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Past and Future of Human Capital in Southeast Asia: From 1970 to 2030



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Abstract

This paper examines levels of educational attainment in Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam for the period 1970-2030 through the reconstruction and projection of levels of educational attainment. While the study of the past shows that the determination to invest in education has been strong in the six countries, the investments were implemented at different pace and intensity, the projections show the legacy of past investments. In Singapore, Malaysia, and Thailand, there will be tangible increases in the proportion of the working age population with a tertiary education. The Philippines will have a dichotomous society where large proportions will either have a tertiary education or only a primary education. In Indonesia, the bulk of the working age population will shift from primary in 2000 to secondary by 2030. The projection horizon and the trend type of scenario do not allow Vietnam to catch up with the other countries.

Keywords

Southeast Asia, education, human capital.

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Past and Future of Human Capital in Southeast Asia: From 1970 to 2030

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1. Introduction

This paper concerns himself with looking at the past and the future of human capital as measured by levels of educational attainment in six countries of the Southeast Asian region: Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam. This is obtained by implementing population backward and forward projections by levels of educational attainment.

In Southeast Asia, governments have taken very seriously the message that education is likely to play an increasing role for their economies, as can be seen from the development plans of the countries belonging to the region. The example of high performing Asian economies Japan, Hong Kong, Korea, Taipei China, including also Indonesia, Malaysia, Singapore, and Thailand shows that the maintenance of a strong human resource base is critical for good economic performance, with a strong emphasis in the first stage on primary education; and on vocational and technical education at the secondary level in a first stage and then more diversified in a second stage. The first of the four principles of the Thai national plan for the period 2007-2011 is to develop people into quality citizens with both virtue and knowledge¹. An important focus of Indonesia's medium term development plan (2004-2009) is to improve the rate of economic growth through among others "improving human resources ... to better prepare persons for the labour market and for greater participation in the economy" (Bappenas, 2006). Similar objectives are found in medium term development plan for the Philippines (2004-2010). The Socio-economic development strategy of Vietnam (2001-2010) is also targeted at raising the quality, renewing the structure and expanding the scope of education and training system². In Singapore, education is at the heart of the planning as the mission of the education service "is to mould the future of the nation, by moulding the people who will determine the future of the nation"³. Strengthening human capital is seen as a challenge in the ninth Malaysia Plan (2006-2010) to move away from the notion that Malaysia is a nation with 'first class infrastructure, but third class mentality'⁴.

Hence, enhancing education development is not only seen as a mean to meet people's basic rights to education but also to equip the countries to meet the future challenges for economic development. Before the economic crisis at the end of the 1990s, education was said to be one, if not the main, factor allowing the region to have such a high economic growth, particularly

¹ Source: Government of Thailand public relations department at <http://thailand.prd.go.th/> [Consulted on 16/10/2006]

² Source: Ministry of Planning and Investment at <http://www.mpi.gov.vn/strategy.aspx> [Consulted on 16/10/2006]

³ Source: Ministry of education at http://www.moe.gov.sg/corporate/mission_statement.htm

⁴ Source: <http://www.epu.jpm.my/rm9/html/english.htm>

in the case of four fast growing economies: Indonesia, Malaysia, Singapore and Thailand. After the crisis, it seems that most governments plan to use human capital to regain high economic growth and to extend it further. The region has certainly an advantage as more than two thirds of all children in the Philippines, Malaysia, Thailand, and Vietnam attend secondary school. Trends in demography are also playing in favour of those countries, as the school-age population is already diminishing in Indonesia, Thailand, and Vietnam, and will do so by 2010 in Malaysia and the Philippines. However, whereas exports of labor-intensive and low skilled products was the key to the economic advantage of Southeast Asia, it may be of lesser importance as more countries within East- and South-Asia follow the same recipe, having to compete with the two giant neighbouring economies that are India, and China. The increased competition in low skilled industries pushed the Southeast Asian economies to increase their ability to ‘the ability to absorb and master new technologies and on the skill of the labour force. Both of these factors are partly dependent on education.’ (Sjöholm, 2002).

The paper will summarize in a first part the main stage of human capital development in the six countries. After a short look at the methodology for back- and forward projecting educational attainment, the article will present the main features of the past and future of human capital in each country from 1970 up to 2030.

2. Education: Past Main Developments

Indonesia, Malaysia, Singapore, and Vietnam showed very little improvements in the levels of educational attainment in the first half of the 20th century when they were colonized mostly by Western European countries. Thailand, which is the exception in the region and was never colonized, had been pursuing high investment in education, instituting compulsory primary education already in 1921. Although this was only partially implemented, substantial progress had been shown in literacy attainment and progression to primary education, although the abundant land endowment seemed to have been a constraint to invest strongly in education development in Thailand, in opposition to what happened in Japan and South Korea (Douangneune *et al.*, 2005). In the Philippines, although the Spanish government decreed in 1863 a system of free public primary education (as a way to control cultural and intellectual life) attendance was very low. However under the tutelage of the United States, primary education was extended to benefit more people.

The increase in enrolment through the six countries happened at different pace and at different time. After independence in 1946, the government of the Philippines picked up this emphasis on education and opened schools in even the remotest areas of the archipelago during the 1950s and the 1960s. Singapore started as early as 1959 with the government pursuing a clear policy of educational expansion (Mukhopadhaya, 2001a) in two main waves: in a first wave, starting in 1959, investments were increased in primary and later, secondary education, especially after 1965 (full independence). It is at the end of the 1970s that the government targeted the expansion for the post-secondary level that would permit to establish high-tech

industries as an engine of growth (Mukhopadhaya, 2001b) with a full participation of women.

After the Dutch legacy through colonial time with low educational development, one of the first tasks of the Indonesian government was the expansion of primary and secondary school as well as adult literacy campaign (Mason *et al.*, 2001). However, the real expansion of the education system started in 1973 with the boom of oil revenues that were in part allocated to the expansion of the primary education system that allowed universal primary education to be achieved around 1986 (Lanjouw *et al.*, 2001).

In Thailand as mentioned before, improvements have started early and explaining that in 1970, already 94% of the population was literate, the highest rate in the region. However, a large majority of students until the beginning of the 1990s did not pursue education beyond primary education, leaving a small share to secondary education and above, pointing to the existence of a bottleneck between primary and secondary education (Jeong, 2005 & Fan *et al.*, 2004).

Although Malaysia has become independent since 1948, it is not until 1971 and the establishment of the New Economic Policy (NEP) that educational development was judged essential, and especially designed to enhance the economic standing of ethnic Malays and other indigenous peoples (known as "bumiputeras").

Until 1989 when Vietnam instituted the restructuring of the education system through the "doi moi" (new life), a program of overall economic renovation that includes an increase in absolute terms and as a percentage of overall government spending of the spending on education and training, the country showed very little expansion of the education system explaining why it is behind in terms of educational attainment of the others.

Despite reforms aiming at the extension to mass education, many countries suffered and are still suffering from inequality in access to education. Naranong (1998) pointed out that in Thailand the existence of a bottleneck between primary and secondary education until the beginning of the 1990s was probably due to inequality within the country for access to secondary education between rural and urban areas, the latter being handicapped in their advancement to secondary education. Also, the secondary and tertiary education sector was suffering from serious issues of curriculum relevance and quality, due to an outdated education system with teachers receiving low salaries (Sjöholm, 2002). The same is true of Indonesia where while the government extended in 1994 compulsory education to junior secondary (9 years of education until age 15), it seems to have failed to realize this objective especially for the rural and poor segment of the population (Behrman *et al.*, 2002). The decentralization movement that was implemented in 1999 did not seem to be able to address the disparities and may have even increased them (Kristiansen and Pratikno, 2006 & Bjork, 2004). Booth (2000) suggests that programs targeted to the specific needs of poor people in poor and rural areas will be essential. The Vietnamese education system does not target the poor households properly ever as they have not benefited yet from the educational expansion, for instance through membership in the Fast Track Initiative. In the Philippines, however quality seems to be an issue at the primary level where many primary pupils do not seem to

finish the 6-year primary schooling time suggesting also that public investment did not follow population growth in the education sector.

Another specificity common to most of the six countries is the high share of the private sector at all levels of education. In Indonesia, the private sector is particularly important for higher education (Welch, 2006). However most children being privately educated are attending the Islamic schools where the fees and the quality of education are quite low (BPS *et al.*, 2004). Most children in Vietnam are enrolled in the public sector (more than 95%) although the private sector is developing quite rapidly, especially at the pre-school level, in vocational and technical education and tertiary level of general education (Glewwe and Patrinos, 1998 & World Bank, 1997). One of the reasons why the Philippines were able to increase levels of enrolment at all levels of education after 1980s was the implementation of the education-contracting scheme to allow private institutions to contravene to the lack or absence of public high schools (Behrman *et al.*, 2002).

The present high levels of education in Singapore stems from two main factors, namely strong political commitment and governmental control over educational development, and selected migration. Most tertiary students are enrolled in sciences and engineering faculties (Sjöholm, 2002). The population in Singapore traditionally arose from migrants, coming first from India, China and other countries surrounding Singapore before World War II, and from Peninsular Malaysia after the war. At the time of independence in 1965, the government adopted several restricting and selective immigration policies: Highly qualified workers and entrepreneurs are encouraged to take up permanent residency and/or acquire Singaporean citizenship, while unskilled workers only receive short term working permits and are forced to return home after the deadline, with an exception for those that were able to upgrade their skills (Jatrana and Muy Teng, 2001).

