Industrial upgrading and Educational upgrading: two critical issues for Thailand.

Bruno Jetin

Please, quote as:

B. Jetin (2010). “Industrial upgrading and Educational upgrading: two critical issues for Thailand”. In Y.Leclerc, P. Intarakumnerd editors. « Sustainability of Thailand's Competitiveness: The Policy Challenges”, ISEAS Press, Singapore, p 78-128.

Chapter 3

Industrial upgrading and Educational upgrading: two critical issues for Thailand

Thailand can no longer rely on cheap labour and fiscal incentives to maintain a continuous flow of Foreign Direct Investment which is one of the major engines of growth (see chapter 1). In neighbouring Asian countries, multinational firms can find cheaper labour and more tax exemptions, while developed countries offer better competitive advantages in terms of knowledge, productive organisation and infrastructure. To get out of this sandwich-trap, Thailand must upgrade its industrial base and improve its productivity. But this is only possible if Thailand upgrades at the same time its education and scientific systems and combine them in a coherent way, which is not the case today. Primary education is now universal, but not secondary education, and higher education does not play the role that one could expect in developing scientific capabilities. Worse, the problem is not only quantitative but also qualitative. The quality of education in Thailand is poor for a number of reasons among which social inequalities, too much emphasis given on learning by rote past and sometimes dogmatic knowledge, not enough skilled teachers, and above all, the lack of critical mind and initiative which are so important for creativity and in particular scientific creativity. The education system also suffers from an institutional disorganisation that the on-going decentralisation reform will worsen. Much the same can be said of higher education. The absence of long-term policy from the part of the ministry of education and the ministry of science and the too important autonomy of universities makes nearly impossible the organisation of a coherent and national supply of scientists and engineers that could satisfy the needs of private companies and contribute to the accumulation of scientific converging towards the establishment of a national innovation system. This does not mean that Thailand cannot change the present situation. Fortunately, Thailand is not an over indebted country and has the fiscal means for an ambitious education and scientific policy. The issues at stake are essentially a question of public policy. But as education was not put on the agenda early enough, industrial upgrading did not reach the expected level.

This chapter will be organised as follows: **section 1** will assess the achievements of the Thai education system in an international perspective and the education and skill levels of the workforce. For this purpose, we will use extensively national and international data series. The main lesson is that Thailand lags behind compared to Asian countries and has to improve the quality of education. S**ection 2** makes an assessment of the present state of the Thai industry and productivity. The main lesson is that the contribution of productivity to industrial growth has been low and sometimes even negative. One way to improve this poor score is to strengthen the labour productivity thanks to the incorporation of better educated and higher skilled workers.

SECTION 1. UPGRADING THE EDUCATION SYSTEM

Thailand, like other medium-income countries in Asia, has successfully completed universal primary education. For these countries, the focus has now shifted to secondary education for a number of reasons. First, part of the children who completed primary education is now seeking

secondary education to get access to better jobs. Second, because of the ICT revolution and increased competition due to globalisation, economies increasingly need a more sophisticated labour force equipped with new knowledge that cannot be developed only in primary school or in low-quality secondary school programs. Good quality and complete secondary education is now the minimum standard to enter the labour market. Third, secondary education is also a bridge towards tertiary education and the key building block of national technological capabilities

Thus, for all these reasons secondary education has turned critical and justify a special emphasis in our evaluation of the Thai education system. In the Thai context, upgrading education means increasing dramatically the number of students who complete upper secondary education and improving the quality of secondary education.

This has not been the case until now. Unlike OECD countries and many East Asian countries that have followed a pyramid pattern [1], Thailand took a different path. The big push toward universal primary education was given lately in the eighties and completed in the nineties. But then, the focus shifted towards tertiary education, overlooking the expansion of secondary education (D. De Ferranti et al., 2003). The distribution of educational attainment was squeezed in the middle. The consequence is a lack of skill workers and an insufficient supply of good students for tertiary science education.

Productivity and Investment Climate Surveys (PICS) conducted by the World Bank shows that in Thailand 75% of workers in the manufacturing sectors are unskilled workers whereas 11% are skilled workers to be compared with respectively 49% and 31% in Malaysia (World Bank, 2006a, p 98). Again, this is characteristic of the present stage of Thai industrialisation process that relied merely on the incorporation of unskilled rural workers migrating to cities. But if Thailand wants to go beyond the assembly stage and escape from the competition from lower cost assemblers such as China and Vietnam it will have to increase the number and the quality of its labour force.

1. The Thai education system in international perspective.

Thailand has achieved a remarkable success in completing universal primary education. More generally it can be said that the objectives of "Education for all" that corresponds to the "Millennium Development Goals" are already fulfilled. Table 1 shows how Thailand compares with other Asian countries at different development stage for the year 2004 according to several indicators that are deemed relevant by UNESCO for the completion of "Education for all" goals and for the quality of education (see UNESCO 2005). It can be seen that there is a clear pattern of educational achievements according to the level of income per capita. East Asia in general fares much better than South Asia in terms of adult literacy and education enrolment because South Asia is much poorer. Nearly all East and South Asian countries had gross enrolment rates (GER) [2] close or superior to 100% which means that they had completed universal access to primary education [3]. For secondary education, gross enrolment rates are significantly below 100% for Cambodia, China, Indonesia, Laos and South Asian countries (with the exception of Sri Lanka). Universal access to secondary education in these poorer countries is far from being achieved. For tertiary education, the differences in GER are even higher. Gender discrimination, measured by the Gender Parity Index, (GPI) [4] is interesting because there is no real universal education without the

---

[1] Primary education is universalised first then secondary education followed by an expansion of tertiary education.

[2] The Gross Enrolment Rate is the "number of pupils enrolled in a given level of education, regardless of age, expressed as a percentage of the population in the theoretical age group for the same level of education. For the tertiary level, the population used is the five-year age group following on from the secondary school leaving age" (UNESCO, 2006).

[3] Because the Gross Enrolment Rate (GER) does not take age into account, children older than the theoretical grade age and repeaters push the GER above 100, which, in some cases, signals a bad quality of education and bad social conditions of the population. Net Enrolment Ratios are preferable because they do take age into account, but data is missing for a number of countries like Thailand because there is no repeating system. All children go to the upper grade at the end of the year whatever its scores.

[4] The GPI is calculated as the GER of female students divided by GER of male students.

eradication of gender discrimination but also because gender discrimination is generally an indicator of poor quality of education (UNESCO, 2005). A majority of countries still not have achieved gender parity in primary education and the situation is usually worsening in secondary and tertiary education. The share of female teacher and the pupil/teacher ratio in primary are also indicators of quality. According to UNESCO (2005), female teachers in primary have a positive influence on education scores, especially for female students. With exceptions, one can see that richer countries have usually a higher share of female teachers in primary schools. Things are more complex with the pupil/teacher ratio. Theoretically, a low ratio is better for the quality of education and a very high ratio, like in Bangladesh, India, Nepal, Pakistan, Cambodia or the Philippines signal a poor state of the quality of basic education. But the contrary is not true. A low ratio may be preferable but is not the guarantee of good education if it reflects the predominance of rural schools where the number of pupils is low but the schooling conditions are usually bad. Keeping this in mind, one can see that East Asian countries have in general a lower ratio than South Asian countries which creates good conditions for good quality education. Finally, public spending on education shows that richer countries tend to spend more on education (as a share of GDP) and some of them like Hong Kong, Malaysia and Thailand dedicate a high share of total government expenditures to education signalling that it is a national priority.

Given this regional background how does Thailand score? It can be seen that in 2004, Thailand had a high level of adult literacy (92.6%), had completed universal primary education, and had a high gross enrolment rate in secondary education (77%), slightly higher than the regional average (73%) but inferior to the most advanced Asian countries such as Japan, Korea and Hong Kong or even the Philippines. In Tertiary education, the gross enrolment rate is among the highest of the region, putting Thailand ahead of competitors with comparable GDP per capita but still below Japan and Korea. At all level, discrimination against girls is low (GPI close to 1), and there are even more female students than male students at the tertiary level [5].

These goods results are recent and needs qualifications. First, until 1977 there were only 4 years of compulsory education in Thailand (until grade 4 of primary school). From 1978 until 1992 compulsory education was extended to 6 years (until grade 6 or complete primary school). Effective in January 2003, a new compulsory Education Act adopted in 1999 requires that all children aged 7 to 16 have to be enrolled in basic education institutions except for those who have already completed grade 9 at age 15. Actually grade 9, which corresponds to the end of lower secondary education, is presently the end of compulsory education which extends to 9 years of schooling (from grade 1 to grade 9). To help families comply with the law, the Thai state has granted in October 2002 to all students free access to "basic education" covering 6 years of primary and 6 years of secondary education for the first time in Thailand.

---

[5] The Gross Parity Index (GPI) divides the Gross Enrolment Rate (GER) of female students by the GER of male students. A GPI equal to 1 means that there are as many female students as male students. A GPI superior to 1 means that there are more female students.

TABLE 1: EDUCATION SYSTEM AND BACKGROUND CHARACTERISTICS OF SELECTED ASIAN COUNTRIES, REFERENCE YEAR 2004

	BACKGROUND		ADULT LITERACY [1]		PRIMARY		SECONDARY		TERTIARY		TEACHING STAFF		FINANCE	
COUNTRIES AND REGIONS	Population in million 2004	GNP per capita (PPP) 2004	Total	GPI (F/M)	GER (%) 2004	GPI (F/M) 2004	GER (%)	GPI (F/M)	GER (%)	GPI (F/M)	Primary school teachers, female % 2001	Pupil/teacher ratio in primary	Total public expenditure on education as % of GDP	Total public expenditures on education as a % of total government expenditure
East Asia														
Cambodia	14,071	2423	73,6	0,76	137	0,92	44	0,74	3	0,46	41	53	1,9	14,6
China	1 307,989	5003 [3]	90,9	0,91	118	1,00	73	1,00	19	0,85	53	21	3,2 [6]	13 [2]
Indonesia	222,781	3361 [3]	87,9	0,90	116	0,98	62	0,99	16	0,80	52	20	0,9 [3]	9 [4]
Hong Kong	7,040	30822	n.a	n.a	108	0,94	85	0,97	32	0,97	78	19	4,7	23,3
Japan	128,085	29251	n.a	n.a	100	1,00	102	1,00	54	0,89		20	3,6	9,8
Korea	47,817	20499	98	0,98	105	0,99	91	1,00	89	0,61	72	30	4,6	16,5
Laos	5,924	1954	66,4	0,72	116	0,88	46	0,76	6	0,63	44	31	2,3	11,7
Malaysia	25,347	10276	88,7	0,93	93	1,00	70	1,11	29	1,29	67	19	6,2	25,2
Philippines	83,054	4614	92,6	1,02	113	0,99	84	1,10	29	1,28	87	35	2,7	16,4
Thailand	**64,233**	**8090**	**92,6**	**0,95**	**99**	**0,96**	**77**	**1,00**	**41**	**1,17**	**58**	**21**	**4,2**	**27,5**
Vietnam	84,238	2490 [3]	90,3	0,93	98	0,93	73	0,95	10	0,77	78	23	3,2 [3]	12,6 [3]
East Asia and the Pacific Average	2086,748	5354	92	0,93	113	0,99	73	1,0	23	0,89		22		
South Asia														
Bangladesh	141,822	1870	41,1	0,62	109	1,03	69	1,19	7	0,28	36	55	2,5	14,2
India	1 103,371	3139	61	0,65	107	0,94	70	0,82	11	0,67	40	41	3,8	10,7
Nepal	27,133	1490	48,6	0,56	113,9	0,88	44 [7]	0,77 [7]	6	0,40	30	40	3,4 [2]	14,9 [3]
Pakistan	157,935	2225	41,5	0,53	82	0,73	32	0,70	3	0,80		37	2	10,9
Sri Lanka	20,743	4390	92,1	0,95	102	0,99	98	1,00				23	3,1 [5]	
South and West Asia Average	1528,108		59	0,66	110	0,91	51	0,83	11	0,7		39		
World average			82	0,89	106	0,94	65	0,94	24	1,03		26		

Notes: [1] 2000-2004 Average, [2] data for 1999, [3] data for 2003, [4] estimation by ISU for 2002, [5] data for 1998, [6] estimation by OECD for 2001, [7] average of 2003-2005 based on UNESCO data.

