICS) which was funded by the Ministry of Industry and carried out by the FTPI under the overall guidance of the PICSII Technical Steering Committee led by the Ministry of Industry. The report also benefited from valuable inputs from the Bank of Thailand (BOT), National Statistics Office (NSO), National Science and Technology Development Agency (NSTDA), the Federation of Thai Industry, and the Thai Listed Firm Association.

The report was written by a World Bank team which includes Xubei Luo (Task Leader, EASPR), Kirida Bhaopichitr (EASPR), Jean-Jacques Dethier (DECRS), Vatcharin Sirimaneetham (EASPR), and Takanobu Terada (University of Maryland). Shubham Chaudhuri (EASPR) managed the project until May 2008.

The report builds on the findings of *Thailand Investment Climate, Firm Competitiveness and Growth* report (World Bank, 2006). It was prepared under the overall guidance from Mathew Verghis (Lead Economist). Vikram Nehru (Sector Director) and Ian Porter (Country Director) provided oversight. The World Bank peer reviewers for this report were Gary J. Fine (Senior Private Sector Development Specialist, ECAVP) and Giuseppe Iarossi (Senior Economist, AFTFP). Lynn M. Gross skillfully formatted and prepared the report. Susan Middaugh did the editing.

The report team benefited from inputs and consultations at the different stages of the report preparation from the stakeholders in Thailand. We would like to sincerely thank the following government offices and officials: the Ministry of Industry for funding the survey; PICSII Technical Steering Committee chaired by Witoon Simacholedee, Deputy Permanent, Ministry of Industry for its oversight of the survey; Arkhom Termpittayapaisith, Deputy Secretary General, NESDB, and the NESDB staff for their collaboration in providing insights and inputs to the report as well as conducting the qualitative interviews and organizing focus groups meetings for the study; Dr. Phanit Laosirirat, Director, Foundation of Thai Productivity Institute, and the team at the FTPI that conducted the survey led by Nantaphorn Angatichart and Ketmanee Ausadamongkol; Dr. Somchai Harhirun and his staff at the Office of Industrial Economics for sharing the industry surveys and valuable comments on the report; and the National Statistics Office for sharing the industrial censuses.

The team greatly appreciates the inputs and insights provided by key players in the Technical Institutes and the private sector. They are as follows: Vallop, Thailand Food Institute; Vallop Tiasiri, Director, Thailand Automotive Institute; Pattana Sudhirakuljao, Executive Director of Thai Garments Association; Dej Pattanasethpong, President of Thai Garments Association; Chen Namchaisiri, Chairman of Textiles Club, Federation of Thai Industries; Phaiboon Poocharoen, Tri Petch Isuzu Sales; Thavorn Chalassathien, Chairman, Auto-parts industry club, Federation of Thai Industries & Denso International

(Thailand); and Paiboon Polsuwanna, President, Food Processing Cluster, Federation of Thai Industries.

The team is grateful to Albert Zeufack for survey design at the early stage, to Maximilian Hirn for valuable inputs, and to Deborah Bateman, Luis Benveniste, Deepak Bhattasali, Ana Margarida Fernandes, Shabih Mohib, Zhi Liu, Kazi Matin, Chanin Manopinewes, Pajnapa Peamsilapachulchorn, Thomas Rose, Cheanchom Thongjen, Charles Udomsaph, and Tunc Tahsin Uyanik for useful suggestions. The team is also indebted to the workers and managers across Thailand who devoted their time and provided information for the Productivity and Investment Climate Surveys and the interviews on regulatory issues.

Table of Contents

Tables

Figures

Boxes

Maps

EXECUTIVE SUMMARY

1. This report provides an up-to-date assessment of the investment climate of Thailand. As the socio-economic framework in which enterprises operate—including infrastructure, policies and regulations— improving the investment climate is helpful for productivity and economic growth. The report is based mainly on the results of the second round of the Thailand Productivity and Investment Climate Surveys (PICS) carried out in 2007 and on a comparison with results from the first round (conducted between March 2004 and February 2005). Some 1043 establishments from nine manufacturing sectors (food processing, textiles, garments, automobile parts, electronic parts, electrical appliances, rubber/plastics, furniture/wood, and machinery) in six regions (North, Central, metropolitan Bangkok, East, Northeast, and South) were surveyed. This report aims to present policymakers with detailed information on key business climate indicators and their relationship to Thai economic performance.

Main Findings

2. Thailand has achieved great economic and social successes. It ranks in 15th place out of 178 economies in terms of ease of doing business, in the 2008 Doing Business report, and outranks Malaysia, Indonesia and the Philippines. Among East Asian nations, only Singapore is better placed. In comparison with similar middle-income countries including Brazil, China, India and Turkey, Thailand is relatively well placed in terms of infrastructure, regulations and other objective investment climate measures. But Thailand's traditional labor cost advantage is being eroded by fast growing countries and skill shortages are worrisome given the need for Thailand to move toward a more skill- and knowledge-based economy.

3. Thailand's investment climate seems to have worsened between 2004 and 2007 judging by the opinions of firm managers which have deteriorated significantly. However, judging by the changes in objective investment climate indicators, which were generally small in magnitude, the investment climate in Thailand is reasonably stable though a few areas require the attention of policymakers.

4. This worsening of subjective perceptions is probably related to the political uncertainty and the changes in global macroeconomic environment. "Political instability" was ranked second among the top constraints to doing business in 2007 while in 2004 it was not even among the top 10 concerns of enterprises. Moreover, while each one of the 18 investment climate indicators was ranked as a 'major' or 'severe' obstacle by a higher percentage of firms in 2007 than 2004, but political instability more so than any other indicator.

5. Apart from political instability, however, the ordinal ranking of the investment climate indicators was similar in both survey rounds. In other words, firms tended to worry about the same obstacles in 2007 as in 2004, only more so given the background of political crisis. What firm managers view as the four main constraints (which are analyzed in chapters 3, 4, 5 and 6) are:

- Constraints related to the macroeconomic environment and policy (taxation; foreign exchange regulations; etc) and access to finance
- The shortage of skilled labor
- Taxes and the regulatory framework
- The quality, price and reliability of infrastructure

6. Measures to improve Thailand's investment climate should of course take into account the fact that constraints vary across regions, industries and types of firms. These variations, described in details in Annex 1, may have policy implications. For instance, tax reforms need to address the special concerns of small firms; efforts should meet the needs of the industries most affected by skill shortages; etc.

- *Regions:* Particular regions face specific challenges. For instance, concerns about infrastructure supply and utility prices were especially marked in the Northeast. More generally, the investment climate of some regions is perceived as superior to that of others. Bangkok and vicinity, the Central and the Eastern region are viewed most favorably; the South, the North and the Northeast most negatively.

- *Industries*: The extent to which firms are constrained by particular obstacles differs across industries. For instance, the perception of skilled labor shortages did not vary much across regions, but a lot across industries. It was viewed as particularly severe in the garments, wood and furniture, machinery and auto-parts industries.

- *Firm characteristics*: Different firm characteristics often imply different concerns: smaller firms were much more concerned about inadequate access to credit than larger firms. They also appeared more constrained by high and complicated tax regimes. Exporters naturally worried more about foreign currency regulations than other firms.

7. Thailand has much to build on, but decisive action is required as the country moves forward. Improving the investment climate by removing key constraints would help enterprises reduce costly inefficiencies and would give a boost to productivity and growth in Thailand.

Investment Climate and Enterprise Productivity

8. Thailand's rapid growth and transition to middle-income country status in the past two decades was mainly the result of the rapid increase in employment and capital goods. Productivity growth has been relatively low. Out of the six percent annual growth rate in 1985-2005, only one-sixth of that was attributable to total factor productivity and less than one-tenth to human capital improvements.

9. High growth rate may not be sustainable in the long run if it depends solely on factor accumulation due to the diminishing marginal contribution of capital. Not only the quantity but the quality of growth is essential. Given the ongoing decline of Thailand's labor cost advantages in several industries by international competitors and the appreciation of the Thai Baht, much of Thailand's success in the global marketplace will depend on its ability to achieve fast and continuous productivity improvements. This can be accomplished *within each industry*, not only by advancing technological frontiers through innovations, but also by catching up with global best practice through the adoption and adaptation of existing products, processes and methods. Productivity gains can also be attained *between industries* by providing incentives to reallocate resources to more productive industries and by moving up the technology ladder. Enhancing the investment climate helps realizing both types of gains by providing firms with a better environment, fewer unjustified risks and less unnecessary regulations and costs.

10. Chapter 2 of the report provides details about the relationships between investment climate indicators and productivity, both at the national level and across industries, using three different measures (labor productivity, TFP and sales growth). The data from both PICS rounds are not sufficient to make causal statements about these relationships. More research on the links between the diverse elements of the business climate and firm productivity would be required before making pronouncements. In policy terms, it is clear that political stability and stable macroeconomic and trade policies would have positive payoffs in terms of economic growth and productivity. What is less clear is whether improvements in the investment climate, which would certainly provide favorable incentives for increased investment, would also lead to significant productivity gains by firms.

11. The PICS results suggest that firm performance is higher in areas where the investment climate is better, skilled labor supply abundant, regulations and bureaucratic procedures less burdensome, infrastructure services reliable and financial service accessible. An improvement of investment climate over time is associated with an increase in firm performance. This is a self-reinforcing process as high economic returns encourage capital accumulation and growth virtuously. Since development is path-dependent and agglomeration effects play an important role in the growth process, this can perpetuate existing differences in investment climates if they are not addressed appropriately. The urgency to eliminate investment climate constraints is reinforced by the pressure of international competition. Policymakers cannot wait since other countries are catching up and the window to reap the benefits of reforms can close quickly.

Key Investment Climate Constraints

12. The uncertain political situation since 2006 has negatively affected the Thai economy. The PICS 2007 was fielded at a time of great political instability and policy uncertainty. This is clearly reflected in the subjective assessments of enterprise managers. Instability and economic policy uncertainty became major issues – firms that perceived it a major or severe obstacle doubled from one-third in 2004 to two-thirds in 2007. Forty percent of firms ranked political instability as one of their three biggest obstacles in 2007 compared to less than 10 percent in 2004. The negative changes in the investment climate were to some extent magnified by this somber entrepreneurial mood while the improvements often went unnoticed. The pessimistic business sentiment resulted in a sharp decline of private investment growth, from 10.6 percent in 2005 to 3.7 percent in 2006 and 0.5 percent in 2007. Gross foreign direct investment (FDI), which had been the main source of investment growth in 2005 and 2006, declined by US$10 billion in 2007.

13. Inadequate financial service negatively affected firms' investment decisions. Limited access to finance contributed to sluggish private investment growth. An increasing share of firms had to forgo commercial loans and finance their working capital and new investments through internal funds or retained earnings. In PICS 2007, 23 percent of firms reported access to domestic credit as a major or severe obstacle—a sharp increase from the 14 percent of PICS 2004. Some 35 percent of firms reported the high cost of financing to be a major constraint to business in 2007, compared to 15 percent in 2004. Although more than half of the firms reported that fluctuations in the exchange rate and volatility in commodity prices adversely affected their investment decisions, less than one-fifth of firms used financial hedging instruments.

14. Shortages and mismatches of skilled labor and inadequacies in the technological innovation system limited the ability of Thai firms to increase productivity. Employees with college degree or above represented only ten percent of total employment in the PICS 2007 enterprises, and it takes them more than seven weeks to fill vacancies for professionals. Many job vacancies arise because applicants lack both basic and technical skills required by firms; and there is high staff turnover due to intense competition among firms for qualified labor. Two-fifths of firms responded that shortage of skilled labor was one of their three biggest constraints. The insufficient supply of qualified staff in Thai enterprises has dire consequences: not only does it immediately lower their productivity; it also limits their capacity and willingness to invest in training in the long run, which tends to perpetuate the vicious circle. The growth model of Thailand is still largely based on "learning by exporting" and advanced technology or high skill intensity play a limited role in productivity growth. Thai firms adopt new technologies, often by acquiring them from a parent company; introduce new production processes; and develop new product lines but technological innovations are very limited. PICS 2007 indicates that less than one-fourth of Thai firms have R&D staff and they only spend 0.3 percent of total sales on R&D. A weak collaboration between research institutes and industrial sectors also negatively affects innovation and technology transfer.

15. There are some indications that the regulatory framework was burdensome for some enterprises and unnecessarily increased the cost of doing business. One-third of

firms perceived tax administrations as major or severe obstacles to doing business—and one-fourth, customs and trade regulations. Tax administration was perceived by one-fifth of firms as one of their top three constraints (out of 22 investment climate indicators) in 2007—immediately following skilled labor shortage and political instability. The regulatory issues perceived by firms to be the most burdensome were tax administration, followed by customs and trade regulations, labor regulations, and time wasted in obtaining business permits and registration. The higher burden from tax administration was reflected in the greater number of days and larger uncertainty for firms interacting with the tax authorities—in particular with the Revenue Department. Although export customs clearance remains speedy, import customs clearance takes longer than before and has become more uncertain. Inefficient tax refunds, ambiguous goods categorization, cumbersome certification procedures, frequent inspection from multiple agencies, and policy uncertainties on regulations are most often mentioned as key constraints by managers in in-depth interviews.

16. No large public infrastructure investments have been undertaken since the financial crisis in the late 1990s, and the poor quality of infrastructure facilities (and/or lack of maintenance) raised the logistic costs of enterprises. The percentage of firms that reported that inadequate and unreliable public infrastructure services in transport, electricity, water, and telephone were a major obstacle for business is higher in 2007 than in 2004. Production loss due to power outages represents more than 50 percent of the total indirect costs of doing business in Thailand. Infrastructure services were the most adequate and reliable in Bangkok and vicinity and were the least satisfactory in the Northeast, South, and North. Food processing firms, which represent a large share of manufacturing production in those three regions, have the highest transport and logistics costs (eight percent of their export earnings). One-third of firms in this sector owned at least one generator since food quality is sensitive to power interruptions. They often relied on their own generators to supplement the unreliable public electricity supply. There is a pent-up demand for infrastructure in inland container depot (ICD), electricity and piped water (since the government has raised user charges for groundwater significantly).

The Policy Agenda

17. The Royal Thai Government has given priority to improving competitiveness and productivity—the key topics of the 9th and 10th National Economic and Social Development Plans which focus on education and on the development of a knowledge economy. The current government has also announced the continuation of the public infrastructure projects with an emphasis on the mass transit system in Bangkok. Efforts to improve public services and streamline bureaucratic processes are also visible and ongoing.

18. However, many programs need to be expanded and many others remain declarations or plans and still need to be translated into action. The government needs to continue to restrain rent-seeking, establish credibility and foster public trust and legitimacy. Improving the investment climate in the various areas discussed in this report would certainly be helpful. The removal of binding constraints that limit firm

performance will give firms the confidence to invest and expand, and will stimulate economic growth. An improvement in the overall investment climate does not require all constraints to be removed at the same time and the government has the possibility of sequencing reforms and public investments, depending on its policy priorities.

19. First and foremost is the key importance of political stability and economic policy certainty, which are a prerequisite for other investment climate reforms to have a positive effect. Political tensions continue to prevail in Thailand following this election, and are having a deleterious effect on the investment climate.

20. Developing financial markets is also important for business expansion, but making needed improvements in the business environment and making them known are important to boost sentiments to invest.

21. Investing in human capital and ensuring that education is more in line with the skill needs of enterprises is critical. The main challenge will be in the higher education sector, where Thailand's government has been successful in designing and passing the regulations required to modernize and make more efficient its higher education system. It now needs to focus on implementing these policies and on educating the public, and the academic community, about the advantages of a more decentralized and autonomous system. These advantages include having the potential to engage in fruitful collaborations with industry, encouraging entrepreneurial endeavors from faculty to attract external funding, and promoting cross-institutional, cross-border, and interdisciplinary partnerships for maximizing outputs.

22. Promoting a wider use of engineering, design, and IT services, improving and targeting fiscal incentives to promote enterprise innovations, having a more coordinated science and technology policy, and strengthening cooperation between research institutes and firms are also important starting steps to employ more effectively existing technology and knowledge and to help build up the capacity to innovate of the private sector.

23. Providing a stable and conducive regulatory framework is important for firms to make informed decision of investment and concentrate resources to improve productivity. Promoting a greater use of information and communication technology (ICT) services, which have become more available and affordable in recent years, would help to reduce the cost and time spent by firms dealing with regulations. This requires relatively limited budget support and implementation can begin without lengthy preparation. The government is currently making efforts to improve public services and streamline bureaucratic processes. The establishment of the Single Window at the Department of Export Promotion is an excellent example on how better coordination among government agencies can help streamline bureaucratic processes and alleviate the regulatory burden of firms. The establishment of one-stop service centers in each ministry and the greater use of information technology have also been effective in reducing the number of steps, days, and face-to-face interaction with government officials.

24. Improving infrastructure has now become a priority. It would greatly reduce the operational and logistical costs of enterprises. Increasing public investment in projects

with high expected rates of returns is expected to have large impact by alleviating bottlenecks, increasing the availability of infrastructure services and reducing logistic cost, stimulating private investment through public-private partnerships, and through positive externalities for property developers and other businesses. Given the reasonably good budget situation and the fact that new public investments would not pose significant fiscal risks, this is within the fiscal capacity of the government.

1. THAILAND'S INVESTMENT CLIMATE TODAY: MAIN FINDINGS OF THE 2007 SURVEY AND INTERNATIONAL COMPARISON

1. The investment climate is the fundamental socio-economic framework in which firms operate – the macroeconomic and trade policies they face, the labor and financial markets in which they recruit and raise money, the available infrastructure and imposed regulations, as well as all other areas of public policy impacting on private business. An improvement in the investment climate raises returns to current activities and so increases investment in these lines. It generally also creates new possibilities—for example, through trade or access to new technology. It influences the psychology of entrepreneurs, affecting their assessment of whether innovation and researchwill pay off. It puts competitive pressure on firms. This may cause some firms, perhaps those close to technological frontiers, to shine—even as others fail. Yet investment climate fueled growth is not simply a shift toward some technological frontier, and it is not only benefiting the most advanced firms. Instead a better business environment induces changes through a complex dynamic of innovation and competition, relationships between firms and government, and the associated entrepreneurial expectations or "animal spirits", to use the Keynesian term. Large gains may be realized through basic but fundamental improvements to doing business.

THE 2004 AND 2007 PRODUCTIVITY AND INVESTMENT CLIMATE SURVEYS (PICS)

2. The Productivity and Investment Climate Survey (PICS) of Thailand was funded by the Royal Thai Government and carried out by the Foundation for Thailand Productivity Institute (FTPI) under the supervision of the Ministry of Industry, with technical assistance from the World Bank on survey design and implementation. Moreover, a Technical Advisory Committee composed of representatives from the World Bank, the Ministry of Industry, the National Economic and Social Development Board, the Bank of Thailand, the National Statistics Office, and other agencies, provided guidance. The PICS is a collaborative effort of the Royal Thai Government and the World Bank.

3. The first round (PICS 2004) was conducted between March 2004 and February 2005; the second round (PICS 2007) between April 2007 and November 2007. They share a similar survey framework, covering six regions – North, Central, Bangkok and vicinity, East, (Upper and Lower) Northeast, and South – and nine industries – food processing, textiles, garments, automobile components, electronic components, electrical appliances, rubber and plastics, furniture and wood, and machinery and equipments. PICS 2004 surveyed 1,385 establishments in manufacturing and 100 in information and communication technologies (ICT); PICS 2007 surveyed 1043 establishments in manufacturing and 101 in ICT. 426 manufacturing firms participated in both surveys. The

present report focuses on these manufacturing firms. Both rounds include interviews with CEOs, Chief Financial Officers, Human Resource managers, and workers.

4. The general purpose of the surveys is to understand the investment climate in Thailand and how it affects business performance. PICS 2004 and PICS 2007 provide subjective assessments by firm managers and objective measures of various aspects of the investment climate, as well as information on corporate finance for 2001 and 2002, and 2003 to 2006 respectively. The two rounds of survey data allow an examination of the variation of investment climate across and within regions, industries, firms of different sizes and ownerships, and of the impact of the investment climate on firm productivity. A comparison of the results of PICS 2004 and 2007 sheds light on the differential effects of business climate on firm performance over time. In PICS 2007, firms' perception on several important aspects of investment climate, such as macroeconomic stability and economic policy certainty, were to a large extent affected by the interim government arrangements and may thus reflect temporary rather than permanent changes. A third and fourth round of PICS would provide useful information to explore the linkages between changes in investment climate and changes in firm performance on a sounder econometric basis and thus offer more solid support to help policy-makers improve investment climate and stimulate growth more effectively.

GROWTH AND PRODUCTIVITY IN THAILAND

5. Thailand's GDP has grown very fast over the past twenty years. The challenge now faced by the country is to avert the "middle-income country trap." Thailand's rapid per capita income growth of almost 6 percent over the period of 1980-1997 — like that of other emerging economies of East Asia (see Figure 1) — has enabled the country to transition quickly from low-income to lower middle-income country status.[1] Thai exports have increasingly moved from being resource-based and labor intensive to high-tech and capital intensive (see Figure 2). This was the result of many factors including export-orientated policies, opening up of the industrial sector to foreign direct investment (FDI), and the use of abundant cheap labor as well as capital accumulation.[2]

6. However, in recent years, Thailand's real GDP growth has decelerated and is lower than those of other developing East Asian countries. Thailand's real GDP growth fell from 6.2 percent in 2002-2004 to 4.8 percent in 2005-2007, compared with a 2005-07 average of 8.3 percent for emerging East Asian countries.[3] With the intensifying global competition and higher commodity prices, Thailand now faces a serious challenge of

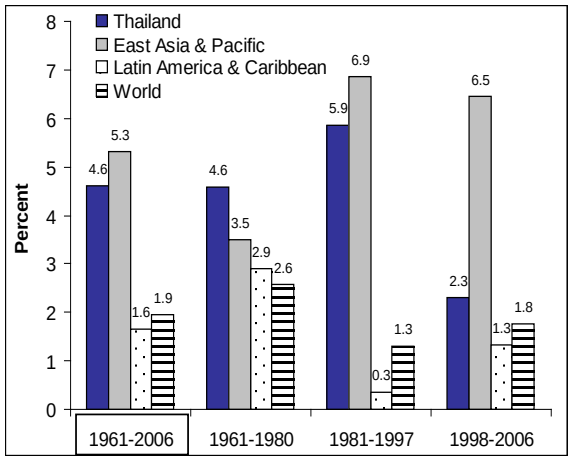
[1] Based on the World Bank Atlas methodology, countries are divided into several groups based on their 2006 GNI per capita: low income country, less than US$900; lower middle income country, between US$900 and US$3,500; upper-middle income country, between US$3,500 and US$11,000, and high income country, greater than US$11,000. Thailand, with a per capita income around US$3,000, is a lower-middle income country.

[2] Thailand has adopted export-oriented policies since the mid-1970s and has opened up its manufacturing sector to foreign direct investment in the 1980s. In the late 1980s, there was an influx of Japanese FDI into Thailand as the yen appreciated sharply after the Plaza Accord. After that, Japanese firms relocated their production to other countries in East Asia to take advantage of lower production costs.

[3] Source: East Asia Update, April 2008.

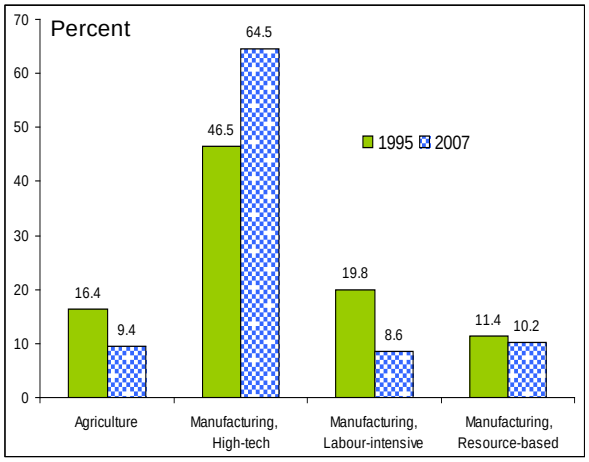
sustaining higher growth if it wants to transition to higher income country status. Policies and stimulus measures to mitigate the short-run downside risks to growth are being put in place. But Thailand also needs to turn to the longer term challenges: it needs to improve its productivity and its competitiveness if it wants to avoid being stuck at the middle income level like many Latin America countries have been for several decades.

Figure 1. Average Annual Growth of GDP per Capita, 1961-2006 (Percent)



Source: World Bank

Figure 2. Export Share by Product Groups, 1995 and 2007



Source: BOT

7. Thailand's rapid growth was mainly the result of rapid increase in employment and capital goods, but productivity growth was low. From 1985-2005, Thailand's real GDP growth expanded at a respectable average rate of 5.9 percent per annum. Almost half of this growth came from an increase in employment, particularly in the industrial sector to which excess agricultural sector migrated. A third of this growth came from the increased use of capital goods (machines and equipment). Education or improved labor quality accounts for only a fraction of this growth. Productivity growth accounts for only 15 percent of overall growth. It contributed only a small fraction to growth in industry and agriculture and was actually negative in the service sector (see Table 1). This calls for greater attention to productivity in all sectors. In an increasingly competitive global economy where an increasing number of countries with cheap labor and abundant resources are trading, Thailand can no longer rely on cheap labor and capital accumulation to support its GDP growth rate as in the past. Instead, to remain competitive and sustain high and balanced growth, it needs to improve productivity in all sectors.

Table 1. Sources of Growth in Thailand, 1985-2005

	Total Economy	Agriculture	Industry	Services
Output growth	**5.9**	**2.8**	**7.6**	**5.4**
of which				
Employment	2.6	0.5	4.9	4.5
Education	0.4	0.2	0.4	0.4
Capital	2.0	1.9	1.9	0.9
Factor Productivity	**0.9**	**0.2**	**0.4**	**-0.4**

Source: *Measuring Output and Productivity in Thailand's Service-Producing Industries (2008),* NESDB and World Bank

8. Improvements in the business climate are critical to stimulate investment and productivity growth in Thailand. In the next section, the results of PICS 2004 and 2007 are outlined in order to give an overview of the key constraints to doing business in Thailand. It is critical that these are addressed if Thailand is to overcome the productivity and growth challenges outlined above.

RECENT DEVELOPMENTS IN THAILAND'S INVESTMENT CLIMATE

9. The PICS provide two types of investment climate indicators: objective and subjective. The objective indicators, such as the quality and reliability of basic infrastructure services, are a key concern when exploring the relationship between the business environment, productivity and growth.[4] Such objective measurements, however, are not necessarily identical with the wide variety of factors that influence subjective opinions of firms about the business climate. As subjective judgments are important for actual investment decisions, it is very important to record these perceptions directly.

10. An analysis of the PICS data on objective and subjective investment climate indicators yields the following key results:

- The changes in objective investment climate indicators were ambiguous and generally small in magnitude between 2004 and 2007. This result—an objectively stable business climate—is not unexpected given the timeframe. Three years is a relatively limited period for fundamental changes to occur in real variables such as the physical infrastructure, the regulatory framework or the skill composition of the labor market.

- Strikingly, however, the subjective indicators record a very significant deterioration in perceptions about a wide variety of aspects of the investment climate. This broad based decline in subjective measures is likely to be related to the recent political crisis in Thailand.

[4] Dramatic changes, for instance a drastic deterioration in the public power supply, would be expected to have strong effects on firms' productivity and growth.

- Aside from the general increase in pessimism, we find the ranking of the perceived main constraints to be very similar in 2004 and 2007. In other words, businesses tended to worry about the same constraints in 2007 as in 2004, only more so given the background of political crisis. Four of these key constraints—analyzed in more detail in chapters 3, 4, 5 and 6 of this report—are the following:

    - The weak macroeconomic environment and inadequate access to finance
    - The shortage of skilled labor
    - Taxes and the regulatory framework
    - The quality, price and reliability of infrastructure

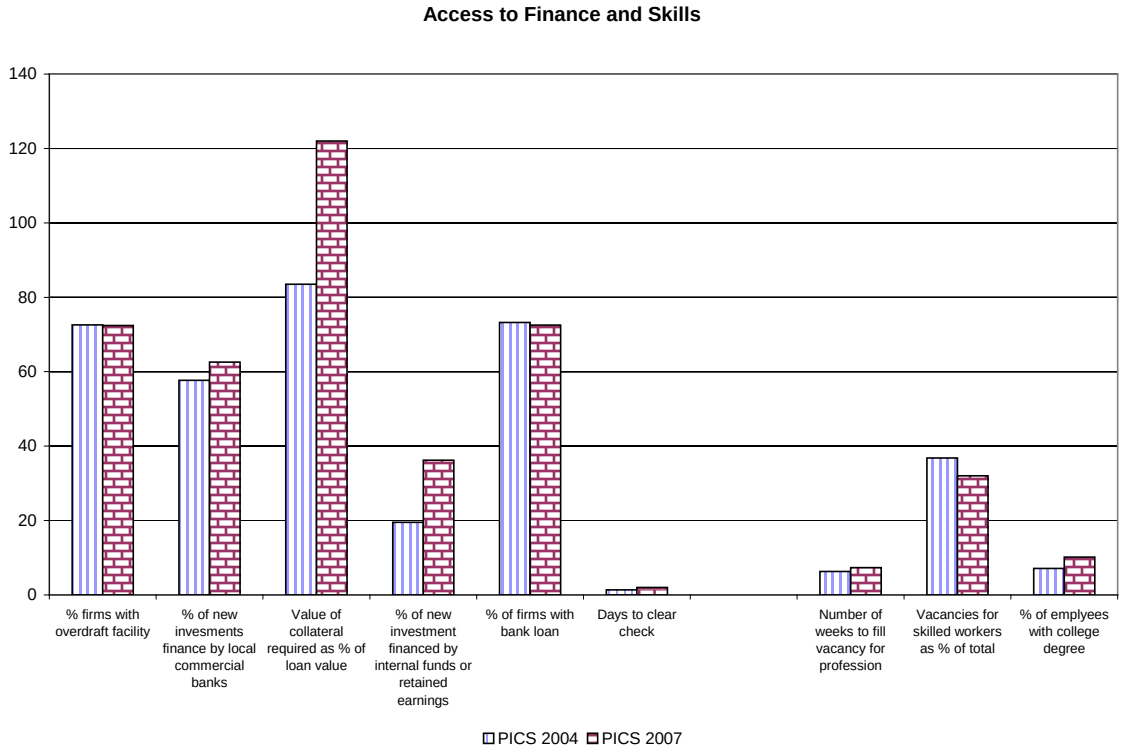
Objective Indicators

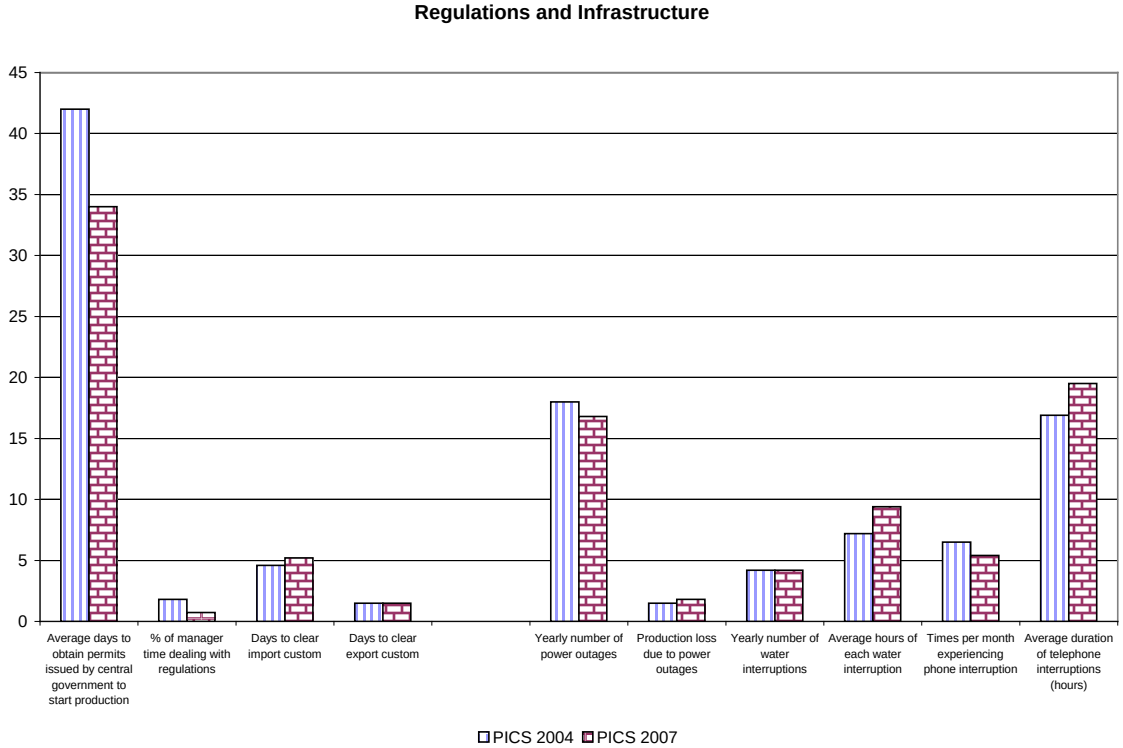
11. The PICS surveys ask firms to provide data on a wide array of objective investment climate indicators. These include measures of physical infrastructure (for instance, 'yearly number of power outages'), of the regulatory environment (for example, 'percentage of manager time dealing with regulations') as well as the efficiency of financial and labor markets ('percentage of firms with overdraft facility', 'average number of weeks to fill vacancy for professional position', etc.).

12. As Figure 3 illustrates, only few of the indicators show large changes and these are of mixed direction.[5] Most objective indicators appear relatively stable over time. The production loss due to power-outages, the number of weeks required to fill a vacancy for a professional position, the percentage of firms with a bank loan and those with an overdraft facility, as well as days to clear export customs remained virtually unchanged.

[5] If instead of the full, nationally representative samples, we use the panel-data containing only those firms that were surveyed in both years, then the changes are even smaller.

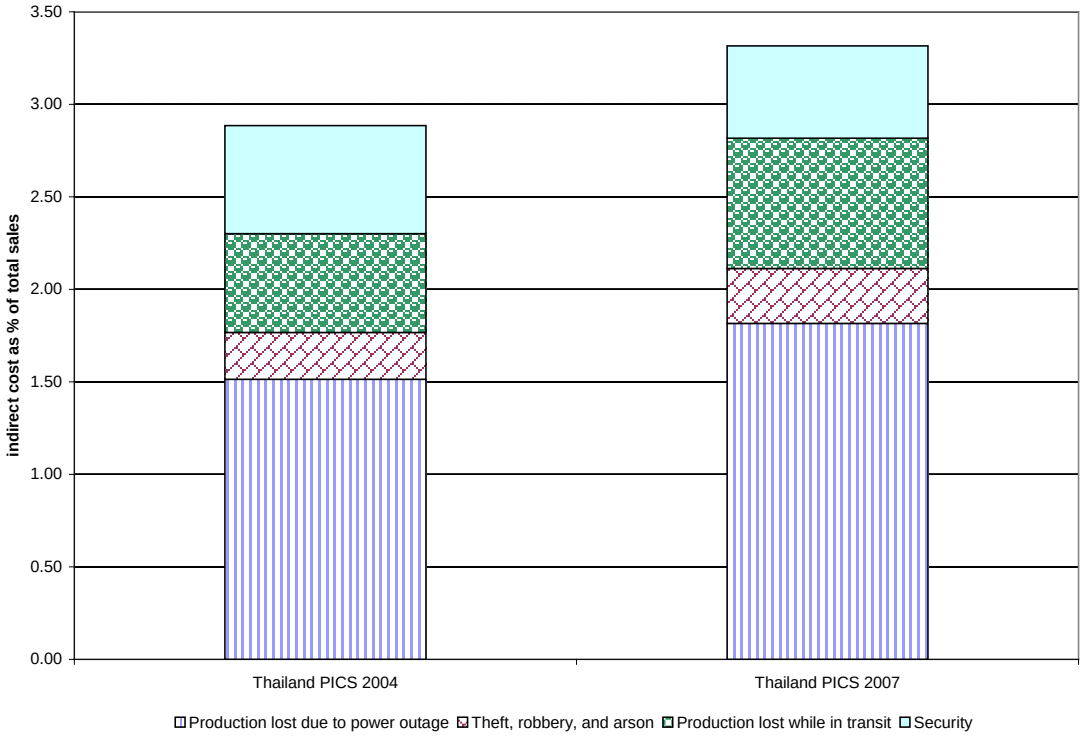
Figure 3. Objective Indicators of Thailand Investment Climate, PICS 2004 and PICS 2007





13. The indirect costs for Thai firms due to power disruptions, theft, robbery and arson, transportation, and security increased only slightly from 2.9 percent of total sales in PICS 2004 to 3.3 percent in PICS 2007. (Figure 4). The cost of production loss due to power outages increased from 52 percent of the total indirect costs to 55 percent; the cost of theft, robbery and arson remained at 9 percent of total indirect cost; the cost of production loss in transit increased from 19 percent of the total indirect costs to 21 percent; and the cost of security declined from 20 percent of the total indirect costs to 15 percent.

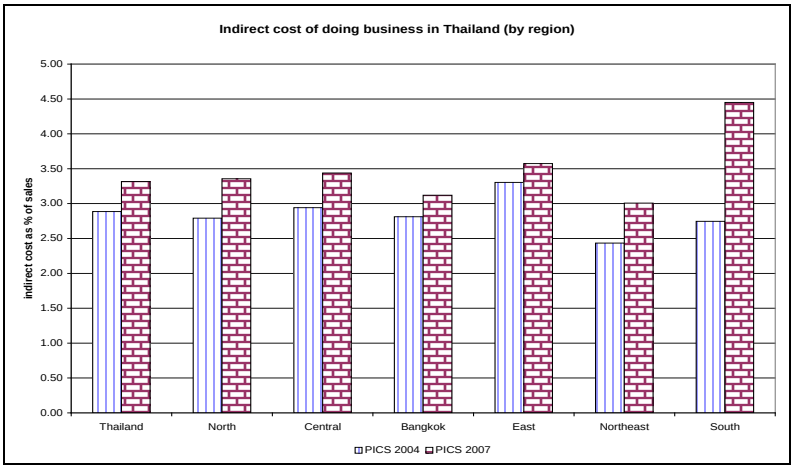
Figure 4. Indirect Costs of Doing Business in Thailand, PICS 2004 and PICS 2007 (Percent of Total Sales)

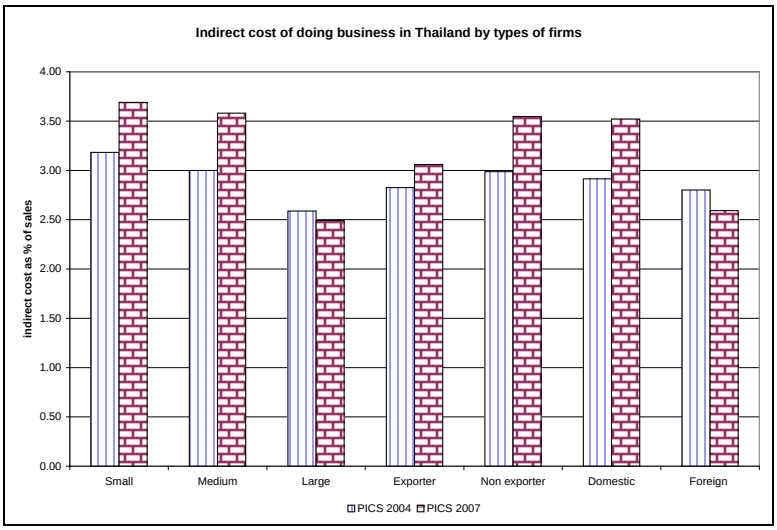


14. Indirect costs as a percentage of sales vary within Thailand (Figure 5).[6] In PICS 2007, indirect costs increased in all regions—with the highest indirect costs recorded in the South (about 4.5 percent of sales). Food processing enterprises reported the highest *increase* in indirect cost for manufacturing, followed by firms producing garments and furniture. Food processing and furniture reported the highest *level* of indirect cost—both amounting to approximately 4 percent of sales. If we consider different firm types, large firms reported lower indirect costs than small and medium firms, and foreign firms reported lower indirect costs than domestic firms. The two categories large firms and foreign firms reported a decline in indirect costs, and small/medium firms and domestic firms reported an increase. Indirect costs are slightly higher for non-exporter firms than for exporter firms.

[6] See Table 30 for details.

Figure 5. Indirect Costs of Doing Business in Thailand, Sub-National Breakdowns (Percent of Total Sales)





Subjective Perceptions of Enterprise Managers

15. For measuring Thai firms' subjective perceptions about the investment climate, this report uses two sets of statistics available in PICS. The first allows ranking investment climate constraints by the percentage of firms that considers them among their top three constraints to doing business. The second statistic is based on a question asking firms to rate, on a close-ended scale, how problematic each of 18 dimensions of the investment climate is for the operation and growth of their business[7].

Perceptions about the Three Top Constraints to Doing Business

16. Given the method of computation of this statistic, it cannot record a general increase in concern, but only a relative change in what firms consider their most pressing investment climate constraints. The ten obstacles judged most important in 2004 and 2007, respectively, are summarized in Figure 6.[8] The key results are the following:

- The impact of the political crisis is clearly visible. In PICS 2004, only 8 percent of firms ranked 'political instability' as among their three biggest constraints to doing business. In the 2007 survey, however, 38 percent perceived political instability as a major constraint, making it second only to 'skilled labor shortage'

- The shortage of skilled labor was perceived as the biggest obstacle to doing business by the largest percentage of firms in both PICS 2004 (48 percent) and PICS 2007 (39 percent). Vacancies unfilled or hire less qualified labor to do the job both lowered firm performance.

- 'Tax regulations and/or high taxes' and 'bureaucratic burden' were the second and third most cited among 'top three' obstacles in PICS 2004, and the third and sixth highest ranked in PICS 2007.

- Concerns related to macroeconomic issues, such as 'insufficient demand for products' and 'competition from imports', were cited by 15 to 20 percent of firms as among their top three constraints.

- Obstacles relating to infrastructure, such as 'utility prices' or 'inadequate access to infrastructure', were ranked among the ten most frequently cited top-three obstacles in PICS 2004 and 2007. [9]

[7] In this question, zero stands for not an obstacle, one for minor obstacle, two for moderate obstacle, three for major obstacle, four for severe obstacle, and NA means not applicable.

[8] Macroeconomic policy uncertainty was not among the 22 investment climate constraints listed in the survey for firms to choose as one of their three biggest obstacles.

[9] Inadequate access to credit was perceived by 15.7 percent of firms in PICS 2007 as a big obstacle compared to 9.2 percent in PICS 2004, suggesting a general tightening of credit accessibility over this period.

Figure 6. Percentage of Firms Perceiving a Particular IC Constraint as One of Their Top Three Constraints to Doing Business

Perceptions of the Severity of Investment Climate Constraints

17. The second type of statistic recording subjective investment climate asks firms to rank the perceived severity of 18 obstacles to doing business on a five point scale. Figure 7 provides an overview of the percentage of firms ranking a particular constraint as 'major' or 'severe' in PICS 2004 and 2007 respectively. The key results are the following:

- The impact of the recent political crisis seems to be strongly reflected in Figure 7 in two ways. Firstly, in 2007 every single of the 18 obstacles was perceived as 'major' or 'severe' by a higher percentage of firms than in 2004. This suggests a broad-based increase in pessimism typical for a general political crisis of confidence. Secondly, the increase in perceived severity was particularly pronounced in indicators closely related to the political and administrative sphere, such as 'economic policy uncertainty', 'corruption'[10] and 'crime, theft and disorder'.

- Both in PICS 2004 and 2007, however, 'macroeconomic instability' was the obstacle which the highest percentage of firms rated as 'major' or 'severe'. The 'cost of financing', linked to increases in the interest rate as well as the availability of formal credit, is viewed particularly severely in 2007.

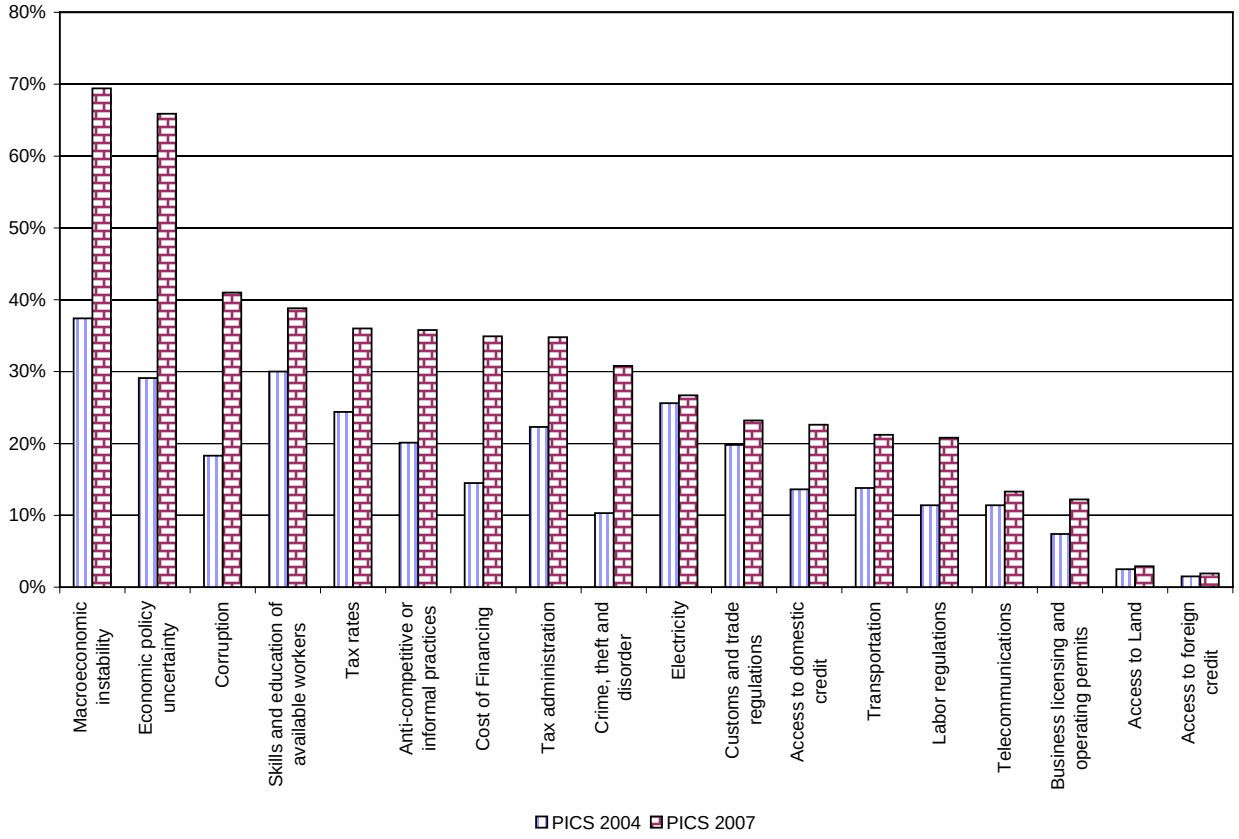
- Skill shortages and lack of education of workers was perceived as a 'major' or 'severe' obstacle by the second highest number of firms in 2004 (30 percent), and the fourth highest percentage in PICS 2007 (38 percent).

- 'Tax rates' and 'tax administration' were perceived as major or severe obstacles by a relatively high percentage of firms both in 2004 and 2007. The former is the fifth highest both in 2004 and 2007, the later the sixth and eight highest respectively. The comparatively high percentage of firms in both survey rounds perceiving 'anti-competitive or informal practices' as major or severe problems. 'Customs and trade regulations' were perceived more severely than 'labor regulations' and 'business licensing' in both years.

- In comparison to the other concerns, basic infrastructure constraints seem somewhat in the background. However, 'electricity', at least, is the fourth highest ranked concern in 2004, and tenth in 2007. Transportation was viewed as a major or severe problem by around 15 and 20 percent of firms in 2004 and 2007 respectively, and in both rounds more than ten percent perceived telecommunications in this way.

[10] The percentage of firms that perceived corruption as a major or severe obstacle more than doubled—from 18 percent to 41 percent.

Figure 7. Percentages of Firms Perceiving Particular Investment Climate Indicators as Major or Severe Obstacles to Doing Business in Thailand



18. To summarize, the picture that emerges from the PICS surveys is one of relatively stable objective conditions, contrasted by a marked decline of perceived investment climate. The increased pessimism seems to be closely linked to the recent uncertain political situation. The actual business climate obstacles about which firms are most concerned, however, are largely similar in 2007 and 2004.[11]

19. The following section compares both objective and subjective Thai investment climate indicators with those of other middle income countries. This provides a useful international perspective before moving to a more detailed examination of Thai productivity and growth and the most relevant elements of investment climate.

THAILAND FROM AN INTERNATIONAL PERSPECTIVE

Objective Indicators

20. Thailand ranks in 15th place out of 178 economies in terms of overall "ease of doing business", based on the 2008 Doing Business report, up from the 17th place in the

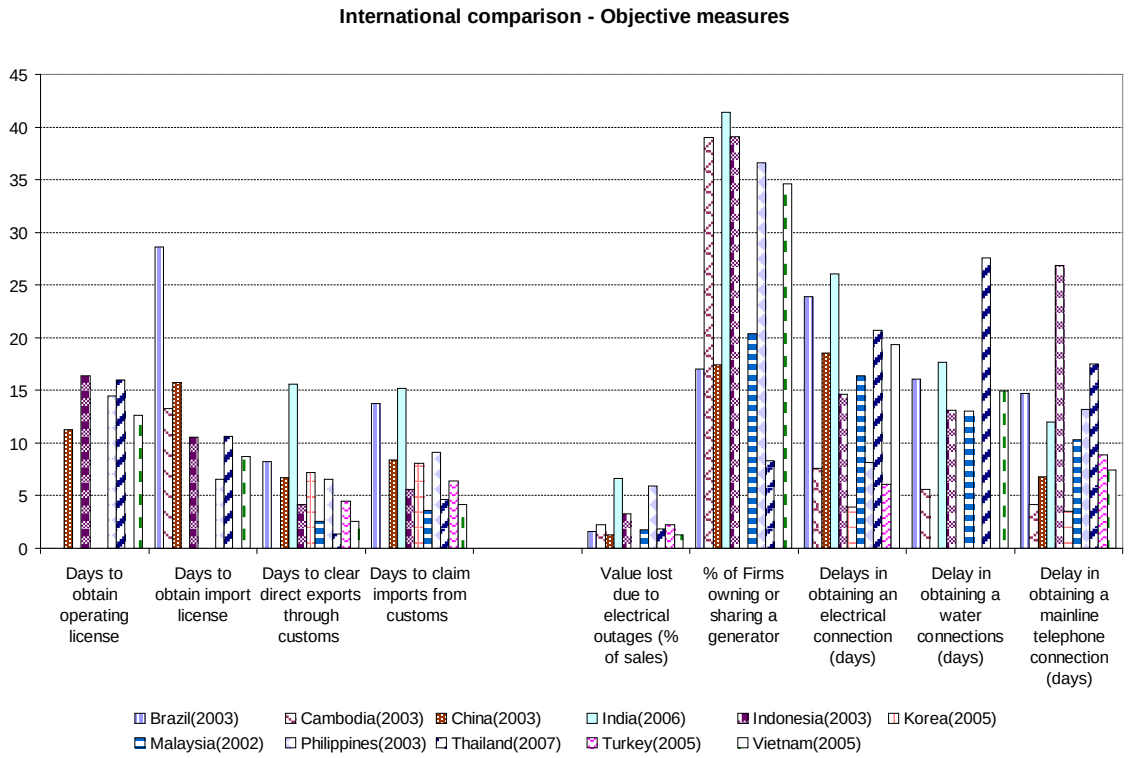
[11] Note that these key results also hold when the indicators of perceived investment climate are computed using the panel-samples which include only those firms that were surveyed in both rounds.

previous year. This compares favorably with other East Asian countries, such as Malaysia (24th place), Indonesia (123rd place), Philippines (133rd place), and Lao PDR (164th place)—though it lags behind the best performer, which is Singapore (1st place). The ten key dimensions of "ease of doing business," are starting a business, dealing with licenses, employing workers, registering property, getting credit, protecting investors, paying taxes, trading across borders, enforcing contracts, and closing a business. All changed only slightly over the last five years.

21. From an international point of view, in terms of regulations and logistics, the number of days to obtain an operating license and an import license in Thailand (16 and 11 days, respectively) is relatively high compared with comparator countries;[12] while the number of days to clear direct export through customs and to clear import customs (1.5 and 5 days) are relatively short (Figure 8). This suggests that, in a relative sense, customs clearance is more efficient in Thailand but more effort in license regulation is needed. In the area of infrastructure, electricity supply in Thailand measured by production loss due to power outage as a percentage of sales compares favorably with most comparator countries—this is consistent with the finding that a lower percentage of firms that own or share a generator (8.3 percent). However, it takes Thai firms a relatively long time to get infrastructure services connected: for electricity, water, and telephone line connection, it takes 21, 28 and 17 days, respectively.

[12] Comparator countries, selected on the basis of income level, export structure, and availability of data, include Brazil, Cambodia, China, India, Indonesia, Korea, Malaysia, Philippines, Turkey and Vietnam. The indicators are selected based on data availability.

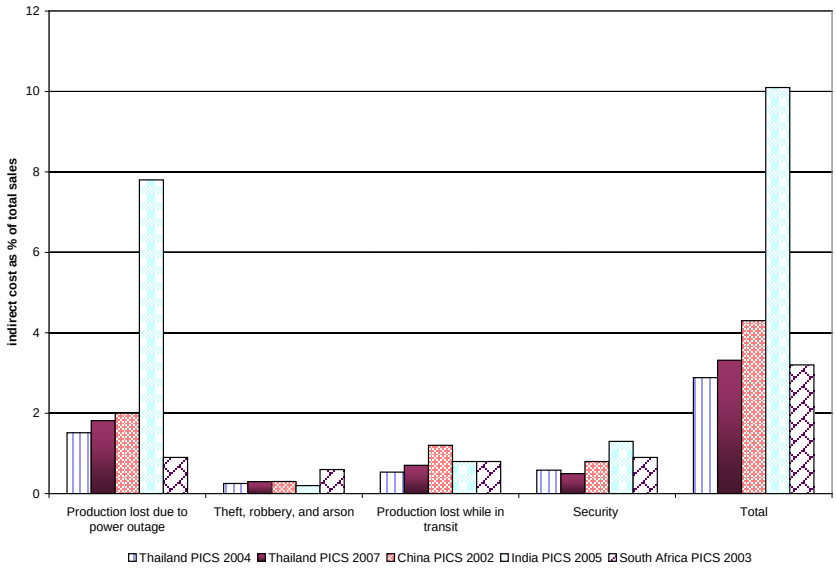
Figure 8. International Comparison - Objective Indicators



22. Firms' indirect costs as a percentage of sales often are an important measure of the overall investment climate since, in general, it is less costly for firms to do business in locations with a better investment climate, others being equal. The overall indirect costs of doing business in Thailand are at par with South Africa, and lower than China and India (Figure 9).[13] The cost of doing business in Thailand associated with production loss due to power outages is relatively high.