The Malaysian government has targeted the expansion of tertiary education (mostly in science and technical universities) as the major step for Malaysia to access the status of a knowledge-based economy, and for Malaysia to become a developed nation by 2020 (UNDP Malaysia, 2006). For example, the number of students enrolled in tertiary education doubled between 1995 and 2000 (Awang, 2004).

According to Fan *et al.* (2005), in the mid-1990s, Thailand was suffering from the emergence of a productivity gap with other newly industrializing nations. This pointed the government to react and it began to address issues of access and quality in secondary and higher education. A nine-year compulsory education was instituted in 1999, together with free schooling up to 12 years. As a consequence, enrollment rates began to rise.

Indonesia suffered the most in the region, together with the Philippines, from the economic crisis that threatened the region in 1997/98. School enrolment went down from 1997 to 1998 as family tried to cover educational expenses of the children most advanced rather than of the less advanced in the school hierarchy (Thomas *et al.*, 2004). However, losses in enrolment were recovered in 1999 (Lanjouw *et al.*, 2001). For other countries where the economic crisis

was severe like Thailand and Malaysia, the impact on the education sector (enrolment) was moderate.

From this short summary of past developments and present situation, it arises that education has become a priority but some countries will have to eliminate some bottle necks due mostly to regional or economic disparities (low income groups) and quality of education.

3. Methodology: Reconstructing Past Education Levels and Forecasting the Future

The purpose of the reconstruction and projection exercise is to estimate the population by age, sex and education for the period 1970-2030. We have defined four education categories, based on the classification detailed in Lutz and Goujon (2001), namely:

1. No schooling: Applies to those who have never entered any level of formal schooling or who have completed less than one year of formal schooling
2. Primary education: Includes all of those who have entered the first level (primary) but did not go on to secondary level studies
3. Secondary education: consists of those moved to the second level of education, whether or not they completed the full course, but did not proceed to studies at the tertiary level
4. Tertiary education: All those who undertook third level studies, whether or not they completed the full course

The starting point of the reconstruction and projection work is the estimation of the population according to the education categories above-mentioned by age and sex. The information on population and education was retrieved from the latest censuses around 2000 of the countries studied except in the case of Indonesia where the data provided encountered many problems and it was felt more desirable to use the Demographic and Health Survey (DHS).

3.1. The Past

In a forward projection, a population increases by births and in-migration and decreases by deaths and out-migration. Conversely, in a backward projection, the population decreases by births and in-migration and increases by mortality and out-migration. Mortality and migration are the main components in backward projection. For backward projection of an age-specific population, infants born during an interim period were simply not born at the beginning of the period. Hence we do not need to worry or assume anything about fertility and infant/child mortality trends during the period. If life expectancy at the beginning of the period is known, mortality rates during a projection period can be derived using standard life tables. Using the mortality rates during a period and population distribution at the end of a period, we can estimate the number of people at the beginning of a period. In a closed population where the life tables are accurate, this method seems to be perfect. If data on migration exists, the migration component can be easily included in the backward projection.

Contrary to forward projections of a multi-state population whose methodology is well documented and frequently applied, our literature review revealed the absence of such methodology for backward projections of a multi-state population, except for event history analysis of backward multi-state projection as the method reconstructs the past by using retrospective data. Hence, the methodology presented here to backward multi-state population projection is unique. The states are defined as levels of education attainment. They are moved backward in time from 2000 to 1970 in 5 years-steps for each sex and each 5-year age group starting at age 15.

The methodology uses existing data on age-sex distributed population at the beginning of each 5-year period and life expectancy at birth during each 5-year period. We derived survival ratios for the five-year period ending in current year base on known life expectancy during the period. For, each five-year age-sex group, the population in different levels of education at the beginning of the current year were then backward projected using the survival ratios. The population thus obtained do not correspond to the actual population due to migration issue. However, the proportions of population in different education attainment states so obtained will be same as that of the real population as we assumed that the survival ratios for native as well as immigrated are same. Hence, we used the proportions so obtained to start the backward projection for the next (backward) period. We repeated this algorithm to obtain the backward multi state projection for years 1995, 1990... back to 1970.

The difference in mortality due to different level of education attainment was introduced in the model as the difference in life expectancy at age 15. The educational mortality differentials are based on the analysis of samples of census data (IPUMS⁵) for more than one cycle for few countries. The analysis showed that the life expectancies at age 15 of people with no schooling, primary education and tertiary education were respectively and on average three years less, two years less and two years more compared with people with secondary education. Hence the life expectancy at age 15 was anchored at the secondary educated population and the life expectancies of the other three groups were calculated based on the estimated differentials. Some sensitivity tests showed that anchoring at secondary level was the most suitable. Finally, these life expectancies were used to obtain survival ratios for each education attainment group.

While working with the data, we faced few problems which can be grouped into method-related problems and data-related problems. In many cases, there were larger age groups and open-ended age group starting at 60 or 65. We fitted a linear model of logit of education attainment progression ratio (EAPR) on age-group to extrapolate the proportions to age 95+ (needed for backward projection till 1970). While extrapolation, the extrapolated proportions were adjusted to maintain consistency with original 60+ or 65+ proportion. We used the same model to interpolate for 5-year age groups in case of available data in larger age groups.

⁵ The Integrated Public Use Microdata Series (IPUMS) are census microdata for social and economic research can be downloaded from the Minnesota Population Center at the University of Minnesota website at: <http://www.ipums.umn.edu/>

This methodology is being applied at IIASA for reconstructing the past levels of educational achievement for a large number of countries (forthcoming in 2006). In this paper, we present the results of backward projection for 6 countries Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam. In addition, to make some comparison we present the results for India and China too.

3.2. The Future

The projections are made using a method that is a combination of the cohort-component projection method used for single-state populations, and an adapted form of the multi-state population projection method. This methodology has been used at IIASA in recent years for projects on Mauritius (Lutz, 1994), Cape Verde (Wils, 1996), North African countries (Yousif *et al.*, 1996), Jordan, Syria, West Bank and Gaza Strip (Goujon, 1997), Yucatan (Goujon *et al.*, 2000), world regions (Lutz and Goujon, 2001), and Indian administrative States (Goujon and McNay, 2003), and for a case study of three countries (Guinea, Nicaragua, and Zambia) for a working paper committed by the World Bank (Lutz *et al.*, forthcoming)

Multi-state population projection software that incorporates the methodology mentioned above is readily available. The PDE population projection software⁶ has been developed at IIASA. The user can define all of the states. They can be regions, educational categories, ethnic or language groups, or other user-defined dimensions. Fertility, mortality, and migration rates can be defined separately for all states. Transitions between states can be defined by age and sex also. All age-specific rates can be defined numerically or in terms of proportional changes of already defined age-specific schedules. Rates can be changed over time by certain changing summary indicators such as total fertility rate (for fertility), life expectancy (for mortality), or net number of migrants (for migration). The starting year parameters can either be entered directly in the PDE excel spreadsheet to be read by the module. Projection results can be presented in tabular and graphical form. The graphs are either moving age pyramids over time or line graphs of total multi-state population for the projection period.

The PDE Population Projection software requires four types of input that are standard to cohort-component projections: (1) base-year data on population by age, sex, and state extracted from census and DHS data as mentioned before, (2) fertility by age and state, (3) mortality by age, sex, and state, and (4) migration by age, sex, and state. One input that is specific to multi-state population projections is the transition between states by age and sex. In this study, states are educational categories. The following tables present the base-year as well as the scenario assumptions that will be discussed later in this section.

⁶ The PDE Population Projection Software can be downloaded free of charge at : <http://www.iiasa.ac.at/Research/POP/pub/software.html>

Fertility by education

The multi-state population projection by education further requires the fertility rates by women's level of education. This is available in Table 1 for the year 2000. The differentials were estimated by the 2003 Bangkok training course participants based on census data (Indonesia 2000, Malaysia 2000, Singapore 2000, Thailand 2000, Vietnam 1999) or DHS (Philippines 2003).

