# UNIVERSITI PUTRA MALAYSIA

# EFFICIENCY, TECHNOLOGICAL SHIFT AND HUMAN CAPITAL IN THE K-ECONOMIES OF ASEAN FIVE PLUS THREE

**WONG MEI FOONG**

**FEP 2007 9**

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**By**

**WONG MEI FOONG**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy**

**July 2007**

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**DOCTOR OF PHILOSOPHY**
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**2007**

***Specially dedicated to***

***My beloved parents, brother and sisters,***

***for their invaluable love, sacrifices and support***

***to make this dissertation possible in every way.***

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment
of the requirement for the degree of Doctor of Philosophy

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**Chairman:** **Associate Professor Tan Hui Boon, PhD**

**Faculty:** **Economics and Management**

Develop towards a knowledge-based economy is extremely important for the ASEAN five plus three countries, since the countries face challenges at the global fronts and technological changes; the rules of competition have changed. A country's competitive advantage is no longer dependent solely on factors such as labor, land and natural resources, but on its potential to produce, acquire, utilize and disseminate knowledge. Thus, this is essentially a shift from economic development based on resources to development based on knowledge where human capital (consequently education) emerges as crucial public policy themes for creating wealth and increasing the quality of life.

This thesis attempts to determine the level of knowledge-based development in Malaysia in terms of efficiency, technical change and human capital. This development is then compared with the other ASEAN five plus three countries,

which includes four members of the Association of Southeast Asian Nations (ASEAN) namely Indonesia, the Philippines, Singapore, and Thailand and the three Northeast Asian states, namely China, Japan and South Korea. In particular, the objectives of this study are to (1) determine the contribution of knowledge-based human capital to economic growth in the ASEAN five plus three countries, (2) identify the determinants of knowledge-based human capital in Malaysia and the selected ASEAN five plus three countries, (3) determine the efficiency of Malaysian in generating the knowledge-based outputs, as compared to other ASEAN five plus three countries, and (4) investigate whether there is any long-run convergence in the development of knowledge-based human capital among Malaysia and the ASEAN five plus three countries.

The empirical findings of the economic growth model using a panel cointegration framework and Fully Modified Ordinary Least Square (FMOLS) show that the human capital significantly influenced the economic growth in the ASEAN five plus three countries. Furthermore, the empirical results of the human capital analyses also indicate significant economic and demographic variables including the Gross Domestic Product (GDP) and fertility rate. However, the time series cointegration test did not detect a significant long-run convergence in the development of human capital among Malaysia and the ASEAN five plus three countries.

The empirical findings of the Stochastic Frontier Analysis (SFA) indicate that Malaysia, Korea, Singapore, Japan and China appear to be the most efficient countries in generating the knowledge-based outputs, followed by Thailand though Indonesia and Philippines appear to be the least efficient countries. In regard to the issue of catch-up and convergence, the results show that Malaysia and Korea are catching up with the developed country such as Japan while other ASEAN five plus three countries are failed to catch-up with developed countries over the period. Last but not least, all the ASEAN five plus three countries have enjoyed from technical progress and achieved positive total factor productivity (TFP) growth rates over the 1992-2005 period.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**KECEKAPAN, PEMINDAHAN TEKNOLOGI DAN SUMBER MANUSIA DALAM ERA K-EKONOMI DI NEGARA ASEAN LIMA PLUS TIGA**

**OLEH**

**WONG MEI FOONG**

**Julai 2007**

**Pengerusi:** **Profesor Madya Tan Hui Boon, PhD**

**Fakulti:** **Ekonomi dan Pengurusan**

Pembangunan ke arah ekonomi berasaskan pengetahuan adalah amat penting bagi negara ASEAN lima plus tiga, memandangkan negara ini berhadapan dengan pelbagai cabaran globalisasi dan pemindahan teknologi; peraturan daya saing telahpun berubah. Kelebihan daya saing sesebuah negara bukan sahaja bergantung pada faktor-faktor seperti buruh, tanah and sumber semulajadi, tetapi juga bergantung pada potensi negara untuk menghasilkan, memperolehi, menggunakan and menyebarkan pengetahuan. Dengan itu, adalah mustahak untuk ekonomi negara mengalih dari pembangunan berasaskan sumber kepada pembangunan berasaskan pengetahuan, di mana sumber manusia (pendidikan sebagai akibat) menjadi polisi kritikal kerajaan yang bertema menghasilkan kekayaan dan meningkatkan tahap kualiti hidup.