[13] The comparator countries are selected based on data availability. In the PIC surveys of China, India, and South Africa, the indirect costs that firms reported—in addition to production loss due to power outage, theft, robbery, and arson, production loss while in transit, and security—also include bribes, which represents 1.9 percent, 2.1 percent, and 0.3 percent of total sales respectively. For comparison, the cost of doing business associated with bribes is not included in total indirect costs in China, India, and South Africa in this report.

Figure 9. International Comparison: Indirect Costs (Percent of Total Sales)



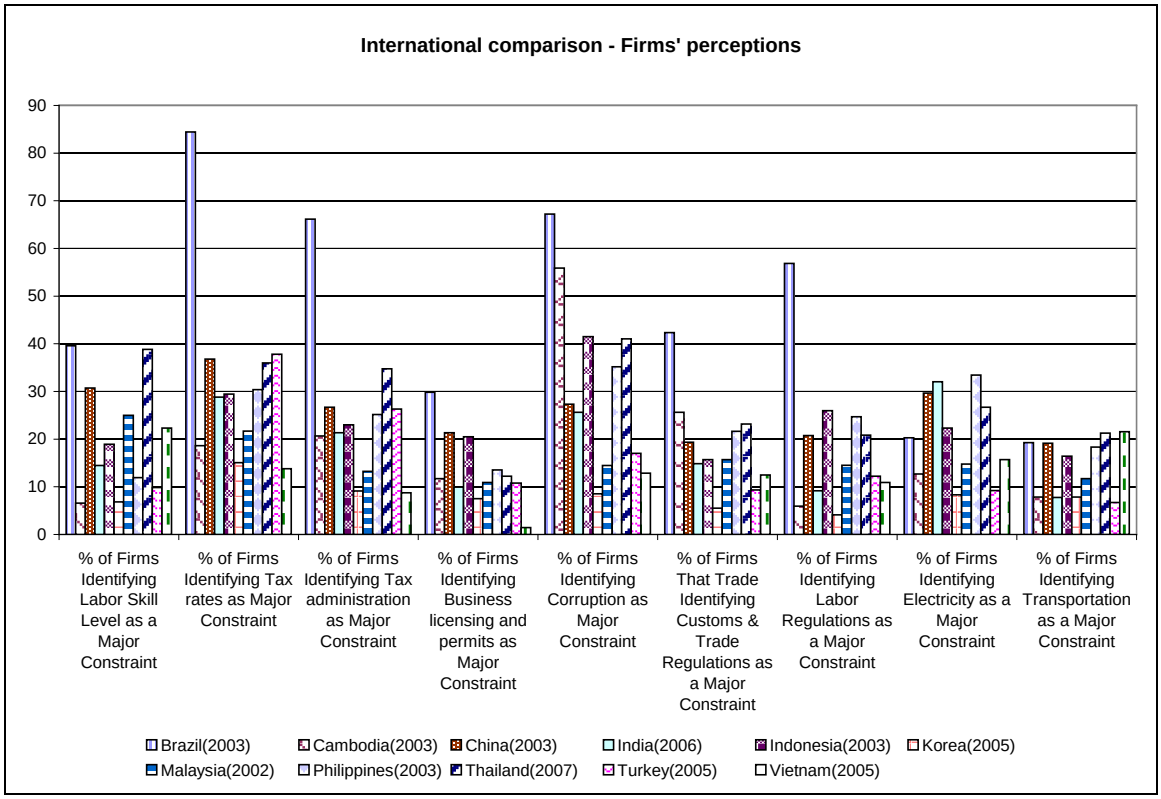
Subjective Perceptions of Enterprise Managers

23. Relative to comparator countries, a larger share of Thai firms considers many aspects of investment climate as major or severe constraints to doing business - the exception being Brazil (Figure 10). For example, the share of firms that perceive skilled labor shortage and transportation as major or severe constraints in Thailand is among the highest internationally.

24. The fact that many Thai firms consider the investment climate to be a major or severe constraint although many aspects of it are good by objective measures, suggests that improving the investment climate (and making firms aware of the improvements) is important to increase the firms' performance.

Figure 10. International Comparison of Perceptions

(Percentage of Firms Identifying a Particular Constraint as 'Major' or 'Severe')



FOCUSING ON THE MAIN INVESTMENT CLIMATE ISSUES

25. The various dimensions of the investment climate interact. For example, without an increase in skilled labor supply, efforts to encourage R&D may not be effective; similarly without alleviating the regulatory burden on trade logistics, improving transport facilities alone may not go far enough in stimulating exports. As the PICS results show, the recent political instability seems to exert a general downward pull on perceptions, which in turn may constrain investments in spite of stable, internationally still competitive objective conditions.

26. Simultaneously addressing the full set of investment climate constraints may be costly and disruptive for the economy and thus not feasible. Therefore, it is important to sequence policy reforms in order to improve the investment climate. The most effective sequence is to start by addressing key binding constraints, giving firms the incentive and the confidence to invest. The process can then be sustained by addressing other constraints in order of their importance.

27. Chapters 3-6 of this report focus on four dimensions of the investment climate that were identified as the key perceived constraints to firm performance above: the macroeconomic environment and financing of firms, skilled labor; regulations, and infrastructure.

- A reasonable level of macroeconomic stability and economic policy certainty is fundamental for a good investment climate. Without this, progress in other areas is unlikely to have traction. Well-functioning financial markets are also important for connecting lenders with borrowers to fund ventures and share risks appropriately. Limited access to finance often jeopardizes investment opportunities and raises costs unnecessarily.

- A skilled labor force is important for the adoption of new and more productive technologies and for increased productivity. A better knowledge base creates higher returns in a sustainable way at any given amount of inputs. Making education more relevant to the skill needs of firms is therefore important.

- Regulations and taxation play a major role in shaping the investment climate. Sound regulations address market failures that inhibit productive investment and reconcile the interests of firms with wider social goals. Sound taxation generates the revenues to finance the delivery of public services that improve the general investment climate.

- Reliable infrastructure services conditions the productivity of firms. They affect the timeliness and predictability of firms' response to market demand, which is more than ever important in a modern economy. Government intervention in the provision of infrastructure is particularly important due to its "natural monopoly" characteristics. This report looks closely at four types of infrastructure – power, water, telecommunications, and transport – of great importance for a wide range of firms.

2. INVESTMENT CLIMATE AND ENTERPRISE PRODUCTIVITY

28. This chapter considers the relationship of investment climate (IC) indicators with productivity in Thailand. First, the importance of productivity growth for economic development, and the possible impact of investment climate thereon, is briefly outlined. Three different productivity indicators are then introduced and their level and variation is examined both for Thailand as a whole and across regions and industries. Finally, the results of regressions of firm productivity on indicators of investment climate and firm characteristics are discussed and the key relationships are highlighted.

PRODUCTIVITY GROWTH

The Importance of Productivity Growth

29. "Productivity isn't everything, but in the long run it is almost everything."[14] If growth depended purely on factor accumulation, sustaining a high growth rate would not be possible in the long run due to the diminishing marginal contribution of capital. However, this limitation may be overcome if growth is driven by productivity gains—for instance, if economies of scale yield increasing returns.

30. The increase in labor cost in recent years, accompanied by the appreciation of the Thai Baht, has contributed to a decline in the competitiveness of several industries in Thailand. Moving from cost- to value- or knowledge-based competitive advantages has thus become increasingly important to sustain Thailand's growth.[15]

Investment Climate and Variations of Productivity and Growth across Locations

31. Locations with superior investment climate tend to attract more firms and investments and are therefore likely to experience higher growth. This is because firms choose their location in order to minimize costs and maximize profits. Profitability, in turn, is influenced by the investment climate which conditions costs, risks, and barriers to entry.

32. Growth and productivity of firms at a given location can improve with business climate through two channels: A better IC can increase the size of investments as well as

[14] Paul Krugman (1997) *The Age of Diminished Expectations: U.S. Economic Policy in the 1990s.* Cambridge, Mass.: MIT Press.

[15] See also: World Bank (2008), *Towards a Knowledge Economy in Thailand.* Washington DC: World Bank.

enhancing firm performance by cutting unnecessary costs. By contrast, an unstable macro environment, uncertain economic policy, limited access to productive factors (for instance, a shortage of skilled labor and difficulties in accessing finance), burdensome bureaucratic regulation or unreliable infrastructure services will result in less value added to the same amount of inputs. In other words, in locations where investment climate is better, firm performance tends to be higher, all other things being equal.

Differences in the Impact of Investment Climate Changes on Productivity across Firms and Industries

33. The productivity impact of changes in the investment climate may alternate across firms and industries. This is because different firms are subject to particular constraints to a varying extent. For example, access to reliable power supply is important to every firm; but smaller firms are likely to suffer a higher loss (relative to their sales) than larger firms, because having their own generators may impose a disproportionate burden on them. Similarly, efficient customs clearance may have a much larger impact on firms that export and import on a regular basis than on those which only occasionally buy or sell a small amount abroad.

34. Firms tend to perceive the investment climate as an integrated package. Addressing only isolated aspects of the business climate may thus not have the expected impact on productivity. For example, if a fundamental concern about macro instability has not been addressed, improvements in access to finance may not have much impact on firms' investment decisions. Similarly, a tax break may unleash growth in an industry for which excessive taxation is the only major binding constraint; but it could have a much less pronounced impact in other industries which are hemmed in by other obstacles for which the tax cut is insufficient compensation.

MEASURING FIRM PRODUCTIVITY

Labor Productivity, Total Factor Productivity, and Sales Growth

35. This section introduces three common measures of productivity – labor productivity, total factor productivity (TFP), and sales growth. These capture different aspects of firm performance. The first two measure the level of productivity in a relatively objective way, while the last captures the change in sales, which can be the result of productivity as well as a host of other endogenous and exogenous factors that influence a company's success.

36. ***Labor productivity:*** Labor productivity is the value-added produced by each worker. The calculation of labor productivity is straightforward mathematically, equaling the value-added divided by the number of workers. Higher labor productivity mainly results from four factors: more capital or machinery per worker; better skills; more advanced or adapted technology; and a better business environment. The first two factors are often industry-specific. For instance, *ceteris paribus*, workers are likely to have higher labor productivity in a more capital intensive industry. Thus labor productivity may be a better proxy of productivity for comparisons among firms with similar

characteristics than across firms with different capital-to-worker ratios and with a labor force of different quality.

37. ***Total Factor Productivity:*** TFP is defined as the residual of output or value-added that cannot be explained by factor inputs. It measures the contributions to output beyond those made by skilled and unskilled labor, the intermediate input, and the machinery/capital used. As the contribution of capital and skills is already accounted for in the production function estimation, TFP is often considered a more appropriate measure for across-industry comparisons of firms' productivity, capturing primarily the impact of technology and investment climate. The estimation of TFP, however, differs subject to the econometric methods applied.[16] This report uses TFP measured as the residuals from a production function estimated for each industry following the Levinsohn and Petrin (2003) techniques.[17] In order to capture the impacts of skills, skilled and unskilled labor is included separately in the production function estimation.[18] The higher marginal contribution of skilled labor than unskilled labor to production is consistent with the observations on the high demand of skilled labor in Thailand.

38. ***Sales growth:*** Sales growth is measured as the annual growth rate of sales. Assuming that firms can choose the level of output to maximize profit in a free market, firms that have more rapid sales growth should have higher productivity. In this case, sales growth can be a direct measure of productivity as well as providing information on which firms actually expand and which contract in the market. It is thus a useful indicator to complement discussions on which firms are more efficient in transforming physical inputs into outputs.

Firm Productivity in Thailand

39. The three measures of Thai productivity – labor productivity, TFP, and sales growth – show different trends (Figure 11). Labor productivity increased from US$12,294 per worker in 2003 to US$16,600 per worker in 2006 and TFP increased about 1.5 percent from 2003 to 2004, but only 0.5 percent from 2004 to 2006. Sales growth dropped from 18 percent in 2003/04 to 9 percent in 2005/06, which is consistent

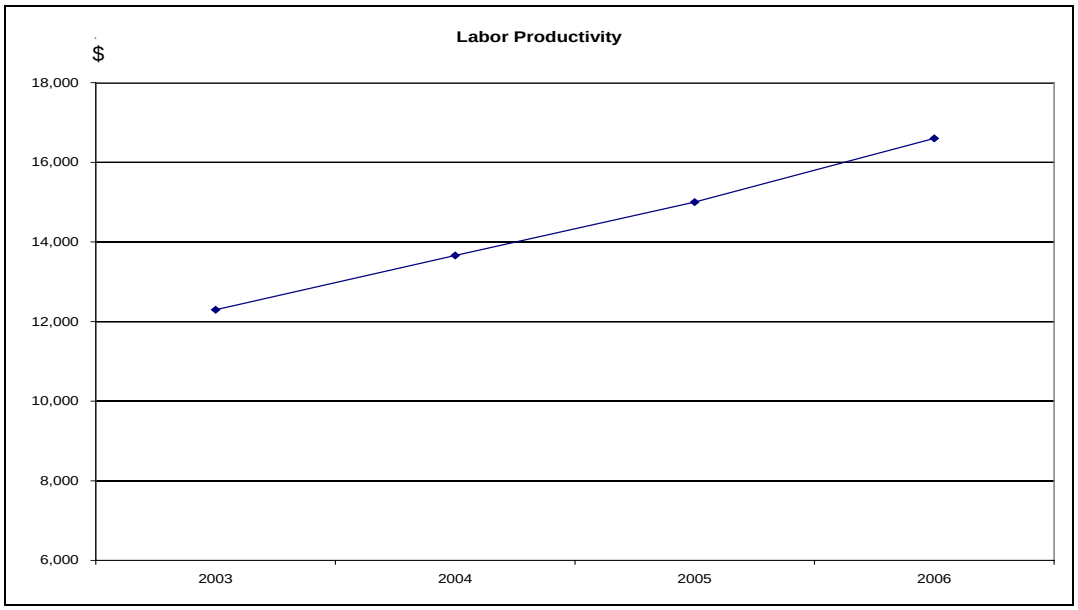
[16] Firms that experience a large positive productivity shock may respond by using more inputs. Potentially, there is correlation between input levels and the unobserved firm-specific productivity shocks in the estimation of the parameters of the production function. Ordinary least squares (OLS) estimates of production functions will thus yield biased parameter estimates of productivity. Different methods have been developed to correct this. Olley and Parkes (1996) use investment to control for correlation between input levels and the unobserved firm specific productivity process. Levinsohn and Petrin's (2003) contribution adds to existing methods of correcting for the potential endogeneity between the choice of inputs and firm productivity by conditioning out serially correlated unobserved shocks to the production technology.

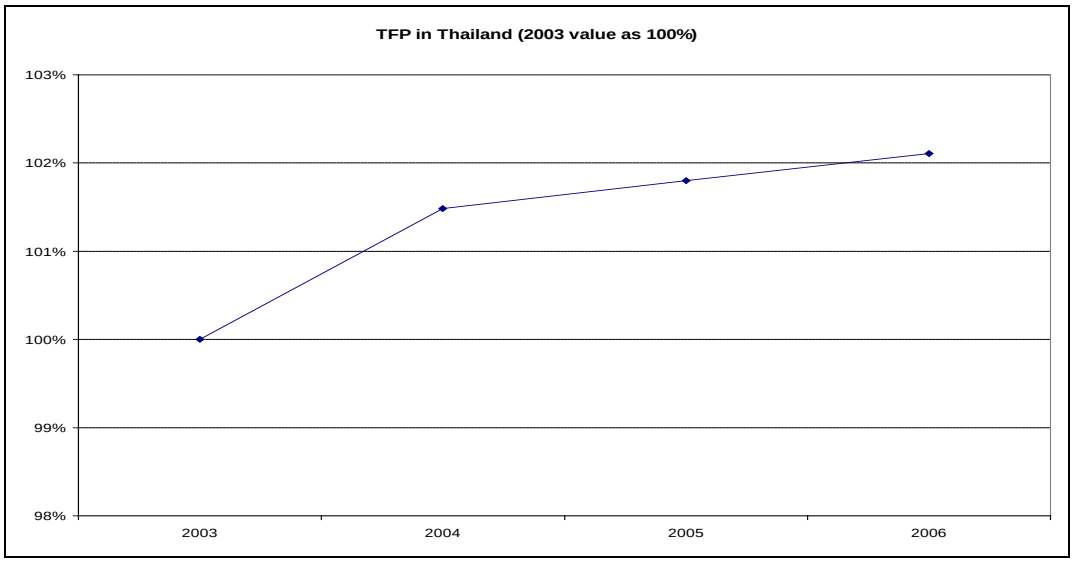
[17] The production function considered assumes that output is produced by labor, intermediate inputs, and capital. The report also includes production function estimates using the Generalized Linear Squares (GLS) method as a robustness check. For most industries, the coefficient of labor estimated with Levinsohn-Petrin method is larger and the coefficient of capital smaller than that estimated with GLS. This is consistent with the general assumption that labor is more likely to be correlated with a productivity shock and overestimated. See details in Table 33 to Table 36.

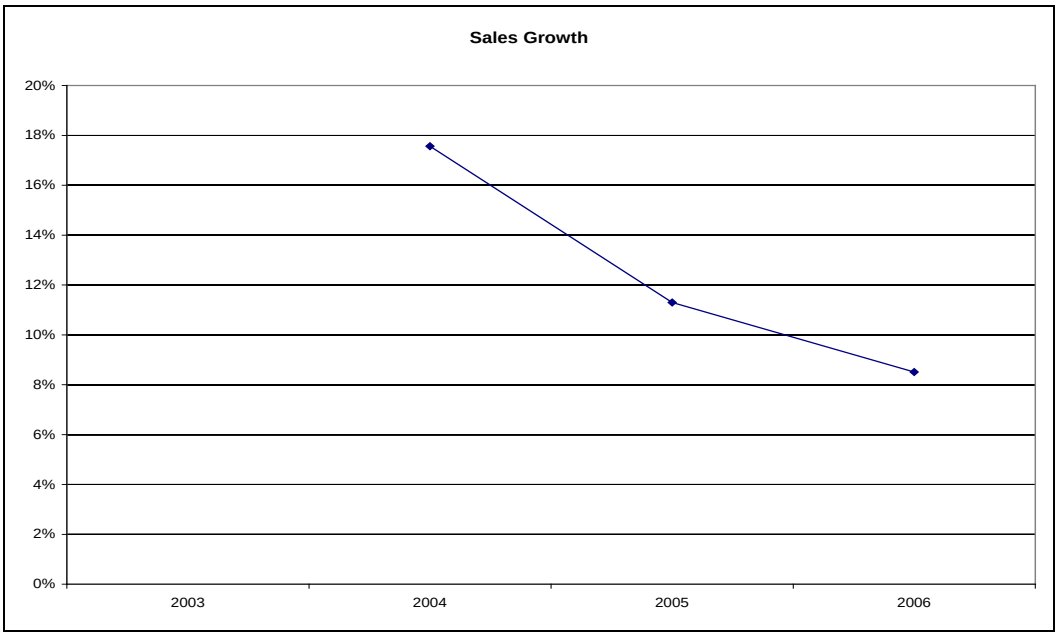
[18] See technical details on the production function estimation in annex.

with the sluggish growth of private investment in recent years. This suggests that although firm productivity increased, firms failed to expand as rapidly as before. Sales growth, which depends not only on changes in productivity, but also factors such as firms' investments based on their perception of the investment climate, slowed down at least in part due to firms' pessimistic subjective assessment.

Figure 11. Firms' Labor Productivity, TFP, and Sales Growth in Thailand, 2003-2006



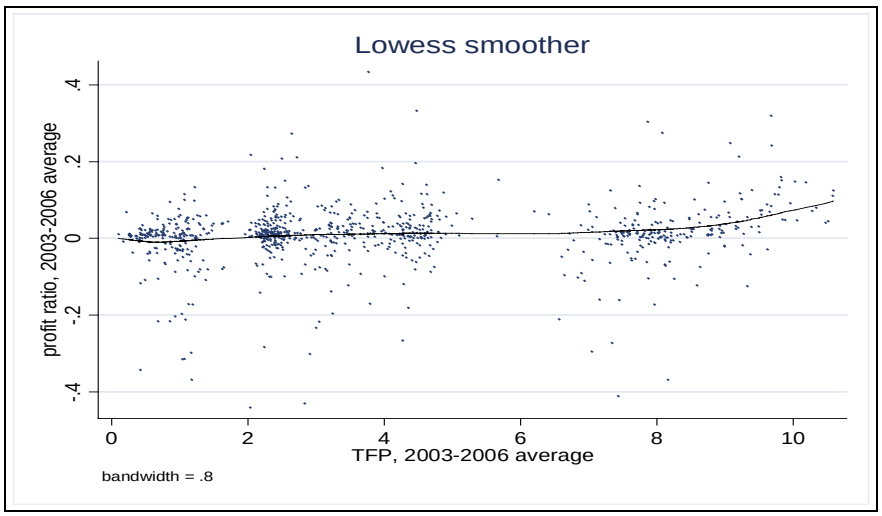


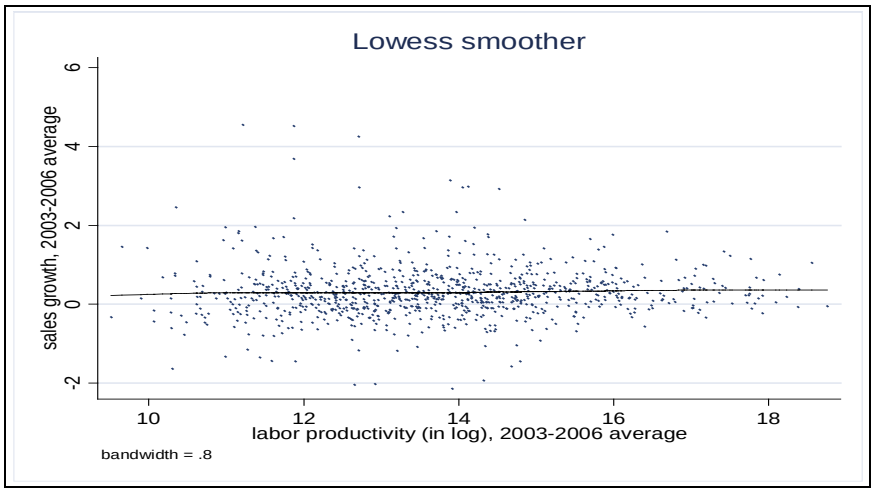


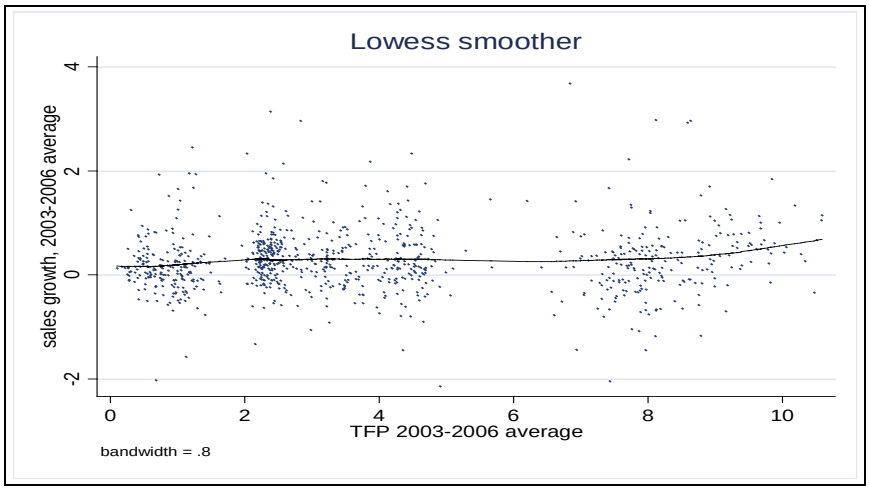
40. Thai firms' profit ratios and sales growth are generally both positively associated with their labor productivity and TFP (Figure 12).[19] Firms in the highest quartile, for example, have a significantly higher profit ratio; those in the lowest quartile often have a negative net profit (loss). Firms with productivity around the median level tend to break even. This suggests that more productive firms make a higher profit. The positive correlation between sales growth and TFP indicates that the overall Thai market is efficient – the more productive firms expand more rapidly.

[19] Profit ratio is measured as the ratio of net profit over operating revenue.

Figure 12. Correlates between Firm Productivity and Profit Ratio and between Firm Productivity and Sales Growth





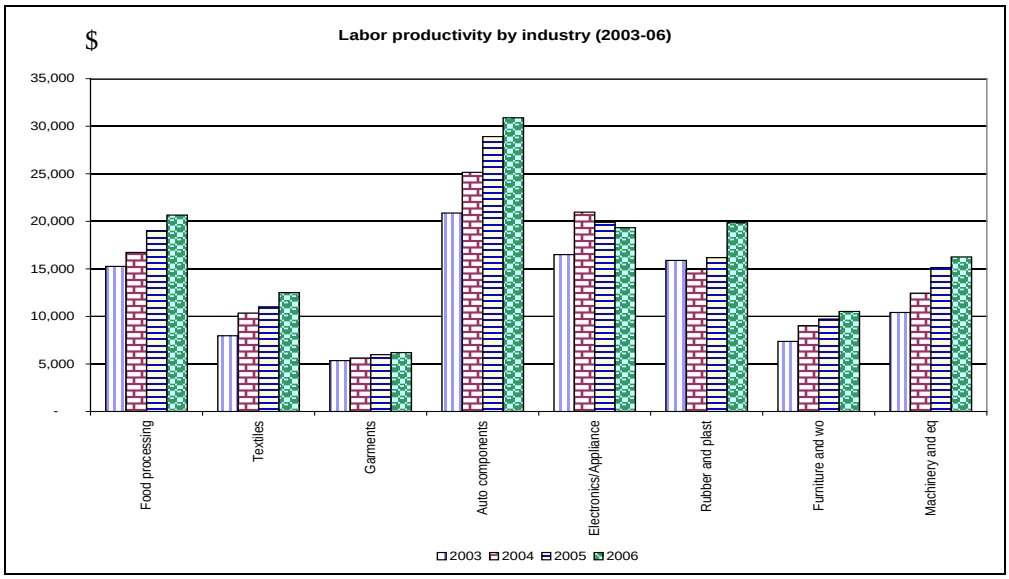


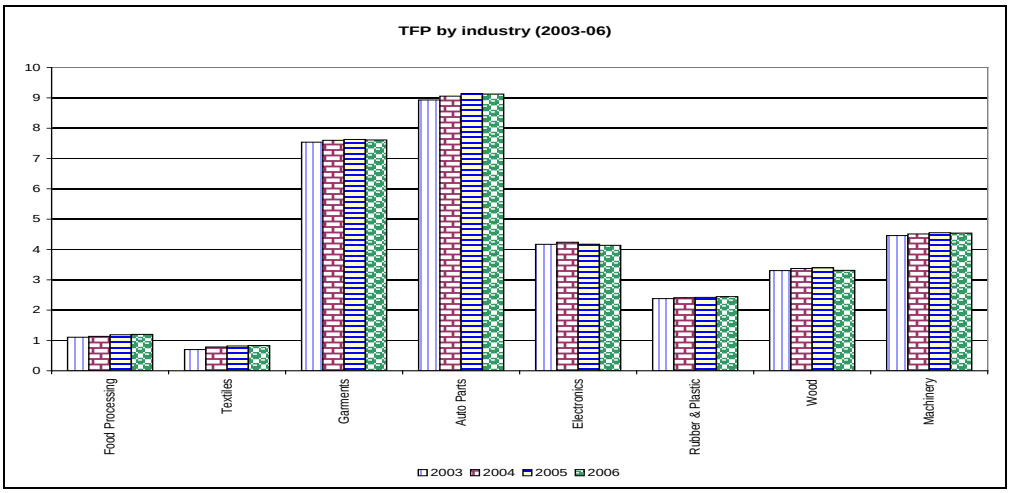
Variations of Productivity within Thailand

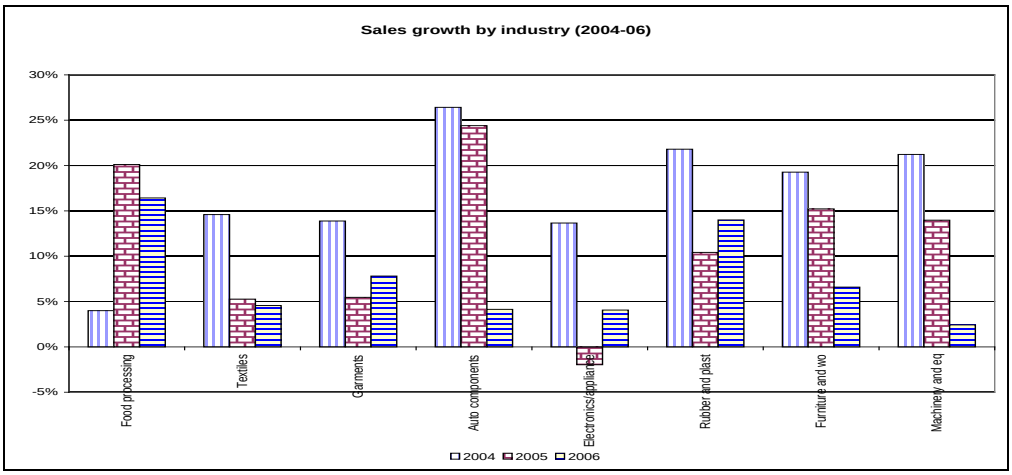
41. Productivity varies widely within Thailand. Firms thrived to a varying extent associated partly with the different investment climates they faced.

42. Productivity differs considerably across industries, but there were relatively few changes in the productivity ranking of industries over time. Firms producing auto-parts had the highest labor productivity and TFP in all periods, while firms producing garments had the lowest labor productivity and firms producing textiles had the lowest TFP (Figure 13). Within industries, increases in TFP were uniformly small, whereas labor productivity increased strongly in some industries (auto components, textiles, food processing) and much less so in others (garments, furniture and wood products). The rapid sales growth of firms producing auto-parts suggests a link between productivity and sales growth in this industry. The sluggish growth of the electronics industry may have resulted from fierce competition in international markets and limited demand. Changes in sales growth were relatively large. Seven out of eight industries had lower sales growth in 2005/06 compared with 2003/04. The food processing industry is the only exception, experiencing a higher sales growth in recent years.

Figure 13. Firm Productivity by Industry, 2003-2006

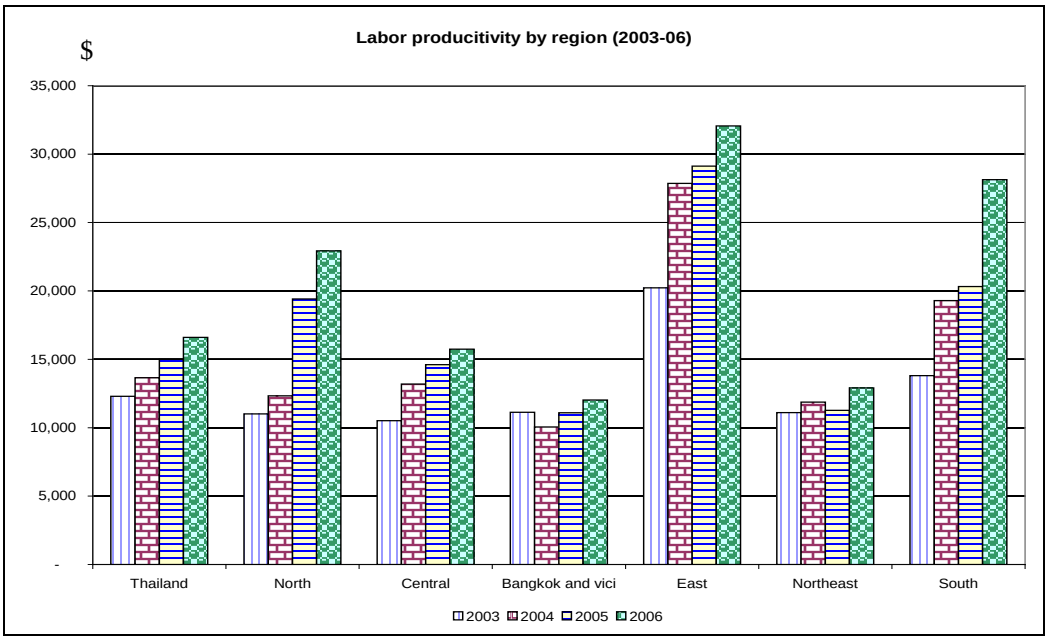




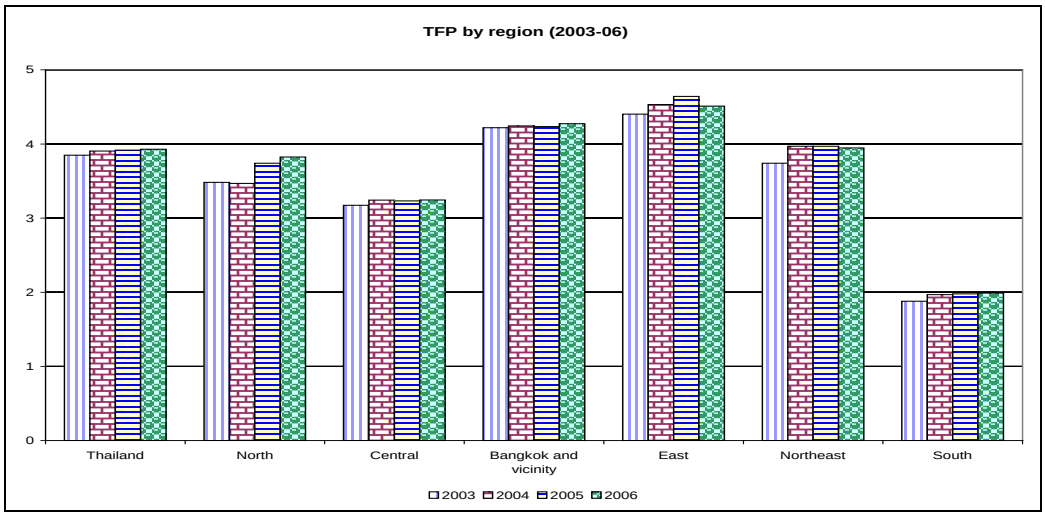


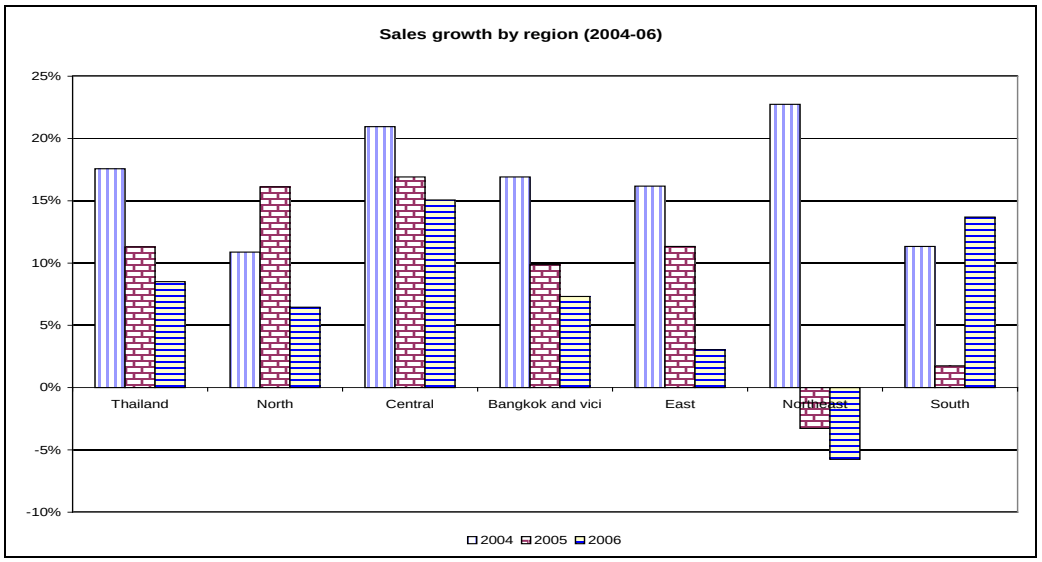
43. In all regions both labor productivity and TFP increased in 2003-2006, while sales growth slowed everywhere except in the South[20] (Figure 14). Variations of firm productivity in different regions depend on, among other factors, regional industry structure and investment climate. Labor productivity and TFP are the highest in the East, while sales growth is the highest in the Central region. The relatively high labor productivity and low TFP in the South region mainly reflects the special characteristics of the two major industries in the region – food processing and rubber and plastics. The high level of TFP and low level of labor productivity in Bangkok and vicinity may capture the strong role of technology and investment climate driving up TFP in the region while the large presence of labor intensive industries pushes down value-added per worker. Overall, the variation in firm productivity is consistent with the regional investment climate indicators – the three regions with better investment climate, Bangkok and vicinity, East, and Central, have more productive firms and these firms expand more rapidly.

Figure 14. Firm Productivity by Region, 2003-2006



[20] Sales growth in the South increased sharply in 2005/2006 after a deep decrease in 2004/05, which may result from the undiversified production structure in the region, where 90 percent of firms produce rubber and plastic or process food and their high sensitivity to demand (price) change.





International Comparison of Labor Productivity

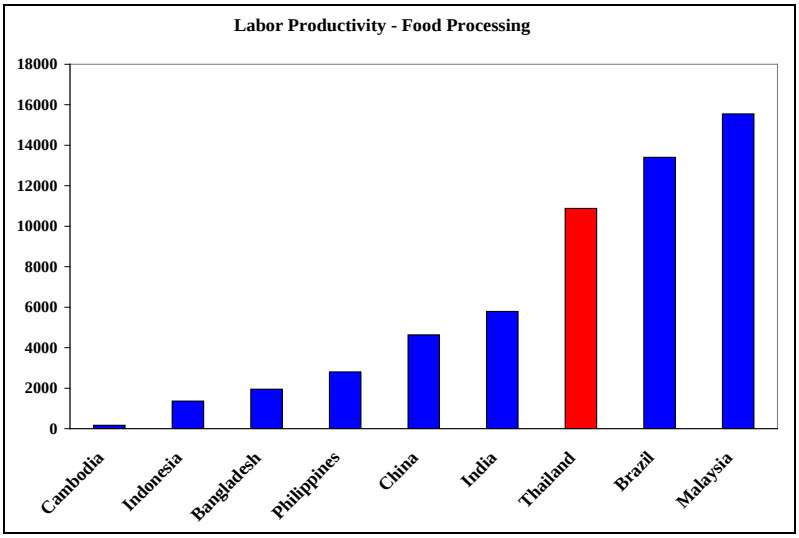
44. Comparing Thai labor productivity in selected industries to a set of low and middle income countries, we find Thai productivity relatively high, if still lagging behind neighboring Malaysia as well as Brazil (Figure 15).[21] Labor productivity in Thailand is relatively higher in food processing and the electronics/electrical appliances industries. This suggests that Thailand still commands a reasonable labor productivity premium relative to competitors in these industries.[22] However, Thailand's premium in the important textile and garment (export) industries is barely higher than India's. As Thailand's economy develops to a higher stage, it is important to move up the

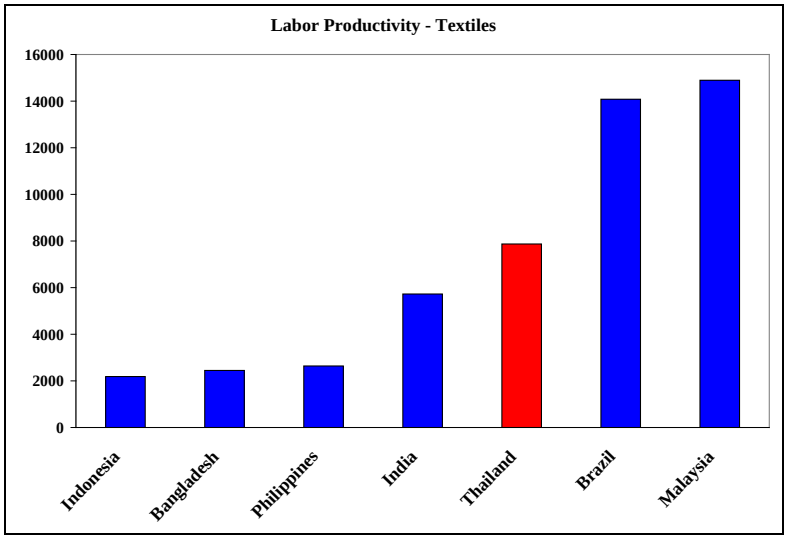
[21] The four industries presented in the report are selected based on data availability in comparator countries. The data of Cambodia is from PICS 2003, Bangladesh PICS 2003, Philippines PICS 2003, Brazil PICS 2003, Malaysia PICS 2003, Philippines , China PICS 2003, and India PICS 2002.

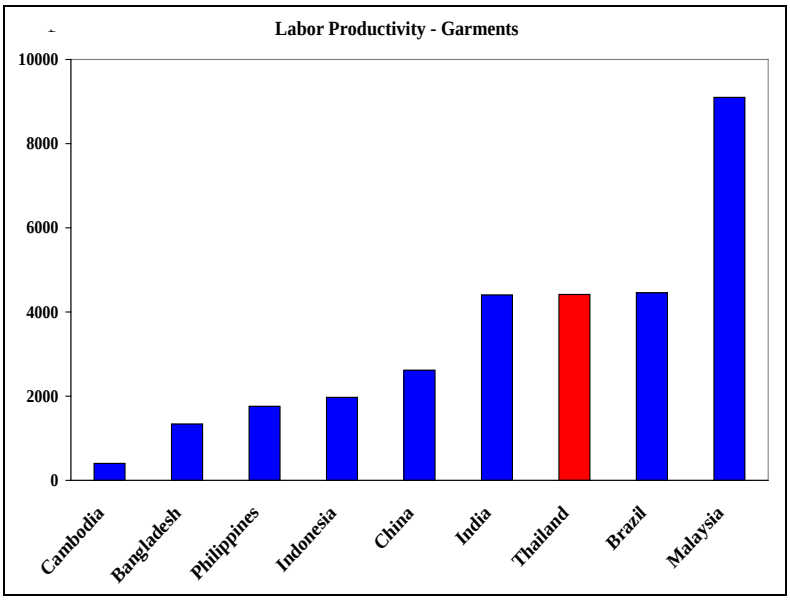
[22] The wage level is higher in Thailand than in these comparator countries in Asia with lower GDP per capita level.

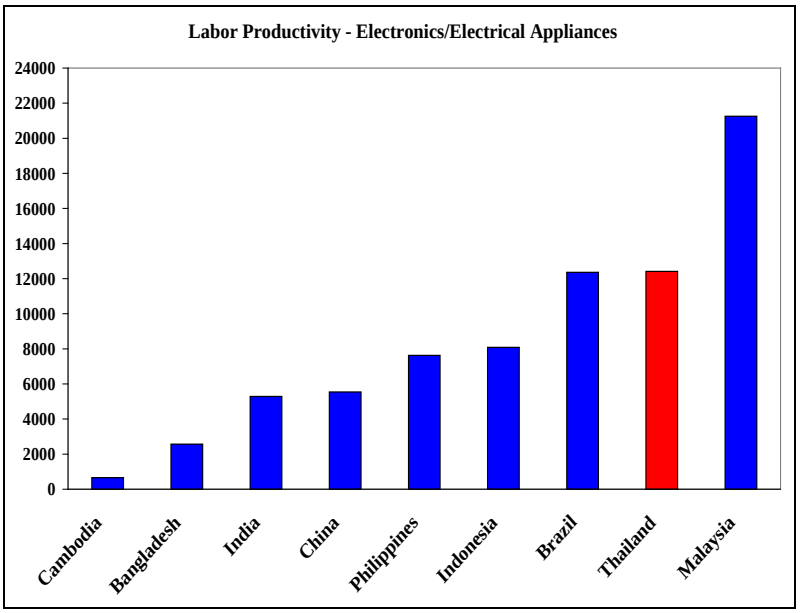
technological ladder and rely more on value-based competitiveness rather than labor cost advantages.

Figure 15. Labor Productivity in Different Industries – International comparison (Median Value-Added per Worker, 2001 U.S. dollar)









REGRESSING PRODUCTIVITY ON INVESTMENT CLIMATE INDICATORS AND FIRM CHARACTERISTICS

45. In what follows, the key results of a set of panel data regressions of productivity on firm characteristics and investment climate indicators are highlighted. The panel data set used for the analyses consists of 426 firms that participated in both PICS 2004 and PICS 2007. The distribution of these 426 firms is similar to the full samples of PICS

2004 and PICS 2007.[23] The precise specification of the regression equations is provided in the Technical Note (Annex 2).

46. The analytical results allow basic insights into the relationships between productivity, IC and firm characteristics. However, a number of analytical caveats need to be borne in mind. Firstly, some important aspects such as macro instability, which is likely to have played a key role in Thai firm performance in recent years, cannot be directly captured in the estimations due to limited information. Secondly, the regressions may suffer from a reverse causality problem if specific investment climate indicators at the firm level are themselves determined by productivity. For instance, the size of a firm can impact firm performance through economies of scale, but firm size can in turn be influenced by productivity if firms hire more workers as their profits increase. A third problem is that using firm-level investment climate indicators results in smaller samples, because some firms did not answer certain questions. For instance, some firms might not have tried to recruit skilled labor in the survey period, or may not have recent experience in ordering a new telephone line, but they would face similar constraints as other firms if they had done so.

47. To minimize the problems of endogeneity and sample constraint, this report uses regional industry mean levels of the investment climate indicators instead of the firm level data.[24] These can be considered largely exogenous to a specific firm, and are also used to replace missing values. [25] Firm characteristic variables are kept at firm level.

Correlates between Firm Characteristics and Performance

48. Firms' productivity is associated with their specific characteristics. Table 37 and Table 38 show the correlates of labor productivity, TFP, and sales growth with a set of key firm characteristics, including age, size, foreign/domestic ownership status, export status[26], measures of technology and innovations (percentage of computer controlled machines, percentage of machinery under five-years of age, R&D status) for Thailand during the period of 2001-2002 and 2003-2006 respectively. Dummies are included to capture the effects of regional, industry, and time specific characteristics.[27] The results of PICS 2004 and PICS 2007 are in general consistent.

49. Firm age is associated with higher labor productivity and TFP, but lower sales growth. This suggest that older firms in general have better performance compared with

[23] Productivity of these subsamples, however, is higher than that of the full samples. One reason may be that the subsample consists only of firms that participated in both surveys. Those firms not available in the 2007 survey may partly be those who exited the market because of their low productivity performance.

[24] See the Technical Note for more detail

[25] See Dollar, Hallward-Driemeier and Mengiste (2005) for detailed discussion.

[26] As export status and foreign ownership status are often closely associated with each other in the case of Thailand, dummy variable "domestic export" rather than "export" is included in the estimation.

[27] No significant changes in impact of firm characteristics on performance are associated with the inclusion of dummies. The report focuses on the results with all three dummies included, i.e. regressions [3], [6], and [9] if not otherwise mentioned.

younger firms but a slower growth rate, which is consistent with the findings of many studies on the life-cycle of firm performance.

50. Firm size measured by the number of employees is positively associated with labor productivity and sales growth in a significant way. This suggests that larger firms are in general more productive and have higher growth rates due at least partly to the importance of economies of scale.[28]

51. Foreign-owned firms are more productive, measured by labor productivity as well as by TFP. According to the results of PICS 2007, labor productivity of foreign firms is 12 percent higher than that of domestic firms, and their TFP is 25 percent higher. This is consistent with findings in many other countries. Foreign firms tend to be more productive as they often have access to more advanced technology and management. However, the sales of foreign firms have been slower in recent years, which may be resulted from the slower growth of foreign indirect investment.

52. Performance of domestic firms that export[29] is higher than those that do not export, measured by labor productivity as well as by TFP. This suggests that the edge of competitiveness of Thai exporters over non-exporter firms remains. Exporter firms gain in productivity from exposure to international market and competition. However, as the competitiveness of many exporter firms was mainly cost- rather than value- or knowledge-based, their gains in productivity may soon reach a ceiling. Further improvement may need to come from other sources, such as skills and knowledge. The competition from other countries, for instance Cambodia, Vietnam and China in the garments market, is fierce and may affect export performance of Thai firms, especially with the appreciation of the Baht.

53. Firms better equipped with machinery tend to have higher productivity. As expected, firms that have a higher percentage of computer-controlled machines have significantly higher labor productivity and TFP. Their sales growth, however, does not show significantly different trends compared with firms that have a lower percentage of computer-controlled machinery. Firms that have a share of machines under five-years of age have higher labor productivity, TFP, and sales growth. This suggests that, in general, recently purchased machinery embodies the appropriate technology and has contributed to improving firm productivity.

54. Firms engaging in R&D activities generally achieve a higher labor productivity and TFP, while the association of R&D with sales growth is insignificant.[30] However, only 23 percent of firms surveyed reported they have engaged in R&D. This percentage is virtually unchanged since the early 2000s. As technology and innovation are associated

[28] However, the aforementioned caveat regarding reverse causality should be kept in mind.

[29] Domestic exporter firms are defined here as firms with more than 10 percent sales from exports and with less than 10 percent foreign ownership.

[30] As exporter firms and foreign-owned firms often invest more in R&D, the effect of R&D dummies might be partially captured by other firm characteristics.

with better firm performance, it is important to provide incentives for firms to invest in R&D.

55. In short, older firms, firms of larger size, foreign-owned firms, exporter firms, firms with a higher share of computer-controlled machinery, firms that have a higher percentage of new machines, and firms engaging in R&D have higher labor productivity and TFP in Thailand. Larger firms, and firms having a higher percentage of new machines, experienced more rapid growth in sales in recent years, while older firms expanded less.

56. The correlates between firm characteristics and performance in Thailand, however, vary across industries (Table 39 to Table 41). For example, the positive correlation between the percentage of computer-controlled machines and labor productivity only holds for industries with higher technology, such as auto-parts, electronics, rubber and plastics, and machinery. This suggests that the use of computer-controlled machine, though it can be labor-saving in general, is more closely related to firm performance increases in industries which have a higher technology component; their use in more labor-intensive industries, where other factors play a more important role in the production function, may not significantly improve labor productivity at the current stage. The significantly positive association between capital vintage and TFP in textiles, rubber and plastics, and machinery, and the insignificant association in other industries, show that the productivity-enhancing effect of new machinery is stronger in the former than the latter. This can be explained by the different appropriateness of the technologies embodied in the machinery newly purchased and by the different capital depreciation rates across industries. The positive association between firm size and sales growth is significant for auto parts, electronics, and rubber and plastics and insignificant for other industries. This offers some support for the idea that economies of scale are stronger in these three higher-tech industries. The negative association between firm size and TFP for some industries, such as food processing, textiles, and rubber and plastics, may result from the nonlinear relationship as the optimal firm size and actual size of each industry differ.

Correlation between Investment Climate and Firm Performance

57. Firm performance is also associated with the investment climate where firms locate. For firms with similar characteristics, those that face a more conducive investment climate are more likely to have higher productivity.

58. As skills, access to finance, infrastructure and regulation and logistics are the key constraints for doing business in Thailand, this report focuses on assessing the impacts on firm productivity of investment climate indicators that capture these four aspects, while controlling for firm specific characteristics. Various elements of investment climate are interrelated. This report selectively includes two key variables for each aspect of investment climate in order to balance the need to include “more indicators”, to limit the potential omitted variable bias, and that to include “fewer indicators” to minimize the potential bias linked to multi-colinearity.

59. This section focuses on examining the correlates between each of the four key aspects of investment climate – skills/knowledge, regulation/logistics, infrastructure, and access to finance – and TFP of Thai firms in 2003-2006 controlling for firm specific characteristics (Table 42).[31]

60. Skills play an important role in firms' TFP. A higher percentage of employees with a college degree and a shorter period of time to fill vacancies for professionals are both significantly associated with higher TFP. If the percentage of employees with college degree is considered as a proxy of the quality of the labor force, and the number of weeks to fill vacancies for professionals a proxy of the skill shortage in the market, then the important role of these two factors in TFP suggests that improving the skills of the existing labor force and increasing the supply of skilled labor to match market demand are both critical for enhancing firm performance. Investing in human capital is important.

61. Regulations and logistics are important binding constraints for many Thai firms. The two indicators of regulations and logistics that were chosen – the number of days to obtain an import permit and the number of days to clear export customs – are both negatively associated with TFP in a significant way. This suggests that improvements such as accelerating the process of obtaining business licenses and permits, and facilitating customs clearance, have considerable potential to enhance firm performance by reducing unnecessary costs.

62. Infrastructure, such as the public power supply,[32] conditions firm performance in a significant way. The number of annual power outages, and the production losses due to these, are both negatively associated with TFP. If the former can be considered as a proxy for the reliability of infrastructure services, and the latter a proxy of the financial loss resulting from unreliable service, this suggests that investing in infrastructure to improve reliability is important. As an interim step, strengthening firms' (especially smaller firms') abilities to deal with unexpected ruptures in infrastructure services will help reduce financial losses, other things being equal.

63. Access to finance, measured by the percentage of firms with bank loans and the number of days required to clear checks, is closely associated with firm performance. Firms with better access to bank loans and to better financial services tend to have higher performance.[33]

---

[31] TFP is often a better measure of firm performance than labor productivity, because it is by definition isolated from the effects of different capital-to-worker ratios across firms. The correlates between investment climate and labor productivity as well as sales growth are presented in Table 43 and Table 44.

[32] Other aspects of infrastructure services, such as electricity and transport facilities, are closely correlated with power supply. The report chooses two key indicators – yearly number of power outages and production loss due to power outages – as proxies for infrastructure services.

[33] The negative correlation between firms with overdraft facility and TFP may have resulted from the close association between the three indicators that are used to measure access to finance. The correlation between firms with overdraft facility and labor productivity is positive.

64. The investment climate indicators are also jointly correlated with firm productivity in a significant way.[34] Investing in skills, providing a good regulatory framework, improving infrastructure services, and increasing access to finance are important measures for alleviating the binding constraints on doing business and enhancing firm performance.

Correlates between Changes in Investment Climate and Changes in Productivity

65. An improvement in investment climate is often associated with an increase in firm productivity, other things being equal. As firms perceive various aspects of investment climate as more or less binding obstacles to doing business, an improvement of a specific aspect of investment climate may have different marginal effects on productivity of different firms. This section focuses on studying the correlates between changes in investment climate and changes in productivity based on the panel data.[35] The results shed light on how closely an improvement of a specific aspect of investment climate is associated with productivity changes.