Table 1. Total fertility rate by mothers' level of education in 2000-05 and 2025-30

Period	Country	No Schooling	Primary	Secondary	Tertiary	Total
2000-05	Indonesia	2.60	2.70	2.50	2.50	2.40
2025-30		2.00	1.90	1.70	1.54	1.71
2000-05	Malaysia	2.13	3.90	3.57	2.02	3.10
2025-30		2.10	2.40	2.20	1.30	1.84
2000-05	Philippines	4.50	4.30	3.00	2.30	3.27
2025-30		2.80	2.60	1.80	1.40	1.80
2000-05	Singapore	4.48	5.46	1.66	0.7	1.42
2025-30		2.75	3.00	1.80	1.16	1.46
2000-05	Thailand	2.82	2.20	1.43	1.37	1.82
2025-30		2.10	2.00	1.50	1.50	1.53
2000-05	Vietnam	4.13	2.42	1.90	1.45	2.32
2025-30		2.10	2.00	1.50	1.50	1.75

Table 2. Life expectancies at birth in 2000-05 and 2025-30 (Source: Authors' calculations except for ^a UN 2004)

Life expectancy		Male					Female				
Period	Country	No Schooling	Primary	Secondary ^a	Tertiary	Total	No Schooling	Primary	Secondary ^a	Tertiary	Total
2000-05	Indonesia	61.6	62.6	64.6	66.6	63.3	65.6	66.6	68.6	70.6	67.1
2025-30		68.3	69.3	71.3	73.3	70.5	71.9	72.9	74.9	76.9	74.1
2000-05	Malaysia	67.8	68.8	70.8	72.8	69.8	72.5	73.5	75.5	77.5	74.4
2025-30		72.1	73.1	75.1	77.1	74.7	76.8	77.8	79.8	81.8	79.4
2000-05	Philippines	65.1	66.1	68.1	70.1	67.0	69.4	70.4	72.4	74.4	71.4
2025-30		70.5	71.5	73.5	75.5	72.9	75.1	76.1	78.1	80.1	77.7
2000-05	Singapore	73.7	74.7	76.7	78.7	76.2	77.5	78.5	80.5	82.5	79.7
2025-30		77.5	78.5	80.5	82.5	80.5	80.9	81.9	83.9	85.9	83.8
2000-05	Thailand	63.0	64.0	66.0	68.0	64.6	70.7	71.7	73.7	75.7	72.2
2025-30		70.6	71.6	73.6	75.6	72.9	76.1	77.1	79.1	81.1	78.4
2000-05	Vietnam	65.4	66.4	68.4	70.4	66.8	69.4	70.4	72.4	74.4	70.6
2025-30		71.2	72.2	74.2	76.2	73.0	75.1	76.1	78.1	80.1	76.8

Mortality by education

Mortality is also considered by age, sex and education. Although information on educational mortality differentials is generally much more difficult to obtain than on fertility differentials

and were not available for the Southeast Asian countries, we have implemented some differentials as explained in section 3.1. Therefore, we used life expectancies estimated by the United Nations (2004) to which we used MORTPAK to fit some mortality rates. These rates were anchored at the secondary level of education. The mortality rates for the other education groups were derived by scaling up or down the mortality rates according to life expectancies according to the differentials defined in section 3.1. Table 2 presents the resulting life expectancies used in the work.

Migration by education

As with population projections in general, migration assumptions are the most difficult because migration flows tend to be the most volatile. Age and education profiles of migrants are sometimes available from censuses or surveys, but the information from sending countries is usually not good. However, since past data are only of very limited use in defining migration assumptions, this is not much of an additional obstacle. For the projections that follow, some differentials for the allocation of migrants between education categories were defined based on the knowledge that the majority of migrants from developing countries belong to the middle education group as opposed to the low (too poor to migrate) or high education group (no need to migrate and a small population). Hence 10% were attributed to each the no schooling and the tertiary education category and 40% each to the primary and secondary education category (see Table 3). The total net migration numbers were extracted from the UN estimates for the period 2000-2030.

Table 3. Net number of migrants per year in thousand in 2000-05 and 2025-30 (Source: UN 2004)

Period	Country	Migrants
2000-05	Indonesia	-200
2025-30		-160
2000-05	Malaysia	+30
2025-30		+10
2000-05	Philippines	-180
2025-30		-180
2000-05	Singapore	+40
2025-30		+25
2000-05	Thailand	-10
2025-30		-10
2000-05	Vietnam	-40
2025-30		-40

Transitions between educational states

The key parameters of the model are the age- and sex-specific educational transition rates, i.e., the age-specific intensities for young men or women to move, e.g., from the category of primary educational attainment to that of secondary attainment. Data on these rates are seldom available, and have to be estimated. The set of necessary transition rates is very limited because education is hierarchical, e.g., persons can only move to the next higher category.

Transitions also occur over a short period of time and only for the few age groups that are in school (usually from five to at most 24 years of age), as the phenomenon of adult education is rather minimal. The best data that would allow the calculation of precise transition rates would be levels of enrolment detailed by age, level of schooling, and sex. In this case, the calculation of transition rates is very simple. However, most of the time the age structure is not available and needs to be estimated from the levels of educational attainment at each age and education levels, translating cohort data in age groups 5-9, 10-14, 15-19, 20-24 into period data. Estimated transition probabilities are described in Table 4.

Table 4. Transition probabilities in 2000-05 and 2030 (scenario Trend)

Transition		From 'No schooling' To 'Primary'				From 'Primary' To 'Secondary'				From 'Secondary' To 'Tertiary'			
		Male		Female		Male		Female		Male		Female	
Sex	Age-group	5-9	10-14	5-9	10-14	10-14	15-19	10-14	15-19	15-19	20-24	15-19	20-24
Indonesia	2000-5	0.85	0.91	0.85	0.94	0.38	0.60	0.43	0.59	0.07	0.13	0.10	0.14
	2025-30	0.85	0.91	0.85	0.94	0.53	0.84	0.60	0.83	0.17	0.32	0.25	0.35
Malaysia	2000-5	0.64	0.94	0.67	0.94	0.67	0.89	0.65	0.91	0.26	0.23	0.35	0.25
	2025-30	0.64	0.94	0.67	0.94	0.67	0.89	0.65	0.91	0.42	0.37	0.51	0.37
Philippines	2000-5	0.73	0.91	0.76	0.92	0.26	0.65	0.31	0.75	0.70	0.18	0.79	0.22
	2025-30	0.73	0.91	0.76	0.92	0.36	0.91	0.40	0.96	0.89	0.23	1.01	0.28
Singapore	2000-5	1.00		1.00		0.44	0.98	0.44	0.98	0.38	0.41	0.45	0.50
	2025-30	1.00		1.00		0.44	0.98	0.44	0.98	0.48	0.52	0.57	0.64
Thailand	2000-5	0.80	0.92	0.83	0.93	0.25	0.74	0.27	0.80	0.14	0.38	0.18	0.47
	2025-30	0.84	0.97	0.87	0.98	0.28	0.82	0.30	0.88	0.20	0.53	0.20	0.52
Vietnam	2000-5	0.74	0.85	0.74	0.84	0.07	0.49	0.08	0.45	0.17	0.18	0.17	0.18
	2025-30	0.82	0.94	0.82	0.93	0.11	0.79	0.13	0.72	0.27	0.29	0.27	0.29

Scenarios

The projections were implemented according to two scenarios: "Constant" and "Trend" scenario. The two scenarios differ only by the education assumptions for the future. Indeed, both scenarios follow the same paths in terms of fertility, mortality and migration. The assumptions concerning those are shown in tables 1 to 3. In the constant scenario, we suppose that the transition probabilities of moving from one education category to the next will remain constant at levels observed in 2000. This scenario is helpful to see the progress already embedded into the population as the transition probabilities for the starting year reflect approximately the present enrolment rates. In the trend scenario, we calculate based on a logarithmic trend the changes in levels of education in the younger cohorts by sex to calculate some trends of how fast the levels of educational attainment were improving or declining. This trend is then applied to the present transition probabilities up to the period 2025-30 (see Table 4).

4. Results: Levels of educational attainment from 1970 to 2030

This will be presented in two sections divided between past and future levels of educational attainment. The results are summarized in a series of population pyramids for all six countries in the Annex.

4.1. The Past

As mentioned in section 2, all countries have seen a relative large increase in the percentage of educated population aged 20-64 between 1970 and 2000 as can be seen from the decline in the proportions of the population with no education who is usually a vulnerable group within a country. In 1970, it ranged from 10 percent in the Philippines – which were an outlier in the region – to 54 percent in Singapore. The six Southeast Asian countries have converged to similar levels of adult population without education: from 2% in the Philippines to 12 percent in Singapore. The gap between male and female is still present in 2000. For instance, women in Indonesia had shares of their population without education higher than men by seven percentage points. Presently, Southeast Asian countries seems to be doing better than India in terms of working age population who have been schooled, which is catching up slowly, and at levels close to that of China, although the history of China literacy campaign is much more recent pointing to a process of rapid catching up.

Table 5. Proportion 15-24 with no education, male and female, 1970-2000 (Authors' calculations)

Country	Sex	1970	1980	1990	2000
Indonesia	Male	8.0	5.2	2.0	1.0
	Female	22.4	12.2	3.7	1.2
Malaysia	Male	8.9	6.1	4.8	2.8
	Female	20.6	10.5	5.8	2.7
Philippines	Male	3.4	2.5	1.8	1.6
	Female	4.0	2.9	2.0	1.5
Singapore	Male	14.5	8.9	4.5	1.5
	Female	26.4	11.0	4.1	1.2
Thailand	Male	8.5	5.9	4.3	2.7
	Female	12.7	7.9	4.6	2.5
Vietnam	Male	4.5	3.8	5.5	5.7
	Female	11.6	6.9	6.5	5.8

The 20-64 age group is quite large and its level of educational attainment reflects mostly past educational and enrolment policy, as are included in this indicator younger and older generations of the living population. One way to look at the new trends in terms of acquiring education is to look at the proportion without education in the youngest age group that is the 15-24. This is shown in Table 5. It shows that entrance to primary education is almost universally achieved for the younger age group at levels of 1.1% (Indonesia) and above. A look in the past shows that if schooling seemed to be acquired already in the 1970s for the young adult male, this conquest is more recent for the female. In 1970, more than 20% of the

young female population of Indonesia, Malaysia and Singapore did not receive any schooling. It is interesting that the poor countries such as Vietnam and Philippines seemed to have achieved the overall levels of enrolment in primary school as their wealthier neighbors in Singapore.