Tesis ini bertujuan untuk menentukan tahap pembangunan berasaskan pengetahuan di Malaysia dari segi kecekapan, perubahan teknologi dan sumber manusia. Pembangunan ini kemudiannya dibandingkan dengan negara ASEAN lima plus tiga lain, yang termasuk empat ahli Pertubuhan Negara-negara Asia Tenggara (ASEAN), iaitu Indonesia, Filipina, Singapura dan Tailand serta tiga negara Asia Timur Laut, iaitu China, Jepun dan Korea Selatan. Secara khususnya, tujuan kajian ini adalah untuk (1) menentukan penyumbangan sumber manusia berasaskan pengetahuan kepada pertumbuhan ekonomi di negara ASEAN lima plus tiga, (2) mengesahkan penentu sumber manusia berasaskan pengetahuan di Malaysia dan negara ASEAN lima plus tiga yang terpilih, (3) menentukan kecekapan Malaysia dalam menghasilkan output berasaskan pengetahuan, apabila berbanding dengan negara ASEAN lima plus tiga lain, serta (4) mengkaji samaada wujudnya pemusatan jangka panjang dalam pembangunan sumber manusia berasaskan pengetahuan di antara Malaysia dan negara ASEAN lima plus tiga.

Empirikal kajian model pertumbuhan ekonomi dengan menggunakan panel kointegrasi kerangka dan Fully Modified Ordinary Least Square (FMOLS) menunjukkan sumber manusia mempunyai pengaruh yang bererti terhadap pertumbuhan ekonomi di negara ASEAN lima plus tiga. Tambahan pula, hasil empirikal kajian sumber manusia juga menunjukkan bahawa pembolehubah ekonomi dan demografi yang bererti termasuk Keluaran Dalam Negara Kasar (KDNK) dan kadar kesuburan. Namun demikian, ujian kointegrasi siri masa tidak

dapat mengesan sebarang pemusatan jangka panjang yang bererti dalam pembangunan sumber manusia di antara Malaysia dan negara ASEAN lima plus tiga.

Hasil empirikal daripada Stochastic Frontier Analysis (SFA) menunjukkan bahawa Malaysia, Korea, Singapura, Jepun dan China adalah negara yang paling cekap dalam menghasilkan output berasaskan pengetahuan, diikuti dengan Thailand, sementara Indonesia dan Filipina adalah negara yang kurang cekap. Bagi isu mengenai pembangunan hampir sama (catch-up) dan pemusatan, hasil kajian menunjukkan bahawa Malaysia dan Korea dapat mencapai tahap pembangunan yang hampir sama dengan negara maju seperti Jepun tetapi negara ASEAN lima plus tiga lain gagal mencapai tahap pembangunan yang hampir sama dengan negara maju dalam jangka masa itu. Akhir sekali, semua negara ASEAN lima plus tiga menikmati kemajuan teknikal dan mencapai positif kadar pertumbuhan produktiviti faktor keseluruhan (TFP) di antara tahun 1992 dan 2005.

## ACKNOWLEDGEMENTS

First and foremost, I would like to express my most sincere gratitude to the Chairman of my supervisory committee, Associate Professor Dr. Tan Hui Boon who has been very supportive and dedicated. Her most professional supervision, constructive suggestions and critical appraisal have been sources of inspiration to make this dissertation a success.

Sincere thanks to both of my supervisory committee members, Professor Maisom Abdullah and Dr. Zaleha Bt Mohd Noor for their precious suggestion and kindness assistance in improving this thesis.

Last but not least, my deepest gratitude goes to my beloved father, Mr. Wong Yin Kwee and my beloved mother, Mdm. Hee Sui Heong and the whole family, for their love, sacrifice and encouragement will remain in my mind forever.