66. Changes in most investment climate indicators are correlated with changes in TFP with the expected signs (Figure 16).[36] Controlling for firm characteristics, they are jointly significant, indicating that improvements in investment climate are associated with increases in productivity (Table 47). Improving infrastructure services – reducing the number of power outages and the production loss due to power outages – is associated with the largest increase in TFP. This is consistent with findings in other studies[37] on the importance of infrastructure services in firm performance. It suggests that although creating new infrastructure and improving existing facilities may involve high costs, the beneficial long-run impacts may justify such investments. The same is true for investing in human capital. Improving the quality of the labor force and addressing skill shortages can have large impacts on firms' productivity. In the shorter run, focusing on reducing unnecessary regulations and logistics will be a cost-effective way of providing a better business climate and the associated productivity improvements. Improving financial services is important in the short run as well as in the long run.

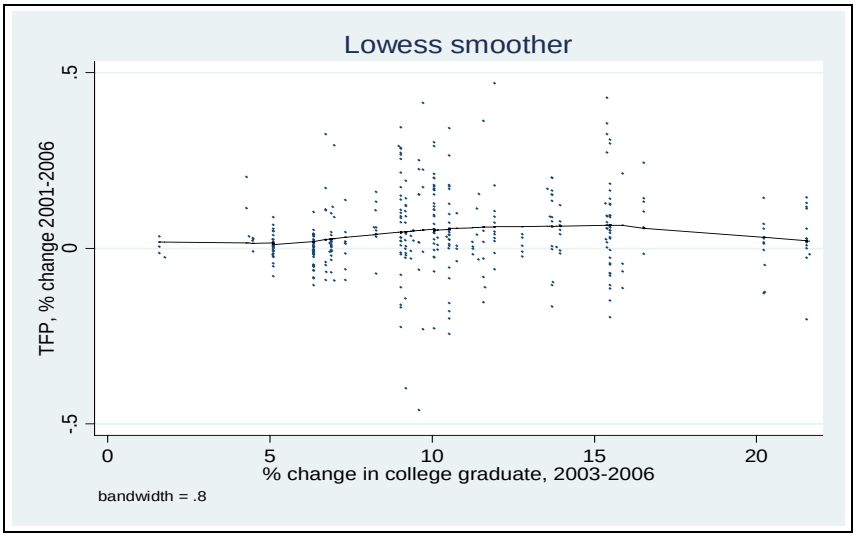
[34] All indicators of each of the four aspects are jointly associated with TFP, labor productivity, and sales growth in a significant way.

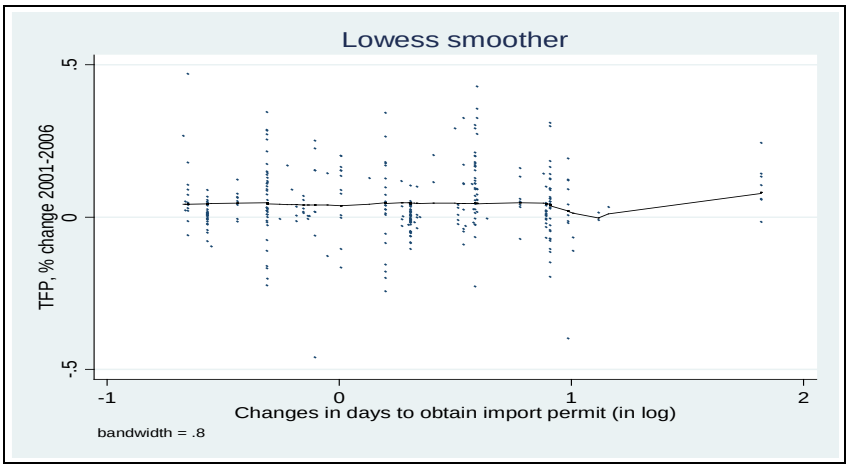
[35] 426 firms participated in both rounds of PICS. See Table 45 and Table 46 for details on production function estimations using the panel data.

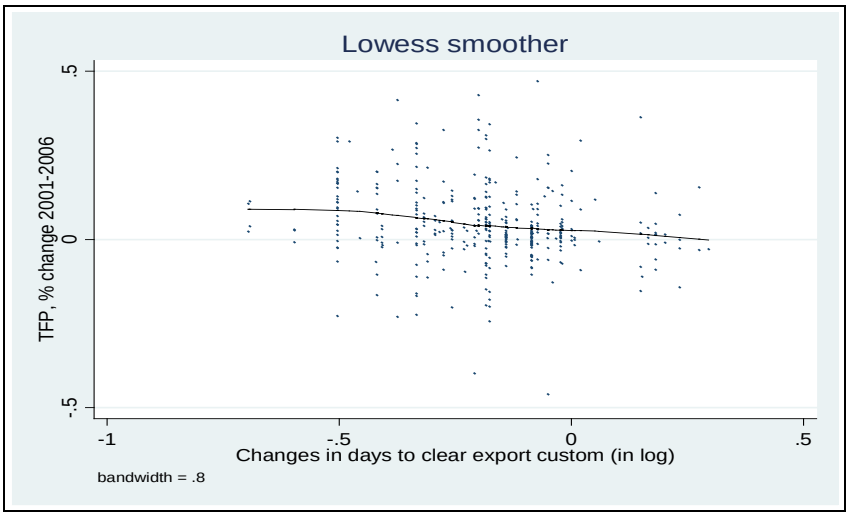
[36] Changes in investment climate are measured as the difference between observations in PICS 2004 and PICS 2007; changes in TFP are measured as the difference between the TFP in the initial year 2001 and the final year 2006, both estimated using the Levinsohn-Petrin method. It is not unexpected that the correlations between changes in most investment climate indicators and changes in TFP are not individually significant given the limited number of observations. The unexpected sign of the coefficient of "number of days to obtain import permit" may be a result of the collinearity between this variable and "number of days to clear export customs".

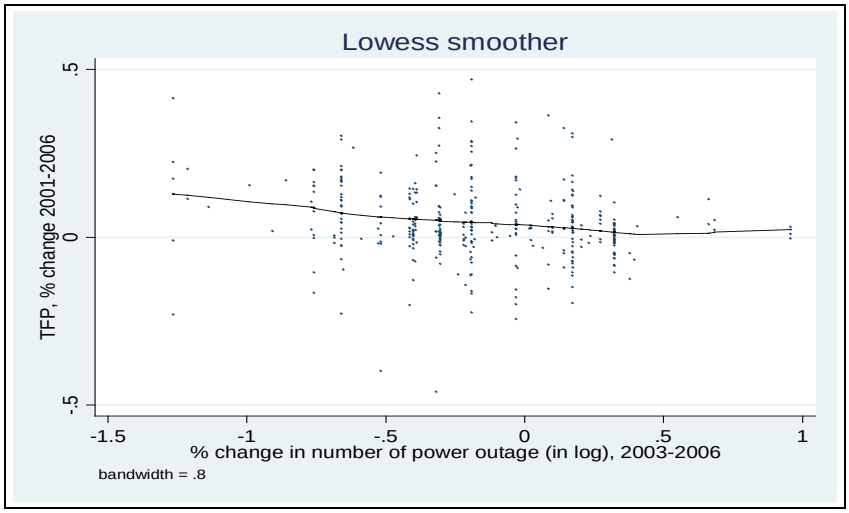
[37] See for example, Dollar et al. (2005).

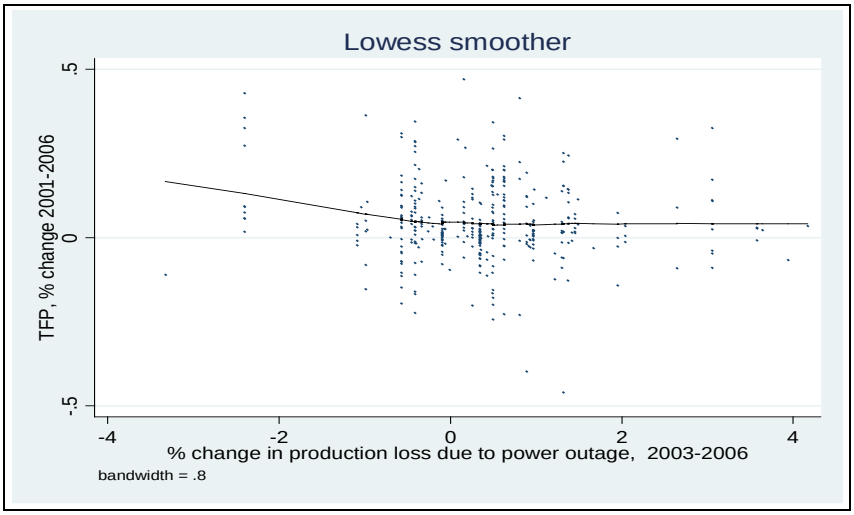
Figure 16. Correlates between Changes in Investment Climate and Changes in TFP, PICS 2004 and PICS 2007 Panel Data

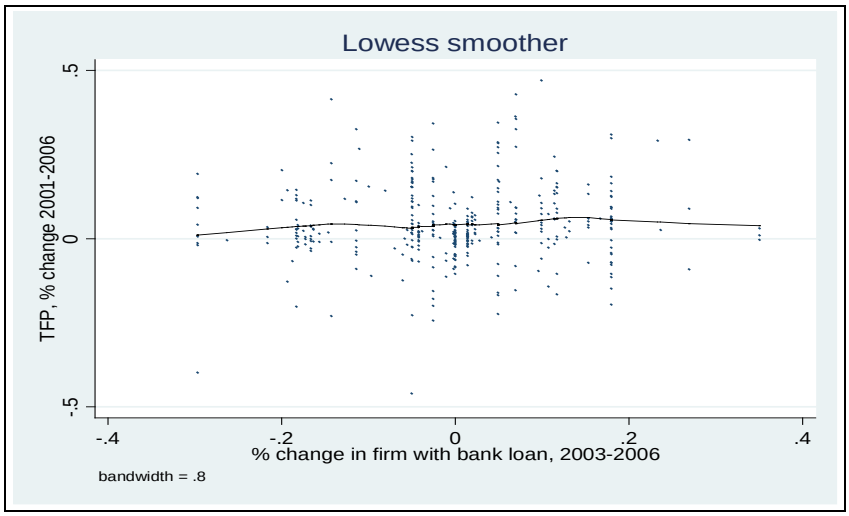


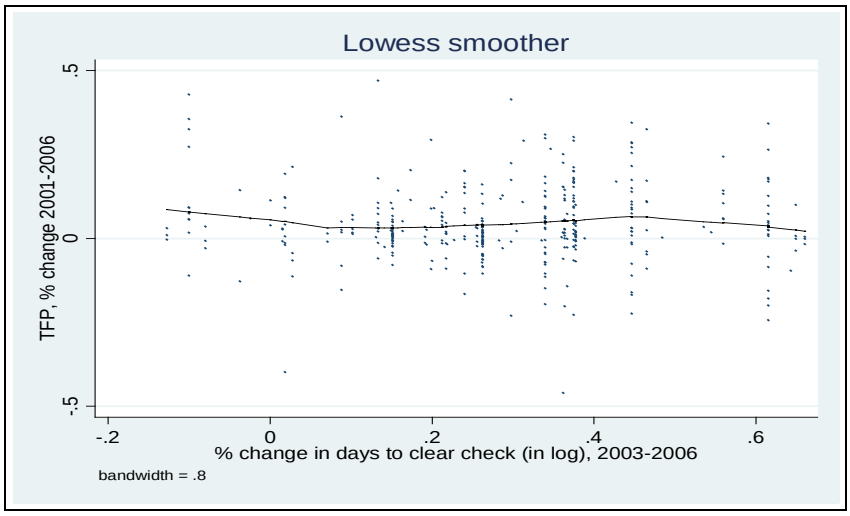



Lowess smoother
TFP, % change 2001-2006
.5
0
-.5
-1
-.5
0
.5
Changes in days to clear export custom (in log)
bandwidth = .8


Lowess smoother
TFP, % change 2001-2006
.5
0
-.5
-1.5
-1
-.5
0
.5
1
% change in number of power outage (in log), 2003-2006
bandwidth = .8


Lowess smoother
TFP, % change 2001-2006
.5
0
-.5
-4
-2
0
2
4
% change in production loss due to power outage, 2003-2006
bandwidth = .8


Lowess smoother
TFP, % change 2001-2006
.5
0
-.5
-.4
-.2
0
.2
.4
% change in firm with bank loan, 2003-2006
bandwidth = .8


Lowess smoother
TFP, % change 2001-2006
.5
0
-.5
-.2
0
.2
.4
.6
% change in days to clear check (in log), 2003-2006
bandwidth = .8

3. MACROECONOMIC ENVIRONMENT AND ACCESS TO FINANCE

67. The first section of this chapter examines the macroeconomic environment. Section two then examines issues related to the cost of, and access to, finance for enterprises.

THE MACROECONOMIC ENVIRONMENT

68. In PICS 2004, the managers of one third of all enterprises surveyed mentioned macroeconomic instability and economic policy uncertainty as major or severe obstacles to doing business in Thailand. In the PICS 2007, this number almost doubled to reach close to two-thirds of enterprises. This serious worsening of perceptions is probably due to changes in global economic environment and an effect of the political instability which Thailand experienced in 2006 and 2007. More than a third of firms perceived it as one of the three top constraints to their business and investment decisions. To determine whether the perceptions of managers are justified by the objective economic situation or are simply the result of pessimistic business sentiments, this section examines key aspects of the macroeconomic environment in Thailand.

69. Both external and domestic factors have adversely affected the macroeconomic environment in 2006 and 2007. These include (i) the rapid increase in the price of oil and other commodities since 2005,[38] (ii) the rapid appreciation of the Thai baht since 2006 as the US dollar weakened and Thailand's current account surplus increased,[39] (iii) the increase in interest rates, [40] (iv) a rise in inflation growth since 2006, (v) the slowdown in the world economy and, especially, in the United States which is Thailand's major export destination, and (vi) the significant slowdown in the growth of domestic household consumption since 2005 (to only 1.4 percent in 2007, the lowest growth since 1999). Insufficient demand is the top constraint to capacity utilization - 70 percent of firms perceived it as a constraint in PICS 2007, increased from 40 percent in PICS 2004.

70. High oil price, Baht appreciation and high raw material price were reported by more than half of the enterprises as main factors that have adversely affected their investment decisions in the last two years (see Figure 17). More than 70 percent of

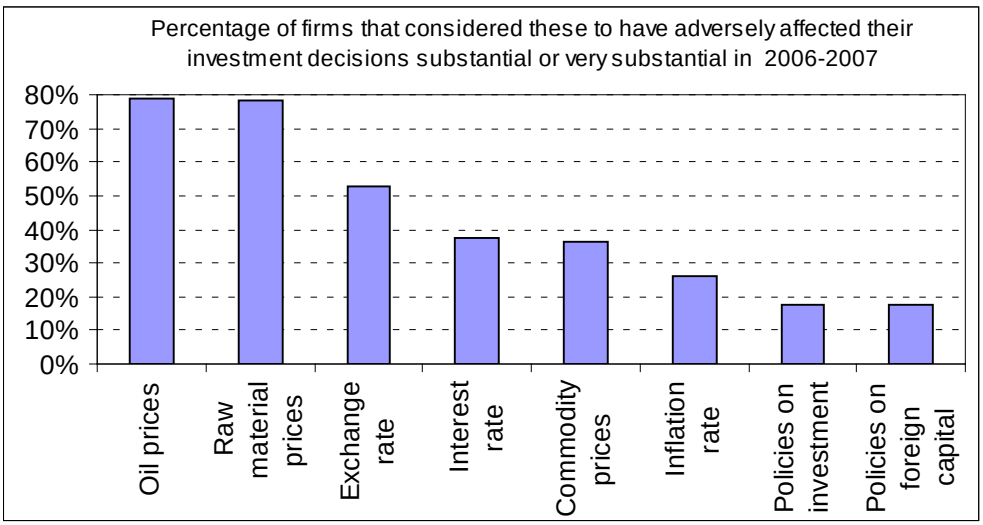
[38] World crude oil prices have rapidly increased since 2005. The Thai government lifted the subsidies on benzene in 2005 and on diesel in 2006, to make retail gasoline prices reflect world prices.

[39] The Baht's real effective exchange rate appreciated by 15.5 percent between 2005 and 2007.

[40] The minimum lending rates (MLR) rose from 5.95 percent in 2005 to 7.53 percent in 2006 and 7.21 percent in 2007. With rising inflation in the last quarter of 2007, firms had anticipated a future rise in the lending rates.

exporting firms said that the appreciating baht had adversely affected their investment decisions. Many of these are large enterprises and are in the food processing, textile, garments, and electrical appliance industries. More than a third of firms cited high interest rates and commodity prices as a major concern. The highest share of firms concerned about the rising commodity prices are in the food processing, machinery and equipment, and automotive part industries because commodities account for a large share of the inputs to their production.[41] Inflation was a major concern for one-fourth of the firms, particularly those in the garments industry, electrical appliance, and rubber and plastic industries, in which at least half of the firms sell domestically.[42] A higher inflation rate in Thailand would mean a lower purchasing power and could reduce the domestic demand for their products, especially when it is very price elastic.

Figure 17. Percentage of Firms that Considered Particular Macroeconomic and Policy Factors to Have Adversely Affected their Business and Investment Decisions

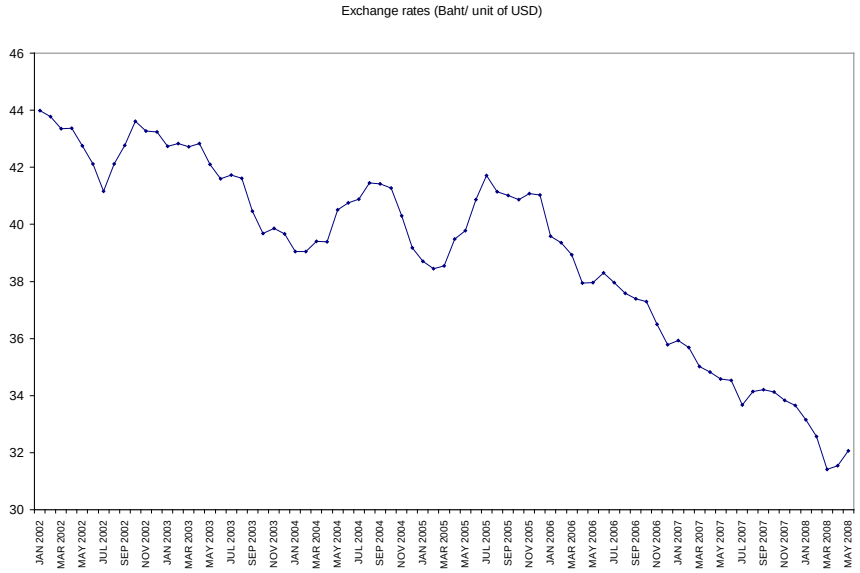


Source: PICS 2007

71. The Baht appreciated significantly against US dollar in the recent years (Figure **18**). The exchange rate went from 44 Baht to a US dollar in January 2002 to 32 Baht in May 2008. The producer price index (PPI)[43] increased from 120 percent in January 2005 to 165 percent in May 2008 reflecting the fact that the inflation rate is partly linked to the appreciation of the Thai Baht (Figure 19).

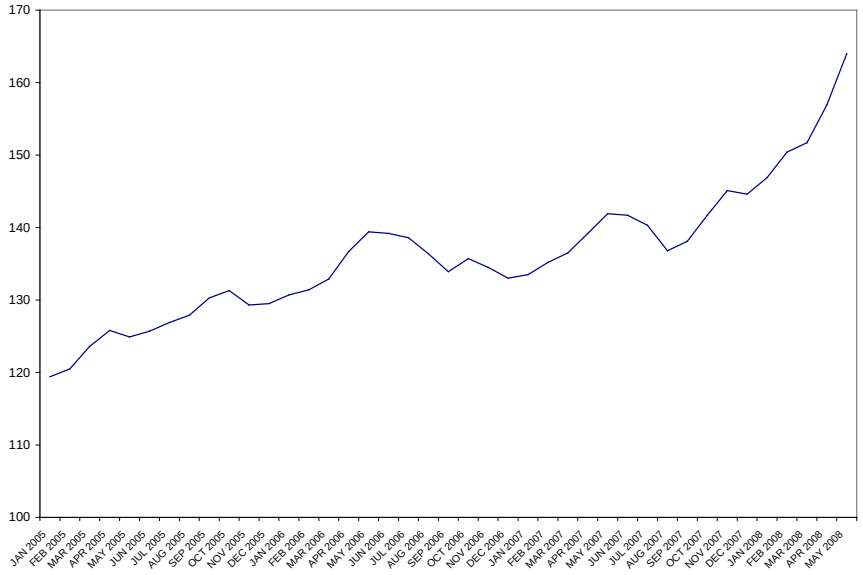
[41] Raw agriculture products are major input for the food processing industry; steel for the machinery and equipment; and rubber for the tire industry which is a large share of the automotive industry in Thailand.
[42] Half of the firms in the garment industry sell mainly in the Thai market (they export less than 10 percent of total production) and more than 60 percent of firms in the electrical appliance and rubber and plastic industries sell mainly in the Thai market.
[43] The base year for PPI is 2000.

Figure 18. Baht/US$ Exchange Rate: 2002-2008



Source: Bank of Thailand

Figure 19. Producer Price Index, 2005-2008



Source: Bank of Thailand

72. How did enterprises cope with this macroeconomic situation? Some 25 percent of the enterprises reported that they did not take any particular measures. The remainder, however, reported that they took some measures to cope with macroeconomic risks. Large firms and exporters—many of which are in the food processing, auto-parts, and electronic component industries—were more active in coping with changes in the

macroeconomic environment. The measures they took include finding new suppliers, securing long term contracts, using financial hedging instruments, pricing in a different currency and investing abroad and improving productivity. Small and medium-sized, many of which are in the electrical appliance, machinery and equipment, textile, and garments industries, took measures to a much lesser extent. In fact, more than one-fourth of small and medium-sized firms had not taken any measures to cope with the macroeconomic risks. We now discuss the measures undertaken by enterprises below.

73. Some 40 percent of the firms found new suppliers and/or engaged in long-term contracts. In trying to reduce their cost, one-third or more of firms of all sizes have found new suppliers who sold at a lower price or are more reliable. This is particularly true for exporting firms and for firms in the automotive parts and in the rubber and plastics industries. By doing so, this would have in part promoted suppliers who have a higher productivity and are more efficient producers. One-fourth of firms tried to lock in their input and product prices through the use of long-term contracts. Large firms have used this tool more than the smaller firms as they have a greater bargaining power with both suppliers and purchasers.

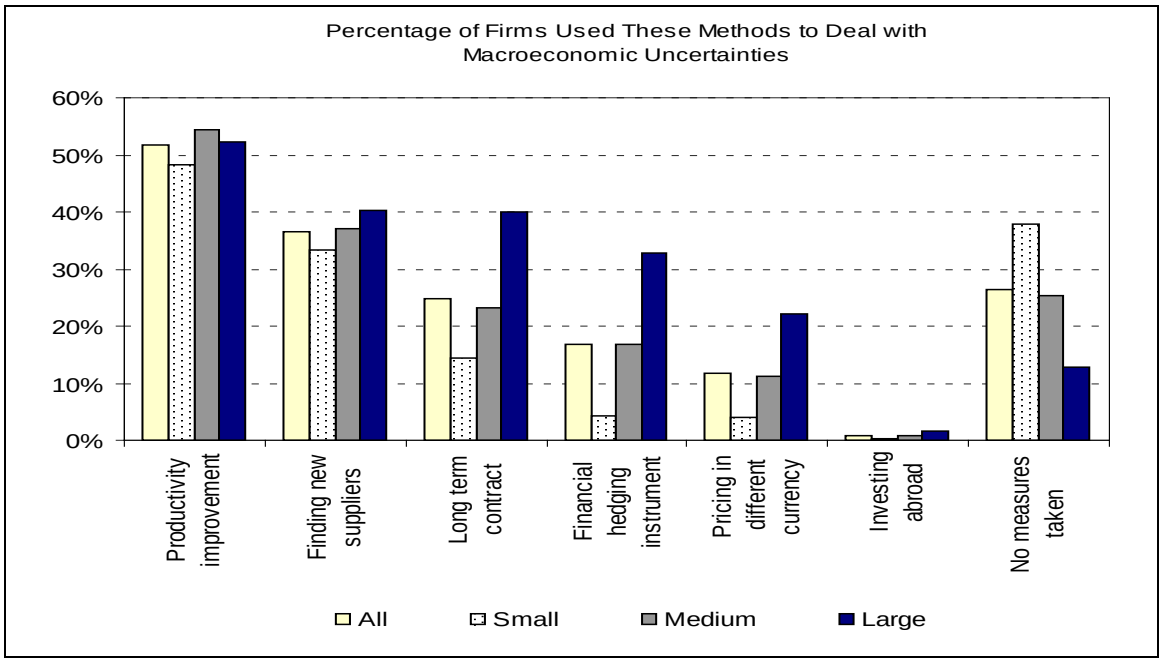
74. The use of financial instruments to hedge against fluctuations in the exchange rate and volatility in input prices was however limited. Financial hedging instruments were used by 17 percent of firms even though more than half of all firms reported that exchange rate fluctuations and volatile commodity prices adversely affected their investment decisions. Only 29 percent of exporting firms used financial hedging instrument even though more than 70 percent of them expressed concerns about exchange rate fluctuations. Financial hedging instruments were used more often by larger rather than smaller enterprises – 33, 17 and 4 percent for large, medium and small firms use hedging instruments, respectively. This may be the result of lack of knowledge of the use of hedging instruments in smaller firms or because they find them unnecessary.

75. Pricing exports in a different currency is difficult for Thai exporters. As exports are usually priced in US dollars, the appreciation of the baht against the US dollar, which has been more rapid than against other major currencies such as the Euro and the Yen, has greatly reduced the export receipts of firms. Since most Thai exporting firms are price takers, it has not been easy to increase prices or shift the pricing to a different currency. With a greater bargaining power with purchasers, a higher share of large firms was able to price their exports in a different currency as compared to smaller firms. Even so, only one fourth of large exporting firms priced their exports in a different currency as compared to one-fifth of medium and small exporting firms.

76. Investing abroad has not been an option for most Thai enterprises. Less than 1 percent of firms surveyed made investments abroad as a means of coping with the global and domestic macroeconomic uncertainties (see Figure 20). A larger share of large and exporting firms, especially those in the electronics and automotive part industries, invested abroad compared to other types of firms. But still, those that have done so represent only four percent of firms in the electronic component industry and 1.8 percent in the auto part industries.

77. One of the possible answers to the question "what measures did you take to cope with macroeconomic risks?" was "increasing productivity," presumably through product and/or process improvements. More than half firms reported that they did.

Figure 20. Methods Reported by Firm Managers to Cope with Macroeconomic Risks (Percentage of Firms)

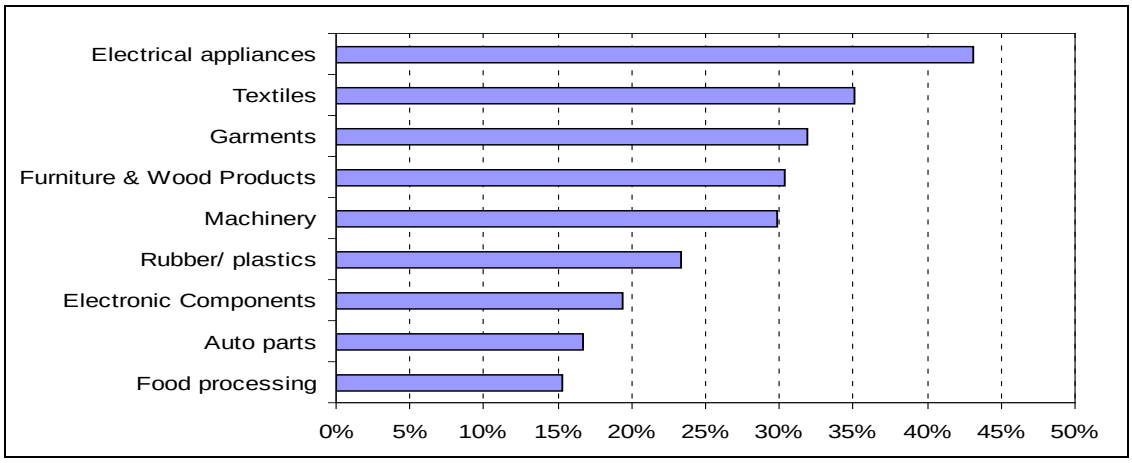


Source: PICS 2007

78. A large number of firms, particularly smaller ones, did not take any measure to cope with the macroeconomic instability. Even though 70 percent of firms expressed that these were major or severe obstacles to their business and investments, one-fourth of firms surveyed reported that they did not take any coping measure, many of which are in the electrical appliance, textile and garments industries (Figure 21).

79. In the electrical appliance industry, which is mainly made up of small, domestic firms, more than 40 percent of companies reported that they did not undertake any coping actions. This corresponds to the high proportion of firms in that industry that cited the lack the knowledge to do so. In the textile and garment industries, which were mainly made up of medium-sized firms, around one-fourth of them did not have the knowledge to undertake the measures. This was reflected in one-third of firms not undertaking any measure, while the firms undertook the measures represented only a small share of firms in the industry. In industries in which relatively few firms reported lack of knowledge about such measures, the share of firms taking actions to mitigate risks was comparatively large. These are firms in industries such as the automotive parts and the electronic component industries, which are mostly made up of large firms.

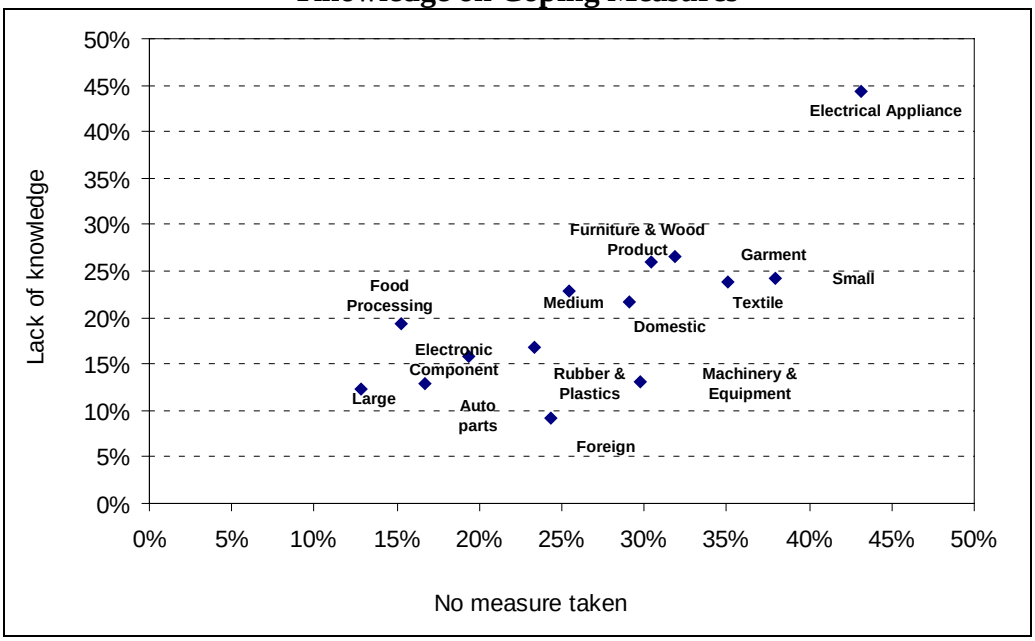
Figure 21. Percentage of Firms that Did Not Take Active Measures to Cope with Macroeconomic Risks, by Industry (Percent)



Source: PICS 2007

80. One of the main reasons for firms not actively undertaking measures to cope with the macroeconomic risks is that firms lack the knowledge to do so. One-fifth of firms did not take risk-mitigating measures because they lacked the knowledge. This was particularly true for the smaller and medium-sized firms which are mostly domestically-owned.

Figure 22. Percentage of Firms that Reported Not Taking any Measure vs. Lack of Knowledge on Coping Measures



Source: PICS 2007

81. Political instability—i.e., the parliamentary dissolution in April 2006 followed by the military coup in September—as well as economic policy uncertainty have affected business sentiments and investment decisions. The political situation led to the perception that changes in certain key policy areas, especially those relating to foreign investments, were in the offing. The proposed amendment of the Foreign Business Act and the capital inflow policies are two examples of the uncertainties of economic policy surrounding investment policies.[44] One-fifth of firms reported that the uncertainty had adversely affected their investment decisions. This is particularly the case for large firms, exporting firms, and foreign firms that are likely to have a higher share of foreign shareholders and higher reliance on foreign capital compared to smaller, non-exporting and domestic firms. These have hurt investor sentiments. Firms tend to delay their investment decisions as the macroeconomic environment was volatile and efficient coping measures are not always available. There is evidence that applications for investment promotions at the Board of Investment (BOI) have increased (Figure 23), which would seem to imply that investors are still optimistic about the future. On the other hand, the decline of business sentiment was reflected in the Bank of Thailand's business sentiment index survey and in PICS 2007 (Figure 24). The evidence is not black and white.

Figure 23. BOI Approvals of Applications (Billion Thai Baht)

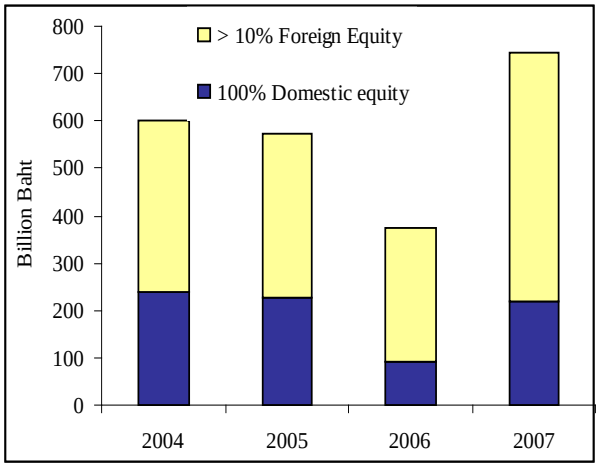
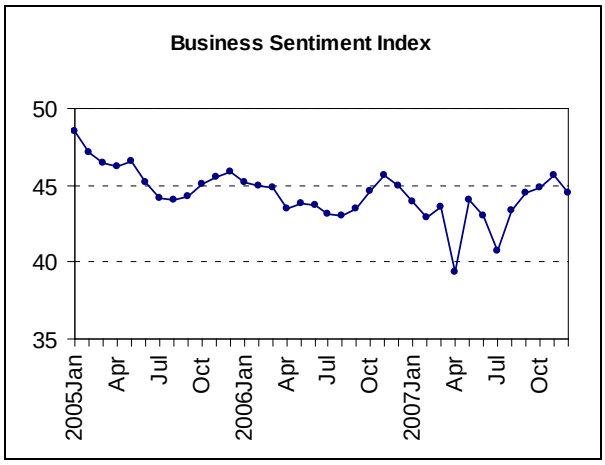


Figure 24. Change in Business Sentiment (Index)

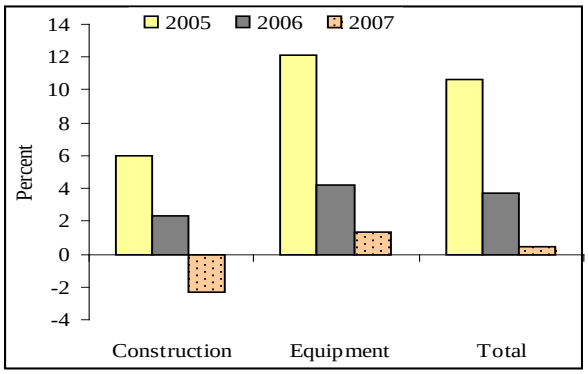


82. Manufacturing production has continued to expand at the rate of 5-6 percent while private investment growth experienced a disproportionate fall from 10.6 percent in 2005 to 0.5 percent in 2007 (see Figure 25 and Figure 26). Overall capacity utilization in the industrial sector increased. Should demand pick up in the near future, supply constraints may result from insufficient capacity. To avoid such vulnerabilities, stimulating

[44] In December 2006, a 30 percent unremunerated reserve requirement on capital inflows was announced and proposed amendments of the Foreign Business Act to increase restrictions on foreign investments were tabled in early 2007. The unremunerated reserve requirement on capital inflows was fully lifted in March 2008. The amendments of the Foreign Business Act are still not approved.

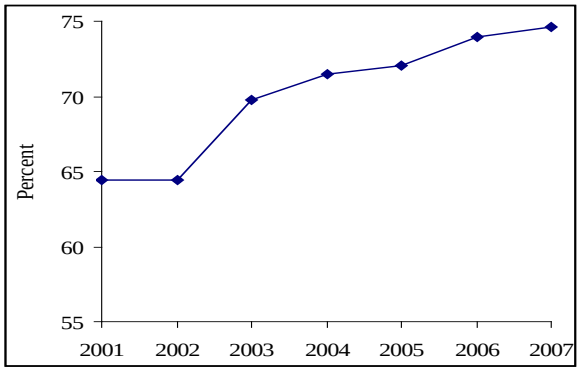
investment growth by optimizing the business climate would be helpful for the Thai economy.

Figure 25. Growth of Real Private Investment (Percent)



Source: NESDB

Figure 26. Industrial Capacity Utilization (Percent)



Source: BOT

ACCESS TO FINANCE

83. An efficient and well-functioning financial system is important to channel funds to the most productive users and allocate risks to those who can best bear them, thus boosting economic growth and improving opportunities. Indicators of access to finance barriers are found to be negatively correlated with the actual use of financial services.[45] From an international perspective barriers to loan services in Thailand in relatively low (see table 2). There is no minimum amount restriction on loan applications, which is important for small and medium enterprises. Fees associated with business loan amount to about 0.55% of GDP per capita in Thailand—which compares favorably with Indonesia (0.9%) but not with Korea (0.29%) or Japan (0%). In Thailand, loan applications can be submitted in bank headquarters or branches only, while in countries with more advanced financial sectors, they can often be submitted in non-branch outlets, electronically, or by phone.

[45] See World Bank (2007), Finance for All: Policies and Pitfalls in Expanding Access

Table 2. Barriers to Lending Services – International Comparison [46]

	Minimum amount business loan (% of GDP per capita)	Fees associated with business loan (% of GDP per capita)
Thailand	0	0.55
Indonesia	0	0.9
Korea	16.99	0.29
Japan	30.98	0
sample median	55.28	1.26

Source: Beck, Demirguc-Kunt, and Martinez Peira (2007)

84. More firms perceived access to credit and the high cost of finance as obstacles to doing business in 2007 than in 2004. Inadequate access to credit was reported by more than 15 percent of firms in PICS 2007 as one of the top three constraints to their operations and investment. This was not the case in PICS 2004. The proportion of firms that perceived access to domestic credit a major or sever constraint increased from 14 percent to 22 percent.[47] The proportion of firms that reported the high cost of financing is one of the major or severe constraints to doing business increased from 15 percent to 35 percent. The 2007 results compared less favorably to the East Asia average where 19 percent of firms report access to finance and 20 percent report cost of finance a major or severe constraint.[48]

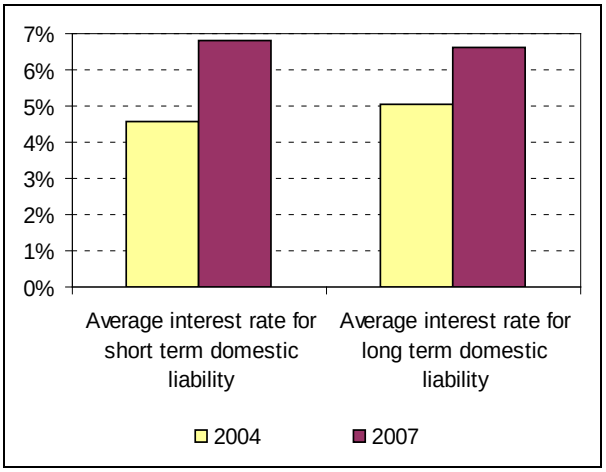
85. Interest rates for short-term domestic loans have risen by 2.2 percentage-points for firms on average, while those for long-term domestic loans rose by 1.5 percentage points (Figure 27). Minimum lending rate increased from about 5.6 percent in the mid 2005 to 7.8 percent in mid 2006; and it remained around that level until it declined to 7 percent in mid 2007 (Figure 28). The higher collateral value required for commercial loans also limit firms' financing. The value of collateral required as a share of the total bank loan value has increased from 83.5 percent to 122 percent or 38 percentage-points.

[46] There are 71 countries in the sample. See http://econo.worldbank.org/programs/finance. The comparator countries are chosen from East Asia based on the data availability. Minimum amount business loan is the smallest amount of loan banks make to business. Fees business loan are the fees associated with business loans. Minimum loan amount and fees are expressed as a share of gross domestic product per capita (GDPPC).

[47] Firms' perception on access to foreign credit is not reported here due to the limited number of observation.

[48] Source: World Bank (2007), Finance for all: policies and pitfalls in expanding access.

Figure 27. Interest Rates Faced by Firms, 2004 and 2007

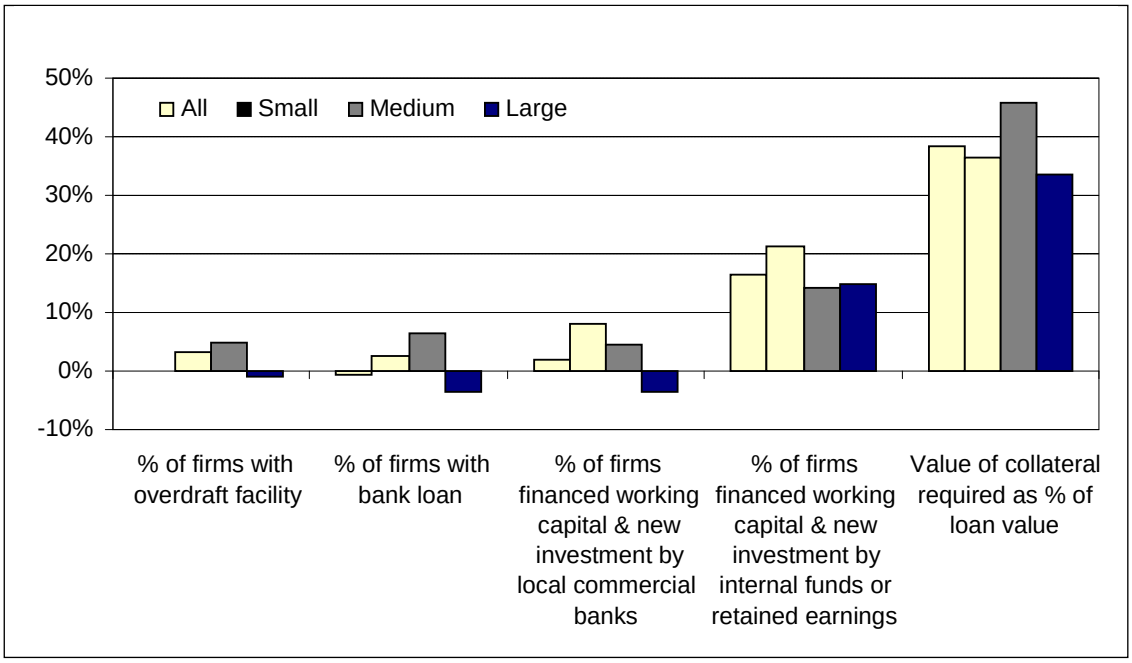


Source: PICS 2004 and 2007

Figure 28. Average Minimum Lending Rate, 2005-2008

86. The high interest rate and collateral requirement resulted in a lower share of firms financing their working capital through commercial bank loans, while the share of firms that financed their new investments by commercial bank loans increased by only 5 percent. Large firms, in particular, have reduced their borrowing from commercial bank for both their working capital and new investments. Instead, an increasing share of firms has financed their working capital and new investments through internal funds or retained earnings (Figure 29). This may imply limitations to the available investment capital compared to the amounts that could be borrowed from commercial banks, thus constraining business improvements and expansion.

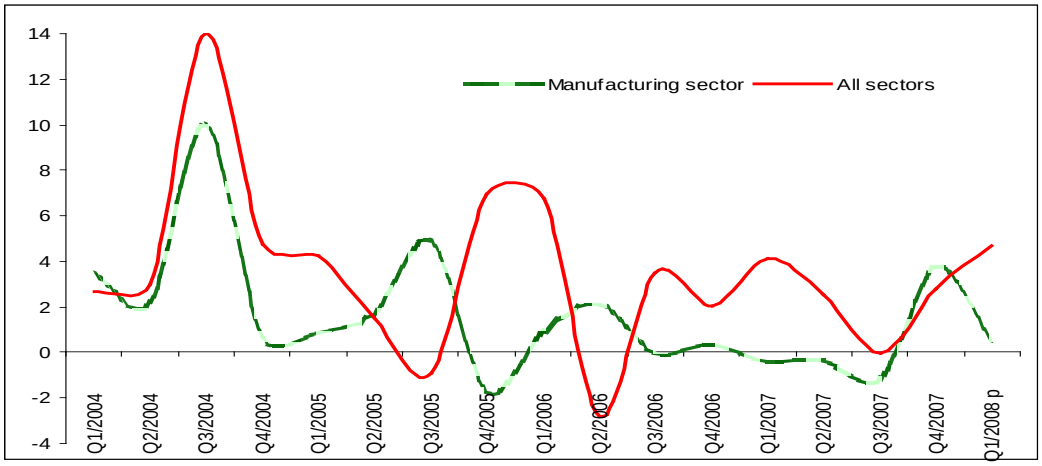
Figure 29. Access to Finance, 2004 and 2007 (Difference in Percent)



Source: PICS 2004 and 2007

87. This was reflected by the declining trend of loan growth in Thailand since 2004 (Figure 30). After peaking at 14 percent (or 10 percent for manufacturing sector) in mid 2004, with fluctuation, it dropped to 0 percent (or -2 percent for manufacturing sector) in the third quarter of 2007. This declining growth of loan may partly explain the declining growth of private investment. No clear trend is discernible from changes that took place in more recent months.

Figure 30. Growth of Lending, 2004-2008



4. ADDRESSING SKILLED LABOR SHORTAGES AND FOSTERING SCIENCE AND INNOVATION

88. For more than 25 years since 1950, Thailand is one of the 13 economies in the world that have grown at an annual rate of more than 7 percent.[49] Six of these sustained high growth economies – Hong Kong (China), Japan, Korea, Malta, Singapore, and Taiwan (China) – now enjoy high-income levels. The others, especially Thailand, Malaysia, Indonesia, and Brazil, reached middle-income status and have experienced less impressive growth.

89. The growth model of Thailand and of other latecomers—such as Malaysia and Indonesia—differs from that of the early East-Asian "Tigers" (South Korea, Taiwan, Singapore, and Hong Kong). "Learning by exporting" has been a major vehicle of productivity growth for Thailand. Through intermediate linkages, the export sectors have had productivity effects on the rest of economy, and advanced technology or high skill intensity have had a much more limited role on productivity.[50] Economic growth in Thailand has been, to a large extent, driven by investments and between-sector productivity growth. To the extent that Thailand has experienced productivity improvements, they have been associated with international spillovers and have been the result of a broad learning process rather than innovation and high-tech production.

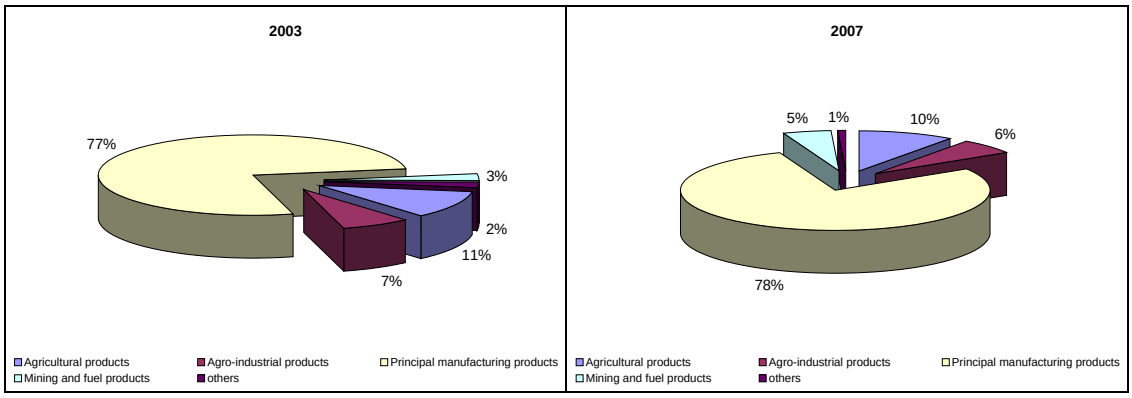
90. Reallocation of resources from lower productivity to higher productivity sectors has largely contributed to total factor productivity growth in Thailand in the past decade. In the past five years, principal manufacturing products have represented over three-fourths of total exports. Agricultural and agro-industrial products have been declining as a share of total exports, representing only 10 and 6 percent, respectively, in 2007 (Figure 31). Some traditional export products, such as garments, have also seen their share in total export decline. The top three exports in the past five years have been more high-tech products: computers and parts, automobiles and parts, and integrated circuits (I.C.) (Figure 32). They account for over 50 percent of the total value of the top 10 exports.

91. Although a large part of the value-added by Thai firms may come from assembly, the fact that high tech products account for a growing share of exports indicates that the production structure in Thailand is moving from labor-intensive to more technology-intensive. These three high-tech sectors all exhibit sizable scale economies. There may still be room for TFP growth from further shifting resources to these and other high-tech productive sectors.

[49] See Commission on Growth and Development (2008)

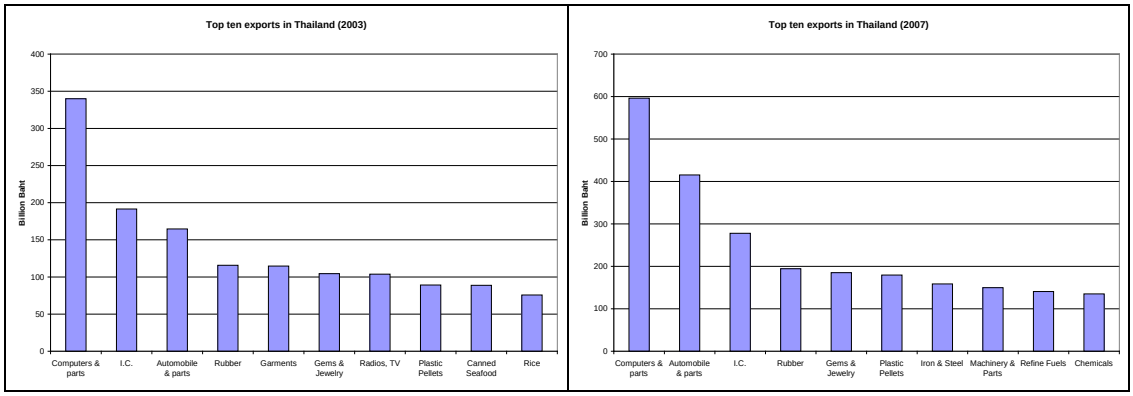
[50] See Diao, Rattso and Stokke (2006).

Figure 31. Export Structure in Thailand, 2003 and 2007 (Percent)



Source: Department of Trade Negotiation, Ministry of Commerce of Thailand

Figure 32. Top Ten Exports in Thailand, 2003 and 2007



Source: Department of Trade Negotiation, Ministry of Commerce of Thailand

92. Promoting innovations, moving toward the global technological frontier or moving the frontier to a more advanced level, to stimulate within-sector productivity growth is important, especially in the long run. The shortage of skilled labor and professionals, the low level of R&D, and the weak cooperation between research institutes and industrial sectors remain important constraints in Thailand. Many small or medium-size firms in Thailand do not have the capability and incentives to undertake R&D in house. Public investment in applied research is essential for their technological upgrading.

93. Acquisition of labor skills and knowledge is essential in the late stages of economic growth. The term "innovation" refers to significant changes leading to productivity increases that are fundamental sources of economic growth.[51] Innovation is not limited to (more easily observable) product innovation but it also includes process innovation, technological innovation, marketing innovation, and organizational innovation—which are all activities that expand the knowledge base. In high-income East Asian economies like Taiwan (China), Singapore, Hong Kong, and Korea, knowledge—as opposed to labor and capital accumulation—increasingly becomes the main engine of

[51] See Baumol (2002).

growth. Moving toward a knowledge-based economy requires four conditions: (i) a skilled labor force; (ii) an effective innovation system; (iii) a modern information infrastructure; and (iv) a supportive institutional regime.[52] The latter—which includes a range of institutional features (macroeconomic framework, trade regime, and regulatory framework) providing economic incentives for the creation, diffusion, and effective use of knowledge—determines the effectiveness of the other three conditions. A "Knowledge Economy Index" (KEI) has been created to measure a country's ability to generate, adopt, and disseminate knowledge.[53] The KEI values for selected countries are shown in Table 3.

Table 3. Knowledge Economy Index for Selected Countries

Rank in 2008	Change in rank from 1995	Country	KEI in 2008 or most recent year	Change from KEI in 1995
1	0	Denmark	9.6	0.0
17	+ 7	Taiwan (China)	8.7	+ 0.5
19	- 2	Japan	8.5	- 0.3
21	0	Singapore	8.4	0.0
26	- 3	Hong Kong (China)	8.2	- 0.1
31	- 3	Korea	7.7	- 0.2
46	+ 1	Malaysia	6.2	+ 0.1
55	+ 11	Brazil	5.5	+ 0.5
63	**- 10**	**Thailand**	**5.3**	**- 0.3**
77	+ 18	China	4.4	+ 0.9
93	+ 3	Indonesia	3.3	- 0.2
96	+ 12	Vietnam	3.2	+ 0.6
100	+ 4	India	3.0	- 0.1

Source: World Bank (2007).

94. The five East Asian economies with a high-income level perform well on the KEI. Malaysia, Brazil, and Indonesia improved their position compared to 1995 but lag behind the richer East Asian economies. Thailand, which ranks 63rd out of 132 countries in 2008 (a drop from 53rd in 1995) is a more worrisome case. This low ranking is due to a poorer score and indicates that conditions that support the move toward a knowledge economy have worsened in Thailand. Unless the country significantly improves the quality of its labor force, information infrastructure, and related incentive mechanisms in the coming years, it may soon be overtaken by emerging economies such as China, Vietnam or India.

[52] See World Bank (2007).

[53] The index is a simple average of normalized performance scores on each of the four conditions. Each condition is measured by three variables so that there are 12 variables in total. For instance, countries with a favorable KEI score (such as Scandinavian countries) will have high adult literacy and school enrollment rates, numerous granted patent applications and scientific journal articles, adequate telephones, computers and Internet services, less distorted tariff and non-tariff barriers, and good regulatory quality and rule of law.

95. This chapter—which does not attempt to provide a comprehensive assessment of the subject—examines some dimensions of Thailand's labor force, innovation system, and information infrastructure using firm-level data from PICS.[54] PICS 2007 results for Thailand are compared with those in PICS 2004 and, to the extent possible, to results from other countries in 2002-2005. The chapter is organized as follows. Section 1 examines shortages and mismatches of labor skills in Thailand. Section 2 examines recent enterprise efforts to conduct innovative activities and assesses the effectiveness of the Research and Development (R&D) system and related government support. Section 3 briefly looks at the use of information technology by local manufacturing firms. Section 4 summarizes the key arguments and makes some policy remarks.