The difference in levels of educational attainment is very noticeable. There seem to be two main typologies of educational attainment. In the first group (Malaysia, Philippines, and Singapore) the working age population in 2000 was in majority in the secondary and higher education categories. In this group, Malaysia is the country that experienced the largest increase as the proportion with secondary and more increased from 18 percent in 1970 to 68 percent in 2000. The Malaysian experience is close to that of China. One should not forget the case of the Philippines where already in 1970, more than 30% had more than a secondary education. The second group includes Indonesia, Thailand and Vietnam where there still seemed to be a predominance of working age people with primary education and less. India is in that group too.

The figures for tertiary education show the lesser improvements over the back-projection period with larger differences in the shares of working age population in the less developed countries of the region (Indonesia and Vietnam at levels comparable to that of China and India) between 5-8 percent. Richer countries such as Malaysia, Singapore, Philippines and Thailand have rather high tertiary enrolment rates: 15% for Malaysia, 14% for Thailand, 24% for the Philippines and 28% for Singapore. Malaysia is investing heavily in tertiary education as it receives 35% of the total education expenditures (UNESCO, 2004).

To make comparison easier, we calculated average years of schooling (Table 12) for the population by weighing the duration of schooling by age-sex-education specific distribution. Philippines stood first with an average of 7 years of schooling. The worst situation was in Singapore with 4.1 years followed by Vietnam (4.2 years), Indonesia (4.3 years), Malaysia (4.9 years) and Thailand (5.3 years).

At the end of the 20th century, the education status in terms of average years of schooling for the population aged 20-64 increased in all the countries (Table 12). However, the pace of change was different between the countries. The average years of schooling more than doubled in Malaysia (11.1 years) and in Singapore (9.3 years). In Philippines, the increase in average years of schooling was slow with an increase of 2.3 years (from 7.0 years to 9.3 years). The lesser increases were observed in Vietnam (7.0 years), followed by Indonesia (8.4 years) and Thailand (8.9 years). (Figure 1a-1h, Table 6-11). To analyse the education attainment in gender perspective, we used the ratio of mean years of schooling of female to that of male. In the beginning of 1970, all countries had the value of this ratio less than 1, implying female were less educated in terms of numbers and/or duration of education than male. Philippines had the maximum value of the ratio, 0.94, in 1970, followed by Thailand (0.78), Singapore (0.60), Malaysia (0.60), Vietnam (0.58) and Indonesia (0.57). China and India had ratio of 0.52 and 0.35. The ratio increased with time for all countries and in 2000, Philippines exceeded one in 1995 and in 2000 the ratio was 1.02. For all countries, this ratio

was getting closer to one with Thailand (0.94), Singapore (0.91), Malaysia (0.91), Vietnam (0.89) and Indonesia (0.87). The value for China and India were 0.84 and 0.57.

What comes clear from the description of the results from the reconstruction of past educational attainment is that the group of countries that were chosen are clearly determined in investing in education. This is especially the case of Singapore, Malaysia, Thailand, the Philippines and perhaps also Vietnam. Indonesia is a country apart as some of its performance in terms of enrolments and investments are rather weak. Indonesia has expanded strongly the education system in the 1970s after the oil boom but did not manage to improve the quality of education as well as the participation and relevance of tertiary studies. Some of the weaker results in education outputs especially educational attainment may be due to the momentum of education – that is the lag between educational investments and the translation into human capita throughout the labour force. This is the case for a wealthy country such as Singapore where some of the labour force is still illiterate, although income level is comparable to Europe or Japan. Education does not jump and one cannot erase so easily decades of neglect in education. Singapore has compensated its lack of human skills by opening the borders to workers. The literature shows that the expansion of the education systems in these countries did not go without problems related to quality or adequacy. This is the case of tertiary in Thailand and Malaysia where most students graduate in humanities, arts, social science, business and law and too few in science and engineering. This necessity to not only look at number of population but also at the quality and curriculum will be kept in mind when projecting the future educational level of the population.

Figures 1a-1h. Proportion of people age 20-64 by education attainment and average years of schooling in six Southeast Asian countries, China and India (1970-2000)