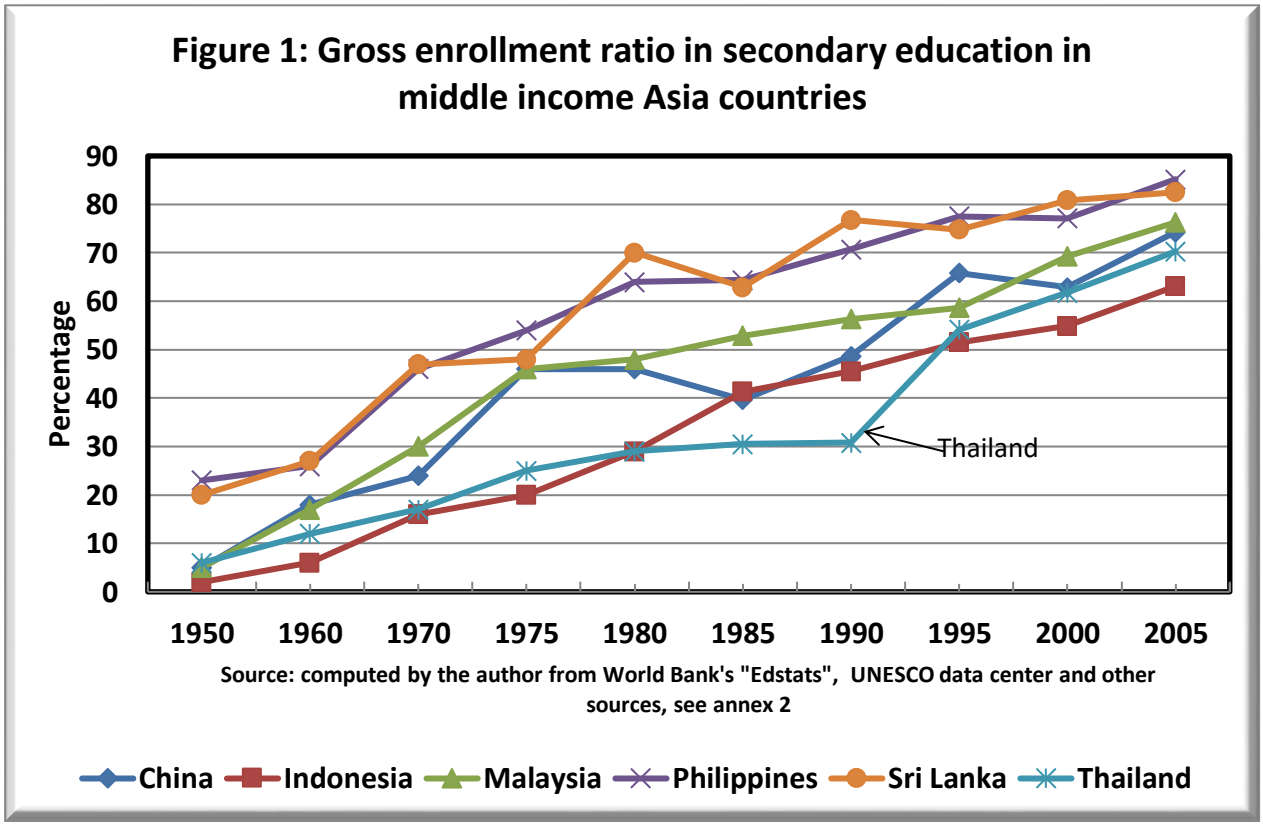
Source: Computed by the author based on UNESCO database, several years and UNESCO 2005, UNESCO 2006a, UNESCO 2006b.

As of May 2004, this subsidy was extended to 2 years of pre-primary schooling so that eventually the provision of free basic education was extended to 14 years.

These institutional evolutions help explain why the progress in education through generations has been slow. Most Thai people have the level of education required by law at the time they were at school. And because complete primary education was made mandatory lately (in 1978) without subsequent extensions until 1992, secondary education enrolment stagnated during all this period.

This explains why, despite the recent improvements, the legacy of the past is still dragging Thailand backward. Figure 1 shows that in the fifties Thailand counted among the countries who had the lowest enrolment in secondary school (6%), together with China, Malaysia, Indonesia, and below all other lower-middle income countries [6]. Yet, the gap with the other countries was not important and could have been filled in the subsequent years. But this has not happened and, on the contrary, Thailand's lag has widened during the sixties and seventies but especially in the eighties. Indonesia overcomes Thailand in 1980 and Thailand became the lower-middle income country with the lowest enrolment ratio in secondary education. During the eighties, this ratio remained constant around 30% while it was above 40% and increasing in all other comparable countries. The eighties can be deemed as the "lost decade" for Thai secondary education. The absence of extension of compulsory education to secondary education is to blame for this stagnation.

.



It was not a fatality due to poverty. In the Philippines and Sri Lanka, enrolment in secondary education has always been higher and even reached 70% in 1990, 40% higher than the Thai level. Economic reasons cannot be invoked because these countries were not richer than Thailand. The real reason is simply that education was not a political priority during a long time in Thailand. Because universal primary education was turned mandatory only after 1977, secondary school generalisation suffered a historical delay in Thailand compared with other Asian countries at the

[6] We use the World Bank classification. Countries are classified in low income, lower-middle income, upper-middle income, and higher income according to their GNP per capita in 2005. In Figure 11, Malaysia is the only upper-middle country while all others are lower-middle income countries.

same development stage. It is only in the nineties, after the extension of mandatory school to 9 years in 1989 (until grade 9) that enrolment in secondary education jumped to 50% in 1995 and then 70% in 2005 [7]. Thai enrolment in secondary school has now converged to the average of low-middle income Asian countries. But the initial delay in generalising secondary education in the eighties still takes its toll.

Table 2: Stock of Education among the adult working population

		Highest school level completed (%)					
	Average yr.	NOED	PRIM	LSEC	USEC	VTE	TERT
East Asia							
Cambodia	4.1	67.3	19.1	8.1	3.6	0.9	1.0
Mongolia	9.4	2.8	10.8		58.4[1]		28.1
Vietnam	8.8	2.2	35.8	36.3	11.7	8.2	5.8
Indonesia	7.2	27.5	32.8	14.9	14.5	5.0	5.3
Thailand	7.1	50.5	16.4	9.4	7.5	5.8	10.4
Philippines	9.6	22.5	30.1		21.7[1]		25.7
China	10.1	8.3	11.4	32.4	21.4	12.6	14.2
Singapore	10.0	22.2	14.1		39.9[1]		23.7
Latin America							
Argentina	9.8	10.1	41.8		17.7[1]	5.7	24.0
Brazil	6.4	53.1	16.4	5.4	17.8		7.3
Chile	9.4	26.6	29.6		17.6[1]	15.8	10.4
Colombia	8.9	4.4	21.7		30.8[1]	5.3	37.8
Guatemala	4.8	40.5	39.2		15.8[1]		4.5
Mexico	8.2	24.1	22.8	27.6	15.0		10.5
Venezuela, R. B. de	8.2	7.8	55.1		19.7	6.0	11.4
Bolivia	6.9	13.0	51.2		20.4	6.6	8.8

Note: NOED = less than full primary education. PRIM = Primary. LSEC = Lower secondary. USEC = Upper secondary. VTE = Vocational and Technical Education. TERT = Tertiary. 1. refers to all secondary.
Source: World Bank 2006c, based on Household surveys.

Table 2 taken from World Bank (2006c) shows the level of education of the adult working population (25 to 65 years) for the period 1999-2004 according to the country [8]. With 7.1 average years of schooling in 2002, Thailand ranks among the lowest, on a par with Indonesia (7.2 years) which has less than half the GDP per capita of Thailand and below Vietnam (8.8 years) which GDP per capita is more than three times lower. Only Cambodia fares worse. Clearly, the level of education in Thailand is not as high as its level of development would enable. 50.5% of the adult working population has not completed primary education and 16.4% has only completed primary

[7] The GER for secondary education for Thailand in Figure 11 for 2005 (70%) is below the GER presented in Table 1 (77%), although both data comes from UNESCO. The reason is unknown because both series use the International Standard Classification of Education (ISCED97). Secondary education corresponds to level 2 and 3. The problem is not so important because we are more interested in the relative position of each country than the exact level.

[8] Source World Bank, 2006c based on the following surveys: Cambodia (Socioeconomic Household Survey 2004), Vietnam (Living Standards Survey 2002), Indonesia (Susenas, 2003), Thailand (Socioeconomic Survey 2002), Philippines (Annual Poverty Indicator Survey 1999), China (Economic, Population, Nutrition, and Health Survey 2000), Singapore (Labor Force Survey 1998), Argentina (INDEC 2003), Brazil (PNDA 2001), Chile (ECSN 2003), Colombia (ECV 2003), Guatemala (MECOVI 2000), Mexico (ENIGH 2002), Venezuela, R. B. de (EHM 2002), Bolivia (MECOVI 2002). All surveys are nationally representative except China's Health and Nutrition Survey, which represents only 9 of 22 provinces in China.

education. The contrast with Vietnam, one of Thailand's newest competitors in the region is striking. Only 2.2% of the adult working Vietnamese has not completed primary education and 35.8% has completed primary education.

2. The quality problem.

Measuring the quality of education is a complex task. It presupposes an agreement on the purposes of education and on the learning process which seldom exists. For some, education should focus on preparing young people to get a job. This narrow definition limits education to the acquisition of what is thought to be useful knowledge. For others, education should also prepare young people to become independent citizens able to live in society. This broader definition of the purposes of education makes more difficult the assessment of the quality of education in a purely quantitative way. For instance, according to UNESCO (2005) "learning to know, learning to do, learning to be together and learning to be" are the four principal concepts that define the quality of education. This implies cognitive and non-cognitive skills, the latter being difficult to quantify by essence. The same difficulty holds for learning. If we define learning in a very narrow way as the transfer of explicit knowledge by teachers to passive students who have to memorise it, then the scope of quality assessment will be very limited. If learning means acquiring explicit and tacit knowledge in a personal and collective way [9], then the quality of an education system should be judged by its capacity to enable students to progress in the acquisition of knowledge so defined. And this is difficult to assess.

These are the reasons why tests scores which are usually considered for international comparisons of education quality must be interpreted with precaution. They provide useful information about how well items in the curriculum are being learned and understood by students. "But they tell nothing about values, capacities or other non-cognitive skills that are also important aims of education (UNESCO, 2005, p 46). In themselves, they also tell us nothing about the underlying causes of the registered results. What are the reasons of bad scores? Poor capabilities of students? Poor quality of schools or poor social conditions of students and their families? A combination of both, but which one? To be useful, tests have to be confronted with relevant indicators that describe the main social features of students, their families and their schools.

In the case of Thailand, two international tests are regularly performed: the PISA [10] and TIMMS [11] tests. When compared with other countries at similar income levels [12], Thailand registers higher scores, which is a good point. But a comparison with the most successful East Asian countries shows how much Thailand has yet to improve (World Bank, 2006b, p 54). For PISA 2003 scores in mathematics, Thailand with 417 points ranks 39 among 46 countries above Brazil, Mexico and Indonesia, but below the OECD average (500 points) and far behind its Asian counterparts Japan (553), Hong Kong (550) and Korea (542). There is a real quality gap with these countries. Moreover, very few Thai children scores in the top proficiency levels. "For PISA, less than 10% of students scored beyond levels 4 in mathematics or reading (among six levels). This is in stark contrast to all three participating East Asian upper income countries, where roughly 50% of

---

9) For more details see B. Jetin (2007).

10) PISA has been set up by the OECD in 1998 and is now covering 59 mainly industrialized and middle-income countries, among which Thailand. Pisa measures the content "literacy", a concept that encompasses how 15 years old students apply knowledge and skills: how they identify, solve and interpret problems; and how they analyse, reason and communicate. It also covers reading literacy.

11) The Trend in International Mathematics and Science Study (TIMMS) was created in the late 1950s by the International Association for the Evaluation of Educational Achievement (IEA). By 2000, some 50 countries were participating in surveys covering mathematics and science, reading and other subjects. TIMMS is a curriculum-based test administered to eight-grade students typically 14 to 15 years of age.

12) These countries are Brazil and Indonesia which together with Thailand belongs to the category of "lower income countries" defined by the World Bank. Mexico and Uruguay were also participating but belongs to the upper-middle category. Japan, Korea and Hong Kong did also participate but important countries of interest such as China, India and Malaysia did not.

students in mathematics and 40% in reading scored above this level". Worse, "a very large share of students is performing below acceptable proficiency level. Thailand has roughly 40% of students performing at or below the PISA level one (among 6 levels) in literacy and over 50% at or below level one in mathematics. To sum up, a vast proportion of students are functioning at or below the most basic level of language, mathematics and science ability" (World Bank, 2006b, p 59). The same holds true for TIMSS.

The bad quality of education in Thailand is the result of several factors among which the socio-economic features of family stand prominent together with the teacher quality, the pedagogy used and school characteristics. For instance, according to the Ministry of Education, only 4% of teacher in lower secondary possessed a Master Degree and 11% for upper secondary. For some, these Master Degrees were obtained in "open universities" whose quality is dubious. In terms of pedagogy, section 22 of the 1989 educational reform promoted innovative ways of learning centred on "self-development enabling learners to develop at their own pace and to maximise their potential" (OEC, 2004, p 75). In reality, these measures are not systematically applied. "Rote learning is pervasive even in the best schools, and innovative forms of learning are confined only to small segments. Vocational schools lack equipment and teachers lack motivations" (S. Khoman, 2005, p 259). Regarding school characteristics, the lack of educational resources (computers, library material, multi-media resources, science laboratory equipment and facilities for the fine arts) appear as the most important obstacle to student achievement.