SKILLS AND EDUCATION OF THE LABOR FORCE

96. Chapter 1 reported that nearly 40 percent of all firms in PICS 2007 cited shortage of skilled workers as one of the three most binding investment constraints they faced. A similar share of firms also viewed "skills and education of available workers" as a major or severe business obstacle. This problem was also emphasized in PICS 2004.

97. In the survey, the labor force is divided into three groups: professionals, skilled production workers, and unskilled production workers. Professionals include trained and certified specialists such as engineers, scientists, software programmers, lawyers, and other university graduates. Enterprise innovation efforts tend to rely heavily on the size and quality of this group. The category skilled production workers primarily refer to skilled technicians involved directly in the production process.

98. The shares of firms with vacancies in each worker group, and the time it took to fill the most recent vacancy are shown in Table 4. On average, firms took 7.4 weeks to find a suitable professional worker in 2007, a week longer than they did in 2004. For skilled technicians, the average time (5.2 weeks) was slightly less than the 2004 level. Despite this improvement, a shortage of skilled technicians is much more prevalent in Thailand than in other countries. Out of 64 countries for which similar data are available, Thailand ranks 53rd. On average, these countries took only 3.8 weeks to find skilled technicians, i.e., about 10 days less than Thailand. Figure 33 shows statistics for selected countries. The time it takes to find unskilled workers (2.2 weeks) remained unchanged in 2007. Thailand ranks 47th out of 66 countries; the average country spends half of a week less than Thailand to fill an unskilled worker position (see Figure 34). When skilled labor is hard to find, this is either because available workforce has poor skills (skill shortage) or workers sufficiently possess certain skills but these are not the skills required by firms (skill mismatch) or both.

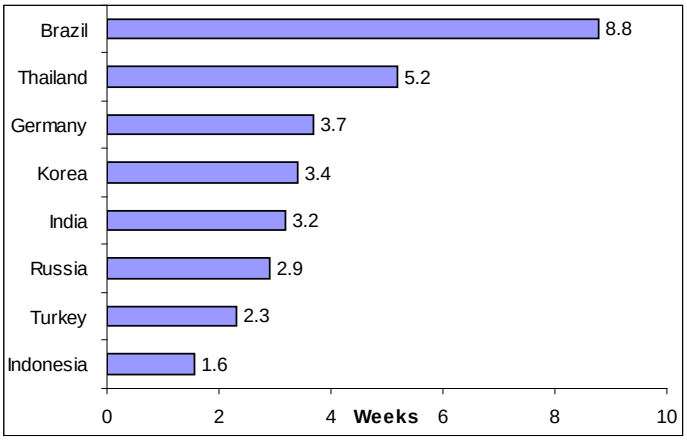
[54] This chapter adds information to the World Bank and NESDB report (2008) examining Thailand's transition towards a knowledge economy. It is based on country-level data and firm-level case studies.

Table 4. Job Vacancies

	Professional worker		Skilled production worker		Unskilled production worker	
	PICS 2007	Change from PICS 2004	PICS 2007	Change from PICS 2004	PICS 2007	Change from PICS 2004
Share of firms with vacancies (%)	20.4	- 8.0	30.1	+ 0.8	48.0	+ 11.0
Time to fill the most recent vacancy (weeks)	7.4	+ 1.0	5.2	- 0.7	2.2	0.0

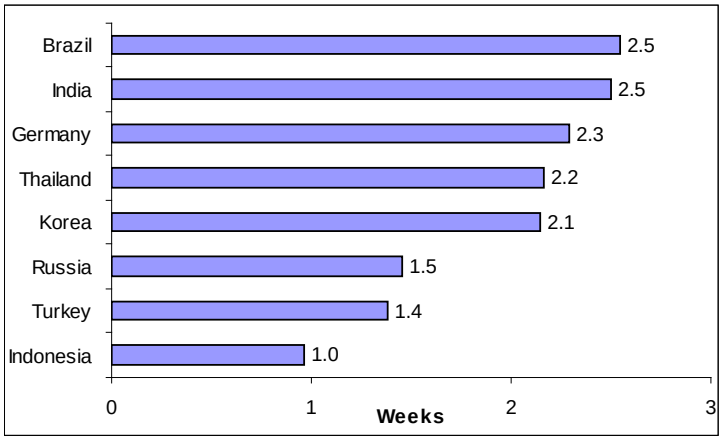
Source: Thailand PICS 2004 and 2007.

Figure 33. Time Required to Fill the Most Recent Vacancy for Skilled Production Workers (Weeks)



Source: Global PICS (2002-2005) and Thailand PICS 2007
Notes: The data are in 2002 for India; in 2003 for Brazil and Indonesia; in 2005 for Germany, Korea, Russia, and Turkey; and in 2007 for Thailand. The global sample has 66 countries.

Figure 34. Time Required to Fill the Most Recent Vacancy for Unskilled Production Workers (Weeks)



Source: Global PICS (2002-2005) and Thailand PICS 2007.
.

99. Table 5 provides a disaggregated picture by region of the time it takes to fill the most recent vacancy for different worker groups. This largely reflects the composition of the manufacturing sector in each region. For example, qualified professional workers are particularly scarce in the Northeast (15.5 weeks compared to the national average of 7.4 weeks—this number is rising sharply compared to PICS 2004), where over half of firms are in the furniture/wood products and garments industries, the two industries that take the longest time to find professional workers. Similarly, skilled production workers are harder to find in the East due to the concentration of automotive parts and rubber and plastics firms, which suffers more from insufficient skilled workers than other industries. This job vacancy rate also applies to a large share of food processing establishments in the South (42 percent) in the case of unskilled production workers. Table 5 also shows that foreign firms take less time to fill job vacancies, most likely because foreign firms typically offer more generous salaries and benefits than domestic ones. Finally, the disparity across firm size and type is less systematic.

Table 5. Time to Fill Job Vacancies in Thailand, by Region, Industry and Enterprise Type

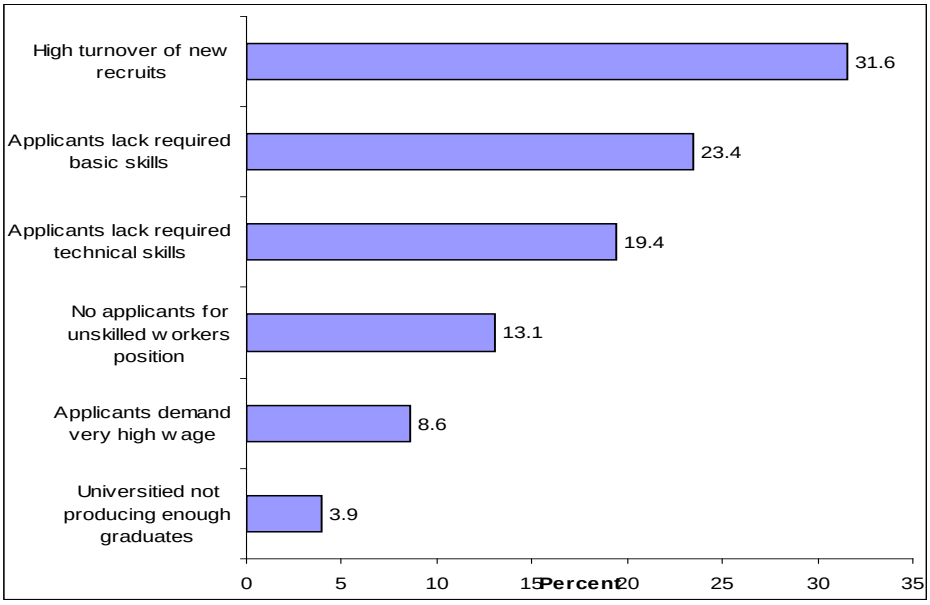
	Professional worker		**Skilled production worker**		**Unskilled production worker**	
	PICS 2007	Change from PICS 2004	PICS 2007	Change from PICS 2004	PICS 2007	Change from PICS 2004
Thailand	7.4	+ 1.0	5.2	- 0.7	2.2	0.0
Bangkok and vicinity	7.7	+ 1.1	5.2	- 1.7	2.0	+ 0.1
Central	6.3	+ 0.5	4.4	- 0.7	2.0	+ 0.4
East	6.6	+ 0.3	7.0	+ 1.5	2.7	+ 0.7
North	6.0	+ 0.2	3.6	- 0.3	2.6	+ 0.8
Northeast	15.5	+ 10.8	5.5	- 2.8	1.7	- 3.6
South	9.0	+ 1.2	5.5	+ 1.8	3.2	- 0.3
Auto components	7.6	+ 0.5	6.0	- 0.4	1.9	+ 0.1
Electrical appliances	7.1	+ 2.4	4.4	+ 0.8	2.1	+ 0.3
Electronic components	6.6	+ 1.6	3.8	+ 0.2	1.8	+ 0.1
Food processing	6.8	+ 0.8	4.0	- 1.9	2.7	- 1.6
Furniture	10.1	+ 2.9	5.1	- 0.5	2.1	+ 0.4
Garments	8.2	+ 0.3	5.3	- 6.7	2.2	0.0
Machinery	8.0	+ 0.8	5.3	- 1.4	2.2	+ 0.1
Rubber and plastics	6.1	- 0.5	5.5	+ 1.4	2.1	+ 0.5
Textiles	7.2	+ 1.5	5.4	+ 0.5	2.2	+ 0.3
Small	6.9	+ 0.5	5.4	- 1.4	2.4	+ 0.3
Medium	7.9	+ 2.2	4.9	- 0.3	2.0	+ 0.3
Large	7.0	+ 0.4	5.3	- 0.8	2.0	- 0.6
Foreign	5.5	- 0.2	3.5	- 1.8	1.3	- 1.9
Domestic	7.7	+ 1.3	5.4	- 0.6	3.3	+ 1.3
Non-exporting	6.6	+ 1.1	5.2	+ 0.1	2.3	+ 0.3
Exporting	7.9	+ 1.1	5.2	- 1.3	2.0	- 0.3

Source: Thailand PICS 2004 and PICS 2007.

100. The key reason for numerous job vacancies, many of which are hard to fill, is the poor quality of the labor force. Over 40 percent of firm managers mentioned that vacancies arise because many applicants lack the basic skills or technical skills that firms

require (Figure 35). At the professional level, the issue is obviously not quantity-related either. Only a small number of establishments indicate that the supply of university graduates falls short of their demand. At the unskilled worker level, however, labor shortages could be a serious problem, especially in labor-intensive industries such as food processing and garments where many vacancies result from too few applicants.

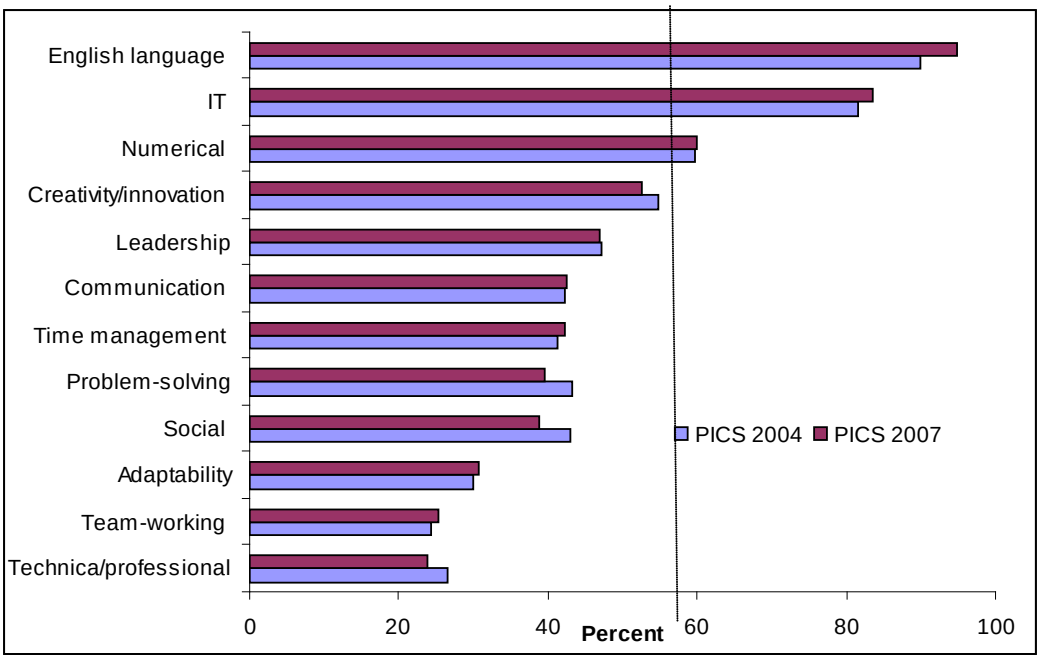
Figure 35: Most Important Cause of Job Vacancies (Percent of Firms)



Source: Thailand PICS 2007

101. There are several skills that firm managers feel their current workers do not possess at a satisfactory level. For instance, at least half of all firms rated the following skills of their local skilled technicians as poor or very poor: English, information technology (IT), numerical skills, and creativity/innovation skills (Figure 36). English proficiency and IT skills have in fact worsened since 2004. In general, the firms are much more positive about the quality of their professional staff, although two-thirds of them believe local professionals are not proficient in English.

Figure 36. Percentage of Firms that Rate Certain Labor Skills as Poor or Very Poor



Source: Thailand PICS 2004 and PICS 2007.

102. In addition to enhanced basic and technical skills, many firms look for loyalty in their employees. In fact, 15 percent of firms viewed loyalty as more valuable than common attributes such as education level and experience. Most of these are small, locally-owned firms, operating in the furniture, textiles, and garments industries. The importance of loyalty is understandable considering that job vacancies in about one-third of all firms arise because of high turnover of new recruits (see Figure 35 on the preceding page). This number could be higher in some industries—for example, 45 percent in the textiles industry. High staff turnover can be detrimental and discourages firms from providing in-house training, thus further weakening labor skills.[55]

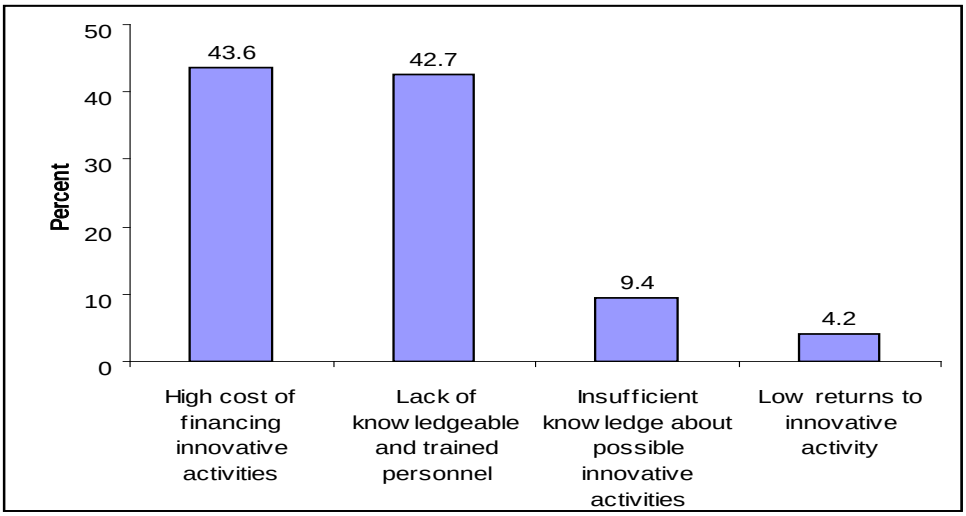
103. Given this general dissatisfaction with basic and technical worker skills and high employee turnover that discourages firms to offer their own training, effective and affordable skill-development support institutions could lessen the problem. Currently, such institutions are not common. The survey responses show that this is mainly because available skill-development services are not relevant for firms. A large number of firms are also unsure how to contact these institutions or are unaware of them. Skill-development support agencies, both private and public, will therefore need to improve their outreach activities and interact more with manufacturing firms on how to design training and other services.

104. Shortages of capable staff can have both short and long-term effects on economic activity. In the short term, firms could operate below full capacity because they cannot find enough competent and experienced workers. In fact, nearly 20 percent of firms in the

[55] An interview with a leading Thai automotive parts company reveals that competition for talented, newly-trained workers is intense. It has forced firms to reconsider the size of their in-house training programs.

garment and machinery and equipment industries cited this as a key reason for capacity underutilization. In the longer run, shortages of well-trained staff limit a firm's effort to enhance productivity. Nearly all firms believe investment in innovation activities yields high returns, however, they do not engage more in these activities for two reasons: they consider innovations to be financially costly and they lack knowledgeable and trained personnel (see Figure 37). As discussed in Chapter 1, shortage of skills is a key reason why firms, especially small and medium firms, do not use financial instruments to hedge against the risk of macro volatility.

Figure 37. Reason Reported by Firms for not Engaging in Innovative Activities (Percentage of Firms)

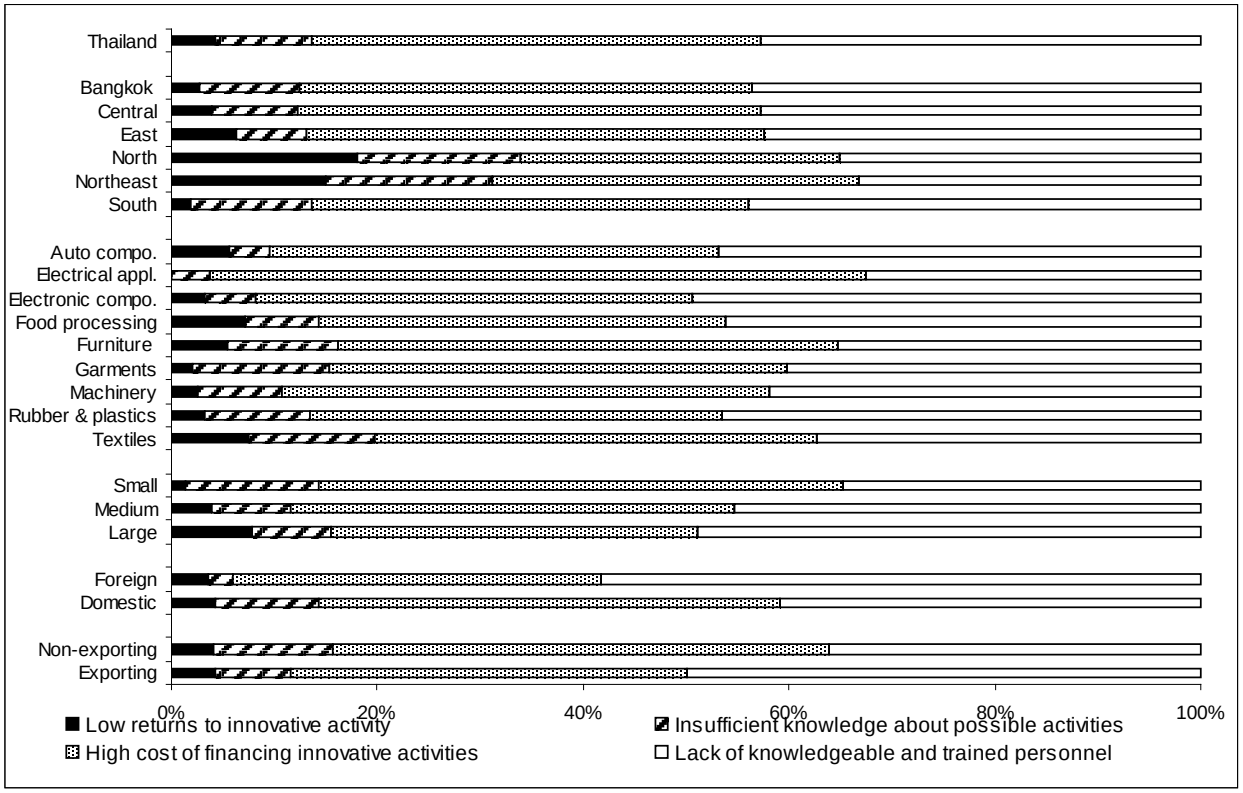


Source: Thailand PICS 2007

105. Figure 38 reveals that the lack of qualified staff who could contribute to innovative activities is more of an issue among large, foreign, and exporting firms.[56] This is rather puzzling, given the result previously reported that foreign firms can generally recruit professional workers quicker than domestic ones, and the fact that large firms do not suffer more than smaller ones from skill shortages. An explanation could be that foreign and large firms are generally more dynamic than their counterparts in terms of innovative activities and hence are more aware of the problem. We will show below that foreign and large firms carried out more innovations such as developing a new major product line, introducing new, substantive technology, and filing patents and utility models relative to domestic and smaller firms. Moreover, foreign and large firms tend to have greater financial resources so that financing is less of a constraint and skill shortage is more binding.

[56] In PICS 2007, large and exporting firms are closely linked. While less than 8 percent of small and medium-sized firms are owned by foreign investors, roughly 22 percent of large firms are foreign-owned.

Figure 38. Reason Reported by Firms for Not Engaging in Innovative Activities—Disaggregated Sample (Percent)



Source: Thailand PICS 2007

106. The share of professional workers —the group most likely to contribute to innovation -- in the labor force is declining; it has become harder to find suitable professional workers. Engineers were on average only 1.1 percent of all staff in 2007, down from an already low 1.4 percent in 2004. The proportion of scientists and information technicians also dropped from 0.2 and 0.5 percent in 2004 to 0.1 and 0.2 percent in 2007, respectively.

RESEARCH & DEVELOPMENT, TECHNOLOGY ACQUISITION AND RELATED SERVICES

107. This section reviews innovation activities that firms have recently undertaken, comparing Thailand with other countries, then examines four activities that facilitate innovations: R&D, channels to acquire technology, related business services, and government support. As stated earlier, innovative activities are not only new products (which are more easily observable) but include any business activities that expand the technology base. Table 6 presents the responses of firms regarding innovations undertaken in recent years. These activities include various dimensions of innovations: technological innovations (e.g., upgrading machinery and equipment), process-oriented innovations (e.g., introducing a new way the main product is produced), product innovations (e.g., developing a new product line) and commercial innovations (e.g., agreeing to a joint venture with a foreign partner).

Table 6. Percentage of Firms That Undertook Innovative Activities in the Past Two Years

	PICS 2007	Change from PICS 2004
Upgrading machinery and equipment	86.4	+ 18.0
Upgrading existing product line	80.3	+ 9.6
Entering new markets due to process or product improvements in quality or cost	57.6	+ 1.6
Developing a major new product line	49.3	- 1.1
Introducing new technology that substantially changed the way the main product is produced	46.7	- 4.8
Filing patent/utility models or copyright protected materials	9.1	- 1.6
Entering a joint venture agreement with a foreign partner	2.5	- 1.0

Source: Thailand PICS 2004 and PICS 2007.

108. When innovations are defined as broadly as is the case here, we find that a large share of the firms surveyed had "innovative" activities in recent years. For instance, at least 80 percent of all firms either upgraded their machinery and equipment or upgraded their existing product line. These are large improvements compared to results in PICS 2004.[57] However, when the innovative activities in question require greater resources and efforts (e.g., introducing new technology or a new product line), less than one-half of firms accomplished these. Less than 10 percent of the firms surveyed filed patents or copyrights. The share of firms that have their own brand (marketing innovation) fell from 51 percent in 2004 to 45 percent in 2007. Overall, the share of firms that did more sophisticated innovative activities dropped since 2004.

109. As shown in Table 7, large, foreign, and export-oriented firms had more innovative activities than their counterparts. Innovations are also more common in the food processing, automotive parts, electrical appliance, and electronic components industries, than in the textiles and rubber/plastics industries. The East has the strongest performance (since more automotive parts as well as large, and foreign companies are located in that region). These findings are hardly surprising. Large, foreign, and exporting firms tend to have more financial resources to fund innovative activities. They are also more likely to be under greater competitive pressure to differentiate their products.

[57] These activities are important to firms' performance. The empirical results in Chapter 3 show that firms with more new machinery and equipment tend to have higher productivity.

Table 7. Percentage of Firms that Recently Undertook Certain Innovations by Subsamples

	Upgraded machinery and equipment		Upgraded an existing product line		Developed a major new product line		Introduced new technology that substantially changed the way the main product is produced		Filed any patent or utility models or copyright protected materials		Entered a new joint venture agreement with a foreign partner	
	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04
Thailand	86.4	+ 18.0	80.3	+ 9.6	49.3	- 1.1	46.7	- 4.8	9.1	- 1.6	2.5	- 1.0
Bangkok and vicinity	85.7	+ 13.2	80.1	+ 4.9	50.6	- 0.6	46.7	- 7.2	9.9	- 2.7	2.3	- 1.3
Central	89.4	+ 20.7	83.1	+ 14.7	50.3	- 1.3	46.3	- 7.7	7.9	- 2.0	2.8	- 0.8
East	91.1	+ 14.0	85.9	+ 8.8	51.0	- 5.3	56.1	- 3.3	10.7	- 3.4	3.4	+ 0.2
North	62.0	- 2.4	56.6	- 14.7	41.8	- 7.5	28.4	- 23.7	3.9	- 4.3	2.3	- 3.2
Northeast	78.5	+ 25.8	70.6	+ 15.1	37.5	- 12.5	43.4	+ 5.9	11.4	+ 7.2	..	..
South	88.3	+ 47.1	75.5	+ 25.9	37.5	+ 3.9	37.9	+ 12.7	2.8	+ 0.9	2.8	- 0.9
Auto components	93.7	+ 13.7	81.3	- 2.8	56.6	- 10.3	61.4	- 1.4	9.6	- 6.9	0.8	- 1.9
Electrical appliances	79.2	+ 13.3	91.0	+ 14.8	57.0	+ 5.8	38.2	- 22.0	14.6	- 3.6	..	..
Electronic components	90.1	+ 15.0	79.6	- 3.2	53.3	- 18.0	58.7	- 13.9	10.9	- 3.8	2.7	- 2.5
Food processing	92.3	+ 20.3	88.4	+ 17.4	58.8	+ 10.8	53.3	+ 2.5	9.7	- 0.4	2.7	- 2.9
Furniture	78.0	+ 17.2	87.3	+ 26.5	58.4	+ 20.0	34.7	+ 1.1	9.2	+ 3.6	4.7	+ 3.9
Garments	82.5	+ 13.4	75.8	+ 8.5	52.1	+ 6.9	48.6	+ 2.2	11.6	+ 0.3	3.0	- 1.8
Machinery	84.1	+ 10.1	87.1	+ 3.1	53.7	- 6.3	40.8	- 23.2	7.3	- 1.7	4.7	+ 0.7
Rubber and plastics	90.0	+ 30.4	78.1	+ 18.6	41.5	- 4.8	48.8	+ 10.5	7.6	- 1.6	2.7	- 0.7
Textiles	81.5	+ 17.6	70.8	+ 6.8	35.3	+ 0.3	34.0	- 14.4	7.1	+ 1.7	..	..
Small	76.8	+ 28.4	78.4	+ 22.5	38.6	+ 4.1	32.6	- 0.7	5.3	+ 0.0	1.0	+ 0.4
Medium	90.9	+ 24.6	78.1	+ 9.3	52.2	+ 4.3	46.9	- 0.2	8.7	- 1.6	3.1	+ 1.0
Large	92.3	+ 10.3	85.6	+ 4.5	58.9	- 3.2	64.1	- 2.2	14.3	+ 0.1	3.6	- 3.0
Foreign	94.4	+ 13.9	86.6	+ 2.8	59.8	- 13.7	70.2	- 1.2	6.9	- 7.7	7.8	+ 3.0
Domestic	85.3	+ 18.8	79.6	+ 11.0	51.7	+ 4.9	44.2	- 4.2	9.4	- 0.7	1.9	- 1.4
Non-exporting	82.0	+ 21.0	75.8	+ 12.6	40.3	- 1.7	37.9	- 4.8	5.9	- 1.3	0.7	- 0.3
Exporting	91.2	+ 17.2	85.3	+ 8.9	59.2	+ 2.5	56.4	- 1.7	12.5	- 0.8	4.5	- 0.9

Source: Thailand PICS 2004 and PICS 2007.

110. Across countries, firms in Thailand are relatively "innovative" as shown by the data in Table 8. More firms developed a new product type, upgraded existing product lines, and adopted new technology than in most other countries for which data are available. Joint venture agreements with foreign partners are more common in advanced economies like Korea and Ireland than in Thailand.[58] Enterprises in Brazil appear to perform very well in innovative activities.[59] This appears to reinforce the fact Brazil moved up quickly in the ranking of the Knowledge Economy Index.

Table 8. International Comparison - Percentage of Firms that Undertook Innovative Activities in the Past Two Years

Developed a major new product line		**Upgraded an existing product line**		**Introduced new technology that substantially changed the way the main product is produced**		**Entered a new joint venture agreement with a foreign partner**	
Brazil	67.6	Brazil	94.6	Brazil	67.9	Korea	11.5
Philippines	49.4	**Thailand**	**80.3**	**Thailand**	**46.7**	Ireland	10.8
Thailand	**49.3**	Indonesia	68.2	Vietnam	45.1	*World Average*	*6.3*
Vietnam	43.8	Vietnam	65.9	Philippines	42.2	Indonesia	5.9
World Average	*39.2*	Philippines	64.2	Ireland	38.1	Vietnam	5.7
Ireland	38.5	*World Average*	*56.1*	*World Average*	*36.6*	Philippines	5.7
Indonesia	37.8	Ireland	54.7	China	33.4	Brazil	4.2
Korea	37.5	Korea	53.9	Turkey	30.5	**Thailand**	**2.5**
Turkey	28.9	Germany	45.4	Germany	23.2	Turkey	2.7
China	24.0	China	40.3	Indonesia	22.4	Germany	2.5
Germany	17.5	Turkey	37.0	Korea	16.2	China	n/a

Source: Global PICS (2002-2005) and Thailand PICS 2007.
Notes: The data are in 2003 for Brazil, China, Indonesia, and the Philippines; in 2005 for Germany, Ireland, Korea, Turkey, and Vietnam; and in 2007 for Thailand. The samples used to calculate the world means have 61-65 countries subject to the data availability of specific indicators.

Research and Development

111. Table 9 presents data on research and development efforts by firms. The first row shows that one-fourth of firms hire staff exclusively for R&D or design purposes. This represents a marginal increase with respect to the 2004 level, and raises the average proportion of R&D and design staff to nearly 4 percent in 2007. Despite this, the share of overall R&D spending in operating revenue dropped from 0.5 percent in 2004 to 0.3 percent in 2007. This suggests that although firms on average spent more on R&D personnel, expenditure on other R&D items

[58] This hardly qualifies as an "innovation" but a shift in the management structure can lead to more innovations in the future.

[59] The figures in Table 8 should be viewed as suggestive, as they only show the shares of firms that carried out innovative activities, but not the intensity or complexity of such activities. For example, for Thailand, the number of product types introduced during 2004-2006 was up to one- quarter of the total number of product types manufactured in 2007. This is higher than 15 percent in Brazil, but the latter country reports higher share of firms developing a new product line in recent years. These shares of new products are the median values. The mean values are biased as they vary widely across firms.

decreased. Figure 39 shows that, compared with other countries, the share of R&D spending by firms in Thailand is very low. This low and decreasing expenditure share for research and development can perhaps explain why more sophisticated innovative activities, such as patents, are carried out by much fewer (and a declining number of) firms.

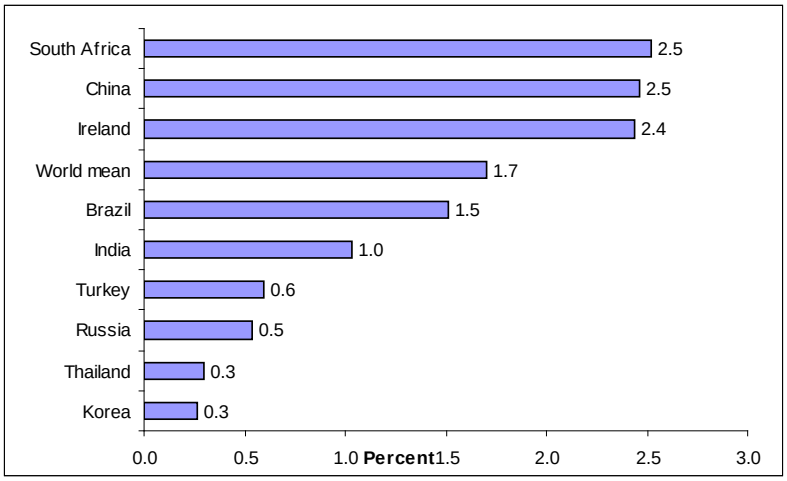
112. Finally, Table 9 shows that less than 10 percent of all firms subcontracted their R&D projects to other companies. Outsourcing of R&D activities tends to benefit firms because they can gain more from global knowledge and more qualified human resources available elsewhere. In many instances, this can also result in more efficient spending for research and development.

Table 9. R&D Indicators

	Share of firms employing staff exclusively for R&D or design		**Share of R&D/design staff in total staff**		**R&D spending as a share of operating revenue (%)**		**Share of firms subcontracting R&D projects to other companies**	
	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04
Thailand	22.4	+ 1.4	3.8	+ 1.2	0.3	- 0.2	7.4	+ 0.1
Bangkok and vicinity	23.0	- 0.5	4.5	+ 1.5	0.3	- 0.4	8.0	- 0.3
Central	22.6	+ 2.7	3.1	+ 1.0	0.4	+ 0.3	6.1	0.0
East	21.4	- 0.5	3.7	+ 1.7	0.1	- 0.5	5.5	- 4.4
North	19.3	- 4.0	1.7	- 0.2	0.1	0.0	4.9	+ 2.2
Northeast	18.5	+ 3.3	1.7	- 1.0	0.3	+ 0.1	7.8	- 0.6
South	22.1	+ 10.9	1.7	- 0.8	0.1	+ 0.1	17.3	+ 14.5
Auto components	22.3	- 1.1	2.5	+ 0.1	0.3	0.0	12.4	+ 2.1
Electrical appliances	38.9	+ 2.5	3.4	+ 1.0	0.3	- 0.9	5.6	- 4.7
Electronic components	34.7	+ 8.6	7.2	+ 5.6	0.7	+ 0.5	10.8	+ 3.1
Food processing	24.4	- 2.9	1.0	- 0.1	0.1	0.0	16.7	+ 8.9
Furniture	29.4	+ 5.4	3.4	+ 0.4	0.5	+ 0.4	2.4	- 1.6
Garments	19.6	+ 2.9	2.7	+ 0.6	0.3	- 1.8	4.4	- 2.7
Machinery	28.9	+ 4.9	5.8	+ 1.8	0.6	+ 0.4	11.5	+ 4.5
Rubber and plastics	18.2	+ 6.6	4.1	+ 0.6	0.2	+ 0.1	5.6	- 1.9
Textiles	13.0	- 1.0	3.3	+ 0.5	0.1	- 0.1	3.3	- 1.5
Small	13.1	+ 1.3	9.5	+ 2.6	0.4	0.0	4.4	- 2.1
Medium	22.3	+ 4.5	3.3	+ 1.2	0.3	- 0.5	7.2	+ 1.2
Large	34.0	+ 4.5	1.4	+ 1.0	0.2	0.0	11.4	+ 2.5
Foreign	30.6	+ 7.9	2.0	+ 0.7	0.2	+ 0.1	11.8	+ 4.3
Domestic	21.6	+ 0.8	4.0	+ 1.3	0.3	- 0.2	7.0	- 0.2
Non-exporting	13.8	- 1.8	6.0	+ 2.0	0.2	- 0.1	5.0	- 0.2
Exporting	31.8	+ 6.7	2.7	+ 1.3	0.4	- 0.2	10.1	+ 1.2

Source: Thailand PICS 2004 and PICS 2007.

Figure 39. Share of R&D Spending in Total Sales (Percent)



Source: Global PICS (2002-2005) and Thailand PICS 2007.
Notes: The data are in 2002 for India; in 2003 for Brazil, China, Indonesia, the Philippines, and South Africa; in 2005 for Ireland, Korea, Vietnam, Russia, and Turkey; and in 2007 for Thailand. The whole sample has 66 countries.

113. Across different samples Table 9 indicates that manufacturing firms in high-tech industries such as electronic components, electrical appliances, and machinery and equipment spend more in conducting R&D. At least one-third of firms that produce electronics and electrical goods employ staff exclusively for R&D or design activities, while electronics and machinery companies spent around 0.6-0.7 percent of their operating revenues on R&D (compared with the national average of 0.3 percent). In general, we see that large, foreign, and exporting firms engage more in R&D activities. Larger shares of these firms hire research and design staff. They also outsource more research projects, although the evidence on R&D spending is less strong. Greater effort has appeared to translate into more innovative activities carried out by these firms.

Technology Acquisition

114. The channels that firms use to acquire technology can have a significant effect on their capacity to innovate. When high-quality affordable technology is already embodied in new machinery and equipment, whether local or imported, firms have weak incentives to innovate. This is also the case for subsidiaries acquiring ready-to-use technologies from their parent (mostly foreign) company. Over the long run, these conditions limit a firm's ability to adopt technological innovations.

115. Table 10 lists the leading ways that manufacturing firms in Thailand adopted to obtain new technology. Changes in the ranking of these channels between 2004 and 2007 are minor. The data show that 22 percent of firms acquire technology embodied in newly-acquired local or imported machinery and equipment. This reliance on imported machinery increased since 2004. As shown in Table 10, in 40 percent of the firms surveyed, technology was developed in-house, with clients or with machinery suppliers. It should however be noted that many of the firms reporting that they developed or adapted technology in-house could refer to minor adaptations of technology transferred from their parent company.

Table 10. Main Channels Used by Firms in Thailand to Acquire Innovations

	PICS 2007	Change from PICS 2004
Embodied in new imported machinery or equipment	22.4	+ 6.8
Developed in cooperation with client firms	18.0	+ 1.5
Developed or adapted within the establishment locally	14.5	- 4.4
Embodied in new local machinery or equipment	12.8	- 0.8
Developed with equipment or machinery supplier	8.2	+ 2.2
Transferred from parent company	8.1	- 3.6
Other channels	6.6	- 0.3
From a business or industry association	4.4	+ 0.4
By hiring key personnel	1.5	- 1.5
Consultants	1.3	+ 0.7
From universities, public institutions	1.2	+ 0.3
Licensing or turnkey operations from domestic sources	0.5	- 0.5
Licensing or turnkey operations from international sources	0.4	- 0.7
Mergers and acquisitions	0.1	- 0.1

Source: Thailand PICS 2004 and PICS 2007.

116. Technological innovations originating from universities and public institutions are used by 1 percent of surveyed firms only. This clearly reflects weak linkages between manufacturing firms and research centres or universities—institutions that are essential for the generation of new technology. The PICS data show that less than 7 percent of the firms that developed/adapted technology locally sought help from universities. The share of firms that collaborated with research institutions is much lower at 1.3 percent. Overall, less than 25 percent of all firms in PICS 2004 and 2007 ever worked with research or technology-support institutions. The services of these institutions are not widely used because their services are not well matched with firm needs. Most firms are unaware of or unsure how to contact these institutions—as was also the case with skills development-support institutions.

117. Table 10 also reveals that new technology acquisition channels relying directly on the availability of human resources (such as key personnel and consultants) are uncommon in Thailand. Recall that we indicated earlier that over 40 percent of firms reported that they did not innovate because they lacked skilled personnel.

118. Table 11 presents the data on technology acquisition by region, industry and ownership type of firm. Small, domestic, non-exporting firms adapt or develop technology in-house or with clients and machinery suppliers more than larger, foreign, and exporting firms—which rely on parent companies. The data indicates that firms in the automotive parts and electronic components sector (mostly subsidiaries of Japanese firms) rely heavily on their parent companies as a source of new technology. None of the electronics/electrical establishments in the survey gained new technology from local universities and public institutions.

Table 11. Main Channels Used by Firms in Thailand to Acquire Technological Innovations, by Region, Industry and Enterprise Type

	Embodied in new local and imported machinery or equipment		Developed or adapted within the establishment locally or with client firms or machinery suppliers		Transferred from parent company		By hiring key personnel and consultants		From universities, public institutions	
	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04
Thailand	32.7	+ 3.5	37.8	- 3.6	7.5	- 4.1	2.6	- 1.0	1.1	+ 0.3
Bangkok and vicinity	37.3	+ 10.6	39.7	- 5.6	2.2	- 6.1	2.8	- 1.4	0.9	+ 0.3
Central	28.4	- 7.4	41.8	+ 4.6	8.6	- 4.0	1.6	- 1.1	1.1	+ 0.3
East	23.8	- 5.1	24.5	- 10.2	25.0	+ 3.7	2.0	- 0.9	1.9	+ 0.2
North	34.4	+ 9.0	31.4	+ 0.9	13.9	- 6.4	3.1	- 0.3	0.0	- 1.7
Northeast	25.4	+ 3.8	32.2	- 12.9	13.0	+ 5.2	2.4	- 1.5	0.0	+ 0.0
South	35.1	+ 1.3	39.0	- 10.4	2.5	- 2.7	7.7	+ 3.8	3.8	+ 2.5
Auto components	27.3	- 10.9	30.5	+ 3.3	27.7	+ 6.3	3.5	- 0.2	2.0	+ 1.2
Electrical appliances	41.5	+ 21.7	39.3	- 4.2	9.6	- 12.7	3.0	+ 0.3	0.0	- 1.3
Electronic components	15.8	- 10.6	44.2	+ 7.4	24.1	- 5.7	4.3	+ 2.2	0.0	- 0.7
Food processing	36.9	- 2.2	34.3	+ 1.2	8.2	+ 0.9	6.3	+ 1.6	0.5	- 2.2
Furniture	30.9	- 1.7	48.2	- 1.3	1.0	+ 1.0	2.2	- 0.1	2.4	+ 2.4
Garments	35.8	+ 8.4	35.9	+ 2.1	4.4	+ 1.5	0.8	- 5.7	0.8	+ 0.8
Machinery	24.0	+ 19.7	44.2	- 22.5	9.4	- 4.6	2.4	- 1.9	2.3	+ 1.2
Rubber and plastics	36.4	+ 5.1	34.8	- 12.8	1.8	- 0.4	2.5	+ 0.3	0.8	+ 0.3
Textiles	36.8	+ 4.9	38.1	- 6.9	2.5	- 7.0	0.6	- 3.0	1.0	+ 0.2
Small	31.9	+ 4.5	44.0	- 7.8	2.4	- 0.7	2.4	- 1.5	0.4	+ 0.0
Medium	31.9	+ 3.2	39.5	- 2.8	5.2	- 3.6	2.6	- 0.2	1.6	+ 0.2
Large	34.8	+ 4.1	28.2	- 7.5	16.6	- 1.6	2.6	- 1.4	1.3	+ 0.7
Foreign	32.0	+ 9.4	17.3	- 2.4	47.7	- 3.7	1.3	+ 0.7	0.0	+ 0.0
Domestic	33.0	+ 2.5	40.5	- 4.7	2.3	- 2.4	2.7	- 1.4	1.2	+ 0.2
Non-exporting	32.0	+ 0.4	41.1	- 5.2	2.6	- 2.5	2.4	- 1.1	0.5	- 0.2
Exporting	33.5	+ 5.8	34.3	- 3.9	12.7	- 3.3	2.7	- 0.9	1.8	+ 0.8

Source: Thailand PICS 2004 and PICS 2007.

119. Table 12 provides an international perspective on technology acquisition. Thailand has more firms developing technology in-house or with client firms or machinery suppliers than comparator countries. Thailand also relies less on technology embodied in new machinery and equipment. This data suggests that compared to other countries Thailand makes reasonable efforts to generate technological innovations. However, the role of Thailand's universities and research centers in generating new technology is more limited than in advanced economies such as Korea and Ireland. More firms acquired their technology from parent companies. Such technology transfer usually discourages local innovations if the technology transferred is ready to use but it helps local firms in building their technological capability.

Table 12. Technology Acquisition in Selected Countries

	Thailand	Korea	Ireland	Brazil	Indonesia	Philippines	Vietnam
Embodied in new machinery or equipment	33.1	40.4	59.7	45.8	48.7	43.0	69.2
Developed or adapted within the establishment locally	19.4	5.3	10.5	19.2	4.7	8.3	9.6
Developed with client firms	17.2	9.6	6.8	4.5	15.1	9.7	0.0
Transferred from parent company	11.8	4.3	2.6	3.1	2.7	4.3	1.6
Developed with equipment or machinery supplier	7.2	4.3	5.2	3.9	7.0	5.0	11.7
From an industry association	4.4	2.1	2.6	0.4	0.0	3.0	0.0
By hiring key personnel	3.0	21.3	8.9	12.5	17.9	14.2	2.3
Licensing or turnkey operations from international sources	1.2	6.4	0.5	0.6	2.3	1.3	3.3
Licensing or turnkey operations from domestic sources	1.1	4.3	1.6	0.4	1.6	0.2	2.3
From universities, public institutions	0.9	2.1	1.6	0.4	0.0	0.2	0.0
Consultants	0.7	0.0	0.0	2.6	0.0	4.5	0.0
Trade Fairs and/or Study Tours	0.0	0.0	0.0	6.6	0.0	6.4	0.0

Source: Global PICS (2002-2005). The data are for 2003 for Brazil, Indonesia, and the Philippines, 2004 for Thailand and 2005 for Ireland, Korea, and Vietnam.

120. Table 13 presents data on local innovations and technology transfers in Thailand. Over three quarters of firms that acquired new technology from a parent company view adaptation or local R&D to suit local conditions as necessary. This share fell by 10 percent with respect to 2004. Fewer firms also indicate that they learn about new technology from being a supplier to a multinational company (MNC). Half of the firms surveyed in PICS 2007 are MNC suppliers so this has an important effect on the overall innovative capability of Thailand. This evidence suggests a need to strengthen new local knowledge and technology.

Table 13. Foreign Technology Transfers and Local Innovations

Share of firms viewing…	PICS 2007	Change from PICS 2004
Adaptation or R&D to suit local conditions is necessary if technology transferred from parent company	77.6	- 10.4
Training of workers to implement technology is necessary if technology transferred from parent company	94.1	- 2.9
They learn about new technology from being a supplier to Multinational Corporation	43.4	- 6.7

Source: Thailand PICS 2004 and PICS 2007.

Business Services

121. Business services—engineering and design, information technology, management and marketing, and legal services—can support innovation. Engineering, design and IT services are especially important for product and process innovations, while management services can help to promote organizational innovation. Legal services become useful for intellectual property rights when firms need to register patents or copyrights. Business services that support innovation seem to have become more available in recent years. For example, firms with calibrating and testing services for machinery and equipment in their own region increased from 62 percent in 2004 to 80 percent in 2007. The increase was 30 percent in the Northeast, though it is still below the national average. In the North, only around 40 of all surveyed firms in the region had calibrating and testing services available nearby.

122. As shown in Table 14, business services are now much more affordable than a few years ago. All business services were perceived to be affordable by not more than 40 percent of all firms in 2004 but these numbers increased remarkably in 2007. There is no indication that the quality of innovation-related services has improved - except for engineering and design services. A small number of firms cited legal services as having poorer quality.

Table 14. Percentage of Firms Reporting that Business Services are Affordable and of Good Quality

	Are affordable		Have fairly or very good quality	
	PICS 2007	Change from PICS 2004	PICS 2007	Change from PICS 2004
Engineering and design	79.6	+ 55.6	85.0	+ 6.5
IT	57.5	+ 27.6	77.7	- 0.3
Management and marketing	89.7	+ 81.1	73.6	- 0.6
Legal	57.0	+ 16.5	81.9	- 2.3

Source: Thailand PICS 2004 and PICS 2007.

Government Support

123. The PICS data on government support relate to public initiatives and projects that support firms to carry out innovative activities. The majority of enterprises innovate without incentives from government. In 2004, 12 percent of all surveyed firms

participated in government schemes to conduct R&D. This fell to 8 percent in 2007. Table 15 shows that a small number of firms participate in various types of incentive schemes. Between 40 and 60 percent of all firms surveyed reported that they had never heard about these schemes. In addition to the three schemes reported in Table 15, 1-4 percent of firms participated in other programs including the Industrial Technology Assistance Program (NSTDA), the Open Lab (NSTDA), the Skill, Technology and Innovation Promotion (BOI), and the R&D Investment Promotion (BOI). Incentives offered by the National Innovation Agency—such as funds for R&D and joint ventures for innovation—are used by only a small number of PICS 2007 firms.

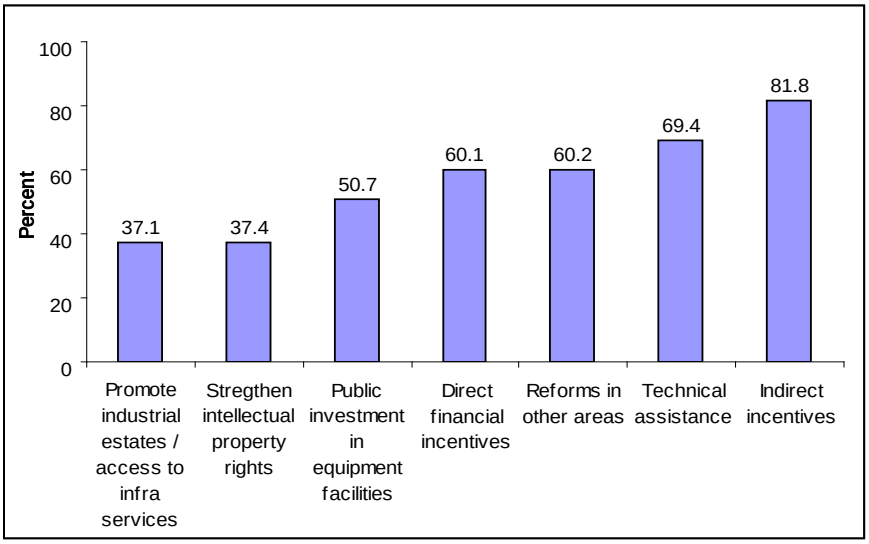
Table 15. Share of Firms Benefiting from Government Initiatives to Promote Innovation (Percent)

	Benefitted from…		Never heard of…	
	PICS 2007	Change from PICS 2004	PICS 2007	Change from PICS 2004
Science Park project (NSTDA)	2.3	+ 1.3	41.2	+ 2.9
Low interest loans for technological development in private sector (NSTDA)	1.5	0.0	45.0	+ 17.4
200% Tax reduction for R&D expenditure (Revenue Department and NSTDA)	1.1	+ 0.3	61.5	+ 18.3

Source: Thailand PICS 2004 and PICS 2007.

124. The Thailand PICS does not specifically ask firms why they do not use government schemes. But possible reasons are poor outreach program of existing government incentives, irrelevancy of incentives to firms' needs, and no demand for incentives. Figure 40 provides the frequency of response to the question "what government initiative do you view as important to promote your firm's innovation activities?" Over 80 percent of firms mentioned indirect incentives such as tax deductions; followed by technical assistance; reforms such as streamlining tax reporting processes and lifting restrictions on capacity expansion; and direct financial incentives such as subsidies and low-interest rate loans.

Figure 40. Percentage of Firms Viewing Certain Government Initiatives as Very Important to Promote Innovation



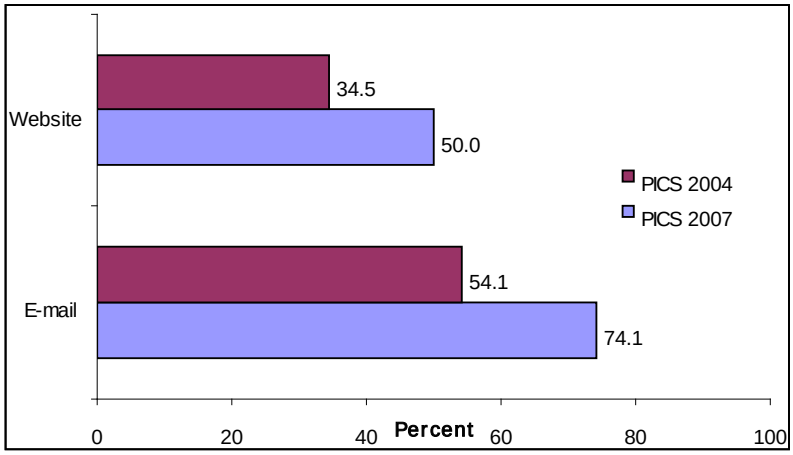
Source: Thailand PICS 2004 and PICS 2007.

MODERN INFORMATION INFRASTRUCTURE

125. This section provides information on the use of information/communications infrastructure for the diffusion of knowledge by manufacturing firms in Thailand.[60] Figure 41 shows the percentage of firms that regularly use email and Internet to correspond with their customers and suppliers. By 2007, websites and e-mails were common in about 50 and 75 percent of the firms surveyed, respectively. This more widespread use of information technology reflects, among other factors, a noticeable increase in IT investment. Planned investments in IT increased from 9 percent of total investment in 2004 to 13.7 percent in 2007 (see Figure 42). In 2007, however, firms considerably reduced their planned investment in IT.

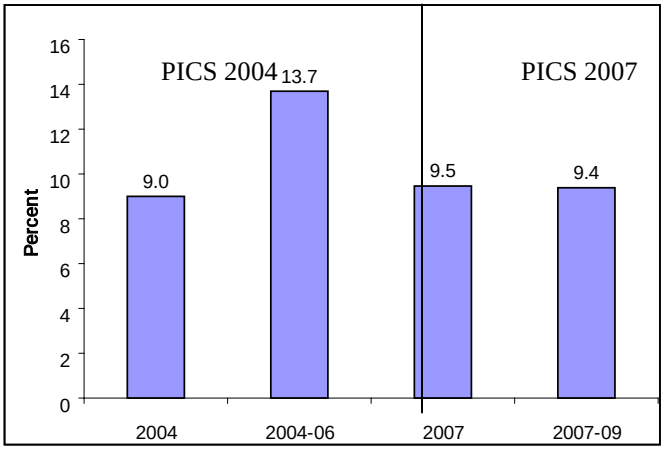
[60] The PICS contains less data on information and communications infrastructure in enterprises than on skilled labor and the innovation system.

Figure 41. Percentage of Firms Regularly Using Emails and Website to Interact with Their Clients and Suppliers



Source: Thailand PICS 2004 and PICS 2007.

Figure 42. Share of Planned IT Investments in Total Investments for Current and Future Years



Source: Thailand PICS 2004 and PICS 2007.

126. The correlation between types of firms that have extensive innovative activities—the large, foreign, and exporting firms and automotive parts, electrical appliances, and electronic components' industries which have higher-technology intensity —and those that invest in IT (Table 16) is high. Nonetheless, these enterprises planned a more moderate investment in IT in the coming years. Firms in the furniture industry generally have a very low share of IT investment. Email and Internet are not common in the textiles industry.