Figure 1a. Indonesia

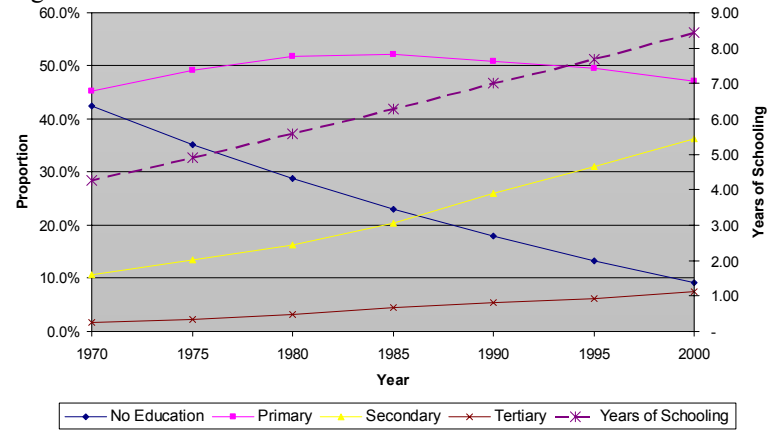


Figure 1b. Malaysia

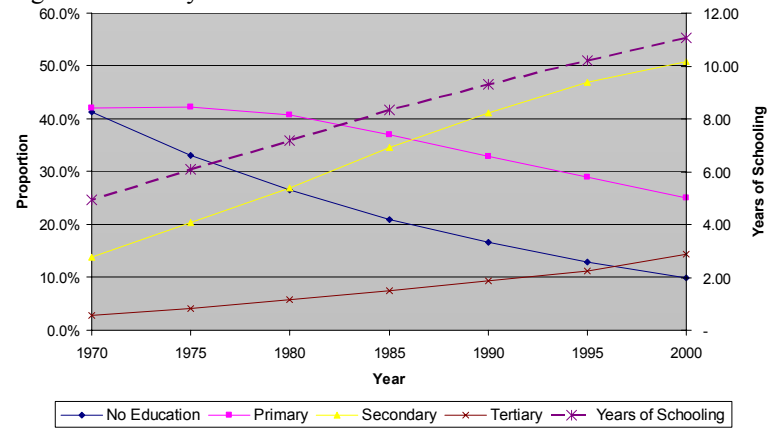


Figure 1c. The Philippines

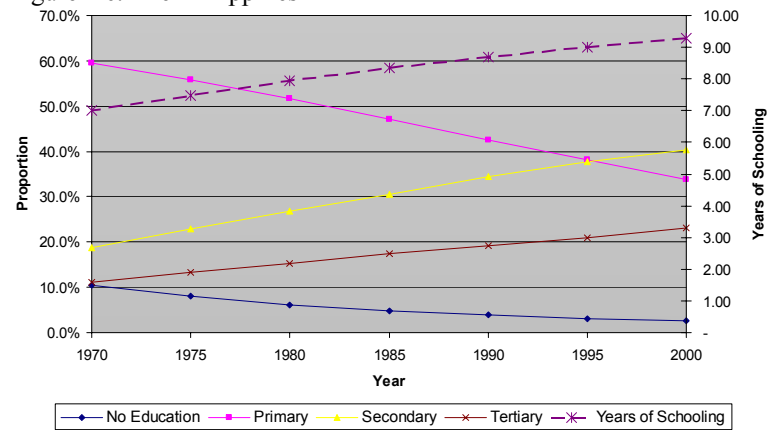


Figure 1d. Singapore

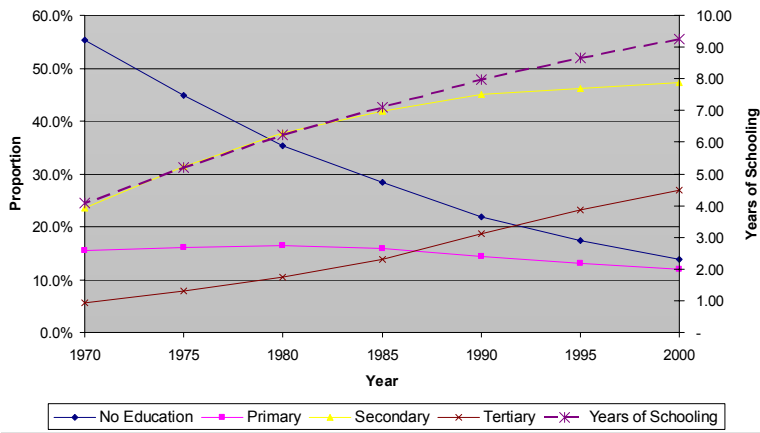


Figure 1e. Thailand

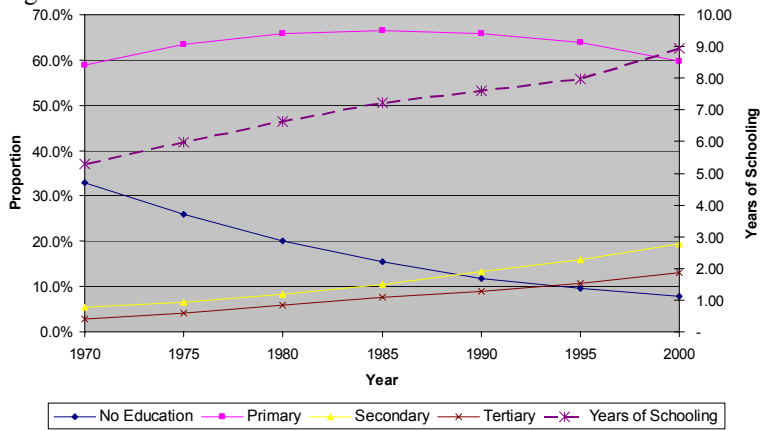


Figure 1f. Vietnam

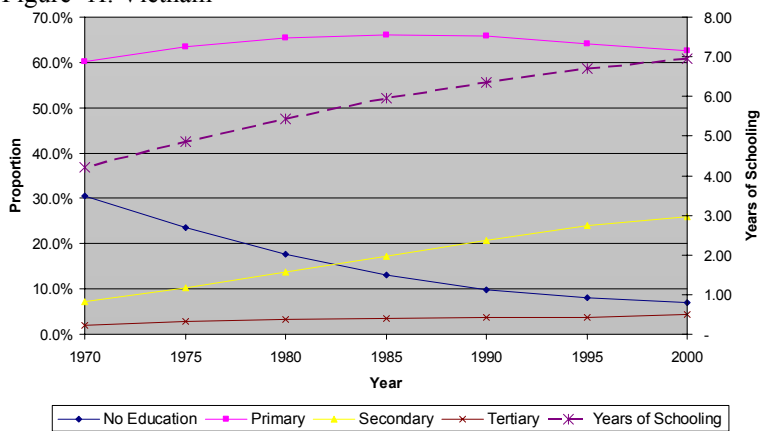


Figure 1g. China

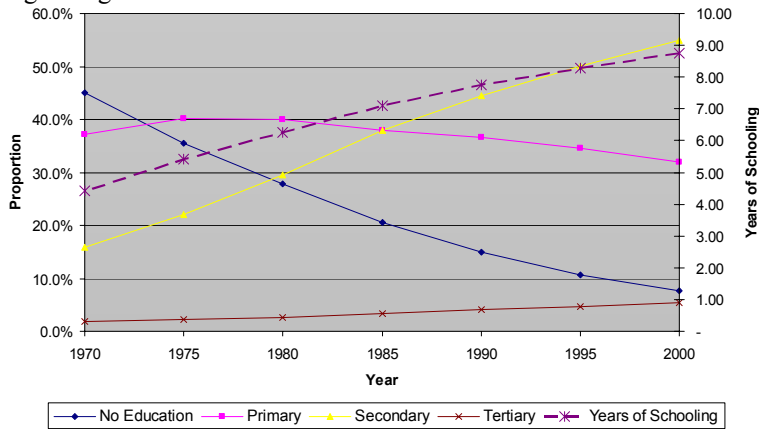
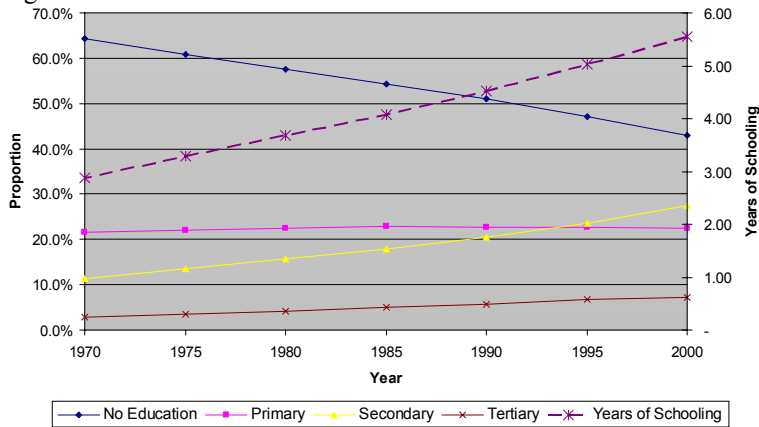


Figure 1h. India



4.2. The Future

Illiteracy -- approximated from the proportion of the population in the no education group--will decline importantly in the next 25 years as shown from tables 6 to 11. All countries will have more than 95% of their working age population male and female population literate. In the Philippines and Indonesia, the literacy rate will be below 2% of the population. In Singapore, the decline in the working age female population with no schooling will be particularly drastic, from 16.4 in 2000 to 3.4% in 2030. Some communities that are not reached by education can explain the persistence of some pockets of illiteracy even under the trend scenario. Those are particularly at risk in the case of an economic crisis. In Singapore and Malaysia, migration is the main responsible for the existence of a non-educated population. This might change as countries of origin develop further access to primary education.

If the Southeast region is quite homogenous regarding the weight of the working age population with no schooling, countries seem to diverge when it comes to levels of educational attainment. There are several patterns of change in the level of educational attainment in the future that reflect the emphasis of the education development policy in the recent years. In Indonesia, in 2000, the bulk of the working age population was in the primary education group: around 47 percent. In 2030, there will be a shift of the working age population to secondary education with about 55% in that group. As can be seen from Table 6, this will happen rather quickly within the next 10 years.

Table 6. Education attainment of population 20-64 in Indonesia, 1970-2030

Education	No Schooling		Primary		Secondary		Tertiary		
	Male	Female	Male	Female	Male	Female	Male	Female	
1970	27.9	56.7	55.4	35.3	14.1	7.2	2.6	0.7	
1980	17.7	39.7	57.1	46.4	20.6	11.9	4.6	2.0	
1990	10.5	25.2	51.9	49.8	31.0	20.9	6.6	4.1	
2000	5.2	12.2	45.9	48.6	40.6	32.3	8.3	6.9	
2010	Constant	2.8	5.9	39.2	42.0	48.5	42.6	9.5	9.4
	Trend	2.8	5.9	39.2	42.0	48.2	42.3	9.8	9.7
2020	Constant	1.9	3.1	33.6	36.1	54.1	49.7	10.4	11.1
	Trend	1.9	3.1	32.5	35.0	53.3	48.6	12.4	13.3
2030	Constant	1.2	1.3	29.4	30.3	58.6	56.0	10.8	12.5
	Trend	1.2	1.3	25.5	26.4	56.7	53.1	16.7	19.2

Malaysia in comparison with Indonesia levels of educational attainment of the working age population is rather more advanced (table 7). In 2000, already 54% of the male and 48% of the female had entered secondary education whereas only 25 % had a primary education. The share of the population with only primary education will decline to 7.5% by 2030. According to the trend scenario, this will be the lowest percentage of the population in primary among the six Southeast Asian countries. The proportion of the population with some secondary education will not be very different than in 2000, although the gap between men and women at this level will be almost closed. This stagnation masks an important shift to the tertiary sector of the education system where 34% of the working age population will have studied.

The pattern of educational change in the Philippines is rather similar to that of Malaysia with the growing importance of the tertiary educated in the working age population (Table 8). The main difference between the two countries is in the proportion of the population with a primary education, which seems to be greater in the Philippines than in Malaysia both in 2000 and in 2030: 22% of males and 14% of females

Table 7. Education attainment of population20-64 in Malaysia, 1970-2030

Education	No Schooling		Primary		Secondary		Tertiary		
	Male	Female	Male	Female	Male	Female	Male	Female	
1970	29.1	53.7	48.6	35.2	18.2	9.5	4.1	1.5	
1980	17.8	35.2	42.7	38.7	31.8	22.2	7.6	3.8	
1990	11.3	22.2	32.7	32.9	44.9	37.2	11.1	7.6	
2000	7.0	12.7	24.2	25.6	53.9	48.0	14.9	13.8	
2010	Constant	4.5	7.0	16.4	18.0	58.8	53.9	20.3	21.2
	Trend	4.5	7.0	16.4	18.0	58.5	53.6	20.6	21.4
2020	Constant	3.4	4.3	11.1	11.6	61.4	57.5	24.1	26.7
	Trend	3.4	4.3	11.1	11.6	59.4	55.8	26.2	28.4
2030	Constant	2.7	2.8	8.0	7.3	62.1	58.7	27.1	31.3
	Trend	2.7	2.8	8.0	7.3	56.8	54.0	32.5	35.9

Table 8. Education attainment of population20-64 in Philippines, 1970-2030

Education	No Schooling		Primary		Secondary		Tertiary		
	Male	Female	Male	Female	Male	Female	Male	Female	
1970	9.5	11.6	57.8	61.4	20.9	16.7	11.7	10.3	
1980	5.5	6.8	50.3	53.2	28.5	25.0	15.7	15.0	
1990	3.5	4.2	42.1	42.1	35.6	33.3	18.8	19.8	
2000	2.5	2.8	35.3	33.0	40.6	39.9	21.6	24.4	
2010	Constant	1.9	1.9	30.8	25.6	44.0	44.1	23.3	28.4
	Trend	1.9	1.9	30.8	25.6	43.9	44.0	23.4	28.5
2020	Constant	1.8	1.6	28.1	21.0	46.0	46.6	24.1	30.8
	Trend	1.8	1.6	26.3	19.6	46.5	46.6	25.4	32.2
2030	Constant	1.7	1.3	26.8	18.3	47.0	48.0	24.5	32.4
	Trend	1.7	1.3	21.6	14.4	48.6	47.9	28.2	36.3