More broadly, Ashvin Ahuja et al. (2006) have analysed PISA 2003 results for mathematics in Thailand to understand how school, family and student characteristics interact and produce cognitive achievements [13]. Findings from the test for 5,236 15-year old students from 175 schools around Thailand are presented in table 3.

Students are divided into quintiles based on their mathematical scores, with 564 points for the top quintile and 328 points for the bottom quintile for an average of 423 points. Table 3 shows that students from the bottom 20% usually go to smaller schools (1471 students), where there is more students per teacher (25.2) than in the big schools (2785 students) frequented by the top 20% students (21.6 students per teacher). They are more numerous to study in small villages and small cities while top 20% students are more numerous to study in big cities. They have less qualified teachers in mathematics than top 20% students and ack of "adequate library".

---

[13] The variables in PISA encompass not only students and family characteristics, but it also includes data on schools characteristics and resources as well as students' attitude toward learning.

Table 3: Differences in Characteristics of Top / Bottom Performers in Test Scores

Main Factors	Whole Sample	Groups of Students	
		Bottom 20%	Top 20%
PISA Test Score			
- Mathematics	423	328	564
1. School Factors			
- School Size	1,718	1,471	2,785
- Student to Teacher Ratio	23.5	25.2	21.6
- Studying in School in big cities (1 million up)	17%	8%	35%
- Studying in School in villages (less than 3000)	15%	23%	4%
- Schools Resources: having enough qualified teachers in Mathematics	42%	38%	53%
- Schools Resources: having "adequate" library	53%	34%	74%
2. Family Factors			
- One parent has education at least university level	20%	8%	42%
- At least one parent is working in full-time job	63%	53%	76%
- Living with brother, sister, cousin, grandparents	38%	30%	53%
- Home Resources : Number of books	66	51	128
3. Student Characteristics			
- Hours spent doing homework per week	7.1	5.3	10.6
- Never arrive late for school in the last 2 weeks	70%	62%	76%
- Attending kindergarten for more than one year	76%	67%	88%
4. Other Factors: Student attitudes			
- Strongly disagree that "school is a waste of time"	59%	51%	63%

Source: Ahuja A. et alii with PISA 2003 data.

Their family factors reveal that only 8% have one parent with a university degree against 42% of the top 20% students. Around half of the bottom 20% have at least one parent working full-time job, which means that for the other half, neither the father nor the mother has a full-time job. They tend to have less books and to live more isolated than top 20% students. Their personal characteristics and attitudes complete the picture. They spent around half the time of top 20% students at homework, arrive more frequently late at schools and have spent less time in kindergarten. Finally, 49% think that "school is a waste of time" against 27% of the top 20%.

All these social characteristics converge to the conclusion that those who have the worse results at the PISA test suffers from social handicaps due to poverty and geographical isolation that usually go together. This is confirmed by the fact that the cost of education remains the main obstacle to access to secondary education. Despite the government's commitment to 12 years of free education, non-tuition costs such as library fees, exam levies, and access to computers, meals and transportations costs create too high a burden for poor families. School tuition and textbooks which are covered by the government for poor families represented only 19% to 25% of the total cost of sending a child to lower or upper secondary school (NSO 2002). The same survey pointed the inability to pay the direct costs of education as the overwhelmingly reason for children who are completing an educational cycle (for instance lower secondary) not to progress to the next educational cycle. According to the World Bank (2006b), the average spending per student at the

secondary level was equal to about 2,300 baht in 2002 (US$), but only 860 baht in the poorest quintile as compared to 6,800 baht in the richest quintile, close to eight times as much. This gap appears to have widened over time since in 1994 the gap was only four times as much. More recent data confirm this trend. According to A. Ahuja et al. (2006), sending children to public high school would cost the family directly and indirectly around 2,500 baht per month, increasing from around 1,500 baht per month for lower secondary school. This is the major reason why poor families decide to stop sending their children to school after the compulsory school ending in grade 9.

3. The need for scientific and researching capabilities

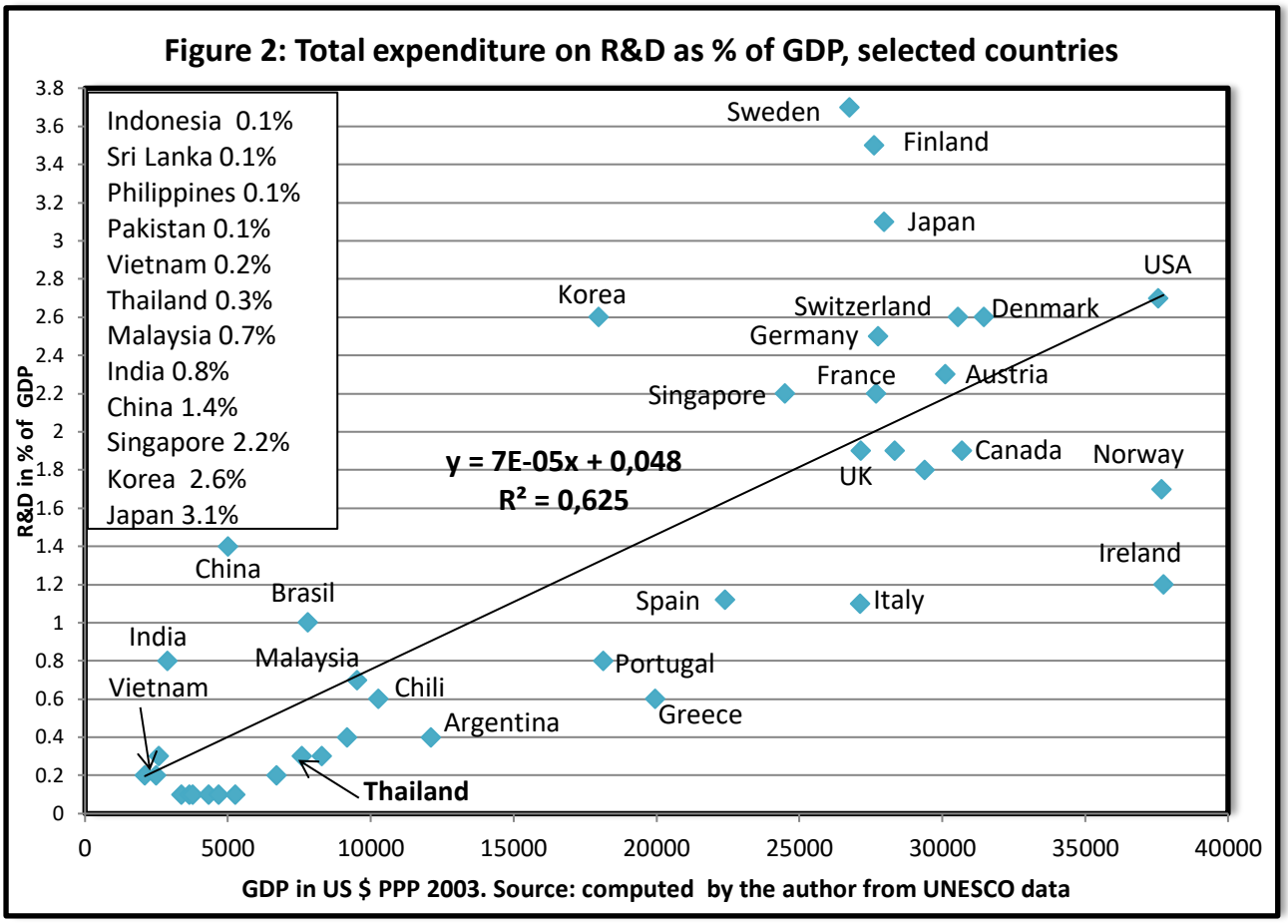
History shows that countries that have climbed up the industrial ladder and caught-up with more advanced countries had at least two things in common: One is the "*rapid increase in the level of education and an emphasis on higher education in science and engineering. Another is the creation of public institutions to conduct research and provide services to industrial firms (*UNIDO, 2005). The reason is that innovative capabilities imply the practise of research which mobilises both explicit and tacit knowledge [14]. Because tacit knowledge and a good part of explicit knowledge is "people embodied" the education system has an important role to play to form skilled workers and researchers. In other terms, as already stated in chapter 2, creating a true National Innovation System (NIS) in coherence with the education system is now a high priority on Thailand's agenda. Due to the cumulative nature of learning, the sooner a country starts increasing the level of education and building scientific capabilities, the higher his chances to engage in a sustained catching-up process. On this regard, Thailand's scores are mixed.

Several studies (P. Intarakamnerd et al., 2004, T. Altenburg et al., 2004, World Bank 2006a) point to the same hurdles in the creation of an efficient NIS in Thailand and the successful upgrading of the industry. First, the aggregate spending on R&D in Thailand as a percentage of GDP is low and rising only slowly from a low base. "Most Thai firms, even large corporations, have a deep-rooted attitude of not developing their own indigenous technological capabilities" and "… want to rely on off-the-shelf imported technology mostly in the forms of machinery, and turn-key technology transfer from abroad or joint venture with foreign partners" (P. Intarakamnerd et al., 2004). Second, "foreign companies have transferred amazingly little tacit knowledge and technology, as evident from a handful of companies setting up research establishments in Thailand and from the scope of research undertaken" (World Bank, 2006a). Third, there is no global and coherent scientific and industrial policy but a multitude of ministers and institutions in charge of different aspects and sectors with overlapping functions and weak coordination. Fourth, there is not enough linkage between public research institutes and universities, and private companies (D. Schiller, 2006) and between companies themselves (S. Dhanani, P. Scholtès, 2002).

International comparisons with other Asian, Latin American and developed countries, are instructive. Figure 2 compares total expenditures on R&D as a percentage of GDP of selected countries ranked by their GDP per capita in US $ at PPP rates in 2003. The objective is not to evidence a strict causality between GDP and R&D expenditures, which on the long-term work both ways, but to situate Thailand on an international scale.

---

[14] Tacit Knowledge is one dimension of knowledge along with explicit knowledge (K. Polanyi, 1966). While explicit knowledge can explain why it is scientifically possible to ride a bicycle, it cannot teach a novice how to actually ride a bicycle. Riding a bicycle can only be learnt by personal experience, even if advice can help. The same applies to a great variety of economic and scientific activities. For example, most of the knowledge required by venture capital and private equity companies is tacit (R. Nelson, 2003). Reproducing successfully a scientific experience implies the personal tacit knowledge of the scientist and not only a scientific publication demonstrating the result.



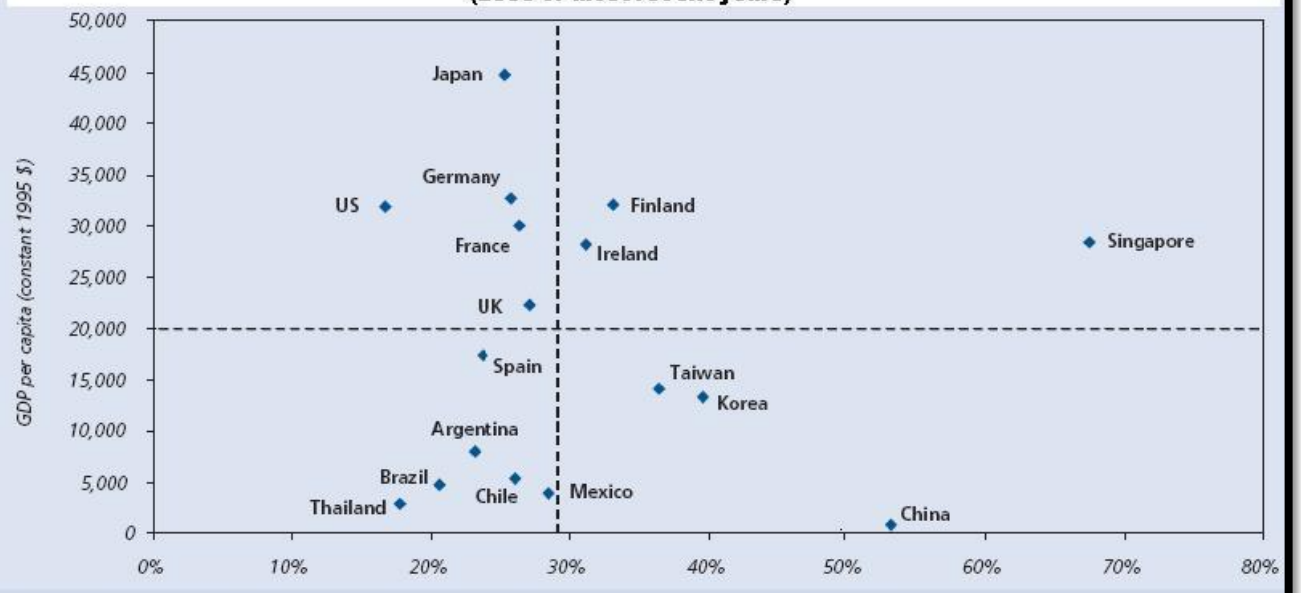
Thailand dedicates 0.3% of its GDP to R&D which in itself is very low and only slightly higher that Vietnam expenditure (0.2%), although her GDP per capita is around three times higher. One could expect that Thailand spends as much as one of its main competitor Malaysia (0.7%). The recent announcement by the Thai government in June 2007 to nearly double the budget of state-run R&D institutes over the next three years will rise the R&D spending to 0.5% (The Nation June 11, 2007). If successfully executed, this decision will put Thailand around the trend which represents the R&D spending that can be expected from a country that has reached a certain stage of development. But that may be not enough. Countries which are catching up, like China, are spending much more (1.4%) than the average. Those which have already achieved a high level of development (Singapore and Korea) are also spending much more than the average (respectively 2.2% and 2.6%). The same is true as far as science and engineering is concerned. Thai research output has specialised in agricultural sciences, life sciences and medical sciences and to a lesser extent in engineering sciences (see table 4) [15]. The specialisation in agriculture science is comparable to the other second generation of Newly Industrialised Countries (NICs) and fits well with the strong exports of agricultural and food products evidenced in section 1. But Thai specialisation in life sciences and medical sciences is encountered neither in first nor in second generation NICs. There is a potential there which is not matched with enough strong industrial companies that could turn it into an export advantage.