Table 16. Use of IT and Planned Investments in IT, by Region, Industry and Enterprise Type

	Share of planned, current IT investment		Share of planned, future IT investment		Share of firms using e-mail regularly		Share of firms using website regularly	
	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04
Thailand	9.5	+ 0.5	9.4	- 4.4	74.1	+ 20.0	50.0	+ 15.5
Bangkok and vicinity	10.5	- 1.1	11.6	- 9.2	73.0	+ 14.9	47.6	+ 12.5
Central	9.8	+ 1.4	7.0	+ 0.2	75.4	+ 19.9	53.4	+ 17.6
East	7.9	+ 2.0	9.5	- 1.8	87.2	+ 24.7	58.3	+ 15.0
North	5.9	- 2.6	7.3	- 1.8	48.2	- 1.1	38.5	+ 4.3
Northeast	4.2	- 1.9	3.6	- 5.0	64.0	+ 33.5	47.1	+ 23.5
South	6.3	+ 4.1	1.8	- 0.6	68.3	+ 37.4	44.0	+ 25.3
Auto components	14.6	- 3.3	12.0	+ 3.8	93.3	+ 25.7	67.2	+ 23.1
Electrical appliances	25.8	+ 21.8	18.6	- 4.8	69.5	+ 13.8	63.9	+ 20.7
Electronic components	22.2	+ 7.5	20.4	+ 13.5	91.7	+ 13.4	63.8	+ 12.9
Food processing	5.2	+ 0.9	6.8	- 0.5	70.8	+ 16.6	55.5	+ 15.3
Furniture	3.5	- 2.3	2.2	- 7.9	75.9	+ 35.1	56.4	+ 37.2
Garments	9.6	+ 4.1	8.3	- 2.6	69.1	+ 12.0	40.1	+ 10.3
Machinery	8.3	+ 2.6	15.4	- 29.5	75.2	+ 17.2	51.8	+ 14.8
Rubber and plastics	6.1	- 3.6	6.5	- 5.8	76.8	+ 34.8	45.6	+ 16.5
Textiles	8.6	+ 5.3	8.0	- 0.5	53.6	+ 11.7	38.0	+ 14.3
Small	6.9	+ 1.9	8.6	- 19.1	61.6	+ 31.2	33.5	+ 17.4
Medium	9.8	- 1.7	9.1	- 5.3	75.0	+ 22.9	53.3	+ 22.5
Large	10.6	+ 2.1	10.3	+ 2.8	88.3	+ 18.6	66.2	+ 17.5
Foreign	16.2	+ 2.4	10.5	+ 3.6	92.9	+ 17.3	58.2	+ 6.8
Domestic	8.6	+ 0.7	9.2	- 6.0	71.8	+ 21.0	48.9	+ 17.0
Non-exporting	8.7	+ 0.5	9.0	- 5.7	59.1	+ 22.5	35.2	+ 16.0
Exporting	10.1	+ 0.6	9.6	- 3.4	90.6	+ 23.2	66.2	+ 20.2

Source: Thailand PICS 2004 and PICS 2007.

127. In general, most managers think that IT investments yield reasonable rates of return and that adopting IT helps to enhance productivity. But they are reluctant or unable to introduce or expand IT usage. The main reasons are the high cost of IT equipment and maintenance and the lack of skilled human resources. Table 17 also shows that the percentage of firms viewing these constraints as very important increased significantly from 2004 to 2007. This could explain the declining share of IT investment planned for the future in PICS 2007.

Table 17. Percentage of Firms Viewing Certain Constraints to Introducing or Expanding IT Use as Very Important

	PICS 2007	Change from PICS 2004
Lack of knowledgeable and trained IT personnel	50.9	+ 14.8
Lack of experienced consultants to provide or design IT-based solutions system	49.1	+ 13.1
High cost of IT equipment and maintenance	44.3	+ 25.8
Low returns to investments in IT	23.8	+ 11.0
IT-based systems do not improve productivity	20.2	+ 5.4

Source: Thailand PICS 2004 and PICS 2007.

CONCLUDING REMARKS

128. Shortage of skilled labor remains a key business constraint in Thailand. Qualified professionals are harder to find, and both skilled and unskilled production workers are scarce compared to countries with similar development level. The extent of shortages varies across industries but is less severe among foreign firms. Many job vacancies arise because applicants lack basic and technical skills that firms require. Managers are particularly dissatisfied with English proficiency and IT, numerical skills, and the creativity of their employees. There is a high turnover of new recruits and this discourages firms from providing training. The lack of skilled staff limits the efforts made by enterprises to innovate. The contribution of public and private institutions in skills development is marginal. Enterprises do not view existing services as relevant to their needs.

129. A large number of enterprises in Thailand, especially large and foreign firms and those in the high-tech industries, are innovating through activities such as upgrading machinery and existing product lines. In that regard, Thailand compares favorably with other counties. But more sophisticated activities such as introducing new technology or product type, are carried out by less firms. R&D spending is low by international standards. A large number of firms in Thailand develop technology in-house or with clients and machinery suppliers but manufacturing relies predominantly on technology embodied in imported machinery and equipment. Universities and public institutions play a more limited role in generating new technology in Thailand than in other comparable economies. Business services to support innovation, such as engineering, design, and IT services, are now widely available but their quality has not improved. Finally, only a limited number of firms benefit from government initiatives and other incentive schemes.

130. Information technology tools such as the email system and Internet are widely used, especially by large and foreign firms and firms in the high-tech industries, which are also firms that undertook more innovation. There was a large planned increase in IT investment in 2004 but not in 2007. Increasing staff skills and reducing IT costs are considered important to encourage more investment in IT.

131. The Thai government has introduced various initiatives to improve the quality of the labor force. At the secondary education level, it has allowed new school designs

including independent private schools; ICT schools integrating computers in teaching and learning; and bilingual schools. Recent measures have been adopted to upgrade teacher standards by focusing on education management and curriculum change, and to improve labor skills and vocational schools. It would be helpful to concentrate on further areas where improvements are needed (World Bank, 2006b). Instructional resources and teaching aids remain in short supply. The government should also consider strengthening internal and external quality assurance mechanisms in schools; decentralizing authority to schools to increase their accountability for student performance; and better targeting of student loan schemes. Many students in general have a strong preference for universities over vocational or technical schools; and university graduates are more valued, both socially and financially, in local labor markets. The government should create more career opportunities and paths in vocational schools.

132. The tertiary education level is where the main challenge lies. The cabinet has approved a 15-year tertiary education framework (2008-2022) focusing on knowledge and innovation. Thailand's government has been successful in designing and passing the regulations required to modernize its higher education system and make it more efficient. It now needs to focus on implementing these policies and on education the public, and the academic community, about the advantages of a more decentralized and autonomous system. These advantages include having the potential to engage in fruitful collaboration with industry, encouraging entrepreneurial endeavours from faculty to attract external funding, and promoting cross-institutional, cross-border, and interdisciplinary partnerships from maximizing outputs.

133. The Government has made many efforts to enhance science and technology in Thailand. First, the government recently adopted a proposal by the National Research Council of Thailand (NRCT) to reform the national research system. This proposal uses a national research project management approach for the management of public research budgets; it strengthens the cooperation between NRCT and other public research funds; it introduces a 'dominant player model' in which only one public agency coordinates research efforts in the public sector and it changes the role of public units from conducting to facilitating research done by other parties. Second, the Cabinet also approved a draft law on science and technology which will set up an institution that will coordinate local and foreign science and technology agencies. Third, the Cabinet also recently approved a promotion plan for 2007-2011 for small and medium-sized enterprises (SMEs) to provide incentives to move toward knowledge-based business; it adopted a five-year strategy to develop robotic technology and automation systems; it established an excellence centre in Physics, and has a project to enhance technological capabilities in the electronics industry. More emphasis is placed on attracting foreign investment to transfer knowledge locally. A decision on a new Board of Knowledge Investment (or on broadening the existing functions of the Board of Investment to include knowledge-based investments) is under review.

134. The government could usefully examine what other countries such as South Korea or Finland have achieved. The South Korean three-year plan has five parts: expanding human resources, enhancing science and technology, developing information infrastructure, developing knowledge-based industry, and eliminating the digital divide.

To achieve these goals, five working groups were established. They involve 19 ministries and 17 research institutes. In Finland, the government clearly stated that it would fund basic and applied research while the private sector should be more involved at the commercialization stage. R&D was first developed through government institutes; the aim was to adapt imported technology to local needs. More R&D is performed by the business sector as the industrial sector expands.

135. In Thailand, at the supra-ministerial level, the National Research Council of Thailand (NRCT) and the National Science and Technology Policy Committee (NSTC), are responsible for the coordination of all national technology policies. These two agencies are not seen as effective in coordinating innovation policies and at providing a vision for innovation and technology (World Bank and NESDB, 2008). This is partly because the private sector is not sufficiently involved in the formulation of policy. This is in contrast to Finland's Science and Technology Policy Council, which is chaired by the prime minister and comprises of representatives from key ministers and the business community, trade unions, and civil society. Such coordinating agencies should be well funded, flexible and focuses entirely on supporting innovation-related projects (World Bank 2007).

136. There are close to 50 fiscal incentives from the Thai government to promote innovations in enterprises. However, their collective impact is rather disappointing because these schemes are uncoordinated. They are designed and provided by different ministries, each with own mission and objectives. In some cases, these incentive schemes are too narrowly defined and benefit only a small number of firms. In other cases, collaterals are required by many loan schemes and limit access for start-up enterprises. The government could study the Finnish, South Korean and other systems to coordinate science and technology policy and increase the impact of its support of innovation.[61]

137. Effective innovation systems generally rely on close collaboration between universities, research institutes and manufacturing firms. To strengthen these linkages, the government could study several measures such as giving greater authority to universities to manage their personnel policies (so they can compete for high-quality students and staff); providing funding for basic research to leading universities; establish science parks and incubators adjacent to universities; create intermediary organizations with representatives from universities, the private sector, and government to help bridge the information gaps between users and developers of technology; or offering matching funds, as in Finland, for universities and companies that work together on specific research and technology projects (World Bank, 2007).[62]

[61] See in particular, Hatakenaka (2008).

[62] World Bank and NESDB (2008) describes in more detail how successful intermediaries are set up, managed, and financed in the US, UK, Canada, and Japan.

5. IMPROVING THE REGULATORY FRAMEWORK

138. A regulatory environment conducive to business would help enhance business productivity and investment. The latter are much needed for Thailand to sustain economic growth in the medium term. A regulatory framework includes not only regulations but also a bureaucracy to comply with these rules. A good regulatory framework promotes competition and does not impose high fees. The lack of restrictions on competition ensures that productive firms remain in the market. Reasonable costs allow businesses more time and resources to improve their productivity. Moreover, this framework allows smaller firms with less capital to join and operate in the sector. Regulations that firms commonly deal with entail tax administration, customs, and labor legislation. The simpler, efficient and more predictable these procedures are, the more time and resources firms will have for other productive activities.

139. This chapter reports what enterprises have to say about regulatory issues and examines actions that the government has taken to address some of them. In PICS 2004 and PICS 2007, firm managers cited regulations as one of the top three major obstacles to business operations and expansion. Section 1 of this chapter presents their perceptions of regulations in Thailand. Section 2 presents the responses to in-depth interviews with firm managers about the regulatory issues they are concerned about as well as the implementation of the regulations by the relevant government agencies. Finally, section 3 puts forth policy recommendations.

REGULATIONS: RESULTS FROM THE PICS

140. Judging by the subjective perceptions of enterprise managers, the regulatory framework in Thailand has worsened significantly since the early 2000s. Firms of all sizes report that regulations in the four areas surveyed – tax administration, customs and trade regulations, business licensing and operating permits, and labor regulations – have become more burdensome in PICS 2007 compared with PICS 2004 (see Table 18).

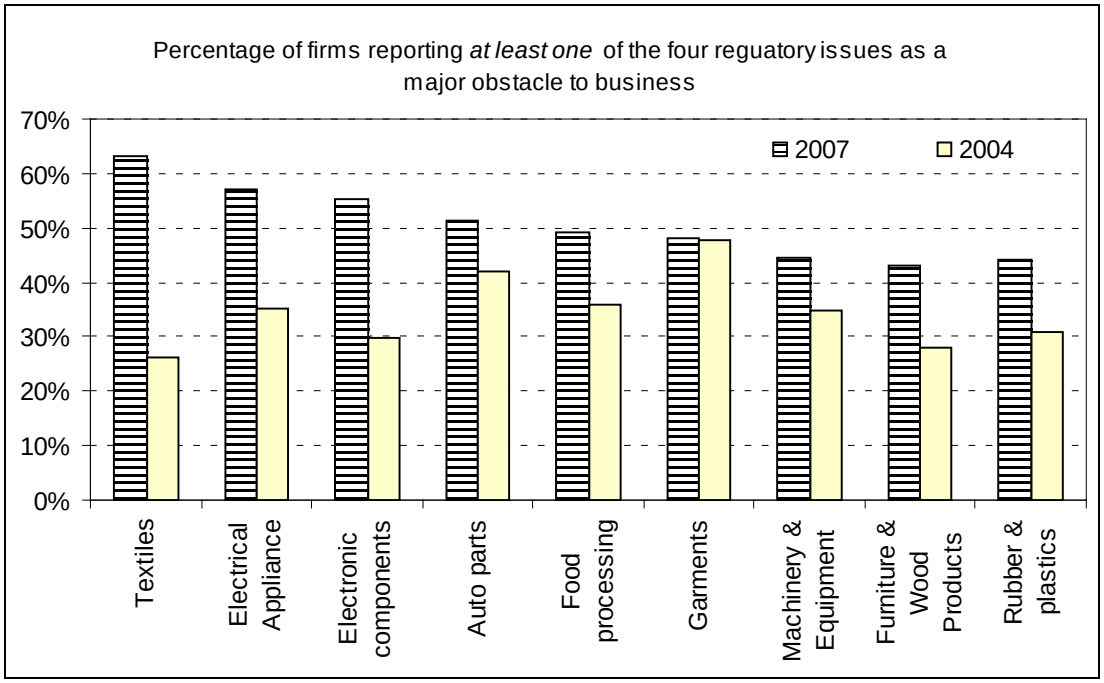
141. In PICS 2007, a significantly higher share of firms in all nine industries surveyed stated that at least one of the four regulatory issues was a major obstacle to their operations and expansion. The garment industry was an exception. This industry reported the severity of these obstacles remained unchanged compared with PICS 2004. Nevertheless, almost half of garment firms have cited at least one regulatory issue to be a major or severe obstacle to doing business (see Figure 43). In PICS 2007, industries that reported the greatest regulatory burden were the following: electronic components, electrical appliances, and textiles. These same industries recorded the greatest increase in regulatory burden from PICS 2004 to PICS 2007. In particular, they cited regulations associated with tax administration and customs and trade regulations.

Table 18. Firms' Perceptions of Severity of Regulatory Burden, by Firm Size
(Percent of Firms that Cited Each Regulatory Issue as a Major Obstacle to Operations and Expansion)

Regulatory Issues	All 2007	Change from 2004	Small 2007	Change from 2004	Medium 2007	Change from 2004	Large 2007	Change from 2004
Tax administration	34.8	12.5	21.3	15.4	36.7	8.6	36.5	14.1
Customs and trade regulations	23.2	3.4	12.7	2.7	15.4	5.3	33.3	8.3
Labor regulations	20.8	9.4	10.7	9.2	19.9	9.6	22.8	10.5
Business licensing and registration	12.2	4.8	6.1	7.6	13.7	0.2	14	7.2

Source: PICS 2004 and 2007

Figure 43. Percentage of Firms Reporting At Least One of the Four Regulatory Issues as a Major Obstacle to Business



Source: PICS 2004 and 2007

142. The regulatory issues perceived by firms to be the most burdensome are tax administration. Customs and trade regulations are next, then labor regulations, and finally the bureaucracy associated with obtaining business permits and registration. One third of firms surveyed in PICS 2007 cited tax administration as a major obstacle to business operations and expansion. Around one-fourth of firms indicated that customs and trade regulations are severe obstacles to doing business (see Table 18). A higher proportion of

firms reported regulations were a severe burden in PICS 2007 compared to PICS 2004. For example, in 2007, tax administration was 12.5 percentage-points higher and labor regulations 9.3 percentage-points higher than in 2004. In PICS 2007, 12 percent of firms complained about the length of time and bureaucracy it took to register and obtaining business permits compared to 7.4 percent in PICS 2004.

143. The higher tax administration burden is due to the greater number of days it takes firms to interact with tax authorities, particularly the Revenue Department. In PICS 2007, firms reported they spent an average of 8 days dealing with the Revenue Department as compared to 1.7 days in PICS 2004. That included time to interact with the Revenue Department in filing taxes and tax refunds and respond to inspections by Revenue Department officials. In the follow up in-depth interviews, managers mentioned the Revenue Department made more frequent inspections in recent years and it took longer for them to resolve delays in VAT refunds (see next section for a more detailed discussion).

144. Customs and trade regulations were also of greater concern, particularly for larger firms and those in the export business. In PICS 2007, one third of large firms stated that these regulations are a major obstacle to their business operations and expansion, compared to one-fourth in PICS 2004. These large firms engage in exports; they have reported a higher regulatory burden compared to non-exporting firms. The following industries reported that customs and trade regulations are major obstacles for them: electronic components, electrical appliances, and food processing. More than half of the firms in the food processing industry export. In-depth interviews with food industry managers revealed that trade regulations are major obstacles for them, particularly the standards imposed by importing countries. They would like the Government to assist them by providing updated standards and by reducing what they view as unnecessary testing procedures.[63] Firms in other industries reported increased delays in tax refunds on imported inputs. Moreover, firms are sometimes unsure of the Harmonized System (HS)[64] codes to be used for imports/exports. This has implications for tariff payments and tax refunds (see next section for more discussion). This is particularly important for import-intensive export industries such as electronic components and automotive parts.

145. Firms reported that customs clearance of imports took longer in PICS 2007 than in PICS 2004. This uncertainty affects their ability to plan. Firms in the nine industries surveyed said it took 5.2 days on average to clear customs for imports in PICS 2007 compared to 4.6 days in PICS 2004. However, the number of days varied by industry. Automotive parts took an average of 7 days to clear import customs compared to 4.6 days in 2004; the garment industry also increased from 4 days to 5.8 days during the same period (see Table 19). Standard deviations for these industries went up and so did the uncertainty. In PICS 2007, the automotive parts industry, for example, took 7 days on average to clear customs, but it could take up to 16 days (the deviation from the average is 9 days). In PICS 2004, by comparison, the average was 4.5 days and the deviation was

[63] Food product exports, for example, are tested once in Thailand before it is exported and again at the export destination.

[64] The Harmonized System (HS) is an international product classification system. Each product has an HS code to which tariff rates are assigned.

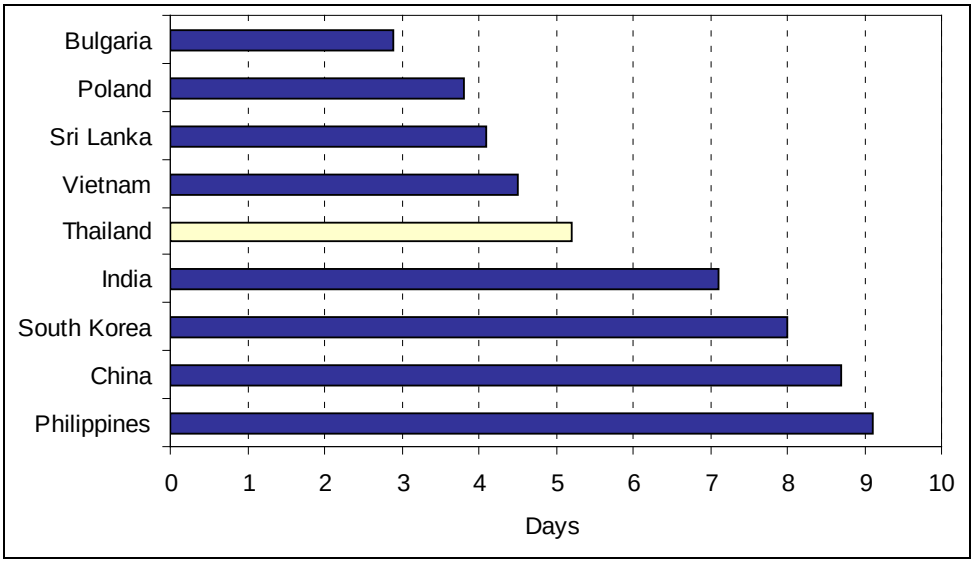
only 5.3 days. It takes less time to clear customs in Thailand than in the Philippines, China, South Korea, and India, but more time than in Sri Lanka, Vietnam and most Eastern and Central European countries (see Figure 44).

Table 19. Average Number of Days, and Deviations from the Average, to Clear Customs for Imports

	2007	2004
All Industries	5.2	4.6
Standard deviation (days)	7.0	7.7
Garments	5.8	4.0
Standard deviation	10	5.0
Auto parts	7.0	4.6
Standard deviation	9.0	5.3
Food processing	5.6	4.0
Standard deviation	8.4	4.5
Electronic components	4.0	3.2
Standard deviation	4.3	3.7
Electrical Appliance	2.4	4.7
Standard deviation	2.3	12.6
Textiles	5.0	4.4
Standard deviation	6.4	5.3
Rubber & plastics	5.8	10.2
Standard deviation	6.7	17.7

Source: PICS 2004 and 2007

Figure 44. Cross-Country Comparison of the Average Number of Days for Imports to Clear Customs (Days)

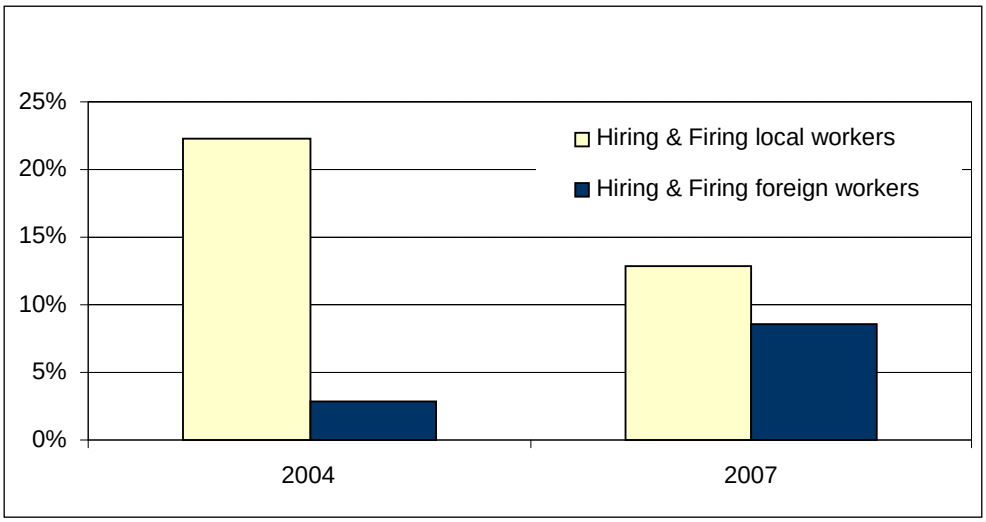


Source: Global PICS 2002-2005, Thailand PICS 2007

146. Customs clearance of exports in Thailand, on the other hand, is relatively fast, indeed faster than in most other countries for which surveys exist. Export clearance took an average of 1.5 days in PICS 2004 and PICS 2007. With a deviation of only 1.5 days, exports clearance could take at most 3 days on average. Clearance of exports takes 1 to 3 days for firms of all sizes in all nine industries. This compares favorably to 70 other countries surveyed, and Thailand ranks as one of the countries with the fastest export customs clearance.

147. Labor regulations, particularly those relating to hiring foreign workers, posed a greater constraint for firms in PICS 2007 than in PICS 2004. In PICS 2007, one-fifth of firms reported that labor regulations were a major obstacle to their operations and growth. That figure doubled from PICS 2004. In PICS 2007 more firms were concerned about regulations relating to the hiring of *local* workers than to *foreign* workers. However, that same year more firms reported that regulations related to hiring foreign workers were major constraints to doing business compared to PICS 2004 (see Figure 45). The industries in which most firms report that labor regulations were major obstacles are labor-intensive industries such as food processing and garments. Both industries hire large numbers of migrant workers. In these industries, the share of firms concerned about hiring foreign workers has risen by almost 10 percent.

Figure 45. Percentage of Firms that Cited Hiring and Firing as Major Obstacles to Business, PICS 2004 and 2007



Source: PICS 2004 and 2007

148. Based on reports, the amount of time required to obtain operating permits and certifications was more burdensome in PICS 2007. Mainly that was because of greater uncertainty about the number of days it would take. It took firms 21 more days on average to obtain permits and certifications from the Department of Industrial Works (Ministry of Industry), in 2007 compared to 2004, and 19 and 16 more days from the Ministry of Commerce and local authorities, respectively (see Table 20). The time taken was particularly long for firms in the food processing, garments, furniture and wood products, and electrical appliance industries, which average around 30 days. Moreover, the uncertainty about the time it takes to get permits and certifications has also risen. In PICS 2004, firms took up to 12 days more than the average of 22 days to get the permits and approvals from the Department of Industrial Works. In PICS 2007, they could take up to 35 days more than the average of 33 days. Similarly, the uncertainty about the time taken to obtain permits and certifications from the Ministry of Commerce and local authorities is higher. The uncertainty in obtaining permits and certifications from local authorities is higher for firms in the garments and automotive parts industries compared to other industries (21 and 27 days, respectively). The uncertainty in obtaining the permits and certifications from the Ministry of Commerce and the Department of Industrial Works is highest for firms in the furniture and wood product industries compared to that of other industries 25 and 81 days, respectively.

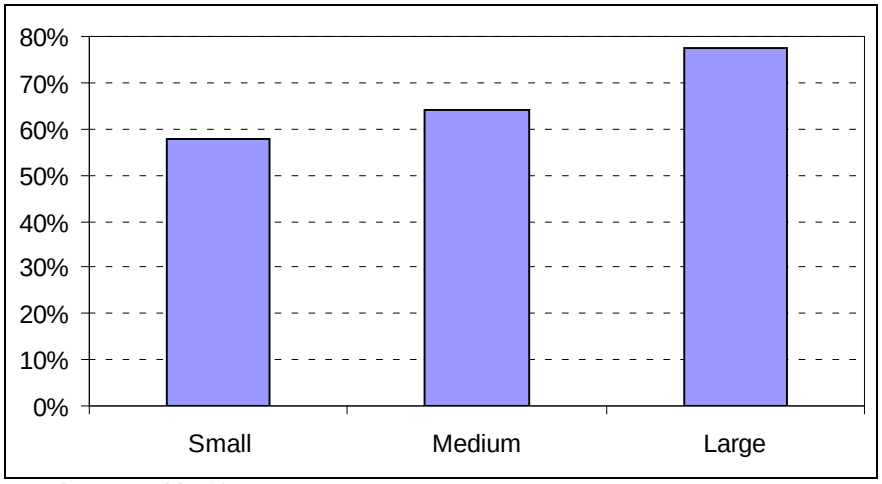
Table 20. Average Number of Days to Obtain Operating Permits and Certifications

	Ministry of Commerce		Department of Industrial Works		Local Authorities	
	2007	**2004**	**2007**	**2004**	**2007**	**2004**
Days	26.3	6.9	33.0	12.0	18.8	2.9
Standard deviation	20.4	16.7	35.0	20.0	17.0	9.6

Source: PICS 2004 and 2007

149. On average, the amount of time to obtain permits, approvals and certificates to start a business has declined, but that varies by industry. Firms in the nine industries reported that to start a business, they needed to obtain an average of four permits, licenses, approvals, and certificates. Most of these were from central government agencies such as the Ministry of Commerce and the Department of Industrial Works. A significantly higher proportion of firms are using agents to help them deal with these uncertainties. During in-depth interviews, firms said one reason it took such a long time to obtain permits and certificates was because they needed to contact several government agencies and were subject to several different inspections (see Section II for a detailed discussion). As a result, in PICS 2007, more than 65 percent of firms used agents to help them process their permits and approval requests compared to eight percent in PICS 2004. This is particularly true for large foreign firms engaged in exporting (see Figure 46).

Figure 46. Firms' Use of Agents to Help Process Licenses, Permits, and Approvals (Percentage of Firms)



Source: PICS 2007

QUALITATIVE INFORMATION FROM IN-DEPTH INTERVIEWS

150. In-depth interviews of firms and government agencies in 2007 provided more detail and a better understanding of the regulatory issues that concern businesses. Qualitative interviews of firms, industrial associations and technical institutes in the food processing, garment, and automobile parts industries took place in the latter half of 2007.[65] The relevant regulations and their implementation were then verified by deskwork and interviews with the relevant government agencies. In total, 32 firms of various sizes and from different geographic regions were interviewed; seven individuals from industrial associations and technical institutes and seven government agencies were too (For as list of the types of firms, individuals, and government agencies interviewed, see Annex 4).

[65] These three industries were selected because they had reported the highest regulatory burden in PICS 2004. Moreover, they represent a good cross-section of the Thai industrial sector that they are technology-based (auto-parts), resource-based (food processing) or labor-intensive (garments).

151. Consistent with the PICS 2007 results, these interviews indicated that tax administration, customs regulations, and bureaucracy were the regulatory issues that firms found to be the most burdensome. Recent uncertainties associated with the direction of public policy had also affected their investment decisions in a negative way. More than half of the exporting firms that participated in the in-depth interviews expressed concerns about obtaining value-added tax (VAT) refunds and import tax refunds[66]. Firms were also concerned about the length and uncertainty of time it took to interact with the Revenue Department and the Customs Department and about the uncertainty surrounding the tax amount they owed. These uncertainties are also a result of the bureaucracy involved in contacting these agencies. The uncertainty surrounding public policies also affected firms' operations and their decision to invest. Ultimately, this uncertainty resulted in changes in the regulations or their enforcement.

152. Firms reported delays in VAT refunds and that the refunds covered only part of their expenses. VAT collection and refunds are administered by the Revenue Department. Exporting firms pay the VAT when purchasing goods to produce products for export. After that, the VAT can be refunded by the Revenue Department. The Department's guideline for VAT refunds is a maximum of 90 day after filing (see Table 21). The time for refunds may be longer if there are errors in the documents submitted or if the firm is suspected of tax evasion. However, several managers who were interviewed, particularly those in the garment industry, reported that VAT refunds usually take longer than 90 days. A few observed that the delays occur when the refund amount is large (generally greater than Bt100, 000). Others observed that delays happen when the firm has other unresolved tax issues with the Revenue Department such as those involving corporate income tax payments. Moreover, firms noted that VAT refunds only cover inputs that make up the finished product. In the garment industry, for example, fabric that is lost during the tailoring process (which can amount to up to 20 percent) is not eligible for a VAT refund.[67]

Table 21. Number of Days to Obtain Value-Added Tax Refunds from the Revenue Department

Types of Exporters	Number of Exporters	Number of days to get refunds if filed through the Internet	Number of days to get refunds if filed at Revenue Department Offices
Good exporters	500	15	45
Registered exporters	1,400	30	60
General exporters	9,300	90	90

Source: RTG, Revenue Department

[66] These are the refunds that firms are entitled to receive on inputs for the production of exports.

[67] In producing 10 kilograms of shirts, up to 2 kilograms of cloth may be lost at the cutting stage (depending on shirt style).

153. Inspections by Revenue Department Officials have become more frequent in the past two years, but officials are more knowledgeable and courteous. Managers observed that visits by officials from the Revenue Department have been more frequent in the past two years. During inspection, firms are required to produce up to three years of financial documents and accounts and they are contacted again if the documents are unclear. This paperwork is time consuming for firms; it can range from eight to 17 days per year according to PICS 2007. Some firms also observed that visits were more frequent in years when the economic performance is low and revenue collection falls below government targets. On a positive note, Revenue Department officials have become more knowledgeable and courteous; they explained tax requirements and procedures more clearly and were more courteous in their interactions with firms, especially smaller ones.

154. Import tax refunds also take a long time. On the other hand, generally firms do not use resources that the Customs Department has for immediate tax refunds. Firms are entitled to receive import tax refunds for inputs into the production of exported products. The Customs Department administers the collection of import tariffs and refunds. It has a guideline of a maximum of 30 days for tax refunds. However, refunds may take longer if the documents contain errors or a firm is suspected of tax evasion. Exporters and importers who have a good track record and hold the Custom Department's "Gold Card" have the right to request immediate tax refunds. Exporters who use the services of licensed custom brokers can also make a similar request. In such cases, the Customs Department will immediately issue the tax refunds and audit the firms later. Currently only 480 firms (or one percent of all importing and exporting firms) are in these two groups. Moreover, most of the members of the two groups have chosen not to exercise their rights to immediate import tax refunds. That is mainly because firms, particularly those who use licensed custom brokers, do not want audits by the Customs Department since they are not familiar with customs procedures. Moreover, the firms are afraid that during the audits, they may be required to produce back-dated documents—which is time consuming. Hence, most exporting and importing firms in Thailand go through the normal channel of tax refunds. This represents a large workload for the Customs Department and can lead to delays in tax refunds at certain times.

155. Firms in certain industries are unclear how to categorize goods in a way that is acceptable to the HS. Clarifications take a long time. Firms, particularly in the automotive parts and garment industries, reported they are unclear and/or uncertain about the identification of HS codes by the Customs Department. These have affected the amount of tariff they paid and their refunds. Automotive parts firms have said they were sometimes unsure about which HS code to use for imported goods and sought clarification from the Customs Department. However, it could take up to six months to get a response. This situation poses a major uncertainty for firms (and in some cases resulted in penalty for misdeclaration of goods). Although there is a rigorous appeals system that firms can turn to in case of disputes in product categorization, firms prefer not to go through this time-consuming process. They would prefer a more rapid and clearer response in the categorization of goods from the Customs Department.

156. Of major concern were bureaucratic procedures that required contacts and inspections by multiple government agencies; these were necessary to obtain business

permits and approvals. In establishing a food processing factory, for example, firms must obtain permits from several agencies such as the Department of Industrial Works and local administrations. The information requested from these agencies is similar, but firms need to produce separate documents and visit each agency to submit them. After a factory is established, it is inspected at different times by various government agencies to validate or extend the business permits and approvals. For food processing, for example, agencies include the Department of Industrial Works, Department of Livestock Development, and local administration. Firms would prefer the inspections to be done at the same time. Moreover, having inspectors from the different agencies present at the same inspection could also help resolve some discrepancies in their inspection results. Firms reported that the same product can be evaluated differently by different agencies, making compliance difficult. Then they must seek clarifications from each agency, which is time-consuming. Another reason cited for the discrepancies in inspections is that operating permits can be issued by one agency while inspections are conducted by another. Hence, sometimes compliance with the requirements is not acceptable by all inspecting agencies. Better coordination of government agencies would greatly reduce the bureaucratic burden on firms to validate and extend their permits and approvals.

157. Obtaining certification of standards also requires contacting many agencies. This is a special concern for the food-processing industry because there are many ingredients in processed food that need to be certified by several agencies. An example is the standard certification of barbecue sticks. These sticks contain meat, seafood, and vegetables, which involves visiting up to four agencies for certification – the Department of Livestock Development (for meat), the Department of Fishery (for seafood), the Food and Drug Administration (for vegetables), the Department of Agriculture and the Ministry of Industry (if it is packaged in a can). Contacting multiple agencies takes time and the time taken for certification by each agency is different and uncertain.

158. Tests carried out before standard certifications can be awarded is time consuming and costly. This is particularly true when there are changes in standards or when new products are introduced, as in the automotive industry. In the food processing industry, changes in standards in the export destination requires new tests. Given limited testing facilities, bottlenecks sometimes occur. Moreover, because the scale of production scale is small, some tests cannot be done domestically and must be done overseas—which is costly for firms. Small and medium-sized firms particularly report that testing costs are a burden. Many smaller firms turn to public testing facilities such as the automotive part testing facility administered by the Automotive Institute, a technical institute financed by the Ministry of Industry. Given the limited capacity of this institute, there can be a long wait. That is especially true when there is a change in standards or when new products are produced by many firms, e.g., in response to a change in automobile specifications.

159. In addition to compliance with specific regulations, businesses are also concerned about keeping up to date with policy changes that could affect their operations. This raises uncertainty of its own. These include overall price administration and foreign business participation policies as well as specific industrial policies affecting their future investment decisions. Because inflation is now a major concern, the Thai government has tightened price administration of over 200 products. This, in addition to the rise in

energy prices and cost of production, has led to a sharp reduction in a firm's profit margins. Moreover, sudden changes in policies create uncertainties for firms and have also resulted in firms delaying their investments. These include last year's proposed amendment of the Foreign Business Act which would tighten the definition of a foreign firm. This was not viewed as a positive signal by foreign investors. It has hurt the sentiments of both foreign and Thai firms, which was reflected in a sharp slowdown in private investment growth, particularly FDI, last year. During interviews, one example of a sudden policy change came from the automotive parts industry. In promoting the use of more energy efficient cars, the government has announced its policy to support eco-friendly cars (cars with smaller engines) by lowering taxes on them. The government later announced that cars compatible with E-20 gasohol would receive larger tax cuts. 68 This year, the government announced that it would promote the use of cars compatible for E-85 gasohol[69] by lowering their taxes. Such ever-changing policies affect the types of cars that manufacturers produce and the demand for different automotive parts. Thai auto-parts manufacturers said frequent changes in their product lines are costly and negatively affect their investment decisions in the future.

CONCLUDING REMARKS

160. Reforms aimed at streamlining the bureaucratic process and establishing predictability in the implementation of regulations would improve the regulatory framework in Thailand. This includes improving coordination between government agencies and using information and communication technologies (ICT) to help in streamlining procedures. ICT can also facilitate the timely implementation of regulations and the dissemination of information on changes in those regulations.

161. Developing better coordination among government agencies can help streamline the bureaucracy for business and reduce their economic burden. This would help reduce the time it takes for firms to deal with multiple agencies and improve predictability. It would also make the implementation of regulations consistent across agencies. Improved coordination can simply mean scheduling inspection trips to enterprises by various agencies on the same day. It could be slightly more complex and entail establishing single-window ('one-stop') service facilities, which many ministries have started. Single-window facilities for multiple ministries would be more convenient for firms. An example is the facility established for exporters by the Department of Export Promotion (DEP). It allows firms to submit a single form when requesting certificates from one of seven participating agencies, instead of having to fill out one form per agency. This has helped reduce the time to request and process certificates from one day to one hour (see Box 1 for more details). Developing and expanding the services of such windows would help reduce the number of days and increase the predictability in obtaining permits and certificates.

[68] E-20 gasohol is made up of 20 percent ethanol and 80 percent benzene.
[69] E-85 gasohol is made up of 85 percent ethanol and 15 percent benzene.

Box 1: Single Window at the Department of Export Promotion

In 2006, the Department of Export Promotion (DEP) established a single window for exporters involving multiple agencies. The goal was to help reduce the time spent by exporting firms to obtain the required documentation for export from different government departments. The DEP single-window facility is physically located at the DEP building in central Bangkok. This one location offers many of the services needed by exporters; it is also opens after normal government office hours.

The services currently offered at the single window involve the issuance of simple official documents such as exporter IDs, certificates of business registration, and certificate of origin. The official forms are available at the DEP office and on its website. Firms can submit and pick up the forms, permits, certificates and relevant documents at that single window. Some exports that require standards testing—particularly food products—can be found at this window and the results are passed on to the relevant certification agencies. The single window also has a hotline that firms can call for questions or information.

The latest initiative is the establishment of a single form which firms can use to request certificates or export documentation from agencies belonging to four ministries and one organization. The form can be used to request seven types of certificates and export documentation on line. This has primarily helped reduce the time firms need to travel to many agencies and fill out multiple forms that request similar information.

Source: Department of Export Promotion, Ministry of Commerce

162. The use of ICT would reduce the time and expense for dealing with regulatory procedures. It would also help disseminate information to firms in a timelier manner. This could greatly help save firms time dealing with relevant agencies and reduce the unpredictability they experience in obtaining services. In some cases, the cost of dealing with the bureaucracy would also be reduced; DEP's single window is an example. It has allowed firms to file requests for certificates online. Similarly, the Revenue Department has introduced online filing of tax payments and refund requests. Firms qualifying as "good exporters" are able to receive VAT refunds within 15 days after receipt of the request online (compared to 45 days if filed on paper at Revenue Department branch offices). Firms, therefore, save not only travel time and costs, but they can also reduce the time it takes to receive refunds. ICT can also be used to link firms to different relevant agencies to collect information. These agencies can update information on new or revised regulations and services on a timelier basis.

163. The use of ICT could also help reduce the bureaucracy for business and promote greater use of services. An example is the introduction of e-Customs last year.[70] When fully developed, this web-based, single-window, paperless system will allow firms to clear customs online. This should reduce the length of time and unpredictability of clearances; it should also streamline the use of customs brokers and thus reducing firm expenses. Also, when firms are able to process the customs clearance themselves, they should be more comfortable in using the immediate tax refund channel. Now firms scarcely use this resource because it leaves them subject to audits by the Customs Department. Most firms currently use customs brokers and are not familiar with customs processes and not comfortable with post-audits. Under the e-Customs system, firms

[70] In 2007, e-Exports, a part of E-Customs, was implemented at key ports and at the Suvarnnaphum Airport. It will be implemented at all ports this year. E-Imports will also be introduced this year. The current paper system will be phased out slowly.

would be more directly involved in the customs clearance process and would presumably be more comfortable with post-audits. More firms could actively use the channels for immediate tax refunds, thus, reducing their concerns about tax refund delays.

164. A stable regulatory framework helps improve business sentiments and the overall investment climate. Broader policies that discourage businesses may need to be revisited. Price administration is an example. Although it helps to slow down price increases in the short run, it hurts firms' productivity and distorts investment decisions. It also has implications for Thailand's growth and competitiveness in the long run. In general, policies which introduce uncertainties in the regulatory framework at the national or sectoral level—including proposed changes in the Foreign Business Act or changes in promotion policies in different industries—should be avoided since, in an uncertain business environment, firms delay their investment decisions (or invest abroad).

165. Civil servants and groups in the private sector have an important role to play to improve the regulatory framework. Although successful regulatory reform is largely a top-down process, civil servants and the private sector can help shape and promote reforms. In Thailand, the private sector—which accounts for a large share of output and services—has an important role to play in suggesting improvements to the regulatory framework, raising the issues with government representatives and monitoring progress. Civil servants also have an important role to play in their efforts to deliver better services to the public. If both sides work together and elevate their concerns issues to a higher level, reforms will receive broad support.

6. IMPROVING PUBLIC INFRASTRUCTURE

166. This chapter presents the responses given by enterprises in PICS 2007 regarding four public infrastructure sectors – transport, electricity, water, and telephone – as well as some concluding remarks about a possible policy agenda for these areas.

167. From 1998 to 2003 public investment spending in Thailand shrank. No significant investment in public infrastructure has occurred since the financial crisis of the late 1990s. The percentage of firms reporting inadequate and/or unreliable public infrastructure services as a major obstacle for business in all four sectors – transport, electricity, water, and telephone—was larger in 2007 than in 2004. Firms in the Northeastern, Southern, and Northern regions of Thailand face greater infrastructure constraints than other regions.

168. Inadequate and unreliable infrastructure causes high operational and logistical costs for enterprises; it is also a bottleneck for future growth. Unreliable infrastructure services—such as power outages that reduce capacity —also lower the incentives to invest. New public investment in infrastructure projects that have high expected rates of returns would help to alleviate these constraints, reduce business expenses enterprise costs and induce firm investments. Many private firms would participate in these projects as consultants, contractors or partners in public-private partnerships (PPPs). These infrastructure projects are also likely to create opportunities for property developers in connection with the mass transit system and rail track areas.

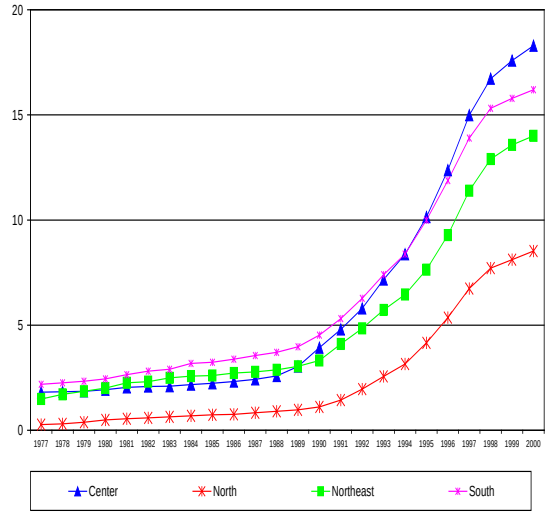
169. In the Northeast, better infrastructure services would facilitate trade and business expansion in the Greater Mekong sub-region (GMS).[71] They would promote economic activities there and trade between the Northeast and neighboring countries. As shown in Figure 47, the road network in the Northeast, which is smaller than in other regions of Thailand, is often impassable during the rainy season.[72] In the rural, mostly agricultural areas of the Northeast—where most of the poor reside—better roads and water system could help reduce farmers' production and transportation costs.[73] Infrastructure development in the Northeast, which is situated in the middle of this region (see Figure 48), would also boost economic activities and trade among GMS countries.

[71] GMS includes Cambodia, Lao PDR, Myanmar, Thailand, and Vietnam.

[72] See *Thailand Northeast Development* (2005), a joint NESDB - World Bank report.

[73] The Northeast region of Thailand borders Cambodia and Lao PDR. Home to around one-half of the poor in Thailand, this region had a poverty head-count ratio of 16.8 percent in 2006.

Figure 47. Length of Rural Roads (Per 100 Square Kilometers)



Source: Northeast Development Report (2005), NESDB & World Bank

Figure 48. Greater Mekong Sub-region (GMS) and Corridors

Note: The circle shows the Northeast region of Thailand

170. Additional public investments can occur without significant fiscal risks. The government has had a balanced budget since 2005 and a deficit of 1.7 percent of GDP in 2007 (The 2008 deficit is expected to reach 2 percent of GDP). Public debt has been falling. It reached 37.5 percent of GDP at the end of 2007—well below the government-imposed ceiling of 50 percent. There seems to be room for spending or borrowing for greater public investment -- without running into fiscal risks. Moreover, the government is exploring greater use of public-private partnerships (PPPs) for public infrastructure.

171. PICS 2007 shows that the quality of some infrastructure services declined from 2004 to 2007. Logistical costs as a share of total production costs, for example, have increased, particularly in the Northeast, North and South. Power outages have also become more frequent and have led to an increase in losses. The number of days it takes to obtain water connections have also increased, ditto for the duration of interruptions in water supply and telephone service. The quality of infrastructure services is the highest in Bangkok and vicinity; in comparison, the Northeast, South, and North have the lowest ratings. Electricity, water, and telephone interruptions last longer in the Northeast than in other regions. It takes firms in the Northeast longer to obtain an electricity connection. As a result, their logistical costs represent a high share of their production costs and export earnings; this share is even higher in the North. The most frequent power outages and telephone interruptions occur in the South. Firms in this region take the longest time to obtain a fixed telephone line than in other regions. The average duration of interruptions for phone and water supply services are also high in the South – though lower than in the Northeast. The most frequent water supply interruptions are in the North; firms there

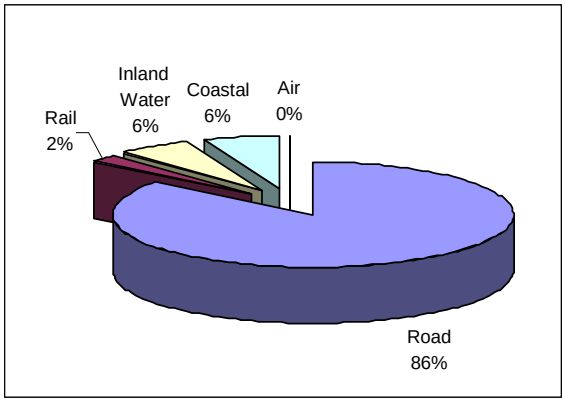
have the highest logistical cost as a share of their total production cost. Likewise, the North experiences the second longest wait to obtain a phone connection.

TRANSPORT AND LOGISTICAL INFRASTRUCTURE

172. The vast majority of domestic freight in Thailand gets transported over roads (see Figure 49). The road network is 180,000 kilometers long compared with some 4,129 kilometers of railroad. Thailand's road density is low (with a ratio of road kilometers per km2 of arable land of 0.11) compared to other countries in the region (see Figure 50). However, almost all Thai roads are paved (98.5 percent) which compares very well with lower-middle or high-income countries such as the United States (64.5 percent). However, the surface quality of major highways has deteriorated in recent years due to inadequate maintenance budgets and frequent truck violations regarding axle-load limits.

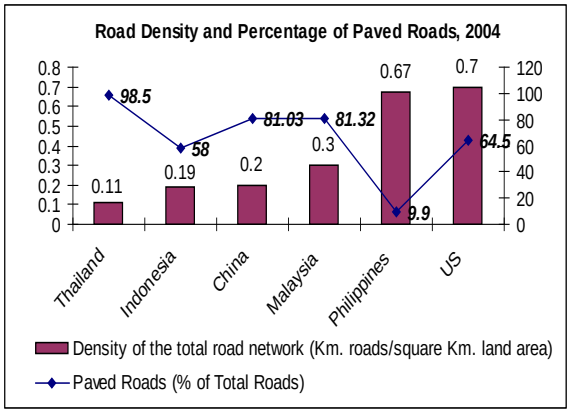
173. Rail is not widely used for the transportation of passengers or freight. The existing rail network has the following problems: The network does not cover the country's production base. Just six percent of the rail system is double or triple-track and it covers only 47 out of 76 provinces. Important routes face such difficulties as limits on capacity and quality constraints, such as sub-standard rail widths and different track configurations in the rail network. Furthermore, rail tracks have been poorly maintained, which compromises efficiency.

Figure 49. Domestic Freight by Different Modes of Transportation



Source: Ministry of Transport

Figure 50. Road Kilometers per Arable Land Area

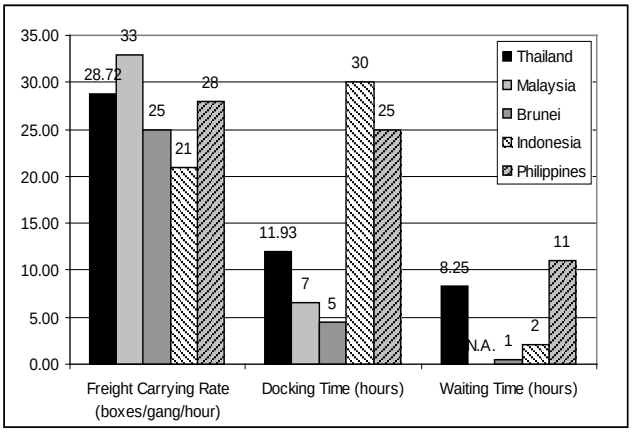


Source: IRF, World Road Statistics, 2006

174. Sea freight transport has come up to international standards, especially the Laem Chabang deep sea port. Nevertheless, authorities have paid less attention to inland waterway transportation. In 2006, coastline and inland waterways accounted for six percent of total domestic freight transport; sea accounted for 96 percent of international freight transport. There are eight international deep sea ports in Thailand; the major ones are in Bangkok and Laem Chabang in the East. In general, these ports are of good quality in terms of freight- carrying rates and docking times. However, some ports (including Laem Chabang) are operating at excess capacity; freight-carrying rates are lower and docking times are higher (see Figure 51). Other ports, notably in the South, are underused; these ports would need investment to expand their capacity and quality.

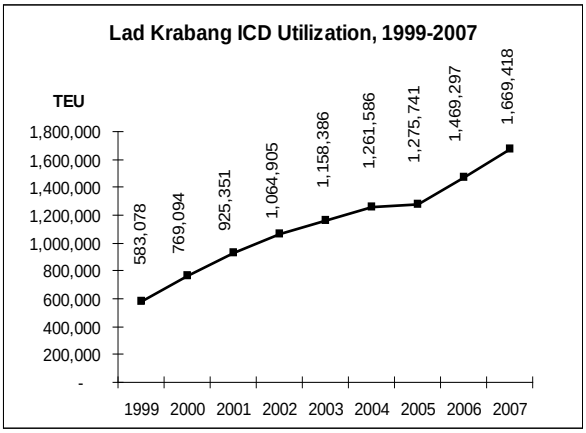
175. The inland container depot (ICD) capacity is insufficient. When the Thai economy shifted from one based on resources (e.g., logs and minerals) to an economy based on medium or high-technology merchandise for export, the pattern of freight transport also changed. Freight transport in the country has moved toward containerization as evidenced by the rapid growth in demand for ICD. Since 2001 the Lad Krabang ICD and a major ICD in Bangkok have been overused. The capacity of Lad Krabang was upgraded to 1,000,000 TEU/year,[74] but the new capacity exceeded it in 2007 when total traffic volume was more than 1.6 million TEU (see Figure 52).

Figure 51. Performance Indicators of Laem Chabang Port



Source: NESDB, A Study on Infrastructure Development Strategy for Enhancing Competitiveness

Figure 52. Lad Krabang's ICD Utilization (Twenty-Foot Equivalent Units)



Source: State Railway of Thailand

176. Businesses' logistical costs have increased, mainly due to the increase in fuel prices. [75] Secondary contributors were pressures resulting from low density and quality of roads and rail, congestion in major ports, and insufficient depot capacity. From 2004 to 2007 the production of manufactured goods grew by 20 percent, exports by 58 percent; the demand for logistics has increased as well. At the same time, because of the lack of investment in infrastructure, the supply of logistical services has not expanded at the same rate. Production establishments, located far from their domestic buyers or ports for exports—as in the Northeast, North, and South—face higher logistical costs.[76]

177. Firms, particularly in the North, Northeast, and South, report that logistical costs have risen. The average logistical cost as a share of total product costs rose from 4.3 percent in 2004 to 5.7 percent in 2007. The increase was similar for exporting firms and

[74] A "TEU" is a twenty-foot equivalent unit.

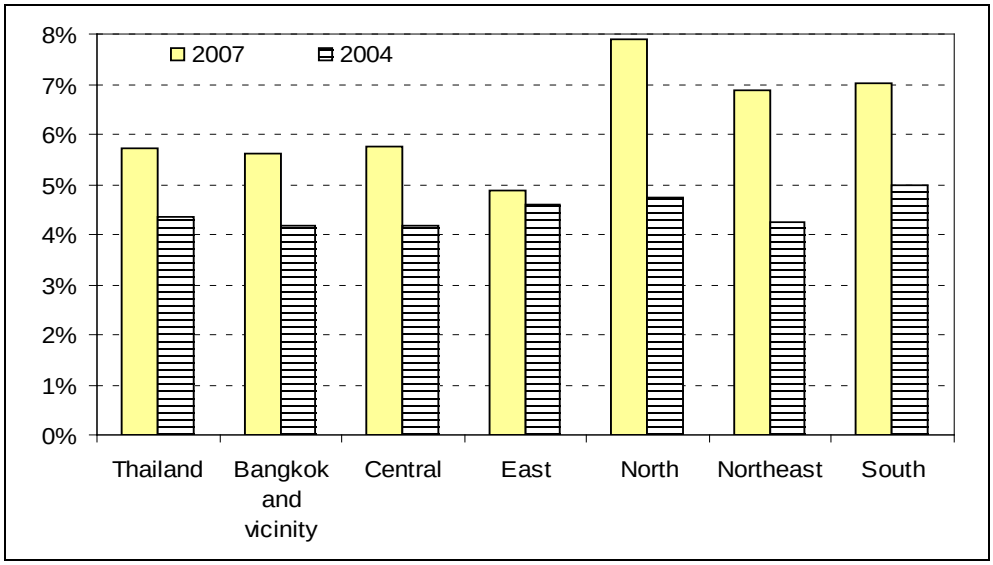
[75] The retail price of diesel increased by 76 percent between 2004 and 2007.