Table 9. Education attainment of population20-64 in Singapore, 1970-2030

Education	No Schooling		Primary		Secondary		Tertiary		
	Male	Female	Male	Female	Male	Female	Male	Female	
1970	45.3	66.1	18.2	12.5	28.8	18.0	7.7	3.3	
1980	27.6	43.2	17.2	15.7	41.5	33.8	13.7	7.3	
1990	17.3	26.5	14.3	14.5	45.9	44.0	22.4	15.0	
2000	10.8	16.4	11.3	12.3	47.8	46.5	30.1	24.8	
2010	Constant	6.8	9.2	11.7	13.0	48.0	46.7	33.5	31.1
	Trend	6.8	9.2	11.7	13.0	47.8	46.5	33.7	31.3
2020	Constant	4.8	5.2	11.2	11.9	46.2	44.5	37.9	38.5
	Trend	4.8	5.2	11.2	11.9	45.1	43.3	39.0	39.7
2030	Constant	3.4	3.4	10.2	10.4	44.8	40.5	41.6	45.7
	Trend	3.4	3.4	10.2	10.4	41.9	37.2	44.5	49.0

Singapore has a unique pattern of educational development. It combines in 2000, quite high proportion of the working age population in the no schooling category (in the older working age categories) and at the same time almost 47% with some secondary education. In 2030, the picture will have changed even more as the bulk of the working age population will have a tertiary education: again 47 percent (Table 9).

Thailand will witness a similar shift from the primary education group to the secondary education group similar to that observed in Indonesia. However at the same time, Thailand will increase the share of the working age population with tertiary education to levels similar to that of Malaysia. The catching up process in Thailand was very much in place in 2000 already. In 2030, Thailand should have 38% of its working age population with a secondary education and 34% with a tertiary education, which represents a rapid increase if we consider that there were respectively only 19% and 13% in 2000 (Table 10).

Table 10. Education attainment of population 20-64 in Thailand, 1970-2030

Education	No Schooling		Primary		Secondary		Tertiary		
	Male	Female	Male	Female	Male	Female	Male	Female	
1970	26.6	39.1	62.1	55.8	7.8	3.0	3.5	2.0	
1980	16.0	24.2	66.0	65.5	11.3	5.2	6.7	5.0	
1990	9.6	14.1	64.2	67.4	16.4	9.9	9.4	8.5	
2000	6.4	9.0	58.0	61.4	22.8	16.2	12.8	13.4	
2010	Constant	4.4	5.6	46.8	49.6	30.3	23.6	18.4	21.2
	Trend	4.4	5.6	46.8	49.6	30.1	23.5	18.7	21.3
2020	Constant	3.2	3.7	37.5	38.6	36.5	30.0	22.8	27.7
	Trend	3.2	3.7	37.1	38.2	35.3	29.7	24.5	28.4
2030	Constant	2.3	2.3	29.0	27.3	41.9	36.4	26.8	34.0
	Trend	2.2	2.1	27.7	26.0	38.9	35.9	31.2	36.0

The trend scenario does not allow for Vietnam to catch up with its neighbours by 2030 (Table 11). In fact, Vietnam's share of the working age population in the primary and secondary education group will be very close to that of Indonesia in 2000. However this trend scenario may hide some rapid change that could occur if the economic development is particularly beneficial and if the need for tertiary educated population becomes more important to the economy. Vietnam is also the country where the gender gap is the largest of the region.

Table 11. Education attainment of population 20-64 in Vietnam, 1970-2030

Education	No Schooling		Primary		Secondary		Tertiary		
	Male	Female	Male	Female	Male	Female	Male	Female	
1970	16.7	44.1	68.5	52.1	11.3	3.2	3.5	0.7	
1980	9.1	25.9	67.3	63.5	19.0	8.7	4.7	1.9	
1990	5.5	14.2	64.3	67.3	25.4	16.0	4.7	2.5	
2000	5.1	8.7	60.2	65.0	29.4	22.5	5.2	3.7	
2010	Constant	4.8	6.3	55.0	59.6	33.5	28.3	6.7	5.8
	Trend	4.8	6.3	55.0	59.6	33.4	28.2	6.9	5.9
2020	Constant	4.5	5.3	51.9	55.8	36.0	32.0	7.6	6.9
	Trend	4.5	5.3	50.1	54.2	36.6	32.6	8.8	8.0
2030	Constant	4.4	4.8	49.2	52.4	37.9	34.9	8.5	7.9
	Trend	4.0	4.4	43.1	46.8	40.6	37.4	12.3	11.5

It is important to note that according to the trend in place at the moment women will have more rapid increase in the rate of educational attainment than men and this will be very visible in those women with some tertiary education. In all countries, to the exception of Vietnam, the proportion of female working age population with tertiary education will be higher than that of men. It would be however important to modulate this with the completed levels of tertiary education. In Europe, women are more to enter tertiary studies but often drop out without completing any levels resulting in a higher proportion of male with tertiary degrees.

The difference between the trend and constant scenario are quite minimal, especially for the two categories ‘no schooling’ and ‘primary education’ which is a reflection the long tradition of important investments in education as mentioned in the introduction. As a result, even if enrolments were maintained at current level observe in 2000, the working age population of Singapore would still be for 40% with some tertiary education and around 25-30% in Malaysia, the Philippines, and Thailand.

An interesting question is that of Asia’s demographic bonus in the future. It is almost accepted that the effect of the rapid and early demographic transition created a demographic bonus during the last 30 years that together with high investment in education most Southeast Asian countries were able to translate into an economic window of opportunity using human capital more than physical capital to obtain high levels of economic growth. Considering the high levels of education and the dependency ratios shown in figure 2 one can predict more years for the Southeast Asian countries to benefit from this demographic and education constellation. Most countries will have declining total dependency ratios below 50% for the projected period that is the case of the Philippines, Vietnam, Malaysia, and Indonesia. In Singapore and to a lesser extent Thailand, the bonus will last for a shorter time, as dependency ratio will start to increase around 2015-2020 for both countries. This will be quite rapid for Singapore.

Figure 2. Total dependency ratios (ratio of the sum of the population aged 0-14 and that aged 65+ to the population aged 15-64), 1970-2030

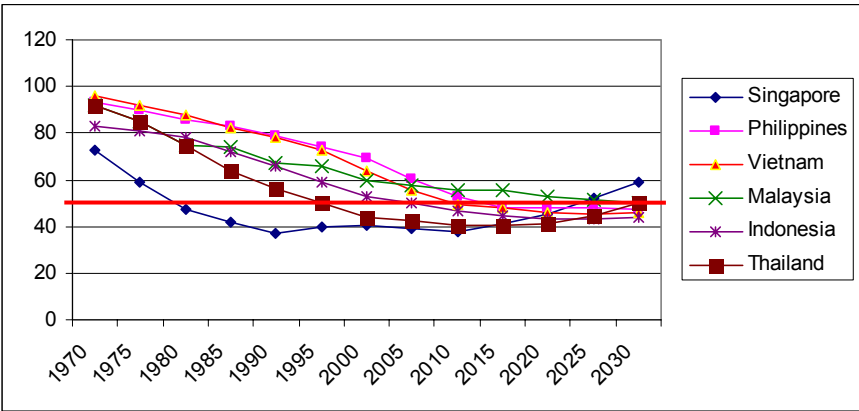


Table 12. Mean years of schooling of the population aged 20-64 during 1970-2030

		Indonesia	Malaysia	Philippines	Singapore	Thailand	Vietnam	China	India
Male	1970	5.4	6.2	7.2	5.0	6.0	5.3	5.7	4.2
	1980	6.6	8.3	8.1	7.1	7.2	6.4	7.5	5.1
	1990	7.9	10.1	8.7	8.6	8.0	7.0	8.7	6.0
	2000	9.0	11.5	9.2	9.7	9.2	7.4	9.5	7.0
	2010	9.7	12.7	9.5	10.2	9.4	7.9		
	2020	10.0	13.1	9.6	10.4	9.9	8.1		
	2030	10.3	13.4	9.8	10.6	10.4	8.3		
Females	1970	3.1	3.7	6.8	3.0	4.6	3.1	3.0	1.5
	1980	4.5	6.1	7.8	5.3	6.1	4.5	4.9	2.1
	1990	6.1	8.5	8.7	7.4	7.2	5.7	6.7	2.9
	2000	7.9	10.6	9.4	8.9	8.7	6.5	8.0	4.0
	2010	9.2	12.2	9.9	9.8	9.2	7.3		
	2020	9.6	12.8	10.1	10.2	9.8	7.6		
	2030	10.1	13.3	10.3	10.6	10.4	7.9		
Both	1970	4.3	4.9	7.0	4.1	5.3	4.2	4.4	2.9
	1980	5.6	7.2	7.9	6.2	6.6	5.4	6.3	3.7
	1990	7.0	9.3	8.7	8.0	7.6	6.3	7.7	4.5
	2000	8.4	11.1	9.3	9.3	8.9	7.0	8.7	5.6
	2010	9.4	12.4	9.7	10.0	9.3	7.6		
	2020	9.8	13.0	9.9	10.3	9.9	7.8		
	2030	10.2	13.4	10.1	10.6	10.4	8.1		

5. Conclusions and Avenues for Future Research

This paper on human capital in Southeast Asia has three main focuses: the first is to analyze the current situation regarding education in the six countries of choice, namely Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam. The second is the reconstruction and analysis of past levels of educational attainment for those countries above mentioned from 1970 to 2000. The third focus is the projection of the levels of educational attainment from 2000 up to 2030.