[15] This table due to D. Schiller (2006) shows an index of specialisation which expresses the share of a scientific field in one country in relation to the share of this field in the world. The transformed values range from -100 to +100. Positive values indicate a specialisation above the world average.

Table 4: Index of specialisation for "Science Citation Publication" (SCI) of Asian countries					
Countries	**Agriculture Sciences**	**Medical Sciences**	**Engineering Sciences**	**Life Sciences**	**Natural Sciences**
Thailand [1]	**47**	**22**	**11**	**26**	**-51**
1st generation NICs [2]	**-38**	**-34**	**71**	**-26**	**41**
2nd Generation NICs [3]	**81**	**-36**	**-14**	**-37**	**-2**
China	**-64**	**-88**	**47**	**-72**	**71**
India	**45**	**-80**	**8**	**-63**	**40**
[1] Thailand: 2002-04; other 1996-2000. [2] Korea, Taiwan, Singapore, Hong Kong. [3] Malaysia, Philippines. Source: calculated by D. Schiller 2006, p 76, based on SCI EXPANDED, NIW et al. 2002.					

However, the specialisation in engineering is rather weak to the contrary of China and first generation NICs (See Figure 3). As previously said, countries that have caught up have invested heavily in science and engineering education (UNIDO, 2005, p 45). If Thailand wants to upgrade its industry with more local R&D content to go beyond the assembly stage, then it has to increase dramatically the number of graduates and PhD in sciences and engineering like Taiwan and Korea did and as China is presently doing.

Figure 3: GDP per capita vs. share of natural science and engineering degrees in total first degrees (2000 or most recent years)



Source: UNIDO 2005, p 45 based on NSF, 2004 and World development indicators, 2003.

Increasing spending in R&D and the number of students in science will prove insufficient if universities, as institutions, are not reformed so as to increase their research activities. According to D. Schiller (2006), "most of University-Industry linkages (UIL) in Thailand are mainly limited to services without deeper research involvement and to linear modes of knowledge transfer. Half of the UIL projects comprise consulting services". Technical services and informal contacts are the second most important modes of cooperation and the third is based on teaching. Research-based and interactive modes of cooperation have been included in less than 10% of cooperation projects. The supply of consultancy and other services lead Thai scholars to spend more time for projects outside the university (8.9 hours per week) at the expense of their time committed to research (5.11 hours per week) (R. Sharma et al., 2004, p 71). The most important reason is that scholars are looking for additional personal income to supplement their wages which are too low. For engineers, the wage premium in the private sector is estimated at about 500% of the corresponding wage in the public sector.
Another factor which is conducive to low research activity of Thai University is that teaching and administrative work is often considered as important as research for advancement in the career path. The consequence is that scholars tend to teach a lot at the expense of research activities not only because it increases personal income but also because it is positively appreciated by the hierarchy for promotion.
The first consequence is that few universities are capable to keep pace with the growth of modern industries and the quick evolution of technological progress. They are therefore unable to take advance in promoting technical progress and research capabilities of private firms. The second consequence is that the link between research and teaching curriculum is weak. Most scholars cannot transform easily their research results into lecture content because their research activity is insufficient. This leads to a lack of curriculum updating and dynamism and to overdependence on foreign research results and foreign textbooks. A subsequent effect is that secondary curriculum and teachers cannot rely enough on research results provided by Thai universities to keep updated and renovate their courses.

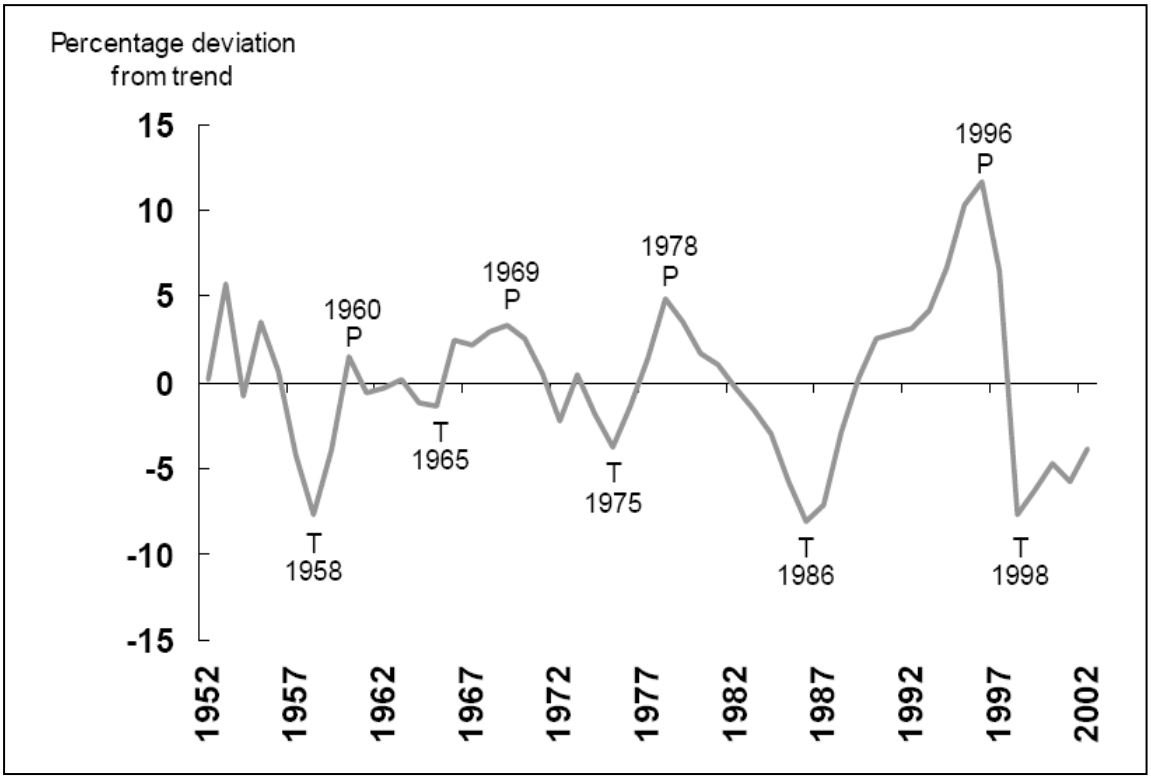
Developing its educational level and technological capabilities became an urgent task for Thailand that has started to diversify its productive system and to specialise at the sector level on a few export-oriented activities. Indeed, the success of this incipient structural change now depends on Thailand's capacity to go beyond the assembly stage (see chapter 8 for example). To upgrade these industries Thailand has mainly relied on on-the-shelf foreign technology products and licences and on technology transfers by multinational firms. This allowed the country to develop to a certain extent but, as we shall see in the next section, did not guarantee a productivity increase sustained enough to avoid difficulties as soon as labour costs grew faster.

SECTION 2: A NECESSARY INDUSTRIAL UPGRADING.

Four major growth cycles have marked the Thai economy in the post-war era, and maybe five if considering the recovery starting in 1999 after the dramatic crisis of 1997-1998. Figure 4 shows that the growth cycle 1987-1996 has been by far the most important one in amplitude and duration. The sluggish recovery that has followed the crisis raises the question whether this boom period was not truly exceptional for structural reasons that have changed since then. Among them, an exceptional mobilisation of the labour force and a high rate of capital accumulation but without proportionate productivity gains. This is characteristic of a necessary take-off phase of industrialisation but cannot be sustainable on the long-run. Once the labour force is fully engaged in the production process and huge investments realised, comes the necessity to shift to an intensive growth regime based on higher productivity and endogenous technical progress. There are reasons to think that this step has become necessary but has not been reached yet in Thailand.

This can be observed in the evolution of the interrelationships between Thailand's international trade and the growth process.

Figure 4: Thailand's output cycles.



Source: R. P. Mallikamas, D. Rodpengsangkaha, Y. Thaicharoen (2003, p 3).

4. **Thai competitiveness before and after the crisis**.

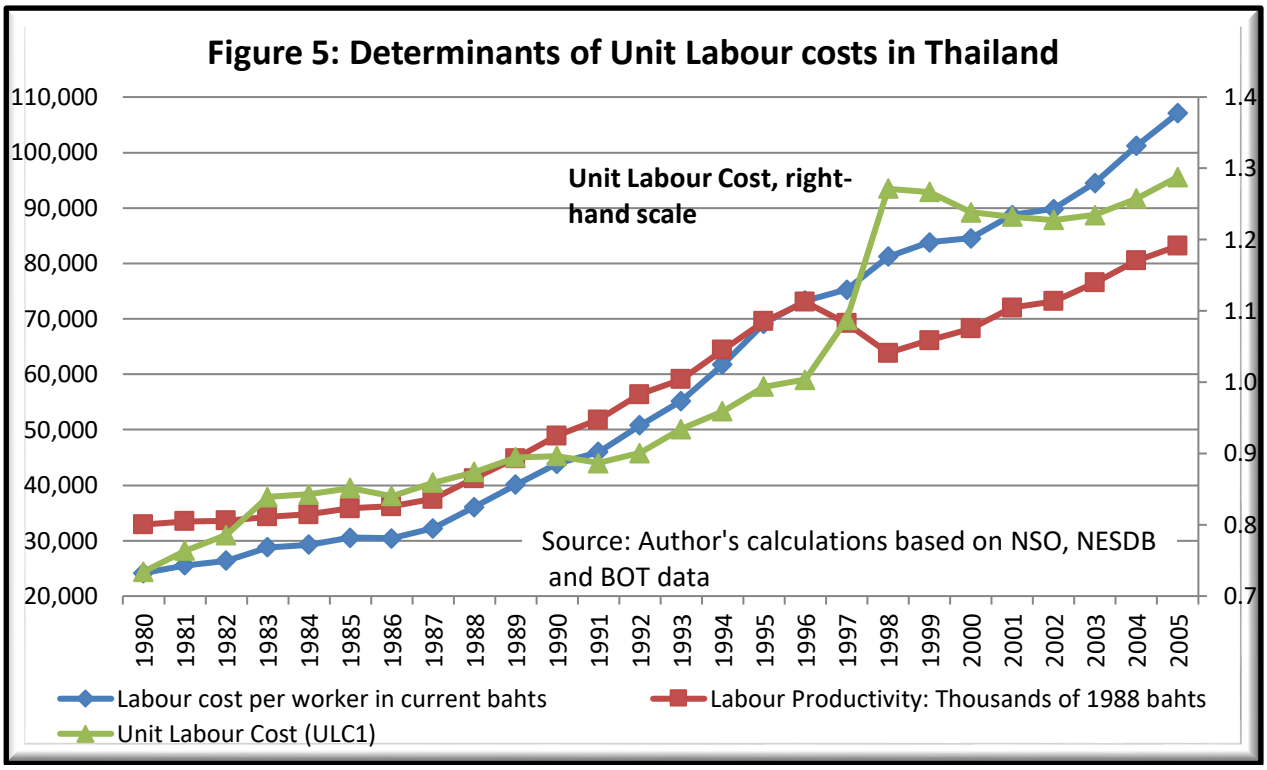
Much publicised survey-based indicators of competitiveness show that Thailand occupies an intermediate or even good ranking position but at the same time suggest the need for urgent progress in technology development and innovation. World Economic Forum's Competitiveness index in 2007-08 ranked Thailand 28th behind 21th-ranked Malaysia and 11th-ranked Korea. IMD placed Thailand in 32nd place in 2006 a small drop from the 30th spot in 2003. The World Bank's Doing Business Survey for 2007 ranked Thailand as 18th among 175 economies while AT Kearney's Global Services Location Index for 2005 ranked Thailand 6th among 40 countries. But the World Bank's Knowledge Economy Index gave Thailand a rating of 4.88 in 2006 as against 8.12 for Taiwan (China) and 8.20 for Singapore.