[76] Generally, firms are in the region where raw materials for their production are abundant. More than one-half of firms located in the Northeast, for example, are in the textile and garment industries; silk and labor are abundant there. Firms in the North are mostly in the food processing industry to take advantage of the fruits and vegetables produced there. Firms in the South are also mostly in the sea-food processing industry.

non-exporting firms. However, because of the additional export-related logistical costs in 2007, these costs were 6.0 percent for exporting firms compared to 5.5 percent for non-exporting firms, the share for exporting firms was higher than those selling domestically. Firms in all regions experienced this increase but the uptick in the East was very small. The largest increases were in the North, Northeast, and South (see Figure 53).

178. In 2007, firms in the North, Northeast, and South had higher logistical costs than other regions. In the Northeast, the higher costs occurred in the food processing, furniture and wood products, textiles, and rubber and plastic industries; the regional mean was 6.9 percent. In the North and South, food processing and furniture and wood products had the highest costs. The share of logistical costs in total production costs was lowest in the Eastern region; firms there are closer to their domestic customers and to ports and airports.

Figure 53. Share of Logistic Costs in Total Product Costs by Region

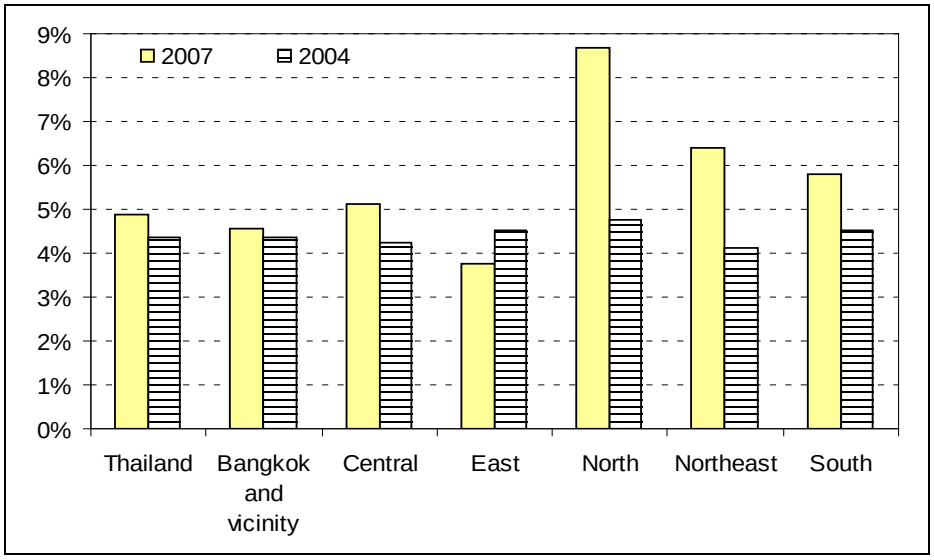


Source: Thailand PICS 2004 and 2007

179. As a share of export earnings, logistical costs in the North, Northeast, and South regions increased from 2004 to 2007. On average, the share was 4.9 percent in 2007 compared to 4.4 percent in 2004. Export firms in those three regions have the highest logistical costs as a share of export earnings compared to other regions. Their 2007 shares went up from 2004, by more than in other regions (see Figure 54). In the Eastern, Central, and Bangkok regions, the share of logistical costs to export earnings has remained more or less similar to 2004. In 2007, this share among exporting textile firms was highest in the Northeast (10 percent); in the North, in food processing (11 percent) and furniture/wood products (9 percent); and in the South, firms in food processing (7.5 percent). This is consistent with the national averages for food processing, furniture and wood products, and textile, the three industries with the highest share of logistical costs to export earnings – 7.7, 5.7, and 5.3 percent, respectively. They are also the industries in which those cost shares increased the most from 2004 to 2007 (see Figure 55). One-fifth

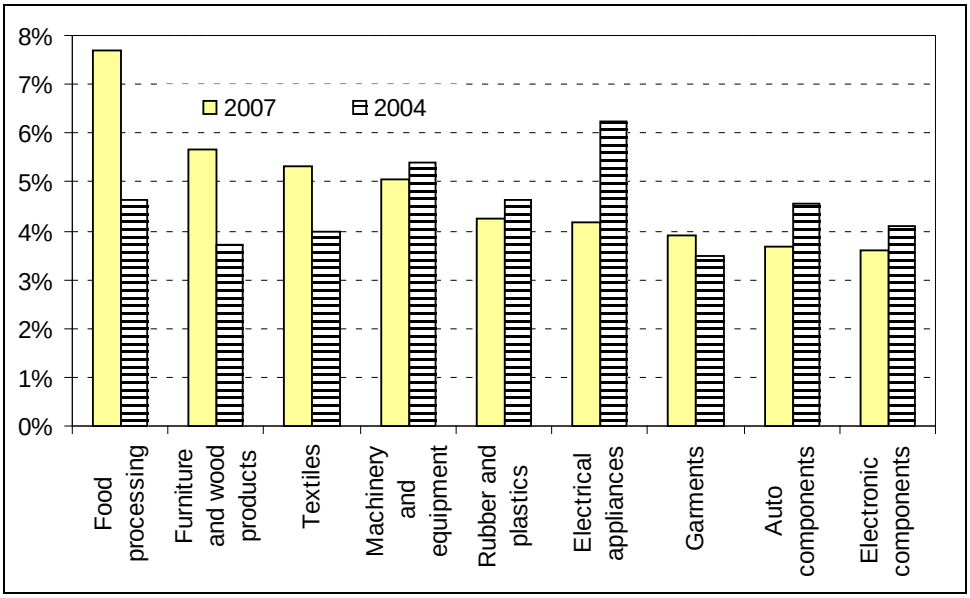
of food processing firms and one-sixth in textiles reported that the high transportation and shipping costs were an obstacle to exporting.

Figure 54. Share of Transport and Logistical Costs in Total Export Earnings, by Region



Source: Thailand PICS 2004 and 2007

Figure 55. Share of Transport and Logistical Costs in Total Export Earnings, by Industry



Source: Thailand PICS 2004 and 2007

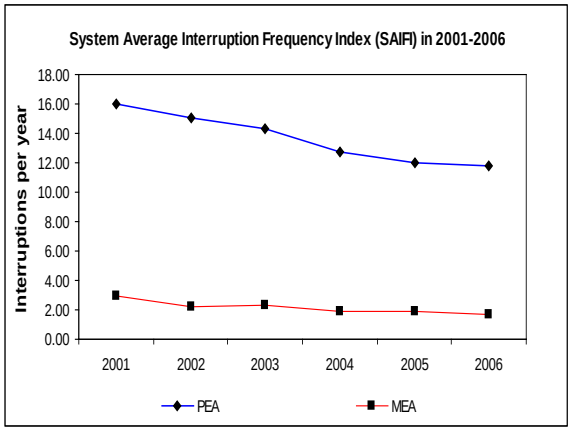
ELECTRICITY

180. The electricity network covers 99 percent of the country; more than 90 percent of the population has access to electricity. Electricity is produced by the state-owned

Electricity Generating Authority of Thailand (EGAT), Electricity Generating Company, independent power producers (IPPs), and small power producers (SPPs).[77] All the electricity that is generated is purchased by EGAT. EGAT then transmits it to the Provincial Electricity Authority (PEA), the Metropolitan Electricity Authority (MEA)[78] and to a few large consumers.[79] PEA and MEA directly distribute electricity to smaller users for industrial, commercial, and residential purposes.[80]

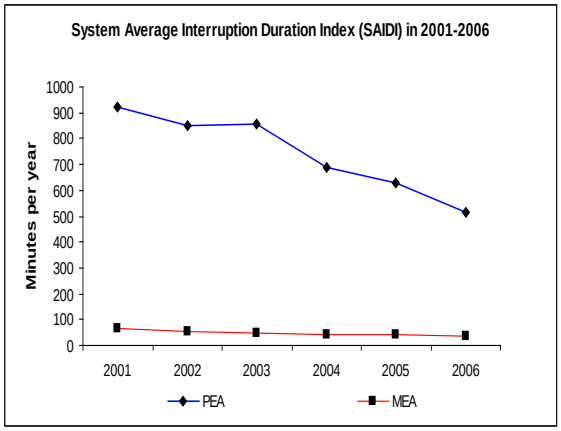
181. The overall quality of electricity service has improved, but the differences between Bangkok and other regions are high. The standard average interruption frequency index (SAIFI) and the standard average interruption duration index (SAIDI) have increased in the past few years. This indicates that the quality of electricity service has improved. The indices are much lower in metropolitan Bangkok (see Figure 56). In 2006, the SAIFI was seven times higher in the provinces (PEA) than in Bangkok and vicinity (MEA); the SAIDI was 10 times in the provinces (see Figure 57).

Figure 56. Quality of Transmission Services (SAIFI)



Source: MEA and PEA, 2006

Figure 57. Quality of Transmission Services (SAIDI)



Source: MEA and PEA, 2006

182. Data from PICS 2004 and 2007 indicate that electricity outages are most frequent in the Southern region; the duration per outage is longest in the Northeast. Table 22 shows the number of power outages was 18 times a year in 2004 and 19 times in 2007. The average outage duration declined from 2.4 hours to 2.2 hours. Businesses in Bangkok and the vicinity enjoy more reliable electrical service than other regions. Power outages from the public grid are less severe in Bangkok than other regions (about 15.5 times per year, lasting about two hours each time); they result in the lowest production loss. Power outages are most frequent in the South, where interruptions take place 52 times per year, each lasting an average of an hour. In the Northeast, there were 20 outages per year on

[77] In 2006, IPPs and SPPs generated bout 52 percent of total power. Imported electricity is very small by comparison.
[78] The MEA distributes electricity to users in Bangkok and Vicinity, PEA to the rest of the country.
[79] A few small power producers sell electricity directly to users in their neighbourhood but their share is minimal.
[80] Industry was the largest user in 2006, representing 45 percent of total consumption. The commercial sector was next at 25 percent, followed by the residential sector at 21 percent.

average, which lasted about four hours each (this duration was twice that in Bangkok). The frequency of outages is the same in the Northeast as in the East; the duration of each outage is one hour less in the East than in the Northeast.

Table 22. Time to Obtain Electrical Connection and Power Outages

	Number of days to obtain an electrical connection		Times per month experiencing power outages or surges from the public grid		Average duration per power outage or surge from the public grid (hours)		Percent of production value lost due to power interruptions from public grid	
	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04
Thailand	23.3	- 3.2	1.5	+ 0.1	2.2	- 0.2	1.8	+ 0.3
Bangkok and vicinity	23.8	- 2.8	1.3	+ 0.3	1.9	- 0.4	1.5	+ 0.1
Central	21.7	- 6.9	1.5	+ 0.2	2.4	- 0.3	2.0	+ 0.2
East	23.0	+ 0.2	1.7	+ 0.1	3.1	+ 0.4	2.2	+ 0.2
North	*14.6*	*- 25.6*	1.5	- 0.3	1.1	- 0.8	2.2	+ 1.2
Northeast	24.1	+ 7.4	1.7	+ 0.2	3.8	+ 1.8	2.0	+ 1.1
South	*50.7*	*+ 17.4*	3.8	+ 0.9	1.1	- 1.5	3.2	+ 1.7
Small	18.5	+ 0.1	1.2	+ 0.0	2.0	- 0.5	2.0	+ 0.3
Medium	21.9	- 6.5	1.7	+ 0.2	2.1	- 0.5	1.9	+ 0.3
Large	27.6	- 0.4	1.7	+ 0.2	2.6	+ 0.4	1.5	+ 0.2

Source: Thailand PICS 2004 & 2007

Note: Figures in *italics* denote samples that have fewer than 10 firms

183. Power outages have resulted in losses except when the business owns a generator. In 2007, the average loss was 1.8 percent of total production compared to 1.5 percent in 2004. The loss was highest for firms in the South where the outages are most frequent. It particularly affected food processing firms where the outages cost about 4.6 percent of total value. In other regions, losses incurred by the food processing industry ranged between 1.3 and 2.0 percent. Poor electricity service also disproportionately affects smaller firms. The latter experience less frequent and shorter power outages, but they cost more in relative terms than large firms because small firms lack back-up facilities during outages. From an international business perspective, Thailand has a small share of firms that have a power generator (except in the South where electricity is less reliable). See Table 23 which compares Thailand with a number of similar countries. In 2007, 8.3 percent of firms in Thailand (but 25 percent in the South) own, share or rent a power generator. Firms with a generator tend to use it to supplement electricity supplied by the public grid as well as a backup facility during outages. Table 23 shows that the few firms in Thailand with generators use them as an additional source of electrical power (11 percent of total power consumption, compared with an international average of 6.5 percent). This is particularly true in the food processing industry where food quality is sensitive to power interruptions. One-third of food processing businesses own generators and 20 percent of their total electrical consumption comes from them. In contrast, in South Africa, which has reliable electricity services, few firms own a generator. Those that do use it only during power outages.

Table 23. Share of Firms that Own a Power Generator in Selected Countries

	Share of firms that own a generator		Percent of electricity consumption from own or shared generator
Thailand	**8.3**	South Africa	0.2
South Africa	9.5	China	1.5
Brazil	17.0	Brazil	1.6
China	18.3	Vietnam	2.7
World mean	**28.4**	Philippines	3.7
Vietnam	34.6	**World mean**	**6.5**
Philippines	36.6	**Thailand**	**11.2**
Indonesia	39.1	Indonesia	12.4
India	63.6	India	19.1

Source: World PICS (2002-2005) and Thailand PICS 2007
Notes: The data are in 2002 for India; 2003 for Brazil, China, Indonesia, the Philippines, and South Africa; in 2005 for Vietnam; and in 2007 for Thailand. The sample used to calculate the international mean has 39 countries.

184. The time required to be connected to the grid has fallen, but it's still higher than in other countries (Table 24). On average, firms had to wait 23 days for an electrical connection in 2007, about three days less than in 2004. Except in the North and the South, where the sample size was small and results should be viewed with caution,[81] the time it takes to obtain an electrical connection was similar across all regions. Compared to 2004, the waiting time in the Central region decreased but it increased in the Northeast. In general, larger firms experienced longer delays, but the regional composition for large firms is not very different from smaller firms. From a comparative perspective, Thailand lags behind countries like South Korea where it takes only 4.2 days to be connected to the grid. Nevertheless, Thailand is in a reasonable position compared to the world average of 20 days. Once the connection is made, electricity services in Thailand are more reliable in the sense that production losses caused by power interruptions are less than the world average. The availability and quality of electrical services in Thailand is comparable to that of Vietnam, a relatively less developed country.

[81] For this question, there are only nine firms surveyed in the North and six firms in the South. The number of days changed dramatically between PICS 2004 and 2007 in these two regions; the small sample size had a significant effect on the results.

Table 24. Time to Obtain an Electrical Connection and Production Value Loss Due to Power Interruptions in Selected Countries

	Number of days to obtain an electrical connection		Percent of production value lost due to power interruptions from public grid
South Korea	4.2	South Africa	0.9
Turkey	6.1	**Thailand**	**1.8**
South Africa	6.3	China	1.9
Philippines	8.2	Vietnam	1.9
Indonesia	14.6	Turkey	2.3
World mean	**19.9**	Brazil	2.5
Vietnam	21.9	**World mean**	**3.2**
Thailand	**23.3**	Indonesia	4.2
Brazil	25.6	Philippines	7.1
India	81.6	India	9.0

Source: World PICS (2002-2005) and Thailand PICS 2007.
Notes: The data are in 2002 for India; 2003 for Brazil, China, Indonesia, the Philippines, and South Africa; in 2005 for Germany, South Korea, Turkey, and Vietnam; and in 2007 for Thailand. The sample used to calculate the world mean for days to obtain an electrical connection contains 71 countries and 67 countries for the share of lost production value.

WATER SUPPLY

185. The supply of piped water service in Thailand is the responsibility of several agencies, mainly the Metropolitan Waterworks Authority (MWA) and the Provincial Waterworks Authority (PWA). MWA and PWA are responsible for the production and distribution of water. MWA is responsible for water in metropolitan Bangkok. MWA's pipe network covered 95 percent of the area and 91 percent of the population in 2006. PWA provides water services to 73 provinces; it served 88 percent of the population of those provinces. In addition, local authorities supply non-piped water to rural populations. Some areas are also served by private water suppliers.

186. It takes 26 days for enterprises in Thailand to obtain a water connection—three days longer than in 2004 (see Table 25). Unlike electricity, access to water varies considerably by region.[82] It takes up to 41 days in the East but only 19 days in Bangkok and vicinity. The longer delay in the East could be due to the lack of physical infrastructure or it could be that one-half of the firms there are large; their size could prolong the water connection process. Connection to the water supply in Thailand takes longer than in other countries in the region. In Indonesia it takes 13 days and in Vietnam 17.5 days. In more advanced economies, such as South Africa, it takes only 4.5 days.

[82] That is when the sample size is sufficiently large. For this variable, only a few firms in the North, Northeast, and South responded.

Table 25. Time to Obtain Public Water Connection and Reliability of Water Supply

	Number of days to obtain a water connection		Times per month experiencing insufficient water supply		Average duration per time of insufficient water supply (hours)	
	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04
Thailand	25.7	+ 3.0	0.4	0.0	9.4	+ 2.2
Bangkok and vicinity	19.3	- 3.8	0.3	0.0	10.4	+ 3.2
Central	28.8	+ 0.9	0.4	0.0	6.2	- 0.9
East	40.9	+ 26.4	0.3	- 0.1	7.3	- 0.2
North	*0.7*	*- 32.8*	1.2	+ 1.1	*5.9*	*-2.3*
Northeast	*3.2*	*- 10.1*	0.2	- 0.3	22.6	+ 17.5
South	*50.0*	*+ 31.5*	0.2	0.0	17.9	+ 10.0
Small	19.2	+ 2.0	0.3	0.0	7.3	+ 0.5
Medium	22.5	- 2.3	0.3	- 0.1	12.4	+ 4.5
Large	32.9	+ 9.1	0.4	+ 0.1	8.8	+ 2.0

Source: Thailand PICS 2004 & 2007
Note: Figures in *italics* denote samples that have fewer than 10 firms.

187. Water shortages have increased from 2004 to 2007, especially in the Northeast, North, and South. In 2007, as in 2004, water shortages occurred about once every two months (see Table 25). However, the average duration of each water shortage increased from seven hours to more than nine hours. The situation is especially bad in the Northeast and South, where the duration increased by 17.5 and 10 hours, respectively. In the North, the frequency of shortages increased significantly (from 1.2 times a year in 2004 to 14 times in 2007). This could reflect a lower quality of infrastructure services. Or it could mean the supply of water declined as demand increased.

188. Firms' use of public piped water has increased sharply. Water shortages have emerged as a result of restrictions in the private use of groundwater. The share of the water supply from public sources has increased from 59 percent in 2004 to 78 percent in 2007. The supply of water from private wells (groundwater) and private services dropped by more than 50 percentage-points (see Table 26). This is particularly true for the Central and Bangkok regions. The government has discouraged the use of groundwater by businesses for environmental reasons. They have done so by substantially raising groundwater user charges which made the relative price of groundwater (per cubic square meter) higher than public sources. [83] In response, firms reduced their use of groundwater and turned instead to public water sources.[84] The purchase of groundwater from private water vendors has also declined.

[83] The Metropolitan Water Works Authority (responsible for sourcing, producing, and distributing water in Bangkok) has a target of reducing groundwater usage by 700,000 cubic meters per day.
[84] Textile firms, for example, have tended to use groundwater. Instead they have turned to piped public water. These firms are located mostly in the Central and Bangkok regions.

189. In regions where water is less widely available or reliable (Northeast, North and South), firms rely on their own water sources and private vendors. In 2007, more than 60 percent of water consumption came from groundwater and private vendors combined. Firms in the East rely least on public water sources and most on private vendors. They tend to be large firms on industrial estates in the Eastern Seaboard and they can purchase water from the estates.

190. Despite an increase in the share of public sources, the reliance on individual tanks and private vendors remains high in Thailand relative to other countries. Water from public sources accounts for 78 percent of total water consumption by enterprises, compared to 98 percent in South Africa. The share of water from individual tanks (31 percent) and private vendors (12 percent) are also higher in Thailand than in 24 other countries (26.9 and 8.0 percent, respectively).

Table 26. Water Supply Sources (in Percent)

Share of firm's water supply from…	Public sources		Own well or tank		Purchase from private vendors	
	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04
Thailand	77.6	+ 18.9	31.3	- 52.3	12.0	- 60.6
Bangkok and vicinity	93.0	+ 9.2	10.7	- 65.2	5.0	- 80.6
Central	75.3	+ 35.9	35.9	- 53.1	14.1	- 64.8
East	39.7	- 8.6	45.7	- 21.4	33.2	- 38.2
North	53.4	+ 16.3	65.0	- 26.9	3.7	+ 3.7
Northeast	58.7	+ 13.0	53.7	- 33.8	10.3	- 64.7
South	22.7	+ 8.9	87.6	- 8.2	1.9	- 13.1
Small	87.9	+ 18.5	25.7	- 63.9	9.8	- 79.8
Medium	77.0	+ 19.1	30.6	- 56.9	11.7	- 57.3
Large	65.6	+ 12.6	36.8	- 41.6	14.3	- 57.2

Source: Thailand PICS 2004 & 2007

Note: The sum of water from public sources, own wells or tanks, and private vendors do not add up to 100 percent because of the different number of respondents in each category.

FIXED-LINE TELEPHONE

191. Thailand's telecommunications sector has come a long way in terms of availability and affordability. Mobile communications dominate the telecom sector in Thailand. There are about 43 million mobile subscribers and 7 million fixed lines. Growth in the mobile market remains strong compared to a stagnant fixed market. By the end of 2007, the total number of fixed lines connected was 7.2 million, which represented 82 percent of line capacity. The tele-density rate was 11.47 lines per 100 residents.[85] The penetration rate has been sluggish in recent years; during the five-year period of 2001-2006, it increased 2.3 percent. This increase was due mostly to the exponential growth of the cellular mobile market.

[85] The tele-density rate is based on a population of 62.8 millions in 2006.

192. PICS data show that fixed line telephone services for businesses improved from 2004 to 2007. The number of days to obtain a phone line declined. In 2007, it took 11 fewer days to obtain a fixed phone line than in 2004. However, each phone interruption lasts longer. In 2004 and 2007, the number of phone interruptions was low -- once every two months -- but the duration of each interruption increased by 2.5 hours (see Table 27).

Table 27. Time to Obtain Fixed Telephone Line and the Frequency and Duration of Telephone Interruptions

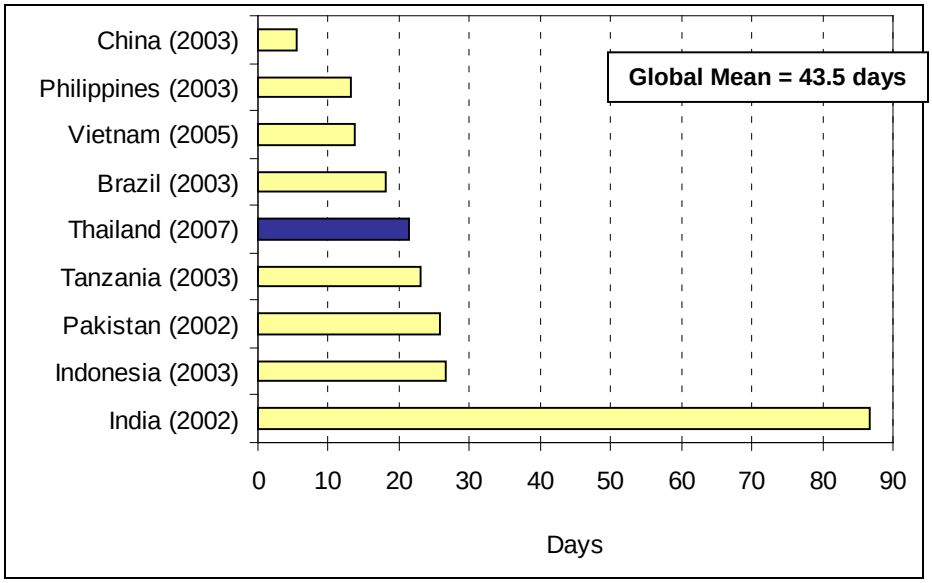
	Number of days to obtain a fixed telephone line		Times per month experiencing telephone interruptions		Average duration per telephone interruption (hours)	
	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04
Thailand	21.3	-11.0	0.5	-0.1	19.5	+2.6
Bangkok and vicinity	18.5	-0.5	0.3	0.0	15.0	+1.2
Central	26.0	-37.5	0.4	-0.1	15.5	-3.9
East	12.2	-16.7	0.5	-0.2	22.4	+2.0
North	35.0	+4.1	0.8	+0.4	17.5	+11.6
Northeast	15.7	-7.1	1.0	+0.5	59.8	+40.8
South	39.7	-2.0	1.4	-0.2	34.9	+10.7
Small	22.2	-49.1	0.5	+0.1	13.9	-5.9
Medium	19.0	-5.6	0.5	-0.2	18.4	+2.1
Large	23.4	1.4	0.4	-0.1	29.2	+13.3

Source: Thailand PICS 2004 & 2007

193. Telephone infrastructure seems to be reasonably good compared to other countries, but it varies by region. Fixed-line telephone services were easier for businesses to obtain in 2007 than in 2004, except in the North. The number of days it took to obtain a fixed phone line was 21 days in 2007 compared to 32 days in 2004. This number has declined everywhere except in the North (where it took 4 more days in 2007 than in 2004). The number of days declined sharply in the Central and Eastern regions (see Table 27).

194. Compared to other countries, Thailand's performance is average. For example, businesses in South Korea, China, Philippines, Vietnam, and Brazil take less than 21 days on average to obtain a fixed phone line, but it takes longer in Indonesia, India, Pakistan and Tanzania (see Figure 58).

Figure 58. Cross-Country Comparison of Days Needed to Obtain a Fixed Telephone Line

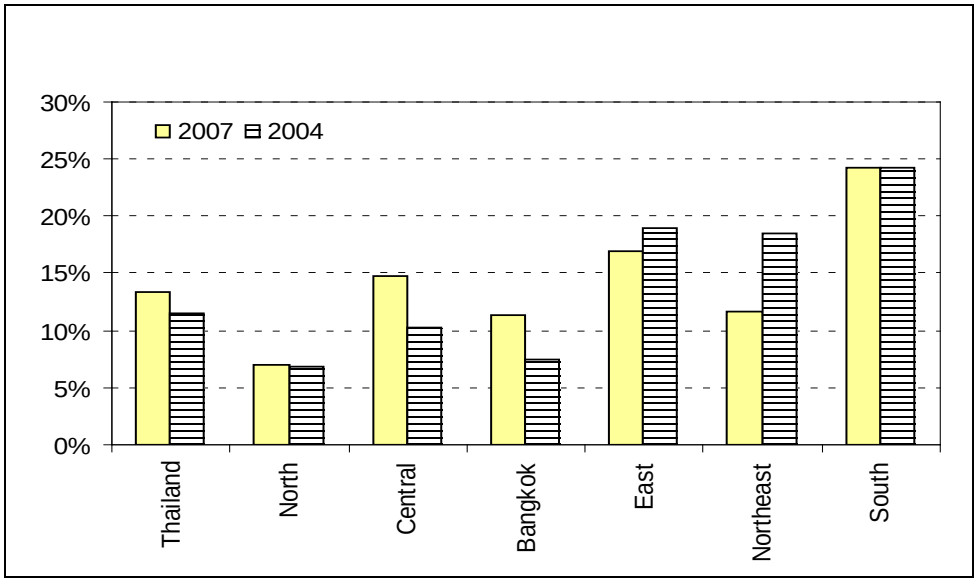


Source: World PICS (2002-2005) and Thailand PICS 2007

195. In 2007, investment climate indicators regarding fixed telephone in the South and the Northeast were below those in other regions. Bangkok had the best indicators. Firms in the South had a longer wait than in other regions to obtain a phone line (40 days). They also experienced more frequent interruptions, each lasting an average of about 1.5 days (see Table 27). Firms in the Northeast do not take a long time to obtain a line, but they have the slowest repair service of all regions. The duration of each phone interruption is 2.5 days. Firms in the North take a long time to obtain a phone line (35 days), but they have short interruptions (once a month on average with each interruption lasting less than a day). Firms in the Central region had to wait almost a month to obtain a phone line, but they had the lowest number of interruptions and the shortest duration of any region including the North. The telephone infrastructure is the best in Bangkok. It is easiest to obtain a fixed line phone connection. Bangkok also has the least number of interruptions per year and the shortest duration of phone interruptions. Firms in the East (most of them large and located in industrial estates in the Eastern Seaboard) experienced phone interruptions, each lasting almost a day on average—the number of these interruptions was greater than in Bangkok and in the Central and North regions.

196. The largest percentage of firms that cited telecommunication infrastructure as a severe constraint to their business operations was in the South (25 percent of firms compared to no more than one-sixth in other regions). A large share of firms in the Eastern and the Central regions (where two-fifths of all survey respondents are located) cited telecommunication infrastructure as a major constraint to their business operation. In Bangkok where telecommunication services are the best, 10 percent of firms said that telecom services are a severe constraint to their business operations (see Figure 59).

Figure 59. Percentage of Firms that Perceive Inadequate or UnreliableTelephone Service as Severe Constraint to Business Operations and Expansion, 2007 and 2004



Source: Thailand PICS 2004 & 2007

CONCLUDING REMARKS

197. Investing in improvements in public infrastructure would reduce the cost of doing business and provide incentives for private investment. The following remarks on possible developments in transportation, electricity, water, and telecommunications draw on World Bank and NESDB (2008) and NESDB (2008).[86]

Transport

198. Thailand relies more on roads than rail for freight and passenger transport. Rail is an energy-efficient alternative and should complement the road system. An integrated road, rail, and water infrastructure would reduce energy costs and increase transportation. A modal shift would reduce logistical costs. The challenge is to find the right mix of transportation to achieve greater efficiency for the whole system.

199. The future of transportation will be affected by regional integration. Cargo from the southern part of China, transported through the Chiangsaen Port, has grown significantly. Thailand also faces increased competition from Vietnam and Malaysia to become the gateway for the region. With shifts in regional logistical patterns and greater integration of trade and transportation networks in regions such as the Greater Mekong Sub-region (GMS) and the IMT (Indonesia-Malaysia-Thailand) Growth Triangle, developments in the transportation system will determine if Thailand will reap the

[86] NESDB (2008), *Infrastructure Situations in Thailand*, Mimeo, and World Bank and NESDB (2008), *Infrastructure Annual Report 2008*, Mimeo. See also Asian Development Bank (2008), *The Sustainable Development of Southern Thailand: Working Paper 1: Needs, Constraints, and Opportunities*, and World Bank (2008), Thailand Economic Monitor.

benefits of regional integration. The development of transport networks in the Northeast –situated in the middle of the GMS—would facilitate trade with other GMS countries, and in the South, trade between the Southern provinces of Thailand and IMT countries.

Electricity

200. The demand for electricity, which has risen rapidly, calls for new investments. In the past 20 years, the aggregate demand for electricity has expanded six-fold. This demand is in line with the growth of industrial, commercial, and residential users. Between 2002 and 2006, peak demand has also gone up every year, which has added pressure to the system. Investments are especially needed in regions like the Northeast where industrial production has grown quickly over recent decades.

201. Enhancements are also needed in the regulatory framework to promote greater competition and to improve tariffs and services. The power and natural gas industries in Thailand remain monopolies; the privatization of EGAT and further liberalization of the electricity sector has been delayed. EGAT, MEA and PEA retain monopoly control over power generation and distribution. EGAT also dominates the market as the single buyer in the electricity sector. This situation suggests that efficiency in the electricity and natural gas industries is suboptimal. For example, the average electricity retail tariff was US$ 0.09 at the end of 2006. Household and industrial tariffs in Thailand are quite similar. In comparison to average electricity retail tariffs in middle- and high-income countries, Thai industrial tariffs are high; household tariffs are more competitive.

Water

202. There is an urgent need to find new sources to produce water. Growing demand for piped public water can be expected, given the increase in economic activity and the need to replace groundwater use, especially in industrial areas. The government's policy of reducing firms' use of groundwater, while commendable from an environmental standpoint, has led to a greater demand for public water.[87]

203. Water loss is also an important issue. Water leakage stems from inadequate maintenance of water pipes, poor quality and outdated pipelines. The rate of water loss—at 30 and 26 percent in MWA and PWA, respectively—is lower than in other countries in the region.

204. The policy of price controls is a constraint for PWA's operations and investments. It forces the company to rely on government subsidies. The pricing policy warrants reconsideration to increase PWA's operational flexibility. That would enable PWA to expand service coverage and improve service quality and still remain affordable. Private participation could play an increasing role in the water sector to complement state investment. Private investment in water utilities could receive incentives, especially in the industrial and tourism sectors. These two sectors have special demand and supply requirements. For example, supplying water to the islands requires special techniques in

[87] In 2006, the MWA produced and supplied 4.7 million cubic meters per day to residents in Bangkok and its vicinity, which represents 84 percent of its total capacity. The PWA, which serves the remaining 73 provinces, supplied 1.9 million cubic meters per day or 74 percent of its capacity.

water production and demand. Private operators could service these demands which are expected to increase.

Telecommunications

205. A clearer direction in policy and a better regulatory framework would make investment in the telecommunications sector easier. It would allow more service providers to enter the sector. Creation of the National Telecommunications Commission (NTC) has led to better regulation and important benefits to the public (see Box 2). However, the NTC still needs to address and implement actions on a broader scale. Its effectiveness has been limited by several factors, particularly uncertainty surrounding the regulatory environment. Another limitation has been the untimely appointments of its commissioners and restrictions on foreign ownership. Further liberalization of the sector would bring about more competition and better services.

Box 2: The National Telecommunications Commission

The 1997 Constitution mandated the liberalization of the telecom sector. A significant transformation of the sector's institutional landscape occurred in 2004 with the establishment of the National Telecommunications Commission (NTC). Policy, regulations and operations are clearly established under the new governing structure. The Ministry of Information and Communication Technology (MICT) sets policies; it also supervises the Telephone Organization of Thailand (TOT) and Communications Authority of Thailand (CAT), two former state-owned enterprises which are now corporations. The National Telecommunications Commission (NTC) acts as an independent regulator. It is also responsible for a master plan on telecommunications development. As a regulator, NTC's functions are: granting licenses, spectrum management, supervising network usage and network connection, controlling the standard of networks and equipment, allocating ratio frequency, consumer protection, ensuring fair competition, and enforcing the law.

REFERENCES

Asian Development Bank (2008), The Sustainable Development of Southern Thailand: Working Paper 1: Needs, Constraints, and Opportunities, Asian Development Bank.

Ariyapruchya, K., C. Olanthanasate, and C. Karnchanasai (2006), "Strengthening the Competitiveness of Thai Firms: What Needs to be Done?", Bank of Thailand Symposium.

Baumol, W. J. (2002). The Free-Market Innovation Machine, Analyzing the Growth Miracle of Capitalism, Princeton: Princeton University Press

Beck, Th., A. Demirgüç-Kunt and M.S. Martinez Peira (2007), " Banking Services for Everyone? Barriers to Bank Access and use Around the World," Policy Research Working Paper No. 4079, World Bank.

Brimble, P., and R. Doner (2006), "University-Industry Linkages and Economic Development: The Case of Thailand", World Development, Vol. 36, No.6.

Commission on Growth and Development (2008). The Growth Report. Strategies for Sustained Growth and Inclusive Development. World Bank

Diao, X., J. Rattsø, and H. E. Strokke (2006), "Learning by Exporting and Structural Change: A Ramsey Growth Model of Thailand", Journal of Policy Modeling, Vol. 28.

Dollar, D., M. Hallward-Driemeier, and T. Mengistae (2005) , "Investment Climate and Firm Performance in Developing Economies", Economic Development and Cultural Change, Vol.54, No. 1.

Gill, I. and H. Kharas (2006), An East Asian Renaissance: Ideas for Economic Growth, World Bank.

Hatakenaka S. (2008), "The role of higher education in high tech industry development: what can international experience tell us?" Paper presented at the World Bank ABCDE Conference, Cape Town, June 2008.

Krugman, P. (1997) The Age of Diminished Expectations: U.S. Economic Policy in the 1990s. Cambridge, Mass: MIT Press

Levinsohn J. and A. Petrin (2003), "Estimating Production Functions Using Inputs to Control for Unobservables", Review of Economic Studies 70.

National Economic and Social Development Board (2008), Infrastructure Situations in Thailand, Mimeo.

Stern, N., J.J. Dethier and H. Rogers (2005). Growth and Empowerment. Making Development Happen. Cambridge, Mass: MIT Press

World Bank (2005), Thailand Northeast Development.

World Bank (2006a), Thailand Investment Climate, Firm Competitiveness and Growth.

World Bank (2006b), Thailand Social Monitor: Improving Secondary Education,

World Bank (2006c), Reforming The Investment Climate: Lessons for Practitioners.

World Bank (2007a), Building Knowledge Economies: Advanced Strategies for Development, World Bank Institute.

World Bank (2007b), Finance for All: Policies and Pitfalls in Expanding Access, Policy Research Report

World Bank (2007c) Thailand Social Monitor on Higher Education: Towards a Competitive Higher Education System in a Global Economy.

World Bank and NESDB (2008a), Towards a Knowledge Economy in Thailand, World Bank and Office of the National Economic and Social Development Board.

World Bank and NESDB (2008b), Measuring Output and Productivity in Thailand's Service-Producing Industries

World Bank and NESDB (2008c), Infrastructure Annual Report 2008, Mimeo.

World Bank (2004-2008), Thailand Economic Monitor

World Bank (2007-2008), East Asia Update

ANNEX 1. INVESTMENT CLIMATE INDICATORS BY INDUSTRY, ENTERPRISE TYPE AND REGION

206. The report presents objective and subjective indicators of the investment climate obstacles at the national level. But conditions differ across industries, firm sizes, export orientation and location. Different aspects of the investment climate may more or less binding constraints depending on the characteristics of each enterprise.

THE INVESTMENT CLIMATE ACROSS INDUSTRIES AND ENTERPRISE TYPES

Differences in the Perceived Severity of Investment Climate Constraints

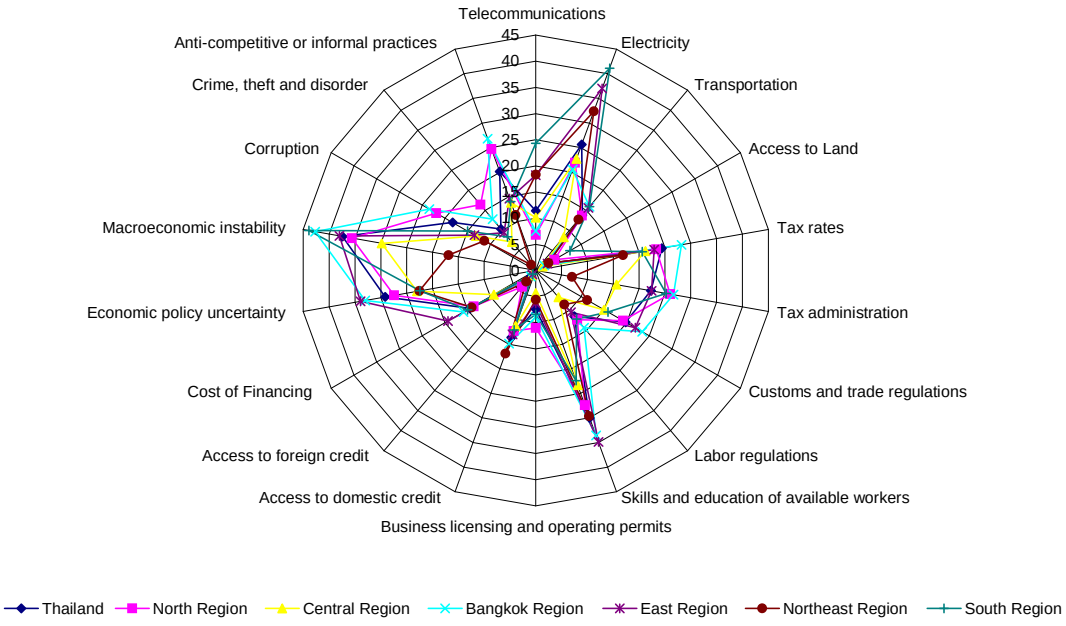
207. The perception of firms on the severity of various constraints differs across regions, industries, firm sizes, and exporters/non-exporters to different extent (Figure 60).

208. In PICS 2007, firms across the board more or less equally perceived economic policy uncertainty to be the more severe constraint. Since firms in different regions face different levels of infrastructure service, perception on this aspect varied relatively widely across regions. For example, electricity was perceived as a major or severe obstacle by more firms in the Northeast where the reliability of supply was poor (39 percent of firms in the Northeast compared to 27 percent for the Thailand average). Firms in different industries, even if they are in the same region, often perceive the same obstacle differently since this constraint may be binding to a different extent. For example, firms producing electronics and appliances, which more often engage in foreign trade, are more likely to perceive customs and trade regulations as a major or severe constraint (34 percent of firms of that sector compared to 23 percent for the average). The same logic applies to firms of different sizes and of different orientation – larger firms (33 percent) and exporting firms (37 percent) are more likely to perceive customs and trade regulations as a major or severe constraint.

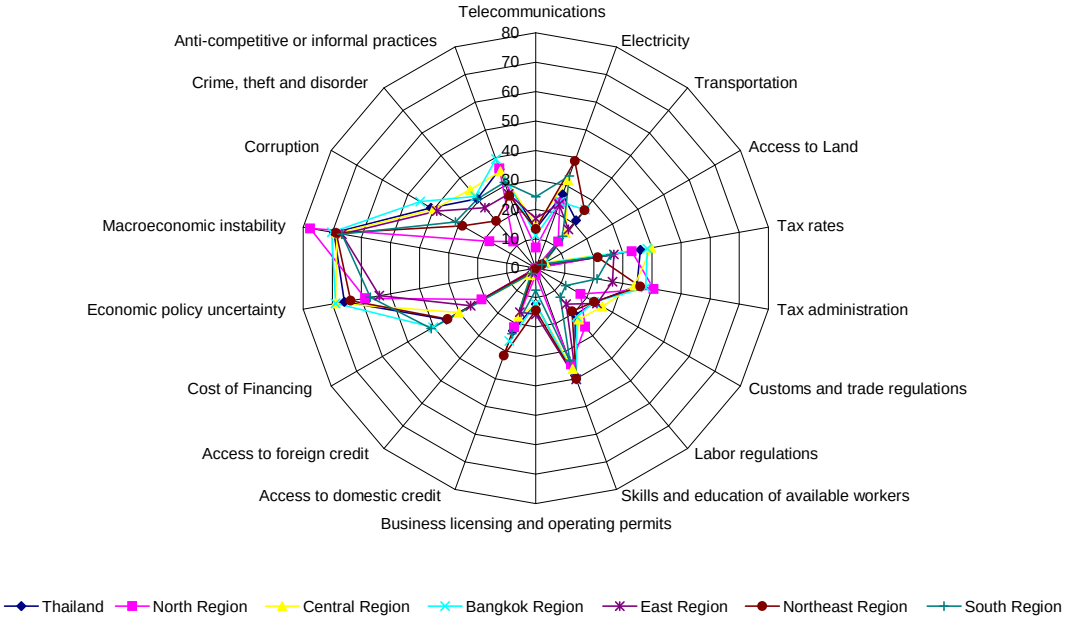
209. Over time, the firms' perception of different aspects of the investment climate can change for two reasons: because the investment climate has altered and/or because other binding constraints have changed. Firms' perception on macroeconomic stability and economic policy certainty worsened as the macroeconomic conditions and the direction of economic policy changed; and more firms – 21 percent in PICS 2007 versus 14 percent in PICS 2004 – perceived transport as a major or severe constraint as transport services became more binding for firms due to higher inter- and intra- regional trade within and across industries although transport logistics costs as a percentage of total costs remained unchanged.

Figure 60. Percentage of Firms Which Perceived Investment Climate Constraints as Major or Severe Obstacles to Doing Business in Thailand (by Region, Industry, Firm Size, and Exporting/Non-exporting)

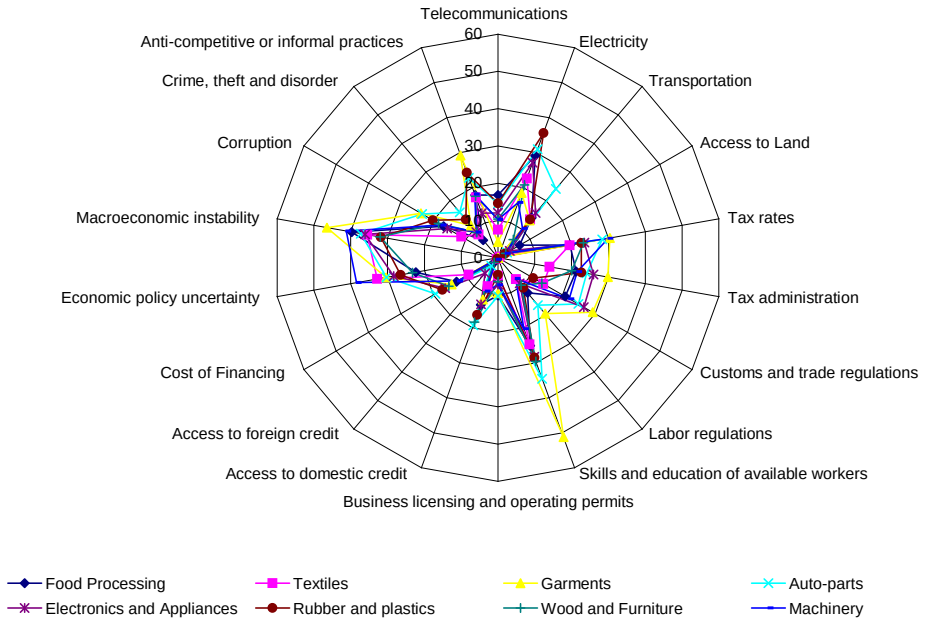
By Region, PICS 2004



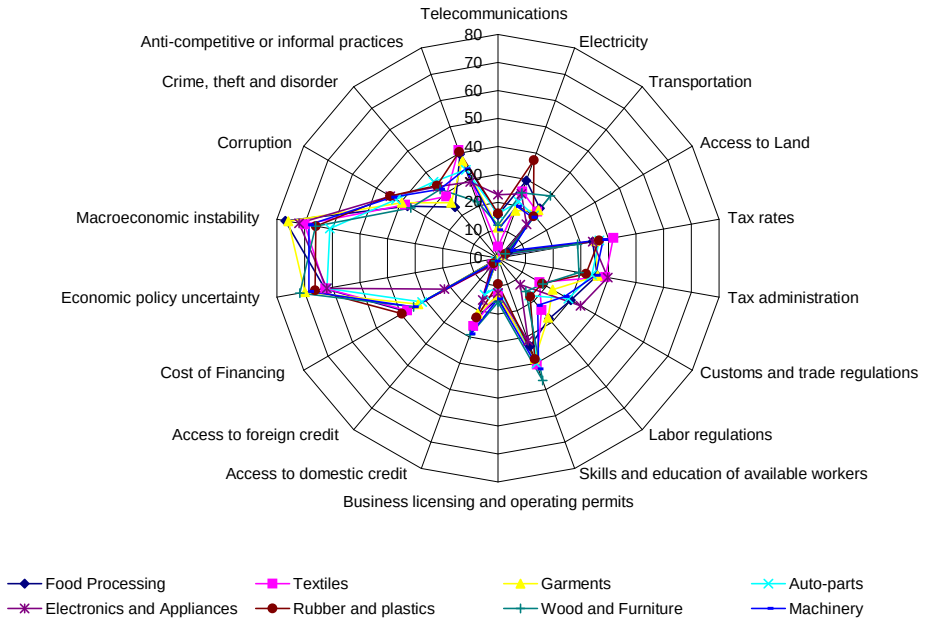
By Region, PICS 2007



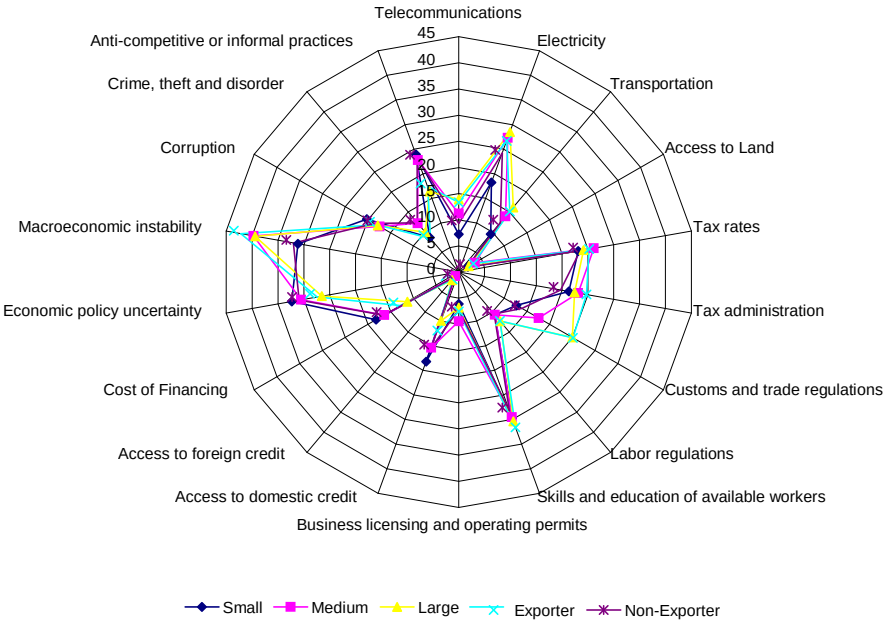
By Industry, PICS 2004



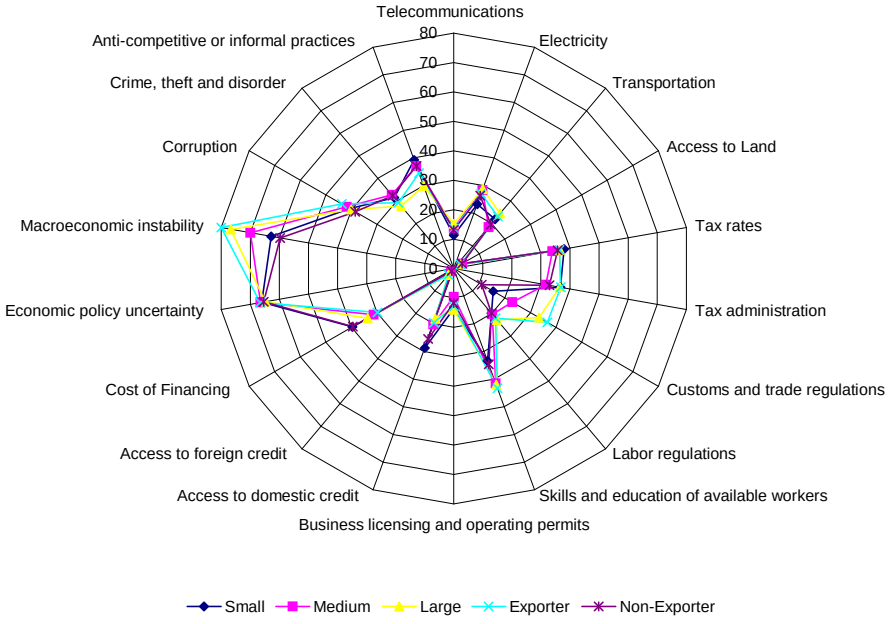
By Industry, PICS 2007



By Firm Sizes and Exporter/Non-exporter, PICS 2004



By Firm Sizes and Exporter/Non-exporter, PICS 2007



Differences in the Perception of the Main Investment Climate Constraints

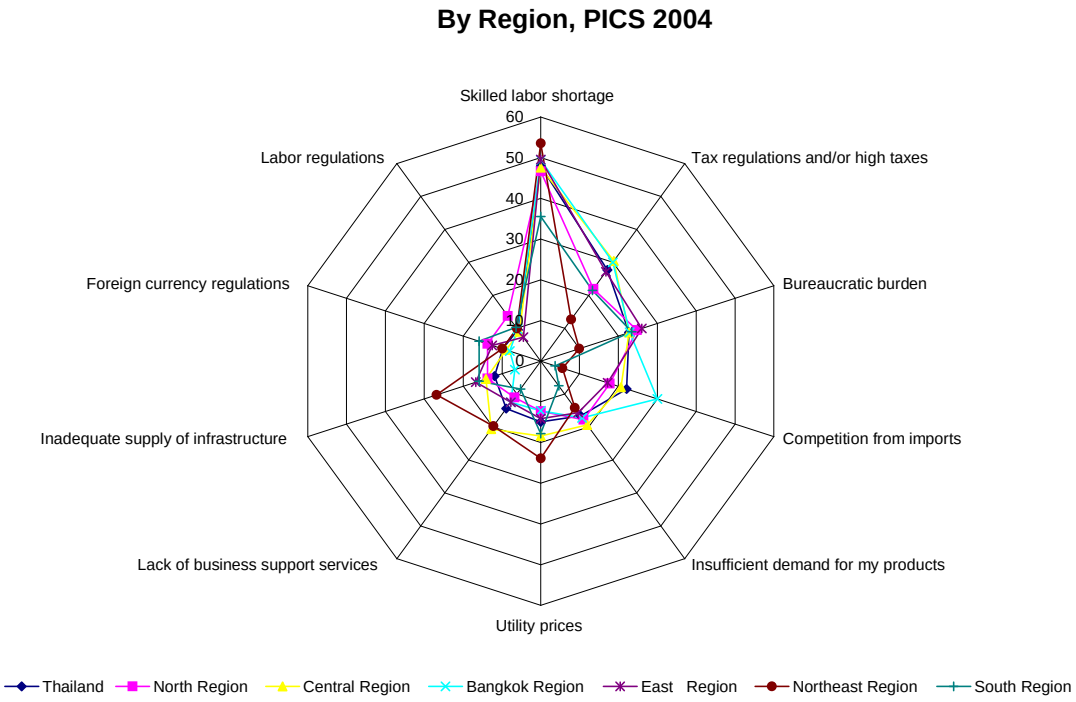
210. The perception of firms on the three main investment climate constraints also varies across region, industry, firm size, and export/non-export orientation (Figure 61).