Education is thought to be essential for Southeast Asia as it was and will continue to be the key element for protection against vulnerability to economic shock (such as the economic crisis of 1997-98) and for sustaining rapid economic growth.

The group of countries that were chosen are clearly determined in investing in education as can be seen from the levels of enrolment, the levels of educational attainment across cohorts, and average years of schooling for the population aged 20-64 in the past and at present. However, the pace of change was different between the countries. Singapore and Malaysia were definitely the front-runners of increases in the levels of educational attainment of the working age population in the last 30 years whereas Vietnam seems to be at the tail of the six countries, although it is benefiting in the last years from important investments in education. Thailand and the Philippines find themselves at an intermediate position between Vietnam on one hand and Malaysia and Singapore on the other hand. Indonesia is a country apart as some of its performance in terms of enrolments and investments are rather weak after a strong expansion in the 1970s after the oil boom.

Past investments in education of the region come out also very clearly from the projections of levels of educational attainment up to 2030 from both the trend and the constant scenario. According to the trend scenario, Singapore will remain the front runner in terms of education as the bulk of the working age population will have a tertiary education. Malaysia will also experience a rapid increase in its tertiary educated working age population but to a lesser extent than in Singapore. The Philippines based on the trend scenario will have a dichotomous society with still a large proportion with primary education and tertiary education. In Indonesia, the bulk of the working age population will shift from primary in 2000 to secondary in 2030. Recent rapid increases in enrolment in Thailand will pay off by 2030 as it will increase the share of the working age population both with a secondary and tertiary education. The trend scenario does not allow Vietnam to catch up by 2030 but this may hide some rapid changes that could occur if economic development is particularly beneficial. These developments in the levels of educational attainment of the working age population will be extremely favourable as during most of the next 30 years, the population of the six countries will benefit from decreasing dependency ratio that gives all countries a demographic bonus. However the 2020-30s will mark the end of that bonus period. In this context human capital will be essential.

This work points out several avenues of research. The first one would be to change the scale of the research and not only to look at the national level but also at the sub-regional level and have an in-depth perspective of the coastal areas' working age and level of educational attainment to evaluate the vulnerability of the population and the imbalances in the population.

The second avenue is to not only look at number of population but also at the quality and curriculum which should always be kept in mind when projecting the future educational levels of the population. For instance, input in education can be measured by the availability of teachers in relation to the number of students. The pupil-teacher ratios as well as the proportion of trained teachers in the country are good indicators of the quality of education. According to UNESCO (2004), the Philippines have the highest ratios at all levels of education, comparable to those of India. Indonesia has low ratios, but it hides the reality that a large proportion of the teachers, especially at secondary levels are not trained (about 47% in 2000-01 according to the UNESCO). Malaysia, that is one the countries spending the most on education, has very few students per teacher at all levels of education.

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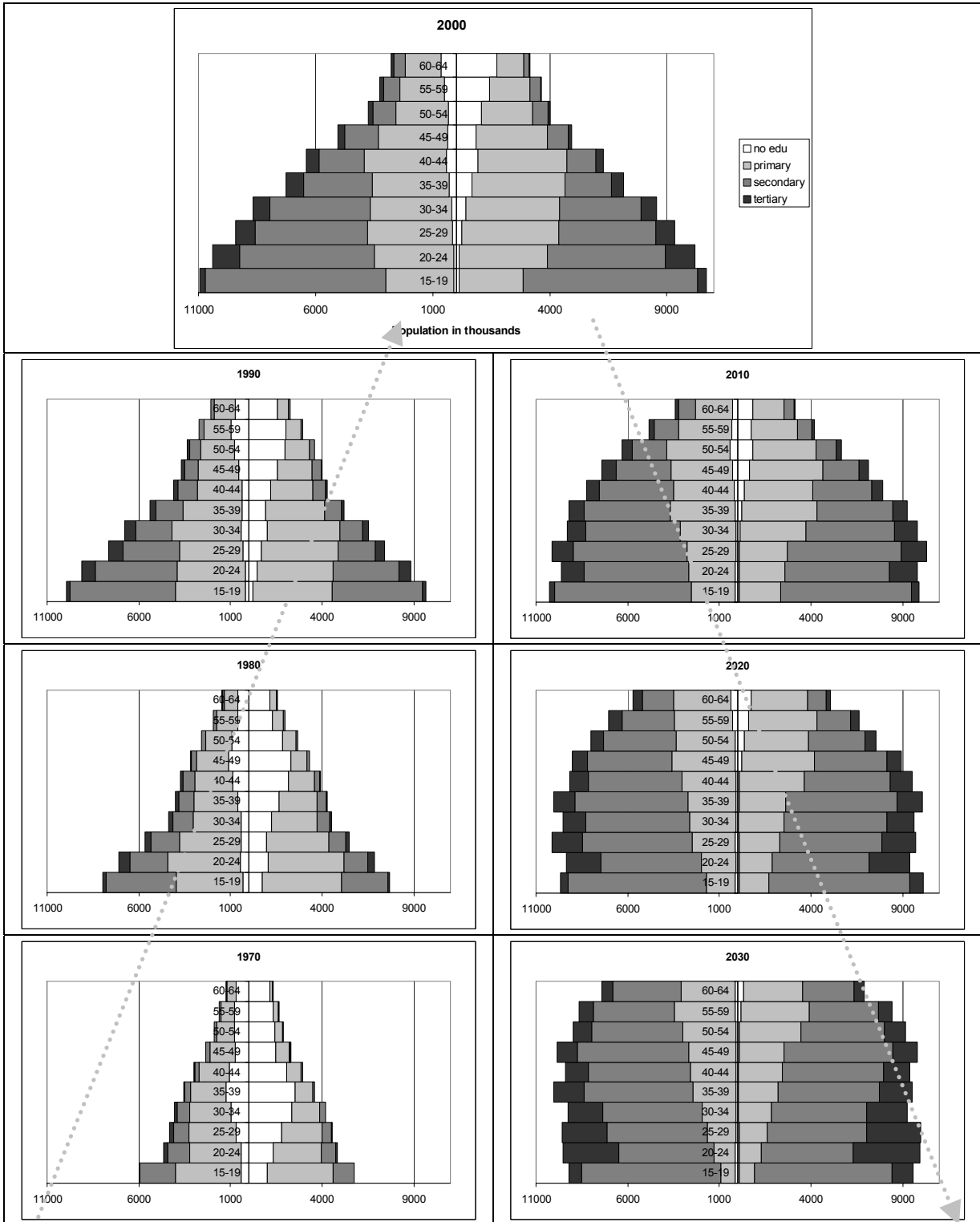
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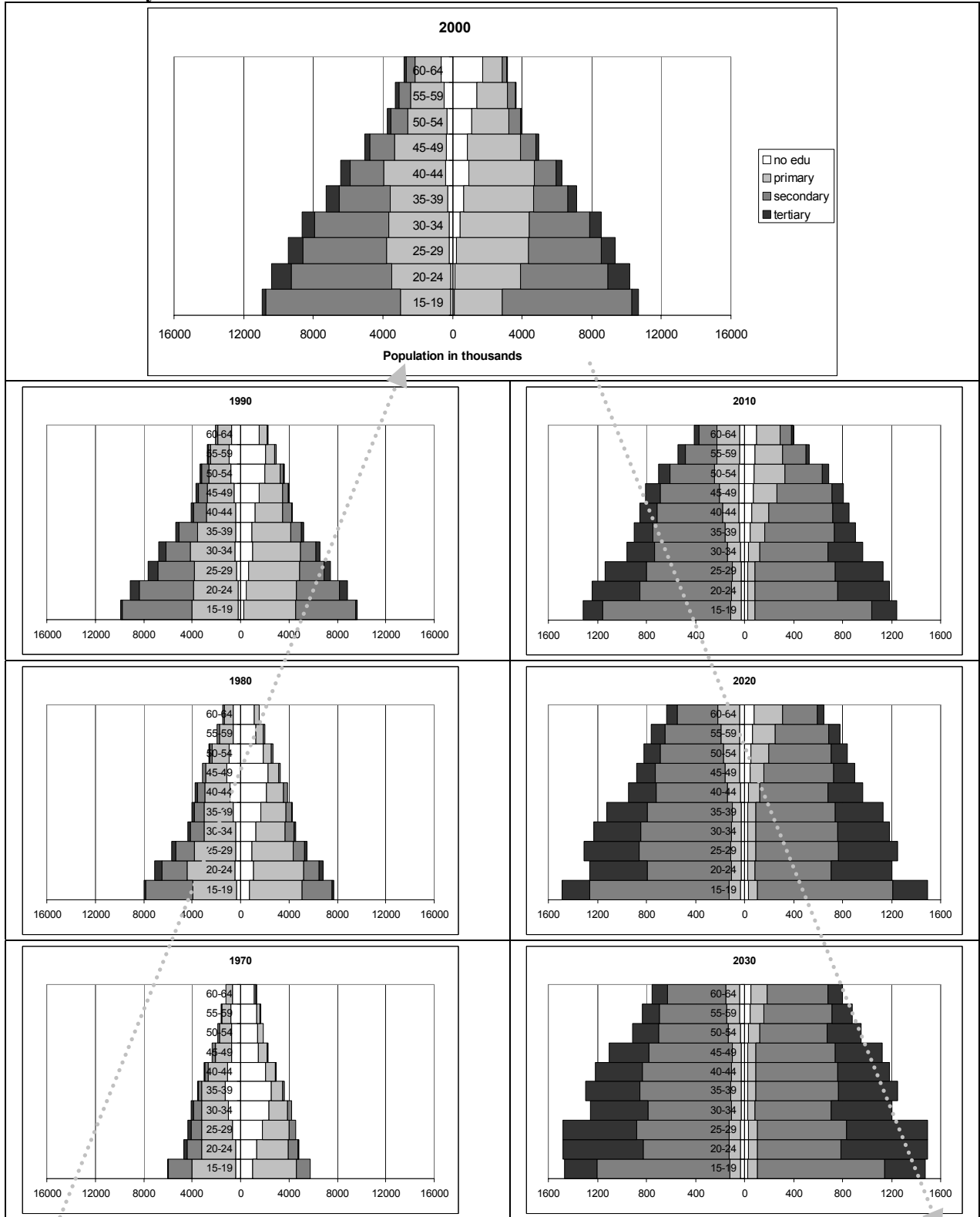
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Annex: Population Pyramids of working-age population (20-64) by levels of educational attainment