These publications try to capture the various aspects of competitiveness which is indeed a multi-faceted and complex phenomenon. But because our purpose is to analyse the link between labour and competitiveness, it is useful to observe the evolution of Unit Labour cost (ULC). ULC is the ratio of total labour costs to real output [16]As such, ULC is a reflection of cost

[16] The labour cost is usually defined as "the compensation of employees", who are by definition wage earners, derived from national account statistics. The advantage of using national accounts is that the definition of compensation includes social contributions and hence is more comprehensive. However, it does not include the compensation of self-employed workers which mixes labour and capital income and is often called "mixed revenues". This is a major problem for the analysis of developing countries where the share of self-employed workers in the workforce is usually 50% or more. The risk is that the major part of labour income is not taken into account in unit labour cost. To address this problem, we have applied D. Gollin's (2002) methodology. Basically, we first estimate the labour income share in GDP of wage earners to get a low estimate. Then we calculate the labour income share of wage earners plus self-

competitiveness. This does not mean that other input costs, particularly capital costs, are not important. But usually the share of labour cost is large relative to other inputs and hence provides useful information on cost competitiveness. ULCs have another advantage. If we divide the numerator (nominal labour compensation) and the denominator (real output) by the number of workers, we obtain a measure of the cost of labour per capita (on the numerator) and a measure of labour productivity (on the denominator). We have therefore a direct link between labour productivity and the cost of labour used in generating output.

If labour productivity rises faster than labour costs per capita, unit labour cost decreases and competitiveness improve and vice versa. This means that cost competitiveness does not only depend on low labour cost but can be improved by raising productivity to create more output. In Thailand, labour cost per employee were initially very low (24,156 baths on average in 1980), below the value of labour productivity (32,905 bath) (17). It has tended to increase at a higher pace than productivity only in the final years of the boom period (1987-1996) (see Figure 5).

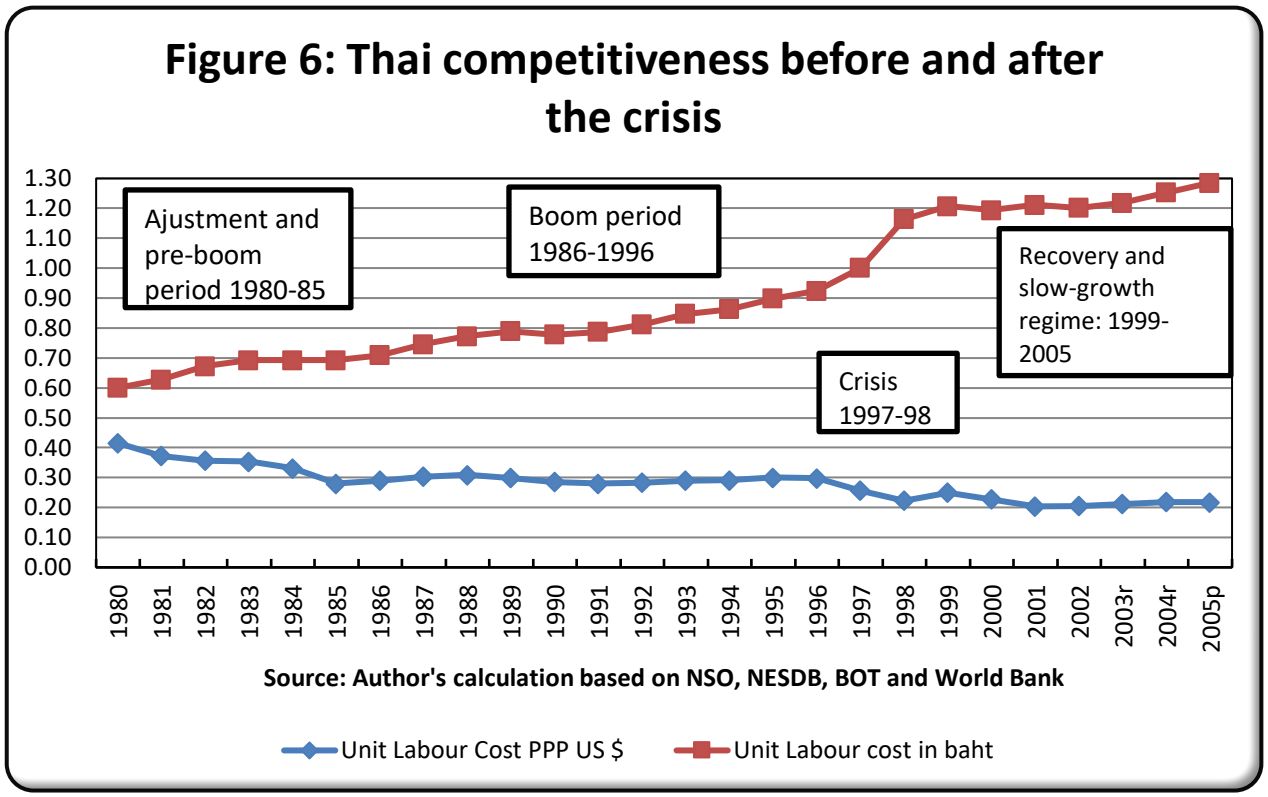


In 1996, one year before the crisis, it caught up with the level of labour productivity. Meanwhile, Thai employers have enjoyed a long period of low unit labour cost which means that Thai workers were producing a higher value than they cost. It is remarkable that after the crisis, the level of productivity stayed below the level of labour cost. On the long-run, this pattern is not sustainable. Labour productivity has to improve in order to at least match the growth rate of labour cost.

---

employed in GDP to get a high estimate. Finally, the "adjusted labour income" presented in figure 2 is calculated as the average of the two estimations. See the methodological annex 1 for further details.

17) Labour productivity is calculated as the GDP at factor cost at 1988 prices divided by total employment (farm and non-farm employment). Data are taken from National Accounts computed by NESDB and the Labour Force Survey computed by the NSO and can be retrieved at their respective website.



This evolution explains why the domestic unit labour cost (in baht) has increased on the long run exerting a negative pressure on cost competitiveness (see figure 6). But this loss of cost competitiveness did not materialise until 2005. Thanks to a 60% devaluation of the baht vis-à-vis the US dollar during the 1997-98 crisis, cost-competitiveness improved sharply until 2005. This is why the unit labour cost converted into US$ with (PPP) foreign exchange rates [18] exhibits a downward trend. This favourable period may be over. Due to a surplus in the balance of payments and the accumulation of foreign reserves, the baht has strengthened recently against the US$. The appreciation of the US dollar has been particularly strong in 2006 and 2007 putting Thai competitiveness under pressure. [19]. Like many other countries, Thailand will have to learn to compensate currency appreciation either with higher productivity or lower wages.

The sustainability issue of the Thai growth regime that was already apparent in 1996 is back again. The long-term solution cannot be permanent wage restraint or systematic devaluation of the baht (which would be difficult anyway due to the excess in the balance of payments) but enhancing productivity and upgrading the industry. This has to be done in conjunction with increasing the local content of FDI-based exports and by diversifying the industrial base to produce more differentiated products. This is the only way to become less dependent upon low labour cost for competitiveness. Thailand has made some progress in this direction. It now produces more scale-intensive and high-tech intensive products. But similar progress in local value-added and in local technological capabilities remains to be seen.

5. Structural change in production and international trade.

During the last two decades, Thailand has turned into a relatively successful industrial country. According to the UNIDO (2005) which measures the overall industrial development of a country by its "Manufacturing Value-Added (MVA) per capita", Thailand comes at the 44th place in 2002

[18] The Purchasing Power Parity (PPP) rate is the rate at which the currency of one country (for instance the Thai baht) would have to be converted into that of another country (usually the US $) to buy the same amount of goods and services in each country. PPP rates are much more stable and enable comparison of labour cost levels across countries because they make sure that the same volume of production is taken as a benchmark.

[19] In 2006, the annual average baht to the US$ exchange rate was Bt 37.88 compared to an average rate of Bt 40.22 in 2005. The real effective exchange rate also appreciated by 8% in 2006. Agriculture and labour-intensive industries are the most sensitive to this appreciation.

up from the 62nd in 1990 among a world sample of 156 countries. This puts Thailand in the second quarter behind Malaysia (34), Taiwan (16), Korea (14) and Singapore (9) but in front of China (75), Indonesia (82) and Philippines (84). In terms of exports of manufactured goods per capita, Thailand ranks 43 in 2002 up from 47 in 1990 within a similar hierarchy of East Asian countries. It can be said that Thailand has reached an intermediate level of industrialisation.

Despite this relative success, Thailand has not earned much foreign exchange through international trade. To the contrary, Thai international trade for overall products but also for manufactured products has been systematically in deficit until the 1997-98 crisis (see figure 7). The deficit in manufactured products was stable around US$ 3 billion during the cycle 1980-86 but widened during the boom cycle to reach the unsustainable level of around US$ 16 billion in 1996. The imports of machinery, technology and intermediate products due to Thailand's rapid industrialisation during the boom cycle (1987-96) were the main cause of this deficit.

Agricultural products and food were among the few products to generate a surplus, but insufficient to compensate the deficit in manufacturing. It is only after the crisis that trade of manufactured products has posted a surplus of US $ 2.8 billion on average on the period 1999-2005. This is a significant change that deserves closer scrutiny. One explanation is the slowdown of economic growth and private investment which reduces imports of capital and intermediate goods. In this sense the surplus in manufactured products is fragile.

A second explanation is the significant progress in the technological upgrading of Thai industrial output since the mid-seventies. As quoted by Dhanani and Scholtès (2002, p 18): "*The share of resource-based industries, including food, wood and paper resources, halved from 50% to around 25 % of total manufacturing value-added between 1975 and 1998" (see figure 8). "Labour-intensive industries increased their share from around 20 to 30% until 1990, and then declined to around 25% by 1998. The share of scale-intensive industries, including basic chemicals, fertilizers, refineries, cement and iron and steel remained stable at 18-19%. The technologically more-advanced differentiated industries, including machinery, consumer electronics and motor vehicles, doubled their share from 8 to 17 % by 1995, while the share of science-based industries, including medicines, office and computing equipment, and precision goods, increased their shares more rapidly, from 3 to 8% by 1995, and to 13% by 1998*".