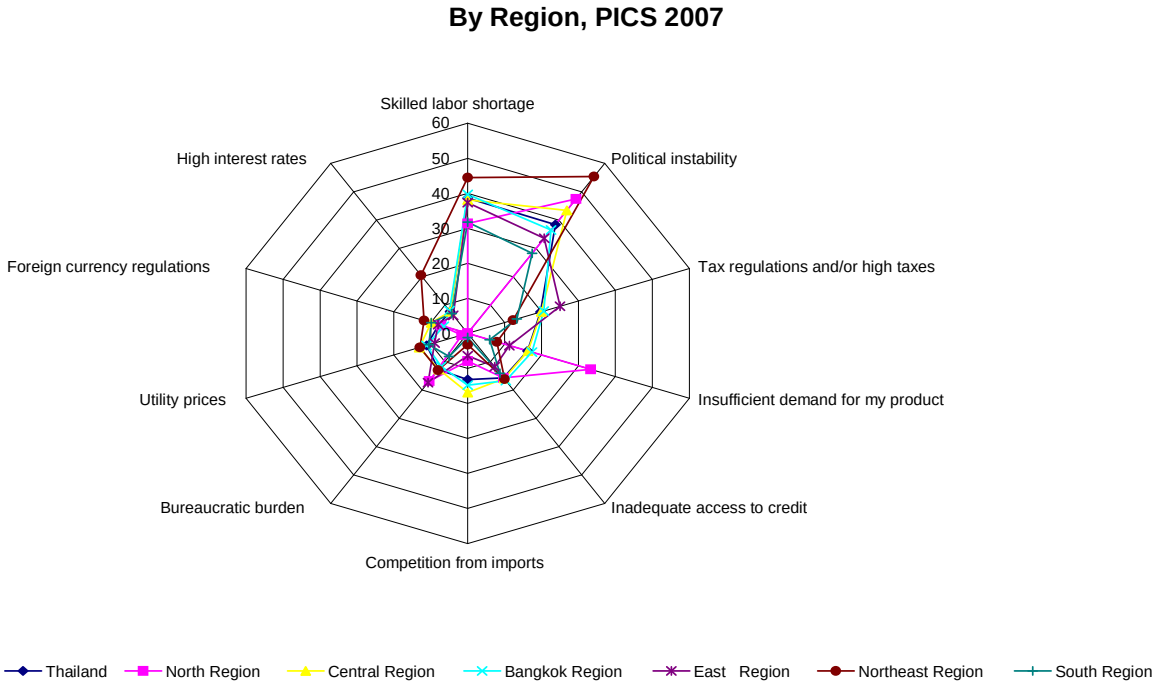
211. The perception of skilled labor shortage did not vary much across regions but varied a lot across industries. A higher percentage of firms in the garment industry and in the wood and furniture industry perceived this to be one of their top three biggest constraints (about 50 percent for both compared to a national average of 39 percent in PICS 2007). Skills are industry specific and/or the demand for skills is therefore also industry specific. Improving the supply of skilled labor to meet the specific demand of firms in different industries is therefore important to enhance their performance.

212. A higher share of small-size firms perceived tax regulations and/or high tax rates to be one of their top three obstacles compared to large-size firms (23 percent versus 16 percent) in PICS 2007. The overall percentage of firms that viewed this as a big obstacle decreased but the margin widened compared with PICS 2004 (29 percent versus 26 percent). This suggests that, while the tax environment was perceived as a top constraint by fewer firms relative to other constraints, it became more binding for small-size firms than for large-size firms. Improving tax laws with specific targets for small scale firms thus appears to be important.

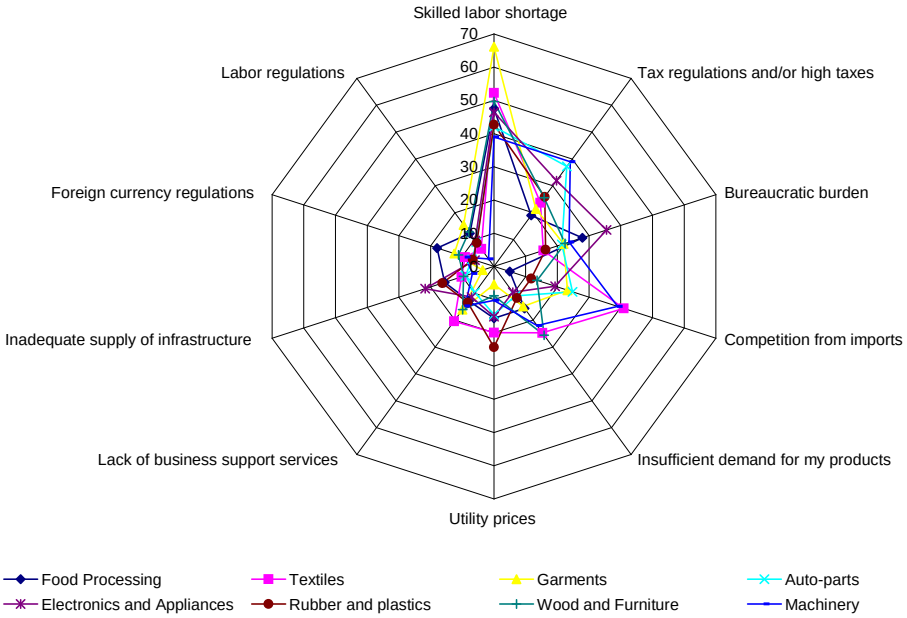
213. For obvious reasons, exporting firms were more concerned about foreign currency regulations than non-exporting firms – 13 percent of exporting firms viewed it as one of their top three obstacles versus 3 percent of non-exporting firms in PICS 2007, and 15 percent versus 5 percent in PICS 2004. Interestingly, a lower percentage of exporting firms felt that "insufficient demand" and "competition from imports" were main obstacles compared with non exporting firms (12 percent versus 20 percent for the former and 12 percent versus 15 percent for the latter in PICS 2007, and 13 percent versus 20 percent and 18 percent versus 26 percent respectively in PICS 2004). This suggests that export-oriented firms are in general more competitive and are facing a less severe constraint in demand from domestic and foreign markets.

Figure 61. Percentage of Thai Firms Perceiving a Particular Obstacle as Among the Three Biggest to Doing Business (by Region, Industry, Firm size, and Exporting/Non-exporting)

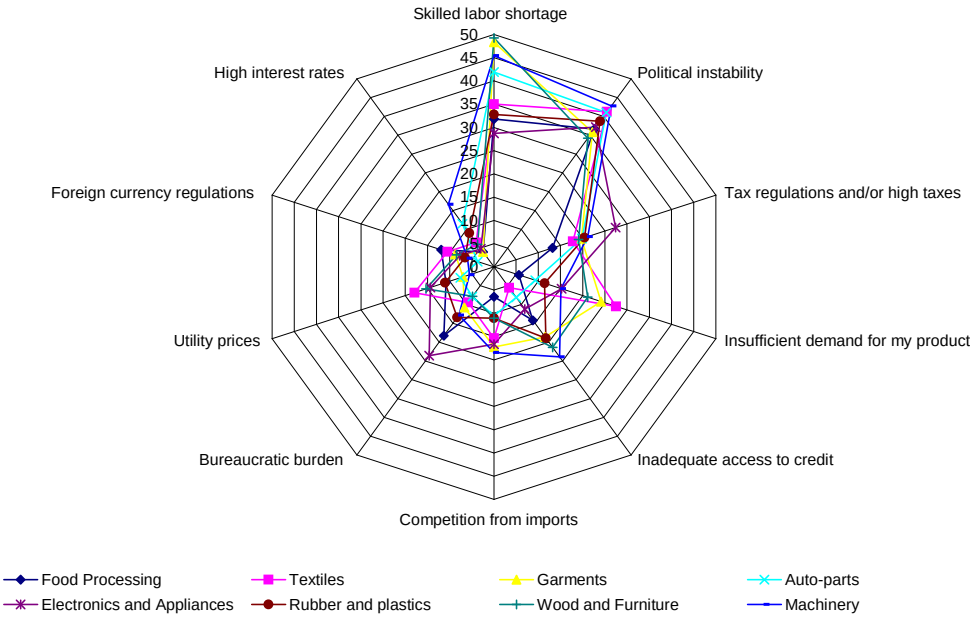




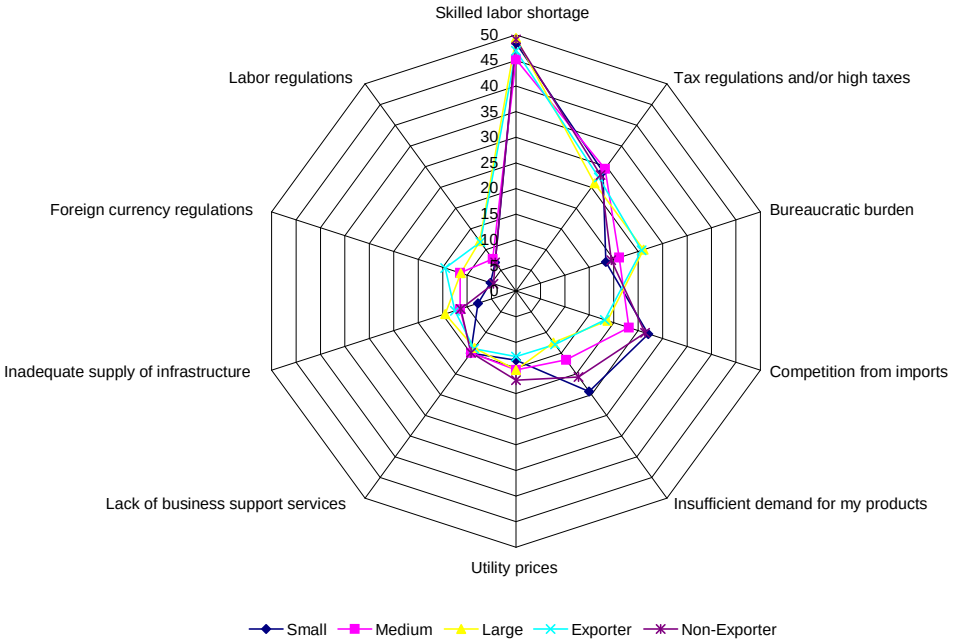
By Industry, PICS 2004



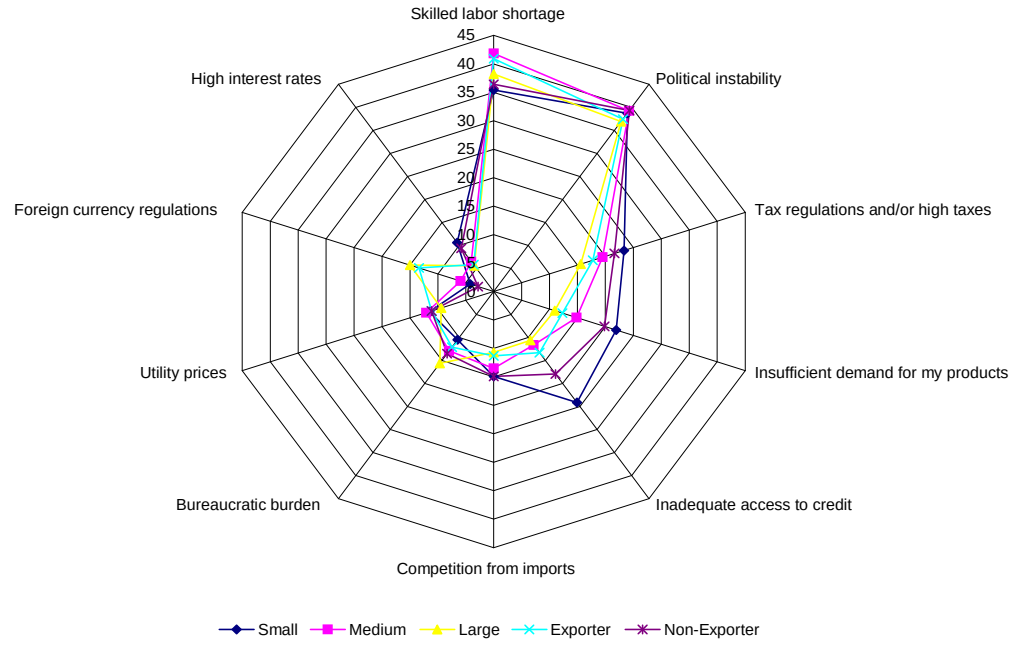
By Industry, PICS 2007



By Firm Sizes and Exporting/Non-exporting Firms, PICS 2004



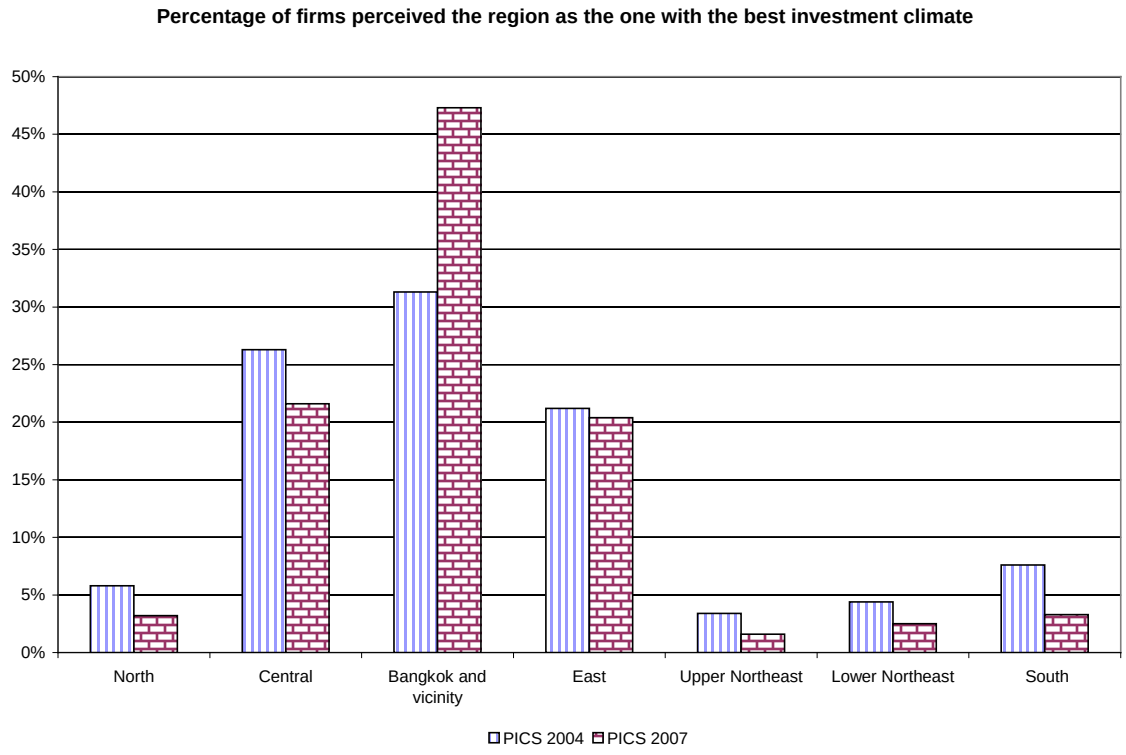
By Firm Sizes and Exporting/Non-exporting Firms, PICS 2007

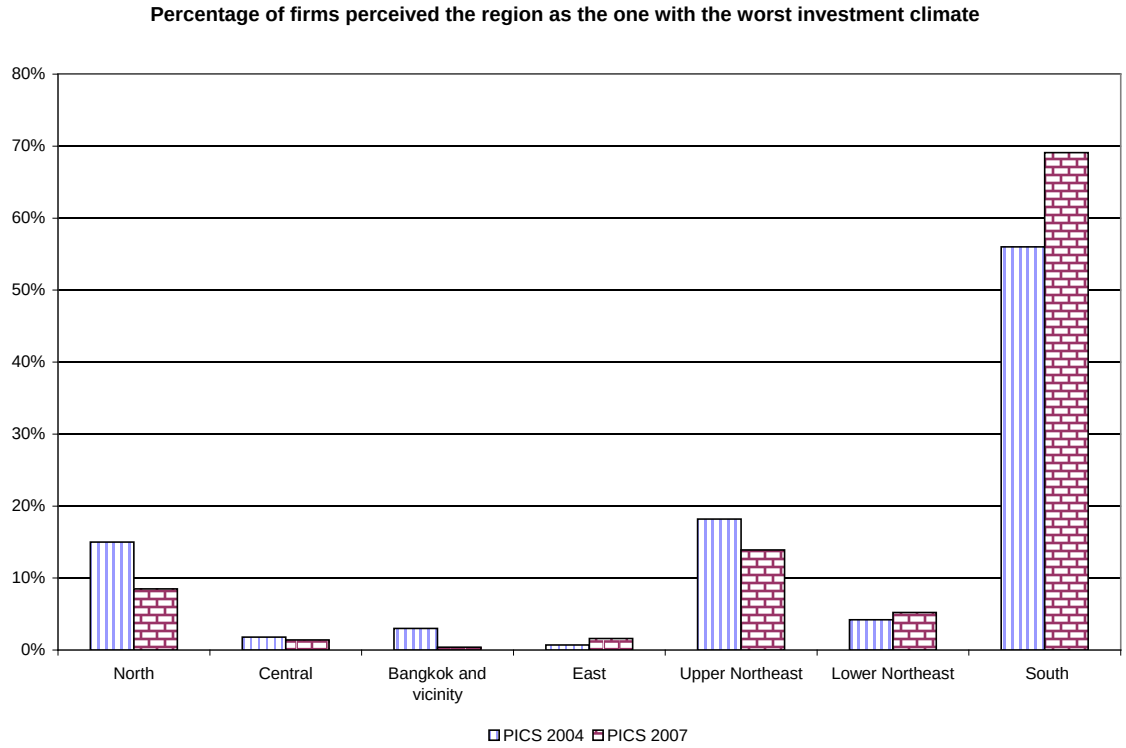


THE INVESTMENT CLIMATE ACROSS REGIONS

214. The investment climate also varies widely across regions in Thailand. Overall, Bangkok and vicinity was perceived by the highest percentage of firms as the region with the best business environment, followed by the Central and Eastern regions (Figure 62). The percentage of firms that viewed Bangkok and vicinity as the most favorable region increased from 31 percent to 47 percent which indicates that firms perceived an improvement in overall business environment in this economic center relative to other regions. Few firms perceived the other four regions – the North, Upper Northeast, Lower Northeast, and South Regions – as having the best business environment. The Southern region was perceived by the highest percentage of firms as the region with the least appealing investment climate, followed far behind by the Upper Northeast region. In PICS 2004, 56 percent of firms surveyed perceived the South as the region with the least appealing investment climate and the ratio increased to 69 percent in PICS 2007. This suggests that firms experienced a deterioration of business environment in the South relative to other regions over time.

Figure 62. Percentage of Firms Perceiving a Region as Having the Best/Worst Investment Climate





215. The perceptions of firms from different regions and of different characteristics vary widely.[88] The percentage of firms perceiving a particular region as having the best investment climate was much higher among firms actually located in that region, compared to firms located elsewhere. This is expected because firms choose to establish themselves where they can maximize profit (therefore, where they perceive that the investment climate is most suitable for their growth, ceteris paribus).For the same reason, very few firms perceived the region where they are located as having a poor business climate. In PICS 2007, 699 out of 1,040 firms, or 64 percent (compared to 55 percent in PICS 2004) considered that their region had the best business environment in Thailand. Only 6 and 12 firms considered that their region had the worst business environment in PICS 2007 and PICS 2004, respectively.

[88] See Table 28 and Table 29.

Table 28. Percentage of Firms Perceiving a Region as Having the Best Business Environment, by Home Region

		Total	North	Central	Bangkok	East	Upper Northeast	Lower Northeast	South
2007	North	3.2	**62.2**	0.2	1.4	1.1	4.0	0.0	0.0
	Central	21.6	9.0	**61.2**	6.7	6.7	15.6	26.8	20.1
	Bangkok and vicinity	47.3	9.7	19.8	**76.6**	14.2	12.8	5.4	22.0
	East	20.4	7.2	14.6	11.4	**72.9**	16.6	19.5	13.3
	Upper Northeast	1.6	2.4	0.9	1.3	0.0	**42.6**	3.4	1.2
	Lower Northeast	2.5	7.9	1.5	1.3	2.0	4.0	**44.9**	0.0
	South	3.3	1.6	1.7	1.3	3.2	4.4	0.0	**43.5**
2004	North	5.8	**45.2**	4.0	2.9	2.1	17.2	13.2	1.0
	Central	26.3	21.9	**57.1**	18.4	9.4	34.5	26.3	8.1
	Bangkok and vicinity	31.3	15.1	14.2	**53.4**	15.2	13.8	10.5	6.1
	East	21.2	5.5	13.6	16.9	**64.4**	6.9	5.3	11.1
	Upper Northeast	3.4	4.1	2.5	2.9	1.6	**24.1**	13.2	3.0
	Lower Northeast	4.4	6.8	2.8	4.6	2.1	3.4	**31.6**	1.0
	South	7.6	1.4	5.9	0.8	5.2	0.0	0.0	**69.7**

Note: In PICS 2007, 3.2 percent for all Thai firms surveyed perceived the North the region with the best investment climate. 62.2 percent of firms surveyed located in the North perceived the North the region with the best investment climate.

Table 29. Percentage of Firms Perceiving a Region as Having the Worst Business Environment, by Home Region

		Total	North	Central	Bangkok	East	Upper Northeast	Lower Northeast	South
2007	North	8.5	**1.6**	7.1	7.1	15.1	4.6	7.3	21.6
	Central	1.4	10.3	**0.0**	0.7	1.6	4.2	0.0	9.5
	Bangkok and vicinity	0.4	0.0	0.3	**0.0**	1.1	4.2	2.4	2.4
	East	1.6	4.6	1.4	1.6	**0.7**	0.0	0.0	3.6
	Upper Northeast	13.9	9.9	19.3	12.3	6.5	**0.0**	8.3	35.5
	Lower Northeast	5.2	3.9	3.9	4.6	6.4	0.0	**0.0**	22.6
	South	69.1	69.7	68.0	73.6	68.6	87.1	81.9	**4.8**
2004	North	15.0	**0.0**	16.4	10.9	16.1	3.3	10.8	47.6
	Central	1.8	4.2	**0.3**	1.0	1.6	3.3	0.0	9.5
	Bangkok and vicinity	3.0	2.8	2.8	**1.7**	4.3	0.0	0.0	10.5
	East	0.7	4.2	0.6	0.5	**0.0**	3.3	0.0	1.0
	Upper Northeast	18.2	18.1	17.3	16.4	26.3	**0.0**	2.7	26.7
	Lower Northeast	4.2	4.2	3.1	4.9	6.5	0.0	**0.0**	2.9
	South	56.0	66.7	58.2	63.3	44.6	90.0	83.8	**1.0**

Note: In PICS 2007, 69.1 percent for all Thai firms surveyed perceived the South the region with the worst investment climate. 1.0 percent of firms surveyed located in the South perceived the South the region with the worst investment climate.

216. The distribution of manufacturing industries across regions provides support for the hypothesis that the attractiveness of investment climate in different regions depends on the industrial sector to which an enterprise belongs. The region of Bangkok and vicinity hosts a large number of firms from many industries, especially in the garments, electric appliances, and machinery sectors, followed by the Central and Eastern regions (Map 1). Only a small number of manufacturing firms located in the Upper and Lower Northeast regions, the North region and the South region.

217. The investment climate of a region affects a firm's location choice, which itself depends on many factors, such as proximity to raw material/input providers and to customers. Firms of different characteristics face different trade-offs among these factors subject to their profit function. The distribution of manufacturing industries is in line with the finding that firms, overall, perceive the investment climate in Bangkok and vicinity to be the most attractive though, in some specific industries, firms find it more beneficial to locate in other regions (for example, in the Central region, in the case of the food processing industry, see Figure 63 and Map 1). How attractive firms perceive a particular region's investment climate may also depend on other characteristics, such as the firm's size, ownership, and whether and how often it engages in international trade.

Map 1. Distribution of Manufacturing Industries in Thailand (Percentage of Industry by Regions)

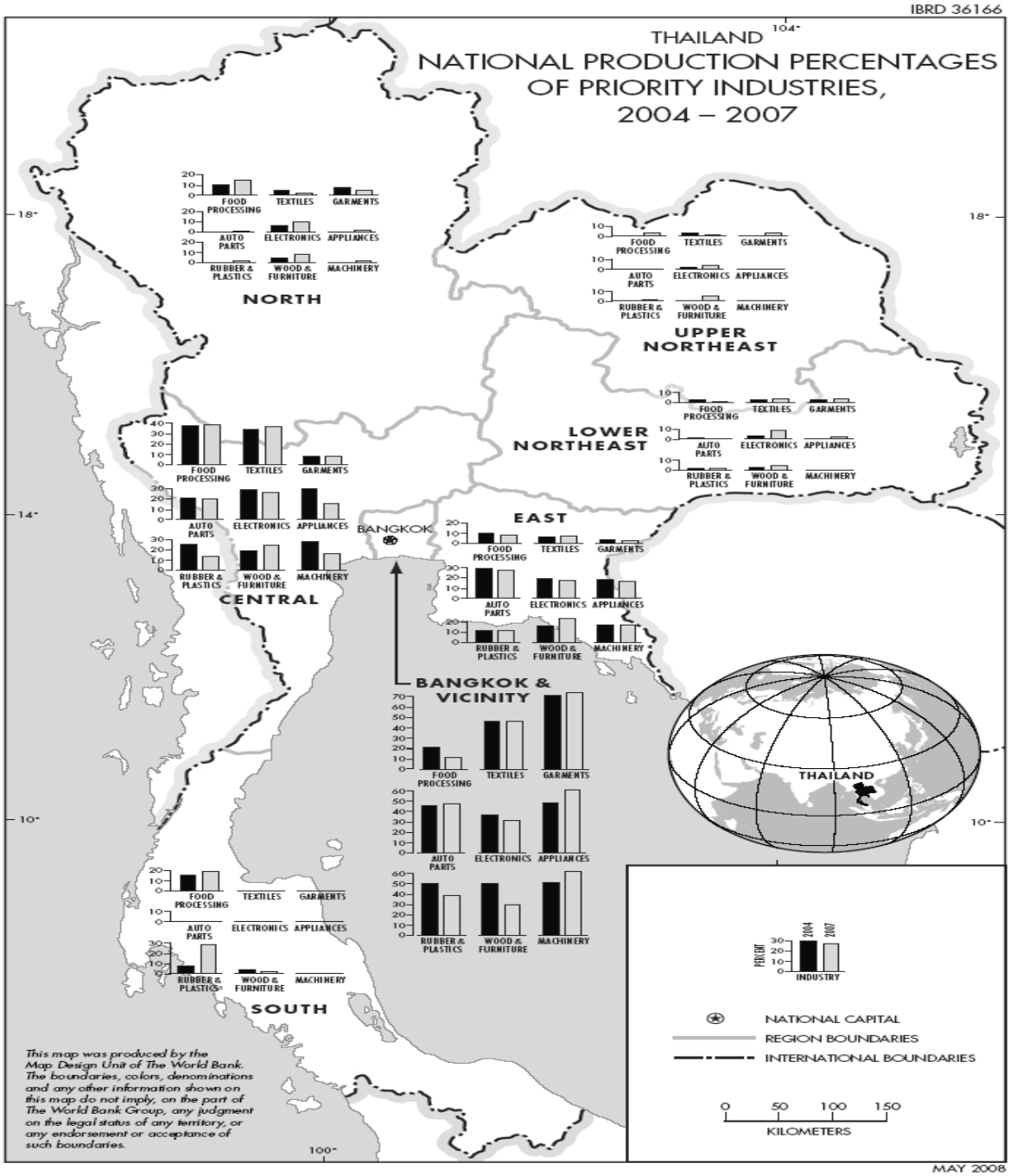
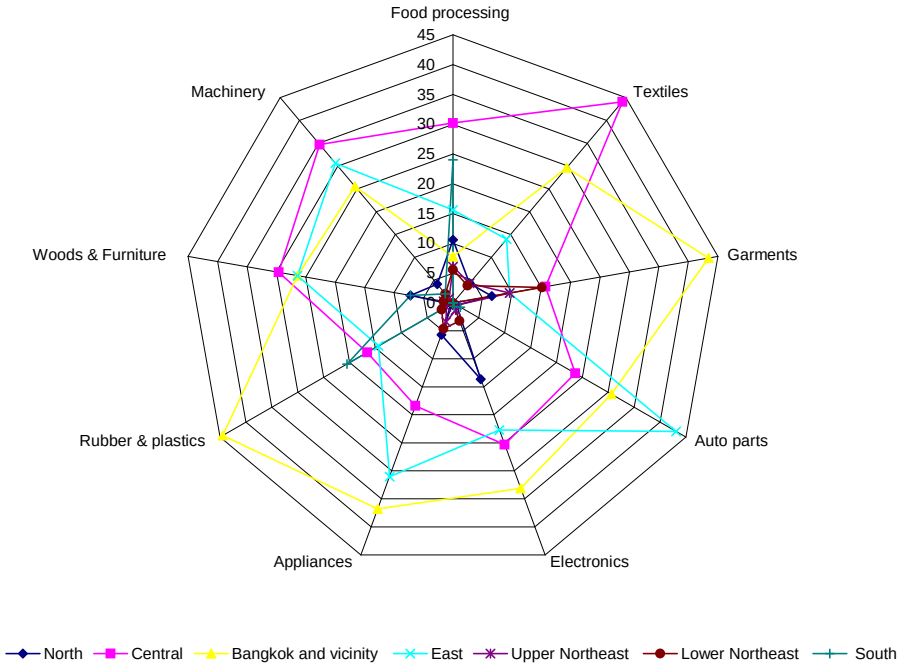
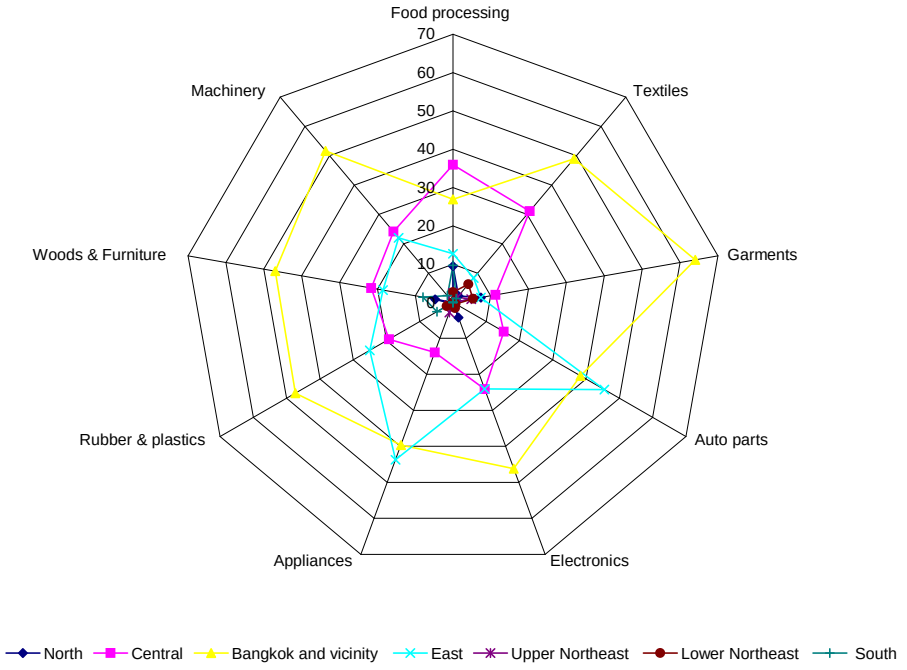


Figure 63. Percentage of Firms Perceiving a Region as Having the Best/Worst Business Environment, by Industry

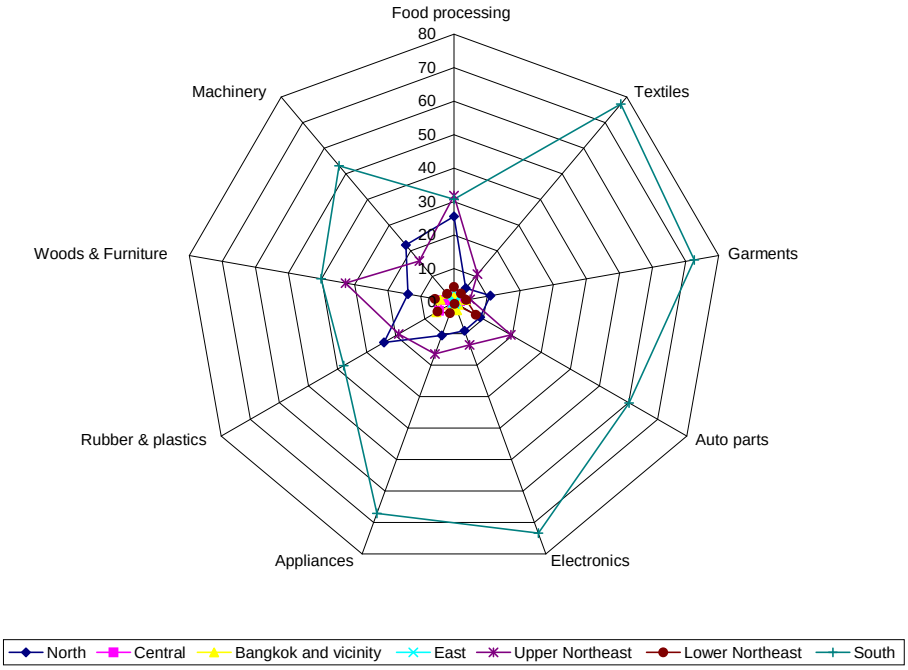
Region with Business Environment Perceived as the Best, PICS 2004



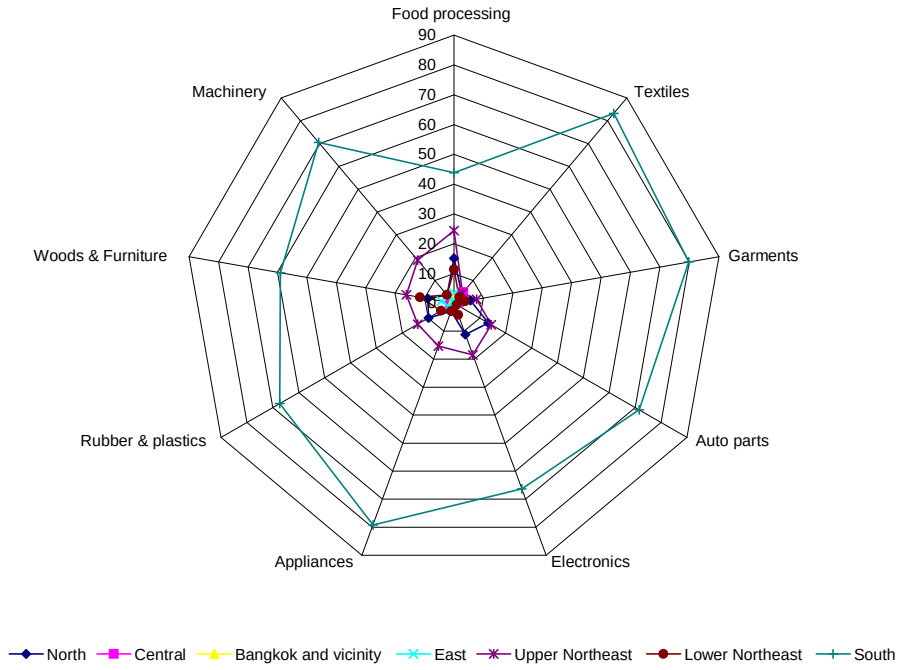
Region with Business Environment Perceived as the Best, PICS 2007



Region with Business Environment Perceived as the Worst, PICS 2004



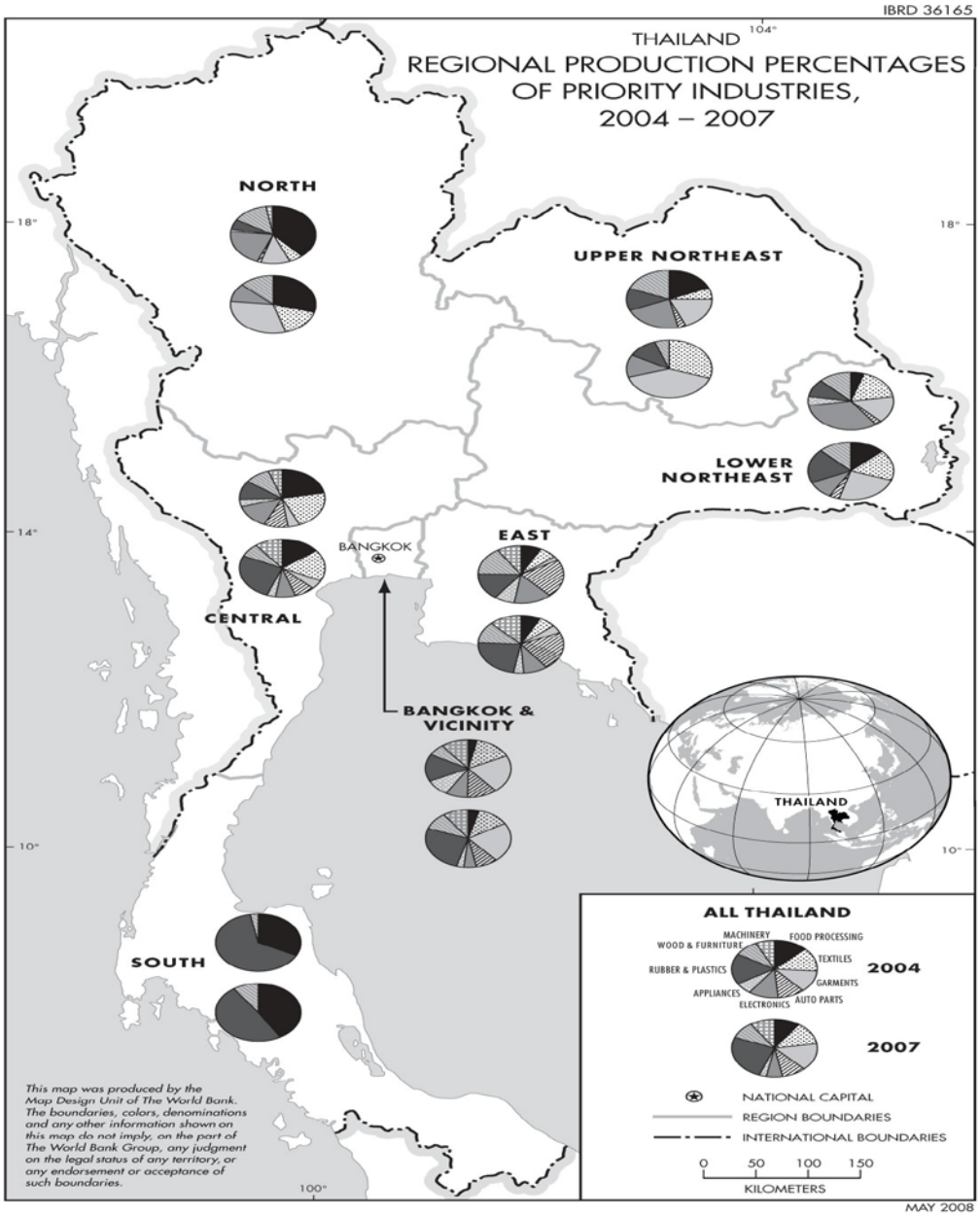
Region with Business Environment Perceived as the Worst, PICS 2007



218. Firms in different industries and of different sizes and export orientation view different aspects of the investment climate as more or less important for their

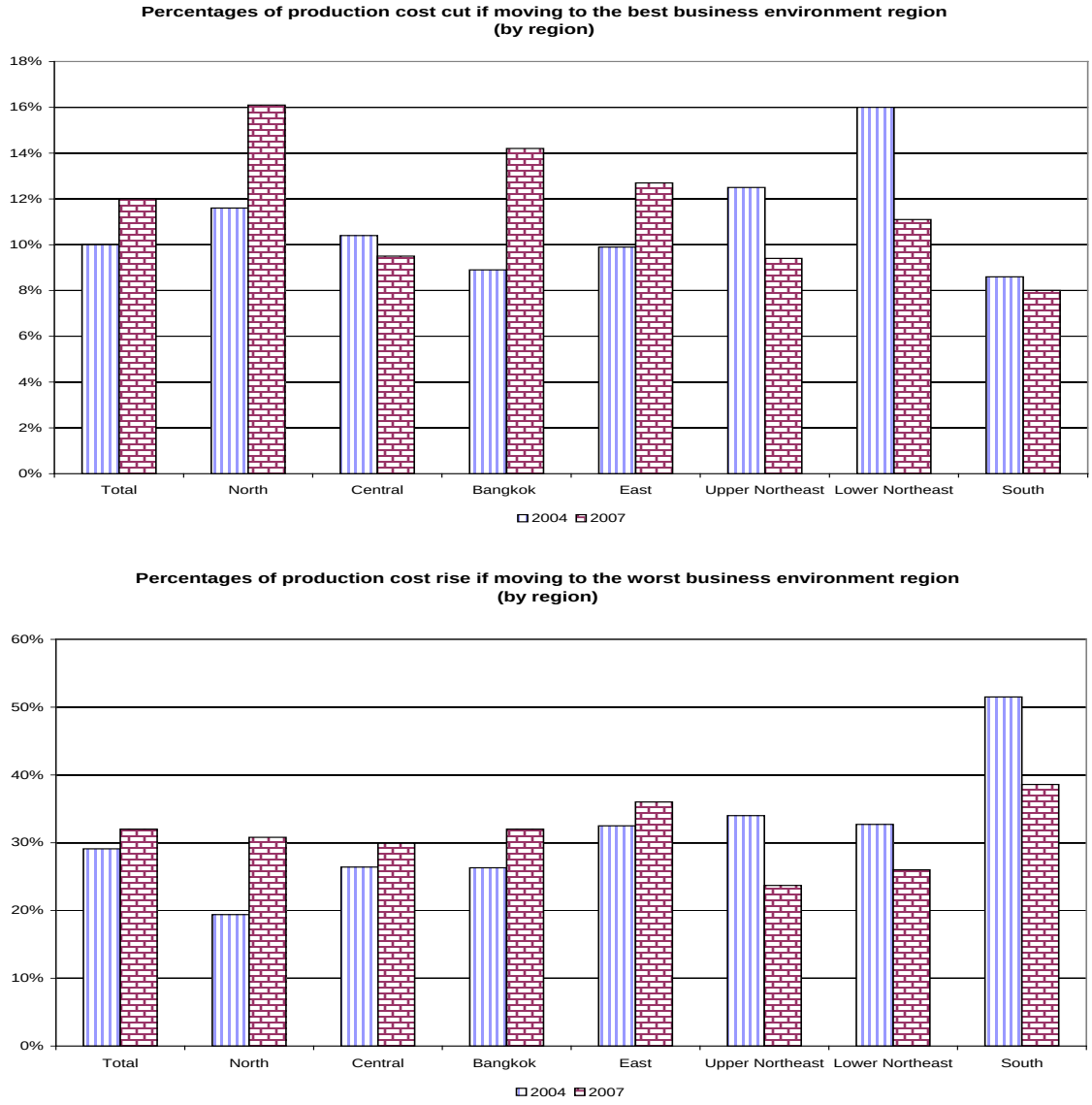
performance, and therefore perceive the investment climate differently in the same region. In consequence, production structures differ across regions (Map 2). The three leading regions of Thailand where the investment climate is perceived favorably – Bangkok, Eastern and Central – have diversified manufacturing structures while the other four regions, where the investment climate is perceived less favorably, specialize in a few industries in which they may have a comparative advantage. For example, in the South, where the investment climate was perceived as the least favorable, it is mainly firms relying on natural resources and proximity to raw materials which chose to locate there – 65 percent of firms produced rubber and plastics and 33 percent of firms processed food in PICS 2007.

Map 2: Regional Industry Production Structures in Thailand



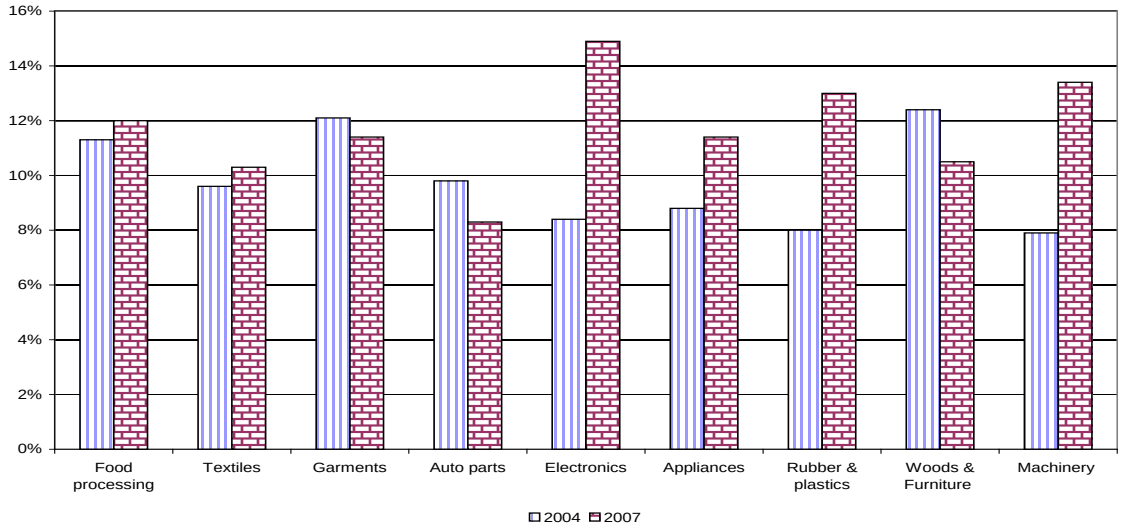
219. Firms that perceived their home region as not having the best business environment estimate that they could cut production cost by about 10 percent if they moved to the region with the best business environment.[89] They considered that their production costs would rise by about 30 percent if they moved to the region with the worst business environment. The perceived reduction and rise in cost varies across regions and industries (Figure 64).

Figure 64. Expected Cut (Rise) in Cost Resulting from a Move to the Region with the Best (Worst) Business Environment (Percentage of Production Cost)



[89] Production costs depend, in addition to the business environment, on other factors such as proximity to inputs or to customers. Some of the reduction in the production cost resulting from relocation may not purely capture the effects of the difference in business climate between two regions.

Percentages of production cost cut if moving to the best business environment region (by industry)



Percentages of production cost rise if moving to the worst business environment region (by industry)

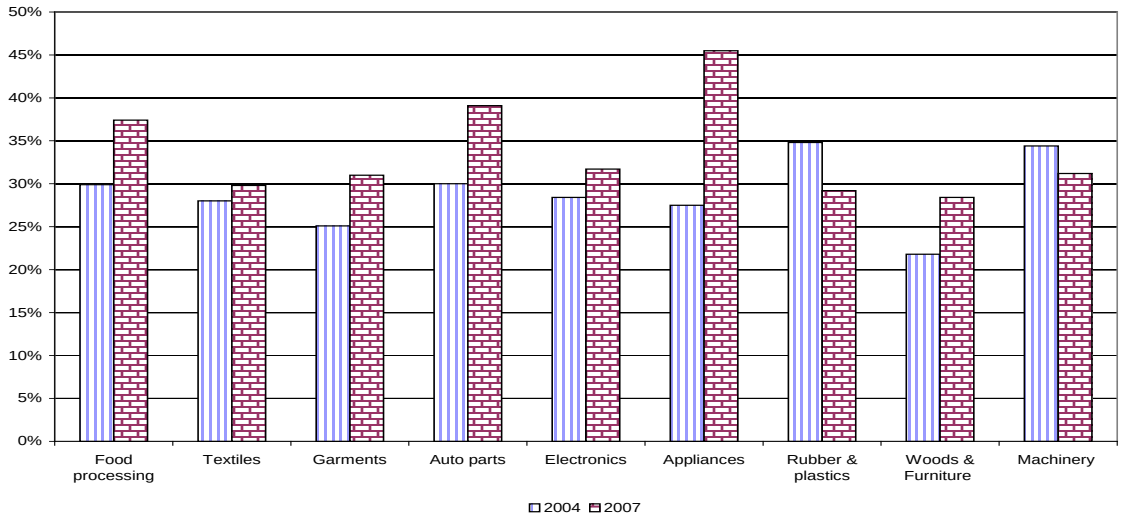


Table 30. Indirect Cost of Doing Business in Thailand by Region (Percentage of Sales)

PICS 2004							
Indirect costs as % of sales	Thailand	North	Central	Bangkok	East	Northeast	South
Production lost due to power outage	1.51	0.93	1.72	1.42	1.92	0.92	1.52
Theft, robbery, and arson	0.25	0.38	0.26	0.26	0.25	0.12	0.18
Production lost while in transit	0.53	0.56	0.48	0.61	0.40	0.50	0.51
Security	0.58	0.92	0.48	0.53	0.73	0.90	0.53
Total	2.89	2.79	2.94	2.81	3.30	2.43	2.75

PICS 2007							
Indirect costs as % of sales	Thailand	North	Central	Bangkok	East	Northeast	South
Production lost due to power outage	1.82	2.17	1.98	1.51	2.17	2.05	3.20
Theft, robbery, and arson	0.30	0.10	0.39	0.24	0.37	0.13	0.53
Production lost while in transit	0.70	0.82	0.68	0.83	0.44	0.21	0.40
Security	0.50	0.27	0.39	0.54	0.60	0.62	0.31
Total	3.32	3.36	3.44	3.12	3.57	3.01	4.45

Table 31. Indirect Cost of Doing Business in Thailand by Industry (Percentage of Sales)

PICS 2004								
Indirect costs as % of sales	Food Processing	Textiles	Clothing	Auto Parts	Electronics / Applinace	Rubber / Plastic	Wood / Furniture	Machinery
Production lost due to power outage	0.97	1.42	1.28	1.68	1.47	1.96	1.17	1.97
Theft, robbery, and arson	0.17	0.16	0.21	0.32	0.38	0.24	0.37	0.25
Production lost while in transit	0.38	0.37	0.21	0.39	0.54	0.77	1.00	0.65
Security	0.56	0.66	0.56	0.71	0.48	0.52	0.67	0.58
Total	2.08	2.60	2.25	3.10	2.87	3.48	3.19	3.45

PICS 2007								
Indirect costs as % of sales	Food Processing	Textiles	Clothing	Auto Parts	Electronics / Applinace	Rubber / Plastic	Wood / Furniture	Machinery
Production lost due to power outage	2.26	1.79	1.65	1.58	1.17	2.11	1.81	1.61
Theft, robbery, and arson	0.47	0.12	0.25	0.32	0.55	0.33	0.14	0.28
Production lost while in transit	0.75	0.25	0.75	0.36	0.46	0.65	1.58	0.92
Security	0.42	0.43	0.58	0.53	0.66	0.45	0.54	0.49
Total	3.89	2.59	3.23	2.79	2.84	3.54	4.07	3.30

Table 32. Indirect Cost of Doing Business in Thailand by Type of Firms (Percentage of Sales)

PICS 2004							
Indirect costs as % of sales	Small	Medium	Large	Exporter	Non exporter	Domestic	Foreign
Production lost due to power outage	1.65	1.57	1.38	1.48	1.58	1.52	1.50
Theft, robbery, and arson	0.29	0.27	0.21	0.25	0.26	0.24	0.29
Production lost while in transit	0.73	0.55	0.40	0.52	0.56	0.58	0.39
Security	0.51	0.61	0.61	0.58	0.59	0.57	0.61
Total	3.18	3.00	2.59	2.83	2.99	2.91	2.80

PICS 2007							
Indirect costs as % of sales	Small	Medium	Large	Exporter	Non exporter	Domestic	Foreign
Production lost due to power outage	1.95	1.88	1.56	1.70	1.92	1.90	1.53
Theft, robbery, and arson	0.39	0.33	0.12	0.25	0.34	0.34	0.13
Production lost while in transit	0.84	0.81	0.39	0.63	0.77	0.75	0.53
Security	0.51	0.56	0.41	0.48	0.52	0.53	0.40
Total	3.69	3.58	2.49	3.06	3.55	3.52	2.59

ANNEX 2. TECHNICAL NOTE

1. This technical note provides definitions of the variables used in the descriptive and analytical part of the report, as well as the specifications for the regressions on which the report's results are based. The structure is as follows: The first section gives an overview of the definitions of our indicators of firm characteristics, of our measures of perceived investment climate (IC) and our variables capturing objective IC. The second section explains the three measures of productivity employed in this report, and the variables necessary to construct them. Finally, the third section specifies the regressions and the explanatory variables used in them. The latter are largely, but not wholly, based on the variables presented in part I and II.

Definitions of variables

2. The summary statistics were calculated with the full sample of observations available in the Thai Productivity and Investment Climate Study (PICS), both for the country as a whole and disaggregated across regions, industries and types of firms (small, medium and large firms; exporters and non-exporters; domestic and foreign firms).

Firm Characteristics

- *Region:* Seven region codes were used to distinguish the location of individual firms - North, Central, Bangkok and Vicinity, East, Upper Northeast, Lower Northeast and South.

- *Industry*: Nine industry codes were constructed based on the four-digit ISIC - Food processing, textile, garment, auto parts, electronic component, electrical appliance, rubber & plastics, wood products & furniture and machinery.

- *Firm size*: Firms are categorized into three groups depending on their size, which is measured by the number of persons employed. A firm is of small-size if its total number of employment in 2006 is less than 50; it is medium-sized if its number of current employment in 2006 is equal to or more than 50 and less than or equal to 200; and it is large if the number of persons employed in 2006 is more than 200.

- *Exporter*: A firm is considered an exporter if the firm exported any part of its output in 2006 as indicated in Part I of PICS, question 1.12.

- *Domestic firms*: A firm is considered a domestic firm if less than 10 percent was owned by a foreign private sector firm in 2006 as indicated in Part I, question I.4.

- *Age of firm*: Time since the firm commenced operations in Thailand, given in Part I, question I.1.

Subjective Business Climate Indicators

- *Severity of perceived investment climate constraints*: For each of the 18 investment climate constraints about which firms were asked in question V.1 of Part I, we calculate the ratio of the number of businesses who responded with 3 or 4 (major or very severe) to the total number of non-missing responses.

- *Top three business constraints*: We obtain the list of the three biggest obstacles as perceived by the surveyed Thai firms in Part I, question V.2. We divide the number of firms that name an IC obstacle out of 22 items for 1st, 2nd, and 3rd biggest obstacles to doing business by the total number of Thai firms surveyed.