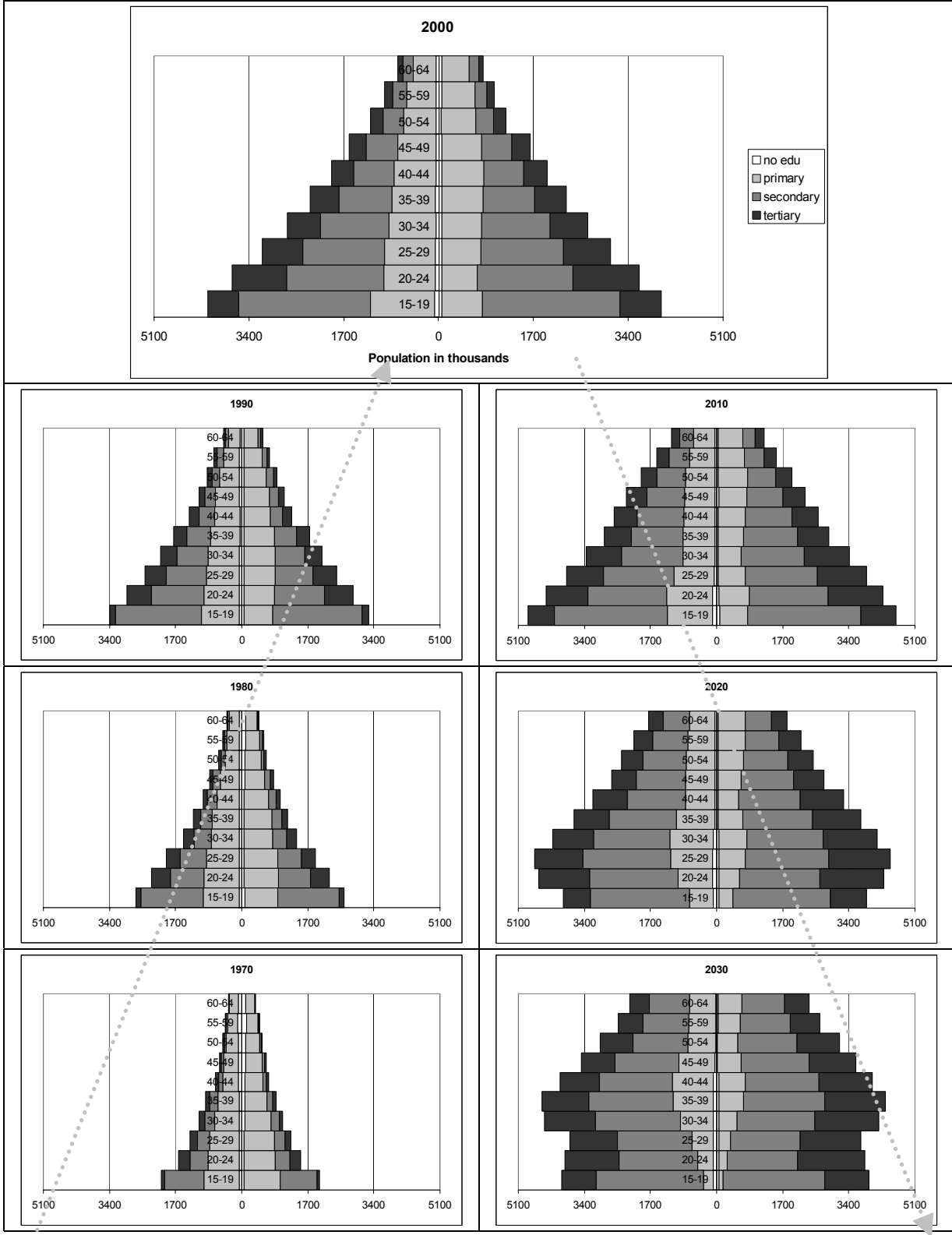
1. Indonesia



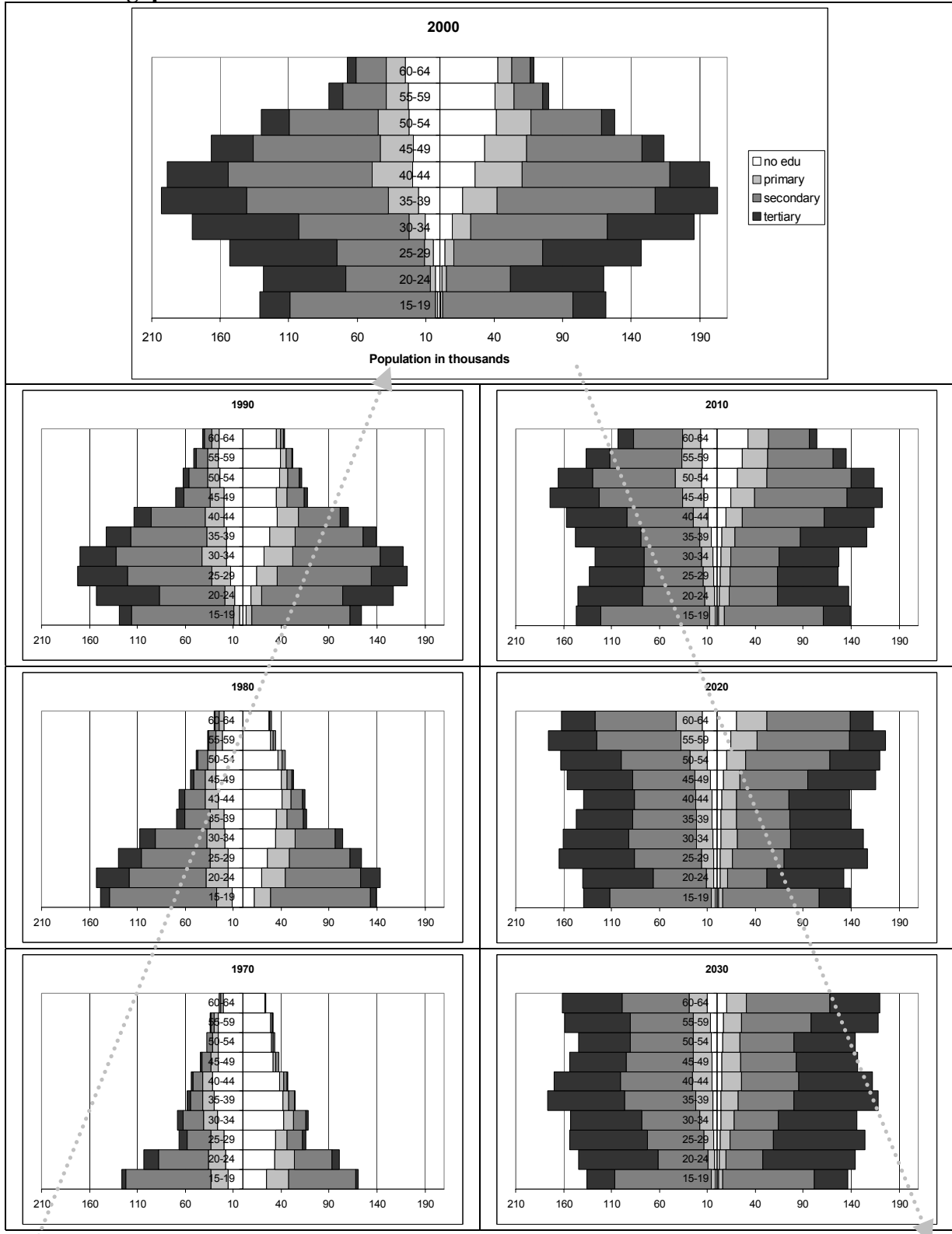
2. Malaysia