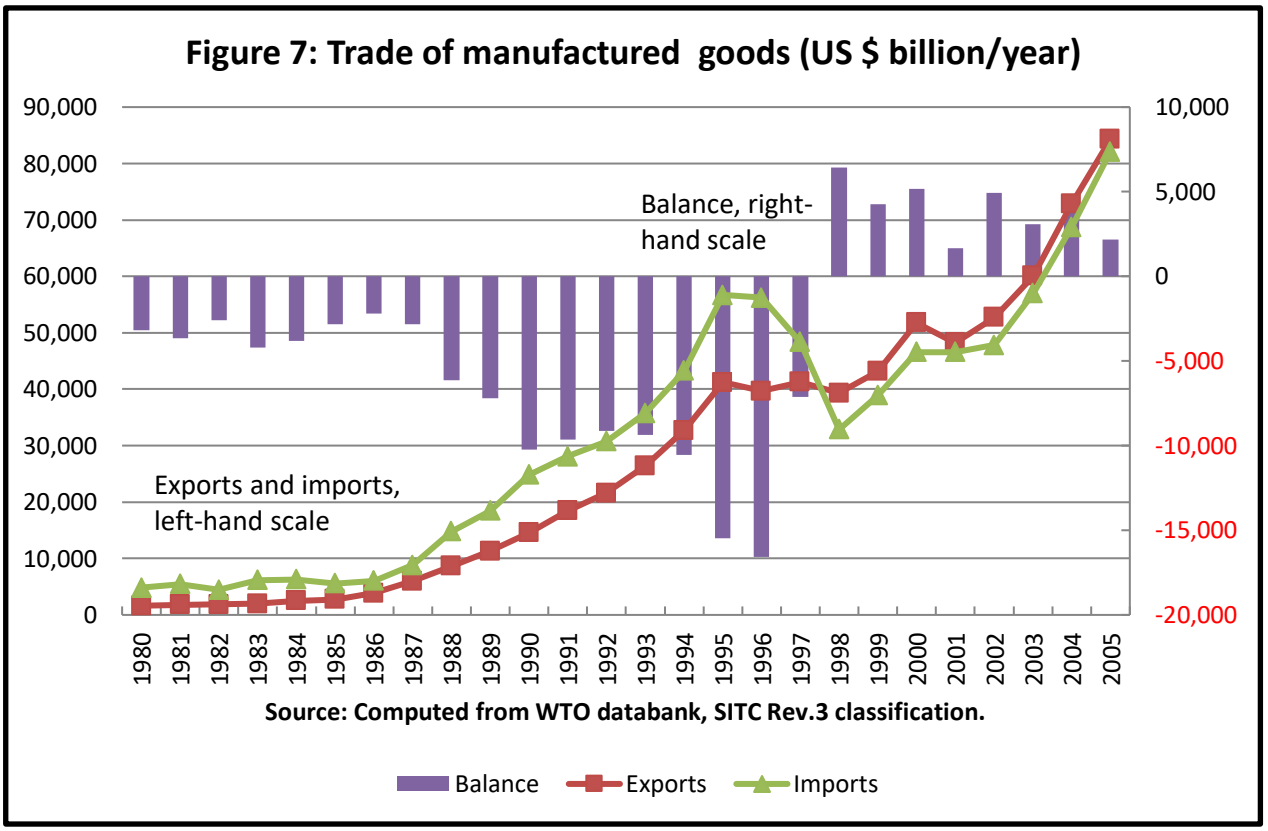
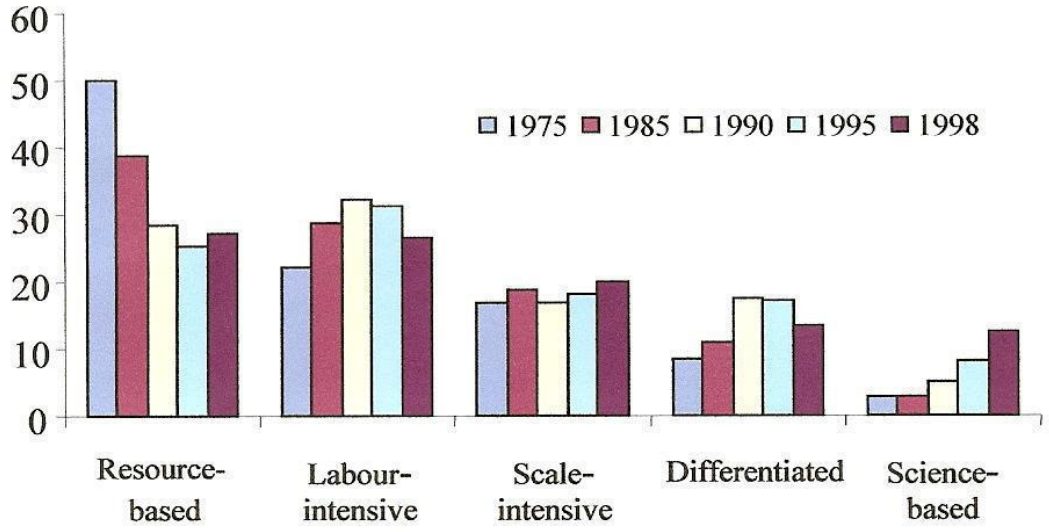


Figure 8 Technology Level of Manufacturing Output, 1975-1998 (% of Value-Added)



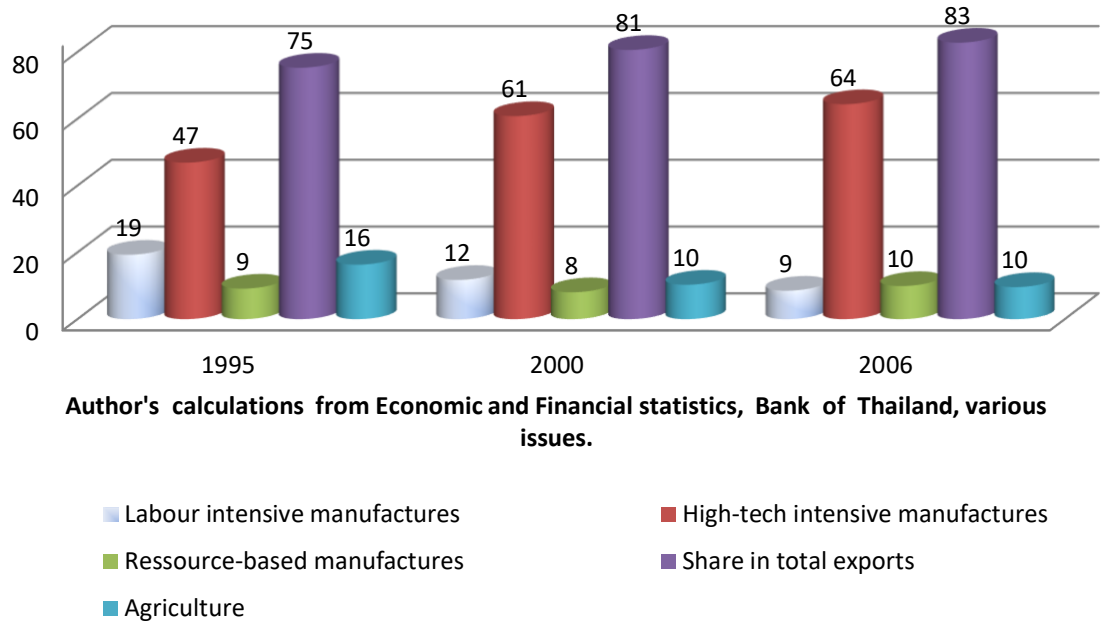
Source: S. Dhanani, P. Scholtès, 2002, from Input-Output tables, NESDB.

The evolution of Thai exports mirrors this structural change in the productive system. Agriculture which represented 16% of total exports in 1995 now accounts for only 10% while manufactured exports now represent 83% of total exports (see figure 9). The technological level of manufactured exports seems to have improved a lot, during the 1990's. The share of labour-intensive manufactures has decreased from 19% in 1995 to 9 % in 2006 while resource-based manufactures have remained constant around 10%. High-tech intensive manufactures have increased from 47% in 1995 to 64% in 2006. A closer look to manufactured exports (see figure 10) reveals that while traditional labour-intensive products such as garment, footwear and leather products are really declining or even disappearing (see chapter 7 for textile), three high-tech intensive products, non-electrical machinery and parts (HS 84), electrical machinery and equipment (HS 85) and vehicles and automobile parts HS 87 are now the top three export products accounting to 44% of total exports in 2006 [20].

This shows an increasing concentration on too few products and a potential fragility in case of a decline in the demand of these products on foreign markets.

[20] Because data bases do not provide an up-dated information on all aspects and differ from country to country and from one international institution to another we have to combine different ones. In this case, the product code comes from the Harmonised System nomenclature (HS) of the United Nations database COMTRADE. Source: http://www.trademap.net/Thailand

Figure 9: Technology level of Thai manufacture exports (% of total exports)



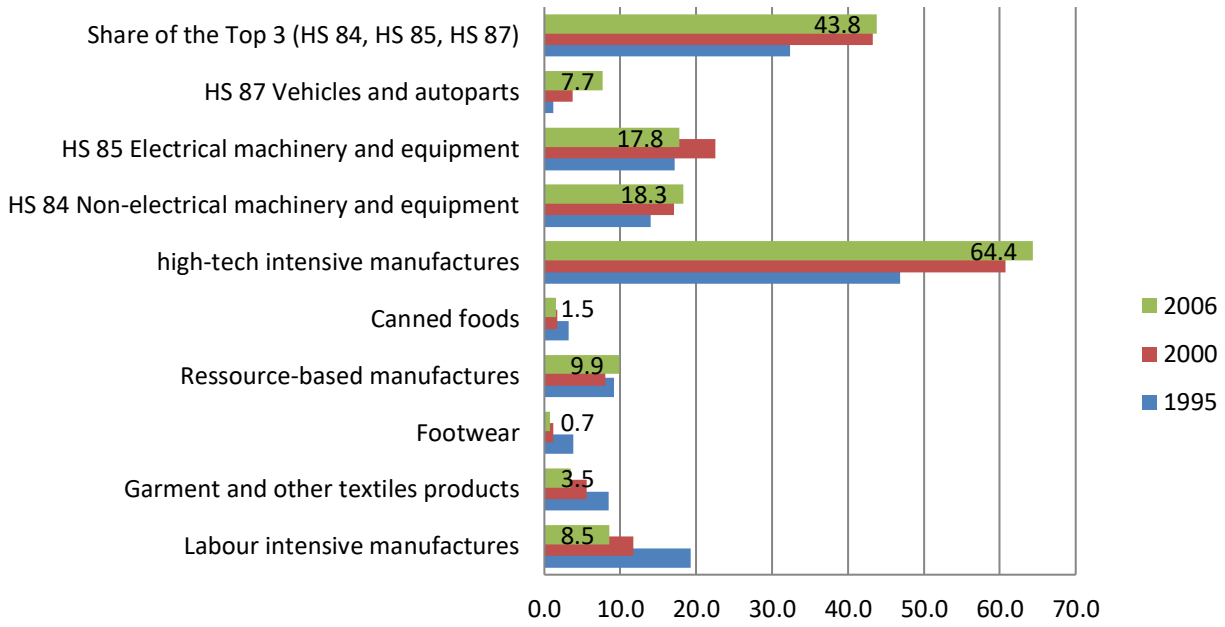
Author's calculations from Economic and Financial statistics, Bank of Thailand, various issues.

To sum up, Thailand is apparently moving from a resource-based and labour-intensive specialisation to a technology-intensive specialisation in phase with the most dynamic sectors of international trade.

The point is that most of these high-tech intensive exports have a high import content which creates problem for the trade balance and indicates that the local value-added is low. One can get a clearer view of the importance of local assembly of imported components and raw materials by looking at the import to export ratio at the sector level and the contribution of these sectors to growth (P. Patrawimolpon, R. Pongsaparn, 2006). Table 5 classifies Thai manufactured sectors into two main groups: low import to export ratio (<100) and high import to export ratio (>100) that impose a burden on the current account. Their growth contribution (GC in the table) is measured thanks to the data provided by the input-output tables of 2000 and compared to the median contribution to growth (0.43) as a benchmark. Table 5 shows that sectors with a low import to export ratio are usually resource-based and labour-intensive like processed food, rubber, textile, footwear, leather, ceramic, furniture, wood and paper, jewellery and non-metallic products.

In particular, textile, processed food and more recently wood are traditional products which have low import content and a high contribution to growth. Sectors with a high import to export ratio are usually the most technological and capital-intensive ones such as vehicles, plastic, petroleum and chemical products, although the ratio may be declining over time.

Figure 10: Thailand's export shares by products, (% of total exports)



Source: Author's calculation from Economic and Financial Statistics, Bank Of Thailand, various issues

Table 5: Growth Contribution (GC) by sector and import/export ratio

manufacturing	0<GC<0.43		0.43 < GC	
	M/X>100	M/X<100	M/X>100	M/X<100
1995-2000	Min, **Plas, Chem,** Met, Petl, Fish	**Cera, Rub, Ftwr,** Non-met, **Lethr,** Jew, Enrg	Agri, **Veh**	Mach, **Text, Profd, Wood,**Non-met
1990-1995	Min, Petl, Veh, Met, Mach, Non-met	Jew, Lethr, Cera, Plas, Ftwr	Agri	Text, Profd
1985-1990	Veh, Non-met, Chem, Met, Plas	Jew, Cera, Lethr, Fish, Rub	Petl, Min, Mach, Wood	Text, Profd
service	0<GC<0.43		0.43 < GC	
1995-2000			Trade, Serv, Commu, Fin, Hotel	
1990-1995	Hotel, Cons		Serv, Commu,Trade, Fin	
1985-1990			Serv, Commu, Cons, Hotel, Fin	

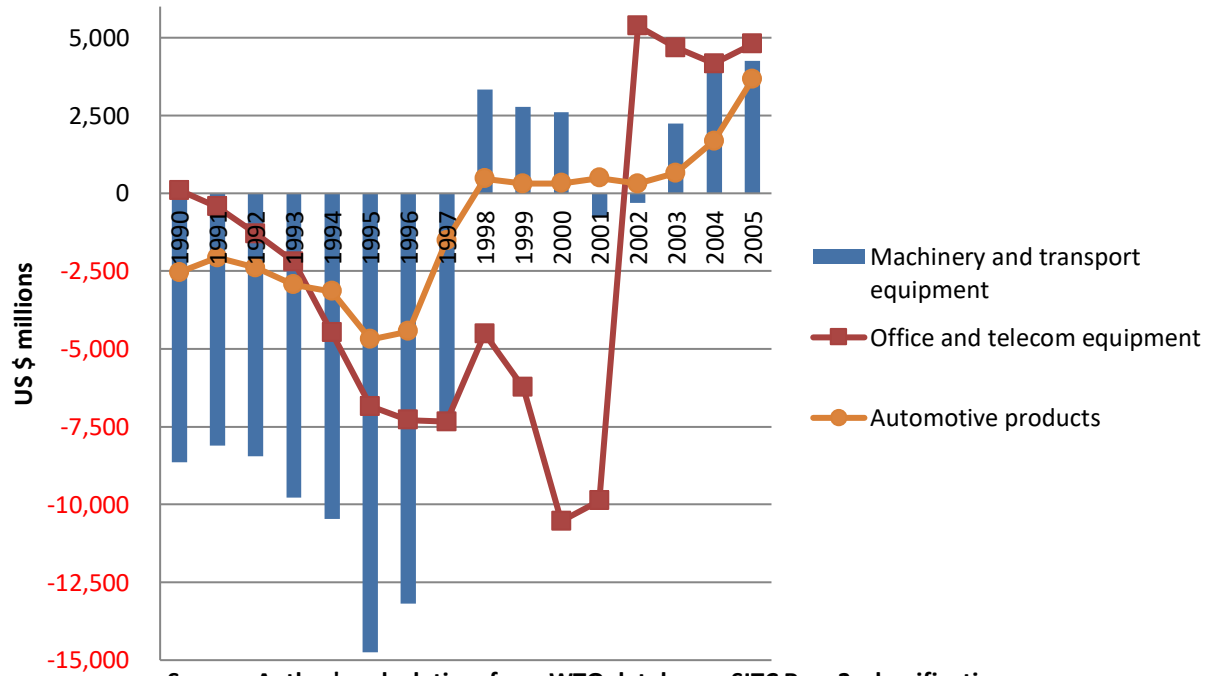
Note: Sectors are compared to the median Growth Contribution rate which is 0.43.
Source: P. Patrawimolpon, R. Pongsaparn, 2006, p 28.