I certify that an Examination Committee has met on _____ to conduct the final examination of Wong Mei Foong on her Doctor of Philosophy thesis entitled "Efficiency, Technological Shift and Human Capital in the K-Economies of ASEAN-plus-Three Countries" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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Date: 15 November 2007

## DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

_____

**Wong Mei Foong**

Date: 23 August 2007

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# INTRODUCTION

## New Economy in ASEAN Plus Three Countries

The ASEAN plus three cooperation commenced in December 1997 with the convening of an informal Summit among the Leaders of ASEAN[1] and their counterparts from East Asia that is China, Japan and the Republic of Korea (ROK) at the tangential of the Second ASEAN Informal Summit in Malaysia. The ASEAN plus three process was institutionalised in 1999 when the Leaders issued a Joint Statement on East Asia Cooperation at their 3rd ASEAN plus three Summit in Manila. The ASEAN plus three Leaders expressed greater resolve and confidence in further strengthening and deepening East Asia cooperation at various levels and in various areas, particularly in economic and social, political, and other fields.

As the region enters the digital age of the 21st century with the new economy, the Association of Southeast Asian Nations (ASEAN) members especially Cambodia, Laos, Myanmar and Vietnam (CLMV) are worried that there will be a wider gap between the old members and the new ones. According to an Organization for Economic Co-operation and Development (OECD) report (2000), this is due to the notion of a new economy is closely tied to the effects of technological

[1] The members of ASEAN are Brunei, Burma/Myanmar, Cambodia, Indonesia, Laos, Malaysia, the Philippines, Singapore, Thailand, and Vietnam.

progress, for the most part of information and communications technology (ICT). To be more accurate, this new economic phenomenon came into existence after the outstanding economic performance of the United States, which was accompanied by growth in multi-factor productivity, followed by some OECD nations. The main essentials of the new economy could be recognized as strong non-inflationary growth, low unemployment, a rapidly increasing role for ICT, still-high stock-market valuations, particularly in the high-tech sector, and continued restructuring of enterprises and markets.

A nation needs capital and skilled workers and the government's commitment in order to have a new economy. Those developed countries that are already well advanced in science and technology, education, economic reforms and ways of thinking will go faster and even push further ahead than less-developed nations which lack these important conditions. In short, there will be the digital divide, or information haves and have nots, which creates inequality of different types among the nations. Digital divide includes divides such as income divide, structural divide, openness divide, knowledge divide, IT divide and perception divide. (World Bank, 2000)

This modern growth is always going along with structural change and generally structural change brings industrialization. While most industrialized countries are pushy for high-tech IT industry which the ratio is of manufactured to total merchandised exports and high-tech exports to manufactured exports disclose the degree of IT development of specific countries. Table 1.1 demonstrate the sectoral

share of GDP of the ASEAN countries by using economic and export structures as the indicators of the level of IT development. The table implies that all the new member countries (Cambodia, Laos, Myanmar and Vietnam) are dependent on the agricultural sector whereas all the pioneering member countries and East Asia are more dependent on the industrial and services sectors. With the exclusion of Laos and Myanmar, the structure of the economies of ASEAN plus three members has changed significantly since the 1980s. This signifies that the introduction of the IT sector in new member countries may be difficult.

The manufactures as a percentage of total merchandised exports reports that the manufactures' share of the total exports of old members and East Asia in 1998 were in the range of 45 to 95 percent. Furthermore, the ratio of manufactures to total merchandised exports increased significantly during the decade. In contrast, the ratio is very low for new member countries, which ranges from 6 percent (Myanmar) to 39 percent (Cambodia) in 1998. (Refer to Table 1.1) Unlike the old member countries, the new member countries almost no high-technology export items in their countries but most of their manufactured export items are textiles and garments. In short, there is no contribution of the IT industry to GDP in new member countries.