- *Best (Worst) IC regions*: We obtain the number of firms that perceived a region as having the best (worst) business environment in Part I, question VI.37 (question VI.39). For each region, we divide that number by the number of total respondents to obtain the percentage of firms that judge a particular region the best (worst).

- *Cost cut (rise) by relocating to the best (worst) IC region*: We obtain the expected cost cut (rise) if a firm were based in the best (worst) business environment region as a percentage of the current production cost in Part I, question VI.38 (question VI.40). We calculate an average cost cut (rise) only for firms that perceive any other region than their home region as having the best (worst) IC.

- *Comparison of business environment among regions*: We obtain firms' comparative perceptions about non-home regions in Part I, question VI.36. For each regions, we calculate the number of firms that perceive that particular region as having a better business environment than their home region, and compute a percentage by dividing that number by the total of respondents.'

- *Perceived severity of macroeconomic volatility/uncertainty*: For each component of macroeconomic instability, we obtain the number of firms that perceived it as '4' or '5' (substantial or very substantially) in question VI1.1, Part I. We calculate the percentage by dividing each number by the total of respondents.

- *Firms' response to macroeconomic volatility*: We obtain the number of firms that takes preventive measures to deal with macroeconomic risks in Part I, question V.1.2. We calculate the percentage of firms that take a specific preventive measure by dividing its number by the total number of respondents.

- *Considerations for recruiting*: For each of six alternative considerations for recruiting, we obtain the number of firms that rated it 1 ('the most important') from Part I, question IV.6. We calculate a percentage by dividing this number by the total number of respondents.

- *Quality of labor*: We obtain the perceptions of the surveyed Thai firms on the qualities of their employees with respect to 12 skills in Part I, question IV.8.

- *Affordability of business services*: We obtain the firms' perceptions on affordability of six alternative business services in Part I, question V.4.

- *Quality of business services*: We obtain the firms' perception on the business service quality in Thailand for six items in Part I, question V.4.

- *Percentages of firms' capacity utilization*: We obtain the amount of output actually produced relative to the maximum amount that can be produced in 2004-2006 in question III.8, Part I.

- *Reasons for insufficient capacity utilization*: For any of seven alternative reasons for insufficient capacity utilization, we obtain the number of firms for which each is relevant in question III.9, Part I. We obtain the percentage of firms naming each reason by dividing it by the total number of respondents.

Objective Investment Climate Indicators

Indirect costs

- *Production lost due to power outage*: In question VI.15, Part I, we obtain the percentage of production value lost due to interruptions in public power provision in 2006. Such losses, for instance, may be due to lost production time from the outage, time needed to reset machines and production rejected due to processes being interrupted.

- *Losses from theft, robbery or vandalism*: In question VI.11, Part I, we obtain the losses from theft, robbery or vandalism as a percentage of total sales in 2006.

- *Production lost while in transit*: We obtain the estimated lost shipment due to breakage, theft or spoilage as a percentage of total sales in 2006 from question VI.13, Part I.

- *Estimated cost of providing security*: The estimated costs of providing security for a firm are obtained as a percentage of total sales in question VI.12, Part I.

- *Total indirect cost*: We calculate the total indirect cost as the sum of losses due to power outage, crime, security provision and transport. Note that the Thai PICS does not provide costs of unofficial payments, such as bribes and gift payments to public officials in 2006.

Infrastructure

- *Yearly number of power outages*: The average number of power outages or surges from the public grid per month in 2006 is obtained in Part I, question

VI.14. We calculate the annual number of power outage by multiplying the average monthly number by 12 after dropping missing values.

- *Production loss due to power outages*: Question VI.15 in Part I yields the production value lost due to power interruptions in the public grid in 2006. Such losses may be due to lost production time, time needed to reset machines and so on.

- *Percentage of firms with a generator*: A firm is considered to have a generator, if the firm owns, rents or has shared access to a generator in 2006. This information is obtained from Part I, question VI.16. We calculate the percentage of firms with generator by dividing firms with generator by the total number of firms after dropping missing values.

- *Days to obtain electricity connection*: This variable gives the days required for obtaining an electricity connection in 2005-2006, as indicated in Part I, question VI.6.

- *Days to obtain phone line*: Question VI.6 in Part I yields the number of days required for obtaining a fixed telephone line in 2005-2006.

- *Constraints to innovation*: For each of five constraints to introducing IT, we obtain the number of firms that respond with 4 or 5 (very important or critically important) in question III.30 of Part I. This number is then divided by the total number of non-missing responses to obtain a percentage.

Finance

- *Percentage of annual sales tied up in overdue payments*: This variable gives the percentage of annual sales tied up in overdue payments in 2006 on average. The information is obtained from question VIII.23, Part IIA.

- *Percentage of firms with overdraft facility*: Question IX.20, Part IIA, indicates whether firms have a bank overdraft facility. We calculate the percentage of firms with an overdraft facility by dividing their number by the total of firms surveyed in 2006, after dropping missing values.

- *Percentage of firms with a bank loan:* Question IX.17 in Part IIA indicates the percentage of firms with a term loan from a bank or financial institution in 2006. We calculate the percentage of firms with a bank loan by dividing their number by the total of firms surveyed after dropping missing values.

- *Days to clear a check*: The average number of days required to clear a check through the firms' financial institution in 2006 is given by question IX.24 in Part IIA.

- *Percentage of firms of which investment financed by informal sector*: This variable is obtained in Part IIA, question IX23. It indicates the percentage of firms that financed their investments using funds from informal sources such as unlicensed money lenders.

Skilled labor

- *Number of weeks to fill vacancy for professionals, skilled workers and unskilled workers respectively*: These variables are defined as the average number of weeks required to fill the most recent vacancy for a professional, a skilled worker and an unskilled worker respectively. This information is obtained from question IV.4, Part I.

- *Ratio of vacancies for skilled workers to total vacancies*: With the information from question X.13, Part IIB, we calculate the percentage of vacancies for skilled workers, i.e., management, professionals, skilled production workers and non-production workers, by dividing their number by the total of vacancies in 2006.

- *Percentage of employees with college degree*: We obtain the number of employees with university degree in a firm in question X.17, Part IIB. We then calculate the percentage by dividing this number by the total number of employees as indicated in question X.8, Part IIB.

- *Reasons to hire workers from other regions or other countries*: For each of three alternative reasons to hire workers from another region, we obtain the ratio of firms which gave that reason to the total number of respondents. This information is obtained from question III32a, Part I.

Regulation and logistics

- *Days to obtain import permit*: This variable is defined as the average number of days required to obtain an import permit in 2005-2006 as indicated in Part I, question VI.6..

- *Days to obtain operating license*: The average number of days required to obtain an operating license in 2005-2006 as given in Part I, question VI.6 of PICS.

- *Number of inspections per year*: This is the sum of a firm's inspections from the Revenue Department, Social Security Office, Immigration Division, Department of Industrial Works and Local Authorities as given in question VI.8, Part I. Note that the questions were phrased slightly differently in PICS 2004 and PICS 2007. PICS 2004 asked the aggregated number of inspectors' visits to their establishment, while PICS 2007 asked the disaggregated numbers of visits from each agency.

- *Percentage of senior managers' time used for dealing with business regulations*: This is the sum of the percentages of senior management's time per year spent

dealing with requirements imposed by government regulation of the Revenue Department, Social Security Office, Immigration Division, Department of Industrial Works and Local Authorities. This information is obtained from Part I, question VI.7.

- *Days to clear import custom*: This is the average number of days required to clear Thailand customs for importing equipment and other inputs. We obtain this information from Part I, question VII.4.a.

- *Days to clear export custom*: Question VII.3.a in Part I gives us the average number of days a firm required to clear Thai customs for direct exporting.

Firm Performance Indicators: Three Measures of Productivity

3. In examining how different dimensions of the business climate affect firm performance, we used three different methods to measure the latter: Labor Productivity (VAL), Sales Growth (SG) and total factor productivity (TFP). These indicators were derived from the PICS survey in 2007 which provides corporate data on 1,043 firms for the last four years. From this total number, 173 outliers were removed, leading to a sample size of 870. We identified a firm as an outlier using several indicators: output-labor ratio; capital-labor ratio; intermediates-labor ratio; intermediates share in output; and labor cost share in output. If the ratio(s)/share(s) of a firm were more than three standard deviations greater or smaller than the mean in the corresponding industry the firm was considered an outlier and dropped from the sample used to calculate our firm performance indicators.

Variables used to construct our productivity measures

4. We used the following variables to calculate firm performance indicators from PICS:

- *Output (y) for years 2003-2006*: Given by the operational revenue in the table of Part IIA – question IX.13, and deflated by the Consumer Price Index of the Bank of Thailand.

- *Intermediate costs (m) for years 2003-2006*: Defined as the sum of direct material cost, electricity expenditures, and fuel and other energy expenditures. These costs are obtained from question IX.13, Part IIA, and deflated by corresponding price indicators from the Bank of the Thailand.

- *Skilled labor (s) for years 2003-2006*: The sum of the number of management, professionals and skilled production and nonproduction workers as given by the table in Part IIB – question X8.

- *Unskilled labor (u) for years 2003-2006*: The number of unskilled workers as given by the table in Part IIB - question X8.

- *Capital stock (k):* Defined as the book value of machinery and equipment as given in Part IIA, question IX.14, and deflated by the Consumer Price Index of the Bank of Thailand.

The three productivity measures

5. The three productivity indicators we use, Labor Productivity (VAL), Sales Growth (SG) and total factor productivity (TFP), capture different dimensions of firm performance.

- VAL measures the productivity of labor. It is the ratio of value-added, defined as output minus intermediate cost, to total employment. Mathematically, it is defined as:

  $$VAL_{it} = \frac{y_{it} - m_{it}}{s_{it} + u_{it}}$$

  where *i* and *t* stand for firm and time respectively; y_{it} is output measured as operating revenue for firm i at a given time t; m_{it} is material input plus energy cost (electricity and fuel); and $s_{it} + u_{it}$ is the sum of skilled and unskilled labors or the total number of labor.

- SG measures the logarithmic change in operational revenue. Formally:

  $$SG_{it} = \ln(y_{it}) - \ln(y_{it-1})$$

  where $\ln(\ )$ implies that the data take the form of the natural logarithm. TFP captures how effectively a firm employs its factors of production such as capital and labor to produce output. TFP reflects the level of technology that a firm holds, the marginal quality of products and government policies etc. In estimating production functions, we use Levinsohn and Petrin's method to use intermediates as a proxy. The Levinsohn Petrin method yields comparatively unbiased estimators because it corrects for a firm's decision of input adjustment in response to productivity shock. For details, see Levinsohn and Petrin [2003][90].

Explaining Firm Productivity

6. The empirical part of this report discusses the results of regression analyses which seek to explain firm productivity with certai firm characteristics and investment climate indicators. In what follows, we provide the definitions of the core explanatory variables and the specifications of the key regressions. Cooperate finance data of Thai firms, necessary to construct some of the variables, was obtained from the PICS 2007 Part IIA.

[90] Levinsohn, J. and Petrin, A.. (2003). "Estimating production functions using inputs to control for unobservables." Review of Economic Studies, Vol. 70(2), No. 243, pp.317-42.

Explaining Firm Productivity by firm characteristics

7. We examined the relationship between firm performance indicators and several firm characteristics. For this purpose, the following explanatory variables were used:

- *Region dummy variables*: Region dummies were constructed based on the region code which indicates each firm's location. We merged Upper and Lower Northeast because of the limited sample sizes in these regions. This leaves us with six regions – North; Central; Bangkok; East; Northeast and South.

- *Industry dummy variables*: Industry dummies were constructed based on the PICS industry classification, which in turn was derived from the ISIC. We merge electronic component industry and electrical appliance industry due to their limited sample sizes. Thus we have eight industries – Food processing; textiles; garments; auto-parts; electronics & electrical appliances; rubber & plastics; wood products & furniture; and machinery and equipment.

- *Firm Age*: Measured by the difference between the year of the survey and the year operations were started in Thailand, as indicated in Part I, question I.1.

- Firm Size: Measured by the logarithm of a firm's total employment (the sum of skilled and unskilled employment as indicated in Part IIB, question X.8.

- *Domestic exporter dummy*: Defined to be equal 1 if the sum of percentages of direct export and indirect export to total sales, as indicated in question VIII.9, Part IIA, is greater than 10 percent and the percentage of the firm owned by private sector foreign companies, as indicated in question I.4, Part I, is less than 10 percent.

- *Foreign firms dummy:* Defined to be equal 1 if question I.4, Part I., indicates that more than 10 percent of the firm is owned by private sector foreign firms.

- *R&D dummy:* Constructed to be equal 1 if the firm has positive expenditure on R&D in Part IIA – question IX.13.

- *Percentage of computer-controlled machinery*: Given in Part I – question III.7.

- *Vintage of capital*: Defined as the machinery & equipment of the firm that is less than five years old as given in Part I, question III.6.

8. The regression to explore the relationship between firm characteristics and firm performance indicators was tested for 1,043 firms minus the outliers. Outliers were defined as having firm performance indicators greater or smaller than the corresponding industry mean by three standard deviations. We tested a fixed-effect OLS regression model with robust standard error with data for the years 2003-2006. The full model is specified as follows:

$$p_{it} = \delta_0 + \delta_1 \ln(Age_{it}) + \delta_2 \ln(FirmSize_{it}) + \delta_3 DomEx_i + \delta_4 Foreign_i + \delta_5 Comp_i + \delta_6 Vin_i + \delta_7 RD_{it} + X^{time}\gamma_1 + X^{reg}\gamma_2 + X^{ind}\gamma_3 + \varepsilon_{it}$$

where p_{it} is a measure of firm performance indicator, i.e. labor productivity, TFP or sales growth, and the explanatory variables include firm age (in log) Age_{it}, firm size (in log) $FirmSize_{it}$, a dummy variable for domestic exporting firm $DomEx_i$, a dummy for foreign ownership $Foreign_i$ and three measures of technology and innovation, i.e. % of computer controlled machinery, % of machinery that is less than five years old and a dummy for positive R&D expenditure. We include matrices of time dummies X^{time}, region dummies X^{reg} and industries dummies X^{ind}. Parameters δ represent coefficients estimating effects of firm characteristics and γ represent vectors of parameters for dummy matrices. We estimate the effects using Ordinary Least Square (OLS) with robust standard errors to address heteroskedasticity. We repeat the same regressions for each industry without an industry dummy matrix with the same OLS technique.

Adding IC indicators to the regression as explanatory variables

9. In the empirical chapter, we explored the relationship between investment climate indicators and firm performance. In doing so, the following variables were used.

(a) Skilled labor shortage

- *Percentage of employees with a university degree*: Derived from the number of employees with university degree given in Part IIB, question X.17, by dividing it by the total number of employees given in Part IIB, question X.8.

- *Weeks to fill skilled labor vacancy*: Defined as weeks required to fill the most resent vacancy for professionals (in log) indicated in Part I, question IV.4.

(b) Regulation and logistics

- *Days to obtain import permit*: Days required to obtain import permit (in log) as indicated in Part I, question VI.6

- *Days to clear export custom*: Days required to clear custom for export on average (in log) indicated in Part I – question VII. 3.b.

(c) Infrastructure

- *Yearly number of power outages*: The monthly number of power outages or surges from the public grid that surveyed firms experienced in 2006 (times 12), indicated in Part I – question VI.14.

- *Production loss due to power outage*: Defined as production value lost due to power interruptions from the public grid, e.g., lost production time, time needed to reset machines and production, in 2006. Indicated in Part I – question VI.15.

(d) Access to finance

- *Bank loan*: If surveyed firms have a term loan from a bank or other financial institutions. Indicated in Part IIA, question IX.17.

- *Days to clear check*: Average number of days requires to clear checks through a financial institution indicated in Part IIA – question IX.33.

To augment a sample size of IC indicators and to minimize reverse causality, we used industry-region mean of IC indicators instead of firm level data. The mean indicators are obtained by:

$$\overline{X}_{jk} = \frac{1}{n_{jk}} \sum_{i=1}^{n_{jk}} X_i$$

where *j*, *k* stand for industry *j* and region *k*, respectively. Mean of each IC indicator are calculated for each industry *j* and each region *k*.

10. To identify the impact of these IC indicators on firm performance, we tested fixed-effect regressions with robust standard error with panel data. We excluded outliers from the regression analysis. Outliers were defined as firms with firm performance indicators more than three standard deviations greater or smaller than the corresponding industry mean. The full model tested in the chapter 6 is formally specified as follows:

$$\begin{aligned} p_{it} = {} & \zeta_0 + \zeta_1 \overline{ColDegree}_{jk} + \zeta_2 \ln\left(\overline{SkilledVac}_{jk}\right) + \zeta_3 \ln\left(\overline{ImPermit}_{jk}\right) \\ & + \zeta_4 \ln\left(\overline{ExCustom}_{jk}\right) + \zeta_5 \ln\left(\overline{OutageNB}_{jk}\right) + \zeta_6 \overline{LossOutage}_{jk} \\ & + \zeta_7 \overline{BankLoan}_{jk} + \zeta_8 \ln\left(\overline{CheckClear}_{jk}\right) \\ & + \zeta_9 \ln\left(Age_{it}\right) + \zeta_{10} \ln\left(FirmSize_{it}\right) + \zeta_{11} DomExp_i + \zeta_{12} Foreign_i + \zeta_{13} RD_{it} \\ & + X^{time}\gamma_1 + X^{reg}\gamma_2 + X^{ind}\gamma_3 + \varepsilon_{it} \end{aligned}$$

where $\overline{ColDegree}_{jk}$ denotes average ratio employees with university degree to the total employees in industry *j* and region *k*; $\ln\left(\overline{SkilledVac}_{jk}\right)$ average number of weeks required to fill skilled labor vacancy (in log); $\ln\left(lineoverImPermit_{jk}\right)$ mean days required to obtain import permit; $\ln\left(\overline{ExCustom}_{jk}\right)$ average number of days required to clear export custom; $\ln\left(\overline{OutageNB}_{jk}\right)$average number of power outage from the grid per year (in log); $\overline{LossOutage}_{jk}$ average fraction of production loss due to power outage to total sales; $\overline{BankLoan}_{jk}$ average fraction of firms with bank loan; and, $\ln\left(\overline{CheckClear}_{jk}\right)$ average number of days clear check. The regression model also includes the firm characteristics mentioned above, except two measures of technology. Again, we tested the model with the fixed-effect OLS with robust standard error to address heteroskedasticity. The results are shown in Table 42, Table 43 and Table 44.

- *Further comments on IC indicators and firms performance indicators*:

  - We chose the IC explanatory variables based on the following criteria:

    - Firm managers' perceptions on major IC constraints;

    - Important IC indicators suggested by Dollar et al. [2005]; and.

    - We systematically remove IC indicator candidates based on their statistical significance.

  - The results from regression analysis are very informative and intuitive. But it should be reiterated that the statistical significance of these firm characteristics and IC indicators does not necessarily show a causality of these indicators. For example, firms with foreign ownership tend to show higher levels of labor productivity and total factor productivity. This may reflect a fact that firms with foreign ownership tend to be innovative as a result of technology transfer from foreign stakeholders. But it is also true that the best performing domestic firms are very attractive for foreign investors, resulting in higher share of foreign ownership. Thus, the findings from regression analysis on relationship between IC indicators and firm performance do not necessarily indicate a causal relationship**.**

  - Analysis of IC indicators is subject to a potential econometric problem of multicolinearity – some of explaining variables are strongly correlated among IC indicators. We observe significant correlation among some of these indicators. In order to identify the problem of multicolinearity, we complement analysis of the regressions of firm performance and IC indicators with partial regressions of IC indicators of each IC category (see columns 1-3 of Table 42, Table 43 and Table 44). The partial regressions tend to show stronger and more significant impacts of these IC indicators given multicolinearity.

ANNEX 3. ANNEX TABLES

Table 33. Levinsohn-Petrin Production Function Estimation (PICS 2007)

Dependent Variable Output (Operating Revenue)

	Food processing	Textiles	Garment	Auto parts	Electronics / Appliance	Rubber / Plastics	Wood / Furniture	Machinery
Skilled labor	0.108***	0.095***	0.176***	0.158***	0.145**	0.143***	0.206***	0.252***
	[0.040]	[0.035]	[0.034]	[0.035]	[0.063]	[0.030]	[0.050]	[0.055]
Unskilled labor	0.021	0.069***	0.158***	0.012	0.109*	0.028	0.109**	0.044**
	[0.033]	[0.026]	[0.030]	[0.032]	[0.061]	[0.026]	[0.040]	[0.023]
Intermediates	0.93***	0.95***	0.43**	0.44*	0.64***	0.81**	0.69***	0.64***
	[0.289]	[0.255]	[0.219]	[0.265]	[0.160]	[0.326]	[0.240]	[0.095]
Capital	0.01	0.01	0.1	0.07	0.13	0.06	0.1	0.09
	[0.096]	[0.030]	[0.082]	[0.060]	[0.063]	[0.051]	[0.085]	[0.047]
Observations	355	437	492	360	224	884	329	361

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 34. Levinsohn-Petrin Production Function Estimation (PICS 2004)

Dependent Variable Output (Operating Revenue)

	Food processing	Textiles	Garment	Auto parts	Electronics / Appliance	Rubber / Plastics	Wood / Furniture	Machinery
Skilled labor	0.104***	0.104***	0.102***	0.122***	0.073***	0.149***	0.220***	0.151***
	[0.028]	[0.024]	[0.027]	[0.036]	[0.028]	[0.042]	[0.036]	[0.039]
Unskilled labor	0.059***	0.038***	0.054***	0.044**	0.049**	0.03	0.091***	0.036**
	[0.016]	[0.014]	[0.018]	[0.018]	[0.021]	[0.035]	[0.023]	[0.016]
Intermediates	0.760***	0.480*	0.07	0.700***	0.33	0.700***	0.47	0.11
	[0.122]	[0.283]	[0.347]	[0.136]	[0.367]	[0.224]	[0.303]	[0.314]
Capital	0.08	0.08	0.04	0.140***	0.1	0.07	0.08	0.09
	[0.055]	[0.102]	[0.076]	[0.052]	[0.082]	[0.069]	[0.079]	[0.058]
Observations	299	324	272	219	279	360	206	279

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 35. GLS Production Function Estimation (PICS 2007)

Dependent Variable Output (Operating Revenue)

	Food processing	Textiles	Garment	Auto parts	Electronics / Appliance	Rubber / Plastics	Wood / Furniture	Machinery
Skilled labor	0.111***	0.120***	0.202***	0.166***	0.165***	0.125***	0.191***	0.276***
	[0.021]	[0.014]	[0.031]	[0.024]	[0.037]	[0.017]	[0.028]	[0.028]
Unskilled labor	0.034**	0.082***	0.194***	0.015	0.181***	0.052***	0.103***	0.051***
	[0.016]	[0.012]	[0.02]	[0.017]	[0.024]	[0.018]	[0.023]	[0.012]
Intermediates	0.820***	0.763***	0.608***	0.709***	0.630***	0.785***	0.691***	0.615***
	[0.019]	[0.016]	[0.033]	[0.021]	[0.025]	[0.025]	[0.026]	[0.024]
Capital	0.055***	0.044***	0.072***	0.112***	0.072***	0.064***	0.075***	0.097***
	[0.013]	[0.008]	[0.014]	[0.02]	[0.016]	[0.01]	[0.019]	[0.013]
Constant	2.380***	3.290***	4.861***	3.431***	4.908***	2.777***	3.815***	4.777***
	[0.289]	[0.182]	[0.39]	[0.266]	[0.339]	[0.296]	[0.364]	[0.299]
Observations	355	437	492	360	224	884	329	361

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 36. GLS Production Function Estimation (PICS 2004)

Dependent Variable Output (Operating Revenue)

	Food processing	Textiles	Garment	Auto parts	Electronics / Appliance	Rubber / Plastics	Wood / Furniture	Machinery
Skilled labor	0.100***	0.149***	0.144***	0.136***	0.105***	0.158***	0.234***	0.169***
	[0.02]	[0.018]	[0.021]	[0.029]	[0.023]	[0.031]	[0.024]	[0.026]
Unskilled labor	0.054***	0.055***	0.080***	0.049***	0.069***	0.038	0.101***	0.048***
	[0.011]	[0.012]	[0.015]	[0.014]	[0.018]	[0.024]	[0.015]	[0.013]
Intermediates	0.794***	0.773***	0.747***	0.777***	0.799***	0.831***	0.758***	0.755***
	[0.025]	[0.02]	[0.02]	[0.028]	[0.017]	[0.012]	[0.023]	[0.018]
Capital	0.050***	0.042***	0.007	0.057***	0.030**	0.026***	0.012	0.037***
	[0.017]	[0.008]	[0.015]	[0.017]	[0.014]	[0.009]	[0.01]	[0.007]
Constant	2.934***	3.136***	4.160***	2.964***	3.108***	2.402***	3.480***	3.569***
	[0.343]	[0.258]	[0.283]	[0.314]	[0.201]	[0.173]	[0.295]	[0.247]
Observations	299	324	272	219	279	360	206	279

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 37. Correlates between Firm Characteristics and Performances (PICS 2007)

Dependent variable	Labor productivity			Total factor productivity			Sales growth		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Firm Age	0.279	0.254	0.224	-0.364	-0.331	0.037	-0.099	-0.101	-0.103
	[0.028]***	[0.027]***	[0.025]***	[0.075]***	[0.073]***	[0.011]***	[0.012]***	[0.012]***	[0.012]***
Size (# of employment)	-0.028	-0.02	0.005	0.097	0.084	0.002	0.014	0.016	0.019
	[0.015]*	[0.015]	[0.014]	[0.047]**	[0.047]*	[0.007]	[0.006]**	[0.006]***	[0.006]***
Foreign ownership (>10%)	0.795	0.774	0.702	1.043	1.159	0.241	-0.032	-0.032	-0.034
	[0.040]***	[0.040]***	[0.039]***	[0.134]***	[0.133]***	[0.019]***	[0.015]**	[0.016]**	[0.016]**
Domestic Exporter (Export>10% Foreign Ownership<=10%)	0.273	0.253	0.343	0.218	0.498	0.055	-0.025	-0.025	-0.015
	[0.041]***	[0.040]***	[0.039]***	[0.126]*	[0.122]***	[0.017]***	[0.018]	[0.018]	[0.018]
% Computer controlled Mach.	0.387	0.372	0.373	0.057	0.063	0.135	0.165	0.163	0.165
	[0.058]***	[0.058]***	[0.055]***	[0.177]	[0.170]	[0.025]***	[0.025]***	[0.025]***	[0.025]***
Capital vintage (% Mach. Under 5 yrs)	0.536	0.533	0.324	1.512	1.094	0.027	-0.007	-0.007	-0.019
	[0.070]***	[0.070]***	[0.071]***	[0.236]***	[0.228]***	[0.035]	[0.027]	[0.027]	[0.027]
Dummy for R&D	0.162	0.159	0.102	-0.148	-0.176	0.045	-0.02	-0.021	-0.02
	[0.045]***	[0.044]***	[0.045]**	[0.174]	[0.171]	[0.023]*	[0.021]	[0.021]	[0.021]
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Regional dummies	no	yes	yes	no	yes	yes	no	yes	yes
Inudstry dummies	no	no	yes	no	no	yes	no	no	yes
Observations	3578	3578	3578	3483	3483	3483	2698	2698	2698
Adj. R-squared	0.19	0.22	0.29	0.06	0.13	0.98	0.1	0.1	0.11

Note: OLS estimation is used. Robust standard errors are in brackets. * stands for significant at 10%; ** significant at 5%; *** significant at 1%.

Table 38. Correlates between Firm Characteristics and Performances (PICS 2004)

Dependent variable	Labor productivity			Total factor productivity			Sales growth		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Firm Age	0.117	0.134	0.121	0.013	-0.287	0.02	-0.085	-0.084	-0.086
	[0.033]***	[0.035]***	[0.035]***	[0.090]	[0.088]***	[0.013]	[0.013]***	[0.013]***	[0.014]***
Size (# of employment)	0.037	0.033	0.039	-0.218	-0.086	-0.002	-0.013	-0.013	-0.003
	[0.016]**	[0.016]**	[0.016]**	[0.050]***	[0.049]*	[0.008]	[0.006]**	[0.006]**	[0.006]
Foreign ownership (>10%)	0.768	0.726	0.702	0.945	1.056	0.17	-0.022	-0.027	-0.034
	[0.050]***	[0.050]***	[0.050]***	[0.161]***	[0.156]***	[0.023]***	[0.019]	[0.019]	[0.020]*
Domestic Exporter (Export>10% Foreign Ownership<=10%)	0.324	0.285	0.333	0.047	0.255	0.056	-0.054	-0.058	-0.029
	[0.047]***	[0.047]***	[0.048]***	[0.140]	[0.135]*	[0.019]***	[0.018]***	[0.019]***	[0.019]
% Computer controlled Mach.	0.042	0.059	0.104	0.628	0.333	-0.041	0.099	0.1	0.119
	[0.070]	[0.070]	[0.070]	[0.197]***	[0.185]*	[0.029]	[0.028]***	[0.028]***	[0.029]***
Capital vintage (% Mach. Under 5 yrs)	0.499	0.524	0.433	0.193	-0.158	0.025	0.039	0.04	0.001
	[0.064]***	[0.065]***	[0.065]***	[0.195]	[0.194]	[0.028]	[0.023]*	[0.024]*	[0.025]
Dummy for R&D	0.189	0.188	0.17	-0.323	-0.357	0.031	0.006	0.006	0.018
	[0.050]***	[0.050]***	[0.049]***	[0.150]**	[0.138]***	[0.018]*	[0.018]	[0.018]	[0.018]
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Regional dummies	no	yes	yes	no	yes	yes	no	yes	yes
Industry dummies	no	no	yes	no	no	yes	no	no	yes
Observations	2674	2674	2674	2430	2430	2430	2702	2702	2702
R-squared	0.17	0.18	0.21	0.03	0.13	0.98	0.04	0.04	0.07

Note: OLS estimation is used. Robust standard errors are in brackets. * stands for significant at 10%; ** significant at 5%; *** significant at 1%.

Table 39. Correlates between Firm Characteristics and Labor Productivity by Industries (PICS 2007)

Dependent Variable: Labor Producitivity (PICS 2007)																
	Food processing		Textiles		Garment		Auto parts		Electronics		Rubber/plastics		Wood/furniture		Machinery	
Age	0.434	0.543	0.181	0.166	0.364	0.285	0.127	0.128	0.334	0.23	0.151	0.125	0.04	0.086	0.175	0.15
	[0.063]***	[0.060]***	[0.062]***	[0.060]***	[0.066]***	[0.078]***	[0.098]	[0.093]	[0.108]***	[0.110]**	[0.061]**	[0.056]**	[0.075]	[0.069]	[0.058]***	[0.061]**
Size (# of employment)	-0.066	-0.057	-0.083	-0.022	-0.015	0.001	0.25	0.251	0.072	0.111	-0.032	-0.002	0.134	0.089	0.03	0.048
	[0.036]*	[0.033]*	[0.040]**	[0.033]	[0.035]	[0.041]	[0.042]***	[0.041]***	[0.056]	[0.058]*	[0.030]	[0.029]	[0.056]**	[0.062]	[0.036]	[0.035]
Foreign ownership (>10%)	0.52	0.362	0.64	0.435	0.52	0.556	0.646	0.653	0.517	0.437	0.944	0.782	0.364	0.49	0.713	0.715
	[0.122]***	[0.115]***	[0.113]***	[0.100]***	[0.117]***	[0.113]***	[0.111]***	[0.120]***	[0.201]**	[0.221]**	[0.076]***	[0.073]***	[0.109]***	[0.107]***	[0.083]***	[0.081]***
Domestic Exporter (Export>10% Foreigı	0.15	0.121	0.354	0.278	0.518	0.557	-0.09	-0.07	0.394	0.327	0.769	0.553	-0.449	-0.248	0.577	0.572
	[0.119]	[0.102]	[0.111]***	[0.107]***	[0.087]***	[0.087]***	[0.126]	[0.132]	[0.179]**	[0.169]*	[0.078]***	[0.078]***	[0.117]***	[0.111]**	[0.120]***	[0.119]***
% Computer controlled Mach.	0.123	0.057	0.884	1.047	0.398	0.342	-0.155	-0.156	1.338	1.091	0.164	0.266	-0.268	-0.283	0.779	0.786
	[0.160]	[0.153]	[0.149]***	[0.145]***	[0.143]***	[0.137]**	[0.188]	[0.193]	[0.264]***	[0.302]***	[0.122]	[0.117]**	[0.139]*	[0.139]**	[0.113]***	[0.117]***
Capital vintage (% Mach. Under 5 yrs)	0.87	0.706	-0.083	-0.267	-0.145	-0.228	0.618	0.608	0.27	0.363	0.221	0.36	-0.214	-0.345	0.435	0.384
	[0.447]*	[0.400]*	[0.232]	[0.234]	[0.191]	[0.199]	[0.159]***	[0.173]***	[0.190]	[0.206]*	[0.132]*	[0.136]***	[0.330]	[0.330]	[0.151]***	[0.149]**
Dummy for R&D	-0.049	-0.118	0.219	0.184	0.072	0.132	0.032	0.039	-0.155	-0.155	0.352	0.331	0.44	0.266	0.085	0.048
	[0.087]	[0.090]	[0.126]*	[0.119]	[0.094]	[0.099]	[0.120]	[0.121]	[0.132]	[0.136]	[0.158]**	[0.141]**	[0.188]**	[0.200]	[0.086]	[0.088]
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Regional dummies	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
Observations	359	359	412	412	528	528	390	390	238	238	918	918	353	353	380	380
Adj. R-squared	0.21	0.35	0.19	0.28	0.19	0.23	0.35	0.35	0.23	0.3	0.25	0.35	0.14	0.21	0.32	0.33

Note: OLS estimation is used. Robust standard errors are in brackets. * stands for significant at 10%; ** significant at 5%; *** significant at 1%.

Table 40. Correlates between Firm Characteristics and TFP by Industries (PICS 2007)

Dependent Variable: TFP (PICS 2007)																
	Food processing		Textiles		Garment		Auto parts		Electronics		Rubber/plastics		Wood/furniture		Machinery	
Age	0.046	0.069	0.047	0.04	-0.045	0.004	0.074	0.06	0.018	0.04	0.06	0.055	0.011	0.023	0.06	0.05
	[0.019]**	[0.019]***	[0.018]***	[0.019]**	[0.026]*	[0.027]	[0.028]***	[0.026]**	[0.043]	[0.047]	[0.015]***	[0.015]***	[0.024]	[0.024]	[0.023]***	[0.024]**
Size (# of employment)	-0.011	-0.02	-0.064	-0.061	-0.023	-0.041	-0.023	-0.011	-0.027	-0.056	-0.039	-0.033	0.027	0.035	-0.029	-0.021
	[0.010]	[0.011]*	[0.011]***	[0.011]***	[0.015]	[0.017]**	[0.012]*	[0.013]	[0.020]	[0.026]**	[0.007]***	[0.007]***	[0.020]	[0.022]	[0.014]**	[0.014]
Foreign ownership (>10%)	0.13	0.13	0.151	0.141	0.252	0.248	0.189	0.2	0.118	0.17	0.243	0.221	0.081	0.073	0.154	0.169
	[0.034]***	[0.036]***	[0.037]***	[0.042]***	[0.052]***	[0.047]***	[0.030]***	[0.033]***	[0.060]*	[0.070]**	[0.025]***	[0.026]***	[0.044]*	[0.050]	[0.035]***	[0.035]***
Domestic Exporter (Export>10% Foreign (	-0.005	0.014	0.09	0.088	0.169	0.159	-0.097	-0.1	0.165	0.192	0.133	0.105	-0.177	-0.186	0.112	0.128
	[0.033]	[0.032]	[0.029]***	[0.030]***	[0.037]***	[0.037]***	[0.035]***	[0.038]***	[0.068]**	[0.065]***	[0.018]***	[0.019]***	[0.047]***	[0.053]***	[0.043]**	[0.044]***
% Computer controlled Mach.	0.046	0.003	0.151	0.153	0.005	0.027	0.013	0.006	0.038	0.075	0.1	0.11	0.024	0.029	0.176	0.147
	[0.048]	[0.046]	[0.054]***	[0.056]***	[0.067]	[0.068]	[0.065]	[0.065]	[0.094]	[0.095]	[0.033]***	[0.033]***	[0.050]	[0.052]	[0.055]***	[0.055]***
Capital vintage (% Mach. Under 5 yrs)	0.008	0.023	-0.061	-0.062	-0.111	-0.052	0.129	0.161	0.044	0.063	-0.02	-0.006	-0.485	-0.44	0.062	0.05
	[0.095]	[0.092]	[0.071]	[0.071]	[0.086]	[0.081]	[0.049]***	[0.054]***	[0.077]	[0.075]	[0.034]	[0.035]	[0.133]***	[0.133]***	[0.070]	[0.065]
Dummy for R&D	-0.004	-0.01	0.075	0.081	-0.004	-0.024	0.12	0.125	-0.103	-0.093	0.13	0.12	0.144	0.131	0.023	-0.005
	[0.031]	[0.031]	[0.029]**	[0.031]***	[0.031]	[0.039]	[0.064]*	[0.063]**	[0.054]*	[0.051]*	[0.033]***	[0.033]***	[0.077]*	[0.079]	[0.040]	[0.040]
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Regional dummies	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
Observations	353	353	410	410	505	505	387	387	225	225	909	909	344	344	350	350
Adj. R-squared	0.11	0.22	0.14	0.15	0.09	0.12	0.21	0.22	0.05	0.13	0.18	0.2	0.15	0.18	0.13	0.16

Note: OLS estimation is used. Robust standard errors are in brackets. * stands for significant at 10%; ** significant at 5%; *** significant at 1%.

Table 41. Correlates between Firm Characteristics and Sale Growth by Industries (PICS 2007)

Dependent Variable: Sales Growth (PICS 2007)	Food processing		Textiles		Garment		Auto parts		Electronics		Rubber/plastics		Wood/furniture		Machinery	
Age	-0.139	-0.123	-0.075	-0.061	-0.115	-0.134	-0.04	-0.047	-0.222	-0.238	-0.101	-0.099	-0.095	-0.093	-0.105	-0.119
	[0.032]***	[0.033]***	[0.023]***	[0.023]***	[0.036]***	[0.037]***	[0.029]	[0.029]	[0.059]***	[0.061]***	[0.022]***	[0.022]***	[0.048]**	[0.048]*	[0.043]**	[0.043]***
Size (# of employment)	0.002	-0.002	0.02	0.016	0.013	0.021	0.036	0.039	0.046	0.065	0.021	0.021	-0.02	-0.018	0.022	0.03
	[0.016]	[0.016]	[0.014]	[0.015]	[0.017]	[0.017]	[0.016]**	[0.017]**	[0.019]**	[0.021]***	[0.010]**	[0.010]**	[0.030]	[0.033]	[0.024]	[0.025]
Foreign ownership (>10%)	-0.017	-0.008	-0.029	-0.007	-0.085	-0.097	-0.052	-0.038	-0.083	-0.092	-0.032	-0.039	-0.037	-0.008	0.014	0.013
	[0.058]	[0.058]	[0.038]	[0.042]	[0.051]*	[0.050]*	[0.036]	[0.040]	[0.071]	[0.075]	[0.026]	[0.026]	[0.056]	[0.061]	[0.053]	[0.054]
Domestic Exporter (Export>10% Foreign Ownership<=10%)	-0.029	-0.013	-0.03	-0.022	-0.052	-0.052	-0.087	-0.068	-0.038	-0.057	0.021	0.014	0.042	0.056	0.046	0.045
	[0.054]	[0.051]	[0.042]	[0.043]	[0.043]	[0.045]	[0.050]*	[0.054]	[0.078]	[0.081]	[0.027]	[0.026]	[0.074]	[0.078]	[0.085]	[0.084]
% Computer controlled Mach.	0.107	0.069	0.131	0.131	0.24	0.234	0.29	0.273	0.047	0.003	0.125	0.139	0.168	0.2	0.176	0.183
	[0.067]	[0.074]	[0.057]**	[0.057]**	[0.071]***	[0.072]***	[0.075]***	[0.077]***	[0.098]	[0.106]	[0.049]**	[0.049]***	[0.077]**	[0.085]**	[0.081]**	[0.082]**
Capital vintage (% Mach. Under 5 yrs)	-0.06	-0.058	-0.076	-0.082	-0.132	-0.142	0.069	0.058	0.04	0.013	0.006	0.012	0.048	0.175	-0.088	-0.121
	[0.145]	[0.144]	[0.059]	[0.058]	[0.081]	[0.080]*	[0.060]	[0.067]	[0.080]	[0.083]	[0.047]	[0.049]	[0.163]	[0.165]	[0.099]	[0.104]
Dummy for R&D	0	-0.006	0.033	0.022	0.044	0.028	0.011	0.015	0.049	0.045	-0.006	-0.006	-0.103	-0.099	-0.106	-0.127
	[0.051]	[0.054]	[0.031]	[0.033]	[0.055]	[0.058]	[0.037]	[0.037]	[0.066]	[0.070]	[0.044]	[0.044]	[0.123]	[0.140]	[0.064]	[0.064]**
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Regional dummies	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
Observations	274	274	317	317	388	388	296	296	179	179	690	690	267	267	287	287
Adj. R-squared	0.18	0.2	0.13	0.16	0.12	0.14	0.19	0.2	0.19	0.22	0.14	0.15	0.1	0.11	0.11	0.13

Note: OLS estimation is used. Robust standard errors are in brackets. * stands for significant at 10%; ** significant at 5%; *** significant at 1%.

Table 42. Correlates between Investment Climate and TFP (PICS 2007)

Dependent Variable: TFP (PICS 2007)						
		[1]	[2]	[3]	[4]	[5]
Skills and Knowledge	% of employees with college degree	0.009				0.003
		[0.002]***				[-1.0]
	Time to fill vacancy for profession	-0.207				-0.111
		[0.032]***				[1.69]*
Regulation and Logistics	Days to obtain Import permit		-0.085			-0.116
			[4.72]**			[6.00]**
	Days to clear export custom		-0.281			0.013
			[3.87]**			[-0.12]
Infrastructure	Yearly number of power outages			-0.114		-0.17
				[0.036]***		[2.99]**
	Production loss due to power outages			-0.058		-0.074
				[0.011]***		[3.34]**
Access to Finance	% of firms with bank loan				0.154	0.09
					[-1.31]	[-0.4]
	Days to clear check				-0.124	0.221
					[2.03]*	[2.11]
Firm Characteristics	Age	0.009	0.016	0.007	0.007	0.019
		[0.010]	[-1.51]	[0.010]	[-0.67]	[1.86]*
	Size (# of employment)	0.008	0.019	0.009	0.015	0.018
		[0.007]	[2.75]**	[0.007]	[2.41]**	[2.53]**
	Foreign ownership (>10%)	0.232	0.209	0.225	0.211	0.197
		[0.018]***	[8.19]**	[0.018]***	[8.80]**	[7.68]**
	Domestic exporting firms(=1 if export>10% AND foreign share <=10%)	0.045	-0.008	0.048	-0.007	-0.004
		[0.017]***	[-0.38]	[0.017]***	[-0.36]	[-0.2]
	Dummy for R&D	0.049	0.056	0.062	0.065	0.053
		[0.023]**	[2.24]*	[0.023]***	[2.83]**	[2.16]*
	Regional dummies	yes	yes	yes	yes	yes
	Industry dummies	yes	yes	yes	yes	yes
	Year dummies	yes	yes	yes	yes	yes
	Constant	1.15	0.901	1.302	0.835	1.046
		[0.078]***	[7.20]**	[0.100]***	[7.93]**	[4.75]**
	Observations	3755	3431	3797	3797	3431
	Adjusted R-squared	0.98	0.98	0.98	0.98	0.98

Note: OLS estimation is used. Robust standard errors are in brackets. * stands for significant at 10%; ** significant at 5%; *** significant at 1%.

Table 43. Correlates between Investment Climate and Labor Productivity (PICS 2007)

Dependent Variable: labor productivity (PICS 2007)						
		[1]	[2]	[3]	[4]	[5]
Skills and Knowledge	% of employees with college degree	0.042				0.037
		[0.004]***				[0.004]***
	Time to fill vacancy for profession	-0.481				0.143
		[0.058]***				[0.109]
Regulation and Logistics	Days to obtain Import permit		0.261			0.274
			[0.028]***			[0.033]***
	Days to clear export custom		-0.274			-0.256
			[0.079]***			[0.096]***
Infrastructure	Yearly number of power outages			0.09		0.181
				[0.061]		[0.076]**
	Production loss due to power outages			-0.085		-0.232
				[0.022]***		[0.030]***
Access to Finance	% of firms with bank loan				2.083	2.48
					[0.159]***	[0.271]***
	Days to clear check				0.608	0.627
					[0.104]***	[0.131]***
Firm Characteristics	Age	0.161	0.128	0.172	0.157	0.122
		[0.025]***	[0.026]***	[0.025]***	[0.025]***	[0.025]***
	Size (# of employment)	0.043	0.046	0.02	0.033	0.082
		[0.014]***	[0.014]***	[0.014]	[0.013]**	[0.014]***
	Foreign ownership (>10%)	0.712	0.767	0.816	0.774	0.67
		[0.037]***	[0.039]***	[0.038]***	[0.037]***	[0.038]***
	Domestic exporting firms(=1 if export>10% AND foreign share <=10%)	0.226	0.181	0.236	0.243	0.218
		[0.039]***	[0.042]***	[0.041]***	[0.040]***	[0.040]***
	Dummy for R&D	0.144	0.212	0.234	0.238	0.114
		[0.048]***	[0.047]***	[0.046]***	[0.045]***	[0.048]**
	Regional dummies	yes	yes	yes	yes	yes
	Industry dummies	yes	yes	yes	yes	yes
	Year dummies	yes	yes	yes	yes	yes
	Constant	8.357	7.517	7.988	6.248	4.721
		[0.128]***	[0.099]***	[0.141]***	[0.136]***	[0.349]***
	Observations	3858	3531	3909	3909	3531
	Adjusted R-squared	0.2	0.19	0.16	0.2	0.25

Note: OLS estimation is used. Robust standard errors are in brackets. * stands for significant at 10%; ** significant at 5%; *** significant at 1%.

Table 44. Correlates between Investment Climate and Sales growth (PICS 2007)

Dependent Variable: sales growth (PICS 2007)						
		[1]	[2]	[3]	[4]	[5]
Skills and Knowledge	% of employees with college degree	0.005				0.005
		[0.002]***				[0.002]***
	Time to fill vacancy for profession	-0.027				0.093
		[0.024]				[0.054]*
Regulation and Logistics	Days to obtain Import permit		0.019			0.022
			[0.015]			[0.016]
	Days to clear export custom		0.011			0.014
			[0.045]			[0.056]
Infrastructure	Yearly number of power outages			0.03		0.081
				[0.025]		[0.033]**
	Production loss due to power outages			-0.025		-0.055
				[0.010]***		[0.014]***
Access to Finance	% of firms with bank loan				0.148	0.454
					[0.074]**	[0.111]***
	Days to clear check				0.059	0.098
					[0.043]	[0.057]*
Firm Characteristics	Age	-0.123	-0.134	-0.13	-0.131	-0.134
		[0.011]***	[0.012]***	[0.011]***	[0.011]***	[0.012]***
	Size (# of employment)	0.018	0.022	0.019	0.021	0.026
		[0.006]***	[0.006]***	[0.006]***	[0.006]***	[0.006]***
	Foreign ownership (>10%)	-0.032	-0.016	-0.021	-0.021	-0.026
		[0.016]**	[0.017]	[0.016]	[0.016]	[0.017]
	Domestic exporting firms(=1 if export>1	-0.02	-0.017	-0.021	-0.019	-0.011
		[0.016]	[0.017]	[0.016]	[0.016]	[0.017]
	Dummy for R&D	-0.032	-0.023	-0.027	-0.025	-0.035
		[0.020]	[0.021]	[0.020]	[0.020]	[0.021]*
	Regional dummies	yes	yes	yes	yes	yes
	Industry dummies	yes	yes	yes	yes	yes
	Year dummies	yes	yes	yes	yes	yes
	Constant	0.373	0.285	0.352	0.254	-0.287
		[0.053]***	[0.073]***	[0.070]***	[0.060]***	[0.154]*
	Observations	2915	2658	2950	2950	2658
	Adjusted R-squared	0.08	0.08	0.08	0.08	0.09

Note: OLS estimation is used. Robust standard errors are in brackets. * stands for significant at 10%; ** significant at 5%; *** significant at 1%.

Table 45. Levinsohn-Petrin Production Function Estimation (Panel Data PICS 2004 and PICS 2007)

Dependent Variable	Output (Operating Revenue)							
	Food processing	Textiles	Garment	Auto parts	Electronics / Appliance	Rubber / Plastics	Wood / Furniture	Machinery
Skilled labor	0.026	0.089**	0.154***	0.115***	0.215***	0.154***	0.136	0.111***
	[0.036]	[0.039]	[0.038]	[0.031]	[0.080]	[0.032]	[0.132]	[0.027]
Unskilled labor	0.022	0.052**	0.120***	0.01	0.113***	-0.024	0.048	0.030**
	[0.034]	[0.023]	[0.022]	[0.031]	[0.042]	[0.027]	[0.059]	[0.012]
Intermediates	0.930***	0.19	0.400**	0.830***	0.650***	0.880***	0.690***	0.840***
	[0.237]	[0.358]	[0.202]	[0.097]	[0.232]	[0.212]	[0.210]	[0.134]
Capital	0.02	0.01	0.01	0.070*	0.07	0.02	0.06	0.03
	[0.055]	[0.031]	[0.040]	[0.039]	[0.048]	[0.060]	[0.067]	[0.031]
Observations	234	337	365	366	218	533	193	272

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 46. GLS Production Function Estimation (Panel Data PICS 2004 and PICS 2007)

Dependent Variab	Output (Operating Revenue)							
	Food processing	Textiles	Garment	Auto parts	Electronics / Appliance	Rubber / Plastics	Wood / Furniture	Machinery
Skilled labor	0.046**	0.122***	0.197***	0.126***	0.282***	0.156***	0.154**	0.115***
	[0.020]	[0.018]	[0.024]	[0.025]	[0.040]	[0.022]	[0.062]	[0.018]
Unskilled labor	0.027*	0.061***	0.148***	0.019	0.128***	-0.014	0.050**	0.031***
	[0.014]	[0.009]	[0.021]	[0.016]	[0.022]	[0.017]	[0.024]	[0.008]
Intermediates	0.881***	0.790***	0.674***	0.795***	0.649***	0.840***	0.749***	0.825***
	[0.024]	[0.022]	[0.033]	[0.026]	[0.025]	[0.012]	[0.047]	[0.014]
Capital	0.022	0.031***	0.038*	0.075***	0.045***	0.040***	0.060***	0.062***
	[0.016]	[0.009]	[0.021]	[0.014]	[0.011]	[0.008]	[0.022]	[0.009]
Constant	2.060***	3.082***	4.480***	2.623***	4.657***	2.300***	3.347***	2.188***
	[0.343]	[0.280]	[0.355]	[0.312]	[0.282]	[0.176]	[0.575]	[0.183]
Observations	234	337	365	366	218	533	193	272

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 47. Correlates between Changes in Investment Climate and Changes in TFP (Panel Data PICS 2004 and PICS 2007)

Dependent Variable: changes in TFP (panel data)					
		[1]	[2]	[3]	[4]
Skills and Knowledge	% of employees with college degree	0.001			
		[0.002]			
	Time to fill vacancy for profession	-0.034			
		[0.023]			
Regulation and Logistics	Days to obtain Import permit		0.017		
			[0.013]		
	Days to clear export custom		-0.036		
			[0.027]		
Infrastructure	Yearly number of power outages			-0.063	
				[0.048]	
	Production loss due to power outages			-0.017	
				[0.010]*	
Access to Finance	% of firms with bank loan				0.025
					[0.040]
	Days to clear check				-0.009
					[0.008]
	Controlling for Firm Characteristics	yes	yes	yes	yes
	Regional dummies	yes	yes	yes	yes
	Industry dummies	yes	yes	yes	yes
	Year dummies	yes	yes	yes	yes
	Constant	0.034	-0.038	0.03	0.049
		[0.047]	[0.068]	[0.039]	[0.041]
	Observations	381	242	386	330
	Adjusted R-squared	0.04	0.04	0.04	0.09

Note: OLS estimation is used. Robust standard errors are in brackets.
* stands for significant at 10%; ** significant at 5%; *** significant at 1%.

ANNEX 4. LIST OF PERSONS INTERVIEWED FOR THE REGULATORY ISSUES

PRIVATE SECTOR

Interviews in the garment, automotive part, and food processing industries were conducted in August 2007.

Note:

- Exporting firms refer to firms that export more than 50% of their total production
- Non-exporting firms refer to firms that export equal to or more than 50% of their total production
- Large firms are firms with 200 or more employees
- Medium firms are firms with 50-199 employees
- Small firms are firms with fewer than 50 employees

(1) Garment Industry

3 key players and industry leaders interviewed

- Mr. Pattana Sudhirakuljao, Executive Director of Thai Garments Association
- Mr. Dej Pattanasethpong, President of Thai Garments Association
- Mr. Chen Namchaisiri, Chairman of Textiles Club, Federation of Thai Industries

6 firms interviewed

- 5 firms are located in Bangkok and 1 in Nonthaburi
- All firms are majority Thai-owned
- 5 exporting firm (export > 50% of production), 1 non-exporting firm (export >= 50% of production),
    - 1 large exporting firm
    - 3 medium exporting firms, 1 located in Nonthaburi province

- 1 small exporting firm
- 1 small non-exporting firm

(2) Automotive Part Industry

3 key players and industry leaders interviewed

- Vallop Tiasiri, Director, Thailand Automotive Institute
- Phaiboon Poocharoen, Tri Petch Isuzu Sales
- Thavorn Chalassathien, Chairman, Auto-parts industry club, Federation of Thai industries & Denso International (Thailand)

15 firms in a focus group meeting

- All firms are large
- All firms are from the Bangkok and Vicinity region
    - 4 exporting and foreign owned
    - 2 non-exporting and foreign owned
    - 9 non-exporting and majority Thai owned

(3) Food Processing

2 key players and industry leaders interviewed

- Vallop, Thailand Food Institute
- Pattana, President, Thai Food Processing Association

11 firms in a focus group meeting

- All firms are majority Thai owned
    - 10 exporting firms (export >50% of production), 1 non-exporting firm (a large firm)
    - 3 small firms, 8 large firms
    - 1 located in North, 2 in South, and 8 on Bangkok and Vicinity

GOVERNMENT AGENCIES

7 agencies interviewed from October to December 2007

(1) Revenue Department, Ministry of Finance

(2) Customs Department, Ministry of Finance
(3) Export Promotion Department, Ministry of Commerce

(4) Office of Industrial Standards, Ministry of Industry

(5) Department of Foreign Trade, Ministry of Commerce

(6) Office of Agriculture and Food Standards, Ministry of Agriculture

(7) Excise Department, Ministry of Finance