This is especially the case of vehicles which have turn into high contributors to growth over time but were still net importers on the period 1995-2000 while Machinery had already turned into a high contributor to growth with a low import to export ratio. These sectors are where FDI is

concentrated and where the import content was initially high, limiting technological spill-over. A decrease in the import content signals an improvement of local capabilities to master a bigger part of the supply chain. To confirm these evolutions, we have calculated with WTO data the net exports of the important category "machinery and transport equipment" (SITC section 7), and two of its main sub-categories, "office and telecommunications equipment" (which includes computer and related products and components) and "automotive products".

Figure 11 shows that after the crisis, "machinery and transport equipment" has turned into a net exporter with a surplus of around US $ 2.5 billion per year, with the short exception of the world economic slowdown in the period 2001-2002. This slowdown had a dramatic impact on exports of "office and telecom equipment" which accused a deficit of US $ 10 billion while "automotive products" were not seriously affected. Since 2002, there is a spectacular turnaround. The surplus in "office and telecom equipment" is US $ 5 billion on average. It remained strong in 2006-07. The automobile industry has also turned into a net exporter after the crisis and has reached the surplus record level of US $ 3.6 billion in 2005 in sharp contrast with the 1990s. This result is achieved in the context of a regional division of labour organised by multinational companies that has contributed to diversify export destinations. In 1995, Thailand was dependent on just three countries for 49% for its exports, namely the US (18%), Japan (17%) and Singapore (14%) (See table 6). In 2006, the situation has improved. These three countries now account for only 36%. Japan's share in particular has lost 4% to the benefit of China (9%), while ASEAN's and the European Union's share remained globally stable. On the import side, the decline of Thailand's traditional trading partners is confirmed (Japan, Singapore the EU and the USA) to the benefit of ASEAN and China. This evolution reflects the growing inscription of Thailand in the regional division of labour. For instance, Southeast Asian countries were the major importers of Thailand's vehicles and parts exports (HS87) accounting for 24% of total vehicle exports in 2006 followed by the EU with 17%. Thai exports of electrical machinery and equipment (HS85) to China are another case in point. About 39 percent of the HS85 exports to China were electronic integrated circuits (HS8542) which were assembled in China before exported to the third markets. Vehicle parts (HS8708) accounts for 75.5 percent of total Thai automobile exports to China. India is still a marginal trade partner. But in the future, it can turn into an important one if the project of a free trade zone between ASEAN and India succeeds and if more multinational companies are willing to extend

Figure 11: Net exports of machinery and transport equipment, (SITC 7)



Source: Author's calculation from WTO database, SITC Rev. 3 classification

their regional division of labour from South East Asia to South Asia, as some are already doing.

Table 6: Thai Exports by destination, in %			
	1995	2000	2006
Japan	16,8	14,7	12,7
Singapore	14,0	8,7	6,4
Asean	19,1	19,4	20,9
China	5,2	4,1	9,0
India		0,8	1,4
United States	17,8	21,3	15,0
EU 15	15,1	15,8	13,0
Total exports	100,0	100,0	100,0
Thai Imports by destination, in %			
	1995	2000	2006
Japan	30,5	24,7	20,1
Singapore	5,9	9,7	4,5
Asean	12,6	16,6	18,4
China	3,0	5,4	10,6
India		0,1	1,3
United States	0,0	0,1	1,3
EU 15	0,0	0,0	0,0
Total imports	14,5	10,2	8,4
Source: Author's calculations with WTO data			

To sum up, since the crisis, Thailand has made some progress in terms of better trade balance, more diversified exports and more diversified customers. But it remains to be seen if these progresses are sufficient to reduce the sensibility to adverse foreign demand shocks.

Furthermore, these significant progresses in the structure of production and trade do not mean that Thailand has succeeded in establishing an integrated and sophisticated production system involving innovation and design. The technological upgrading has not been as important and fast as the above figures suggest. The point is that the classification used is based on the technological level of the final product and not on the technological level of the production process itself and the value-added it incorporates to the product. In fact, the import content of differentiated and science-based products is high, indicating that Thai industries are still more specialized in the low-skilled assembly stage of imported complex components than in the production phase of manufacturing. One has to nuance this assertion because the situation changes a lot according to the industry. The chemical industry for instance requires a high proportion of skilled and high-skilled workers. The automobile industry relies on a lot of assembly tasks, but these now imply a high level of organisational and behavioural skills from the part of workers and the local content is now high (see chapter 6). This is probably less the case in most of the electronic industry segments in Thailand where pure assembly of imported components one into another explain why employers prefer to recruit young low-skilled female workers.

The problem is that assembly process of imported components is clearly less productivity-enhancing than more integrated process with higher local content. This makes the difference at the macro-level for the dynamic of productivity and growth. This is what we are trying to catch by

turning now to a macroeconomic approach.

6. Growth and productivity.

Several studies have analysed the factors of Thailand growth in order to measure the respective contribution of capital, labour (and land (for agriculture) and the so-called called "total factor productivity". The basic idea is that economic growth is explained by the use of increasing volumes of capital, labour and land and by their increasing productivity due respectively to technical progress, education and skills, and fertility. Their combined productivity is called "Total Factor Productivity" (TFP). Studies differ in terms of theoretical approach, methodology, scope and time period. An in-depth survey is beyond the scope of this chapter. Suffice it to say that some studies rely on a production function, usually a Cobb-Douglas one that presents the disadvantage to suppose restrictive hypothesis such as constant returns to scale, perfect substitution between labour and capital and declining marginal productivity. On the contrary, the growth accounting approach does not rely on any of these assumptions. In the case of Thailand, this second strand of studies converges to the following conclusions:

The most important factor of growth has been the accumulation of capital, followed by the mobilisation of labour while TFP has played a modest role, albeit significant. But, most of TFP growth in the past has come from the migration of workers, from agriculture which has a low productivity, to industry which has a higher one. At the opposite, productivity increase coming from the inside of the industrial sector and therefore depending on innovation were rather rare. For the whole period of 1977-1999, A. Chandrachai et. al. (2005) found that the migration from agriculture to industry represented 72.4% of TFP (see page 316). This so-called "productivity bonus" is bound to disappear in the coming years when most of rural workers will have migrated. In 2006, the share of the labour force in agriculture had already dropped to 37% of the total labour force down from 50% in 1996. Unless we hypothesise that this share may fall gradually to less than 10%, which is not plausible, the shift bonus can no longer be an important source of productivity for the coming decades. It is especially the case if most of rural workers find a job in the services sector where productivity is low rather than in manufacturing where productivity is higher.

The most recent growth accounting exercise realised by the World Bank (2006a) covers the period 1977-2004. It shows that in the period prior to the financial crisis (1977-96), capital contributed to 4% out of an average output growth of 7.7%, labour contributed to 2% and TFP growth contributed to 1.6% (see table 7). In itself this level of TFP is non-negligible but if we take into account that most of this TFP stems from the migration of rural workers to industry, this means that endogenous TFP, the one that comes from technical and organisational innovations has been in fact very low. During the recovery period, (1999-2004), the rate of growth (5%) does not fully recover and stays under its historical trend. Capital accumulation falls down (0.9%) and TFP improves (2.1%). It remains to be seen whether this improvement of TFP signals a long-term change or is due to the short-term effect of an intense industrial restructuring due to the crisis.

The decomposition of the contribution of labour into a quantitative effect (employment) and a qualitative effect (progress in the level of education of employees) reveals that education has always been a minor source of growth with 0.3% during 1977-1996 (see "quality of labour" in table 3), while employment (1.6%) played the major role. The most recent period (1999-2004) shows only a slight improvement (0.4%).

Table 7: Sources of growth, 1977-2004 (average annual rate of change)						
	Whole economy			Manufacturing		
	1977-2004	1977-1996	1999-2004	1977-2004	1977-1996	1999-2004
Real Output growth	6.0	7.7	5.0	8.4	10.2	6.6
Labour of which:	1.8	2.0	1.9	2.8	3.2	2.9
Employment	1.4	1.6	1.4	2.4	2.8	2.6
Quality	0.4	0.3	0.4	0.4	0.4	0.4
Capital	3.1	4.0	0.9	4.1	5.4	0.8
TFP	1.0	1.6	2.1	1.2	1.3	2.7
	Agriculture			**Services**		
	1977-2004	1977-1996	1999-2004	1977-2004	1977-1996	1999-2004
Real Output growth	2.9	3.3	3.2	5.4	7.3	4.2
Labour of which:	0.4	0.5	01	3.6	3.5	4.6
Employment	0.2	0.4	-0.1	2.9	3.1	2.7
Quality	0.2	0.1	0.2	0.7	0.4	0.7
Capital	1.9	1.9	1.6	2.5	3.2	0.6
TFP	0.5	0.7	1.4	-0.7	0.5	-0.9
Note: quality of labour is measured by the average years of educational attainment. Source: World Bank, 2006a, p 4.						

This tends to prove that even if the young generations are much more educated, the effect of their better education is still not perceptible in the growth rate. This is due to the fact that the bulk of the labour force remains poorly educated. In 2004, 59.4% of the labour force still graduate less than secondary school, down from 78.3% in 1994. The delay in improving education in Thailand has long-lasting effect on growth.

At the sector level, we observe that this global pattern prevails also in the manufacturing sector. In particular the TFP and the "quality of labour" effect (the effect of the level of education) have been almost the same (respectively 1.3% and 0.4% in 1977-1996) which indicates that manufacturing has not been more efficient than the whole economy, even during the high-growth period. In the last period (1999-2004), the contribution of capital (0.8%) drop more sharply because manufacturing was the most affected by the fall in investment. As a consequence, the strong increase in TFP from 1.3% to 2.7% reflects more the elimination of excess capacity and the search for rationalisation than the incorporation of technical progress through investment in new generation of equipment. In agriculture in the whole period (1977-2004), about two-thirds of output growth is due to capital [21], all other factors playing a reduced role, in particular education. Services is the only sector where labour plays a more important role than capital and where TFP is negative on the long run, which is explained by the severity of the crisis. It is also the only sector where the contribution of education is the highest (13% during 1977-2004) [22] and improving during the recovery period. This may be explained by the fact that the new educated generations prefer to work in services rather than in manufacturing.

To sum up, Thailand is now confronted with the necessity to increase intra-sector productivity

[21] This proportion is calculated by dividing the contribution of capital (1.9%) by the real output growth (2.9%) in the period 1977-2004.

[22] We divide the contribution of the quality of labour (0.7%) by the real output growth (5.4%) for the period 1977-2004.

which implies that education and technological performance must improve substantially. This implies, among other things, establishing a National Innovation System as already discussed in chapter 2 and improving education and skills which lacking quality was clearly emphasized in the first part.

Conclusion.

In conclusion, we would like to draw the lessons of our analysis and present three policy recommendations.