Meanwhile, old member countries such as Singapore is building a new economy - knowledge-based economy (KBE) - by establishing its own intelligent island with the help of ‘SingaporeOne’, and Malaysia is already prepared for a Multimedia

Super Corridor (MSC). Brunei, Indonesia and the Philippines put into practice their own IT programmes of RaGAM21, Nusantara 21 and IT21 respectively. The regional leaders called for the development of an ASEAN Information Infrastructure (AII) which would connect all the national information infrastructure of ASEAN member countries at the ASEAN Summit in Hanoi in 1998. Consequently, ASEAN structured a team to expand a regional action plan on the IT sector in early 2000. In brief, following the United States, Southeast Asia together with East Asia are joining Europe and Latin America in trying to compete in this race to generate new sources of economic growth.

A different fundamental state for developing the new economy is the level of development in terms of income and human resources. Table 1.2 demonstrates the per capita income levels of ASEAN five plus three members in 2004. It implies that new member countries have low GDP and low per capita GDP in absolute terms as well as in relation to founding member countries. The per capita GDP of new member countries ranges between US$300 and US$502, which is about 28 times less than that of the average of the other ASEAN six and East Asia. This specifies that the potential for the establishment of the IT sector in new member countries is very low from both the supply side and the demand side. From the supply side, without receive official development assistance (ODA); it is too capital-intensive to create an IT industry in new member countries given the size of GDP. While from the demand side, the market is very small since people are living in rural areas and their per capita income is so low. As such, the

prerequisites for developing an IT sector are very weak unless Cambodia, Laos, Myanmar and Vietnam (CLMV) take advantage of leap-frogging with help from the rest of ASEAN and other developed nations.

**Table 1.1 ASEAN Plus Three Countries: Structural Divide (in Percentage)**

| | Sectoral Structure of GDP | | | | | | | | | Manufactures as Percentage of | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Agriculture | | | Industry | | | Services | | | Merchandised Exports | | Merchandised Imports | |
| | 1970 | 1980 | 2006 | 1970 | 1980 | 2006 | 1970 | 1980 | 2006 | 1990 | 1998 | 1990 | 1998 |
| Indonesia | 35.0 | 24.4 | 12.9 | 28.0 | 41.3 | 47.0 | 37.0 | 34.3 | 40.1 | 35 | 45 | 77 | 69 |
| Malaysia | - | 22.9 | 8.7 | - | 35.8 | 49.9 | - | 41.3 | 43.5 | 54 | 79 | 82 | 85 |
| Philippines | 28.2 | 23.5 | 14.2 | 33.7 | 40.5 | 31.6 | 38.1 | 36.0 | 54.2 | 38 | 90 | 53 | 80 |
| Singapore | 2.2 | 1.1 | 0.1 | 36.4 | 38.8 | 33.0 | 61.4 | 60.0 | 66.9 | 72 | 86 | 73 | 84 |
| Thailand | 30.2 | 20.2 | 10.7 | 25.7 | 30.1 | 44.6 | 44.1 | 49.7 | 44.7 | 63 | 74 | 75 | 78 |
| Cambodia | - | - | 30.1 | - | - | 26.2 | - | - | 38.6 | - | 39.0 | - | - |
| Laos | - | - | 44.8 | - | - | 29.5 | - | - | 25.7 | 28.6 | 33.4 | - | - |
| Myanmar | 49.5 | 47.9 | 48.4 | 12.0 | 12.3 | 16.2 | 38.5 | 39.8 | 35.4 | 10 | 5.5 | - | - |
| Vietnam | - | 42.7 | 20.4 | - | 26.3 | 41.6 | - | 31.0 | 38.1 | 7.9 | 36.8 | 33 | 23 |
| China | - | 30.1 | 11.8 | - | 48.5 | 48.7 | - | 21.4 | 39.5 | 72 | 87.3 | 80 | 81 |
| Japan | - | 3.6 | 1.3 | - | 40.5 | 30.5 | - | 55.9 | 68.2 | 96 | 94.3 | 44 | 58 |
| Korea | - | 14.8 | 2.9 | - | 39.9 | 35.2 | - | 45.3 | 61.9 | 94 | 91.3 | 63 | 61 |

Sources: Asian Development Bank (2007) and World Bank (2006)