The first concerns the necessary industrial upgrading. Few foreign companies and even less private Thai firms engage in R&D activities because they are not convinced that innovation is necessary for their operations in Thailand. Up to now, firms in Thailand were able to compete and achieved expected profit thanks to low labour cost and labour-intensive technology requiring few local adaptations. But this golden age for private firms is bound to end at medium-term because unit labour costs are rising in Thailand and new low- labour costs countries are emerging. Investing in R&D to improve and differentiate existing products and create new ones, to improve productivity in order to lower unit labour costs is unavoidable. But this is easier said than done. The Thai government is trying to convince foreign firms, for instance in the electronic industry, to locate more R&D activities in Thailand with fiscal incentives and better supply of skilled workers. This runs counter the international tendency of multinational firms to create global supply chains in which each function is located in different countries according to their relative advantage and to diversify risks. Why would multinational firms locate R&D activities or the production of high value-added products in the present Thai environment? Fiscal incentives are insufficient to convince these firms to change their global supply chain. The alternative would be to rely on Thai private firms. But here lies another structural problem of Thai capitalism. For historical reasons, there are not enough big and strong Thai industrial private firms that could take the lead to transform Thailand into an innovative country. There is no equivalent of the big Indians firms like Tata, or of the Korean chaebols like Samsung, LG or Hyundai, or of Taiwanese Acer and innovative SMEs [23]. Deprived from these alternatives, we think that the best solution is an active policy to use state companies as the major vector of R&D activities. This may seem old-fashioned in these times of free trade and market-friendly policies but historical evidence shows that developing countries that have created and accumulated R&D capacities have relied extensively on state companies (J.Katz, 2004). State companies have played the role of incubators for private companies because they have provided jobs to newly graduated scientists and engineers. They have realised R&D that even not on the frontier of technical progress laid the foundations for further endogenous progress. This possibility has not been explored sufficiently in Thailand and because Thailand is not an over-indebted country, there is no strong financial constraint that would make it impossible. This new active public policy could be combined with other measures such as public financing of start-ups in technology-intensive projects. At the present moment, there is no public development bank able to finance start-ups or mechanisms to provide newly graduated Thai entrepreneurs with collaterals that would make them eligible for credit banking.

The second recommendation concerns universities. Thai universities are divided into two broad categories: "Teaching universities" and "research universities". Although scholars in "research universities" do more research than in "teaching universities", they dedicate only 18.1% of their estimated hours per week during teaching period to research and thesis supervision against 30% in Australian universities for instance (R. Sharma et al. 2004). This is clearly not enough. Research should be made a clear priority in terms of time dedicated and status, and universities should be reunited in the same legal status of "research universities". Not only scholars should be better paid, but research should become the first criteria for promotion. In counterpart that scholars' activity should become more transparent and accountable and no side-line jobs should be allowed, especially teaching in private university. A unique and stringent legal status for university would avoid the present situation where tertiary education has become a business. New private universities are opening every year, where quality of education is poor, but which deliver easy to

[23]) For further developments on this issue, see P. Intarakumnerd's chapter in this book.

get degrees. These low-quality diploma mills serve neither the national interest nor even individual interests because they sap the necessary confidence in diplomas and private firms learn to distinguish between them. This supposes a radical reform of Thai universities that is yet to come.

The third recommendation concerns secondary education. Secondary education must progress quantitatively and qualitatively to provide the skilled workers that Thailand is needed and to provide more and better future students for tertiary education, especially in scientific fields. The only way is to remove the financial obstacle by guaranteeing effectively totally and not partially free secondary education for poor households. Given the growing inequality of revenues in Thailand, this means that only the minority of rich households should have to pay for the cost of education. More broadly, positive discrimination for rural schools should be developed beyond the present stage, because this is where the majority of pupils leaving school after grade 9 are located. The fact that the number of pupils in rural areas is reduced create good conditions to improve the quality of education in particular by implementing innovative pedagogy, providing that schools have appropriate equipment and teachers feels the support of the whole institution in favour of innovative teaching.

To finalise, education upgrading cannot be achieved by the education system alone. Without a strong commitment to the reduction of social inequalities, the quality of education cannot be significantly improved, because schools can only partially compensate social handicaps. But without industrial upgrading, education upgrading makes no sense. What's the point in being better educated if there are no better jobs enabling a better life? The promise of higher wages and better work conditions are also strong incentives to become more educated. In this respect, Thailand has a lot of progress to accomplish. Wages really start to rise for those who got a university degree, while students who have completed secondary schools do not have received significantly more that those who have only primary education. Climbing up the development ladder truly relies on decent jobs.

References.

Adams Donald, Chapman David W. (1998). "*Education and national development in Asia: trends and issues*". International Journal of Educational Research 29, p 583-602.

Acedo Clementina, Uemura Mitsue (1997). "*Education Indicators for East Asia and the Pacific*". World Bank, 1997.

Ahuja A., Chucherd T., Pootrakul K. (2006). "*Human Capital Policy: Building a Competitive Workforce for 21st Century Thailand*". Bank of Thailand Discussion Paper, DP/07/2006, BOT, Thailand.

Altenburg T., Gennes M., Hatakoy A., Herberg M., Link J., Shoengen S. (2004). "*Strengthening Knowledge-based Competitive Advantages in Thailand*". Reports and Working Papers 1/2004, German Development Institute.

Ark Van B., Monnikhof E.J. (2000). "Productivity and unit labour cost comparisons: a data base". Employment Paper, n° 5, ILO, Geneva.

Chandrachai A., Bangorn T., Chockpisansin K. (2004). « *Total Factor Productivity Growth: Survey Report. Part II- National Reports, Thailand* ». APO 2004, Tokyo.

Intarakamnerd P., Chairatna P.A., Tangchitpiboon T. (2002). « *National Innovation System in Less Sucessful Developing Countries: The Case of Thailand* ». Research Policy, 31, p 1445-1457.

Deolalikar A., Hasan R., Khan H., Quibria M.G. (1997). "*Competitiveness and Human Ressource Development*" (1997). Asian Development Review, vol. 15, n° 2, pp 131-163, Asian Development Bank, Manilla.

De Ferranti D. et al. (2003). « *Closing the gap in Education and Technology*". The World Bank, Washington D.C.

Dhanani S., Scholtès P. (2002). "*Thailand's Manufacturing Competitiveness: Promoting Technology, Productivity and Linkages*". Small and Medium Enterprises Technical Working Papers Series, UNIDO, Vienna.

Gollin D. (2002). "*Getting Income Shares Right*". Journal of Political Economy, 110(2): 458-74.

Intarakamnerd P., Chairatna P.A., Tangchitpiboon T. (2004). « *National Innovation System in Less Sucessful Developing Countries: The Case of Thailand* ». Research Policy, 31, p 1445-1457.

Jetin B. (2006). "*The Cognitive International Division of Labour Hypothesis: What Possible Effects for Thai Labour and Education*?" Journal of Education, Vol. 33, N° 1-2, January-December 2006, Chiang Mai, Thailand.

Katz J (2004). "*The Limits of The Prevailing Orthodoxy. Technology and education as restrictions to productivity growth and international competitiveness in Latin America*". Communication presented at the DRUID Summer Conference 2004 on Industrial Dynamics, Innovation and Development, Elsinore, Denmark, June 14-16, 2004

Khoman S. (2005). « *Education: The Key to Long-term Recovery*? » In P. Warr editor; "Thailand beyond the crisis". Routledge Curzon, New York.

Lee W.O. (1998). "Equity and Access to Education in Asia: Leveling the Playing Field". International Journal of Educational Research, 29, p 667-683.

Levin Keith M. (1997). "*Education Development in Asia: Issues and Planning, Policy and Finance*". Asian Development Review, vol. 15, n° 2, pp 86-130, Asian Development Bank, Manilla.

Mallikamas P.R., Rodpengsangkaha D., Thaicharoen Y. (2003). "*Investment Cycles, Economic Recovery and Monetary Policy*". Discussion Paper, Monetary Policy Group, Bank of Thailand.

Nelson R. (2003) "*Physical and Social Technologies and Their Evolution*". Économie Appliquée, Vol. 56 (3), pp. 13–29.

Mingat, A., & Tan, J. P. (1996). "*The full social returns to education: Estimates based on countries economic growth performance*". Human Capital Development Working Paper N°. 73. Washington, DC: The World Bank.

NSO (2002). "*Children and Youth Survey (CYS) of 2002*". National Statistical Office, Bangkok.

OEC (2004). "*Education in Thailand*". Office of the Education Council, Ministry of Education, Thailand.

Patrawimolpon P., Pongsaparn (2006). "*Thailand in the new Asian Economy: The Current State and*

Way Forward". Bank of Thailand Discussion Paper, DP/04/2006, BOT, Thailand.
Pholphirul P. (2005). "*Competitiveness, Income Distribution and Growth in Thailand: What does the Long-Run Evidence Shows*?" International Economic Relations Program, Thailand Development Research Institute, May, Bangkok.
Polanyi M. (1966). "*The Tacit Dimension*". Doubleday, New York.
Schiller D. (2006). "*The Potential to Upgrade the Thai Innovation System by University-Industry Linkages*". Asian Journal of Technology Innovation, Vol. 14, 2.
Sharma R., Thasnapark U., Launglaor W. (2004). "*A comparative Analysis of Thai research University's academic staff perceptions of their work and related issues in research and other universities*". Journal of Institutional Research South East Asia, Vol.2, n° 2, June.
UNESCO (2006). "*Global Education Digest 2006. Comparing Education Statistics Across the World*". UNESCO, Paris.
UNESCO (2005). "*Education for All: The Quality Imperative*". The EFA Global Monitoring Report Team, UNESCO, Paris.
UNIDO (2005). "*Industrial Development Report 2005. Capability building for catching-up: Historical, empirical and policy dimensions*". UNIDO, Vienna.
Van Ark B., Monnikhof E.J. (2000). "*Productivity and unit labour cost comparisons: a data base*". Employment Paper, n° 5, ILO, Geneva.
World Bank (2006a). "*Thailand Investment Climate, Firm Competitiveness and Growth*". Report n° 36267-Th, "Poverty Reduction and Economic Management Sector Unit, East Asia and Pacific Region, (Washington, D.C.).
World Bank (2006b). "*Thailand Social Monitor: Improving Secondary Education*". Thailand Social Monitor Series, (Washington, D.C.)
World Bank (2006c). "*Meeting the Challenges of Secondary Education in Latin America and East Asia. Improving Efficiency and Resource Mobilization*" Emanuela di Gropello, Editor. World Bank. III. Series: Directions in development (Washington, D.C.).

Annex 1 relative to Figure 2 and 3.

Compensation of employees is a statistical term used in national accounts and balance of payments statistics. It is defined as "the total remuneration, in cash or in kind, payable by an enterprise to an employee in return for work done by the latter during the accounting period". It also includes "other costs of labour that are paid by employers such as contributions to social security and pension schemes (whether public or private)". (B. Van Ark, E.J. Monnikhof (2000).

The problem with the compensation of employees is that it relates to public and private wages earners and does not take into account the income of self-employed workers in urban and rural areas such as farmers and their employees and "own-family workers". Their income is called in national accounts "Operating Surplus of Private Unincorporated Enterprises (OSPUE). They are usually part of the informal economy. Sociologically, these workers are much closer to wage earners than to employers of big formal firms. In Thailand, the NESDB measures this part of income as "Income from Unincorporated Enterprises". OSPUE should be counted as labour income but the point is that it is in fact a mixture of labour income and profit. Adding simply OSPUE overestimates the share of labour income in GDP but leaving it aside underestimates it. To make things clear, the average share of compensation of employees in Thailand on the 1980-2005 is 36% of GDP while the average share of compensation of employees plus the income of unincorporated enterprises amounts to 80% of GDP. The solution proposed by D. Gollin (2002) consists in two adjustments and then taking the average of the two. Adjustment 1 is calculated as the ratio of the share of compensation of employees plus the share of OSPUE in GDP at factor cost to one. This adjustment treats all OSPUE as labour income. Adjustment 2 is calculated as the ratio of the share of compensation of employees minus the share of OSPUE to one in GDP at factor cost. This adjustment treats OSPUE as comprising the same mix of labour and profits as the overall economy. It is obvious that this or any other procedure involves an element of subjectivity given the issue at hand. It is not claimed that this newly calculated share is absolutely correct. It is

impossible to know. However, it seems much more reasonable than the original one estimated by simply dividing labour compensation by GDP. The sources used are the Thai national accounts provided by the National Economic and Social Development Board (NESDB) from 1980 to 2005 and the "Labour Force Survey" of the National Statistical Office (NSO) for data on employment for the same period. The unit labour cost is then calculated as the ratio of the nominal labour income per worker previously calculated divided by labour productivity. Labour productivity is calculated as the quantity of output per worker. The quantity of output is defined as the GDP at factor cost at constant 1988 prices. The nominal exchange rate and the Purchasing Power Parity exchange rate are taken from IMF data base.

Annex 2 relative to Figure 11.

The following sources have been used to construct Figure 11. "Edstats", the World Bank's data base that compiles a variety of national and international data sources (such as UIS and OECD) and the World Bank data on pertinent education topics. The data retrieved from Edstats for gross enrollment rate in secondary education goes from 1970 to 2005 and generally comes from UNESCO data base, UIS. For previous years we have used the following publications that relied on various issues of UNESCO statistical yearbook: Adams Donald, Chapman David W. (1998), Acedo Clementina, Uemura Mitsue (1997), Deolalikar A., Hasan R., Khan H., Quibria M.G. (1997), Lee W.O. (1998), Levin Keith M. (1997), Mingat, A., & Tan, J. P. (1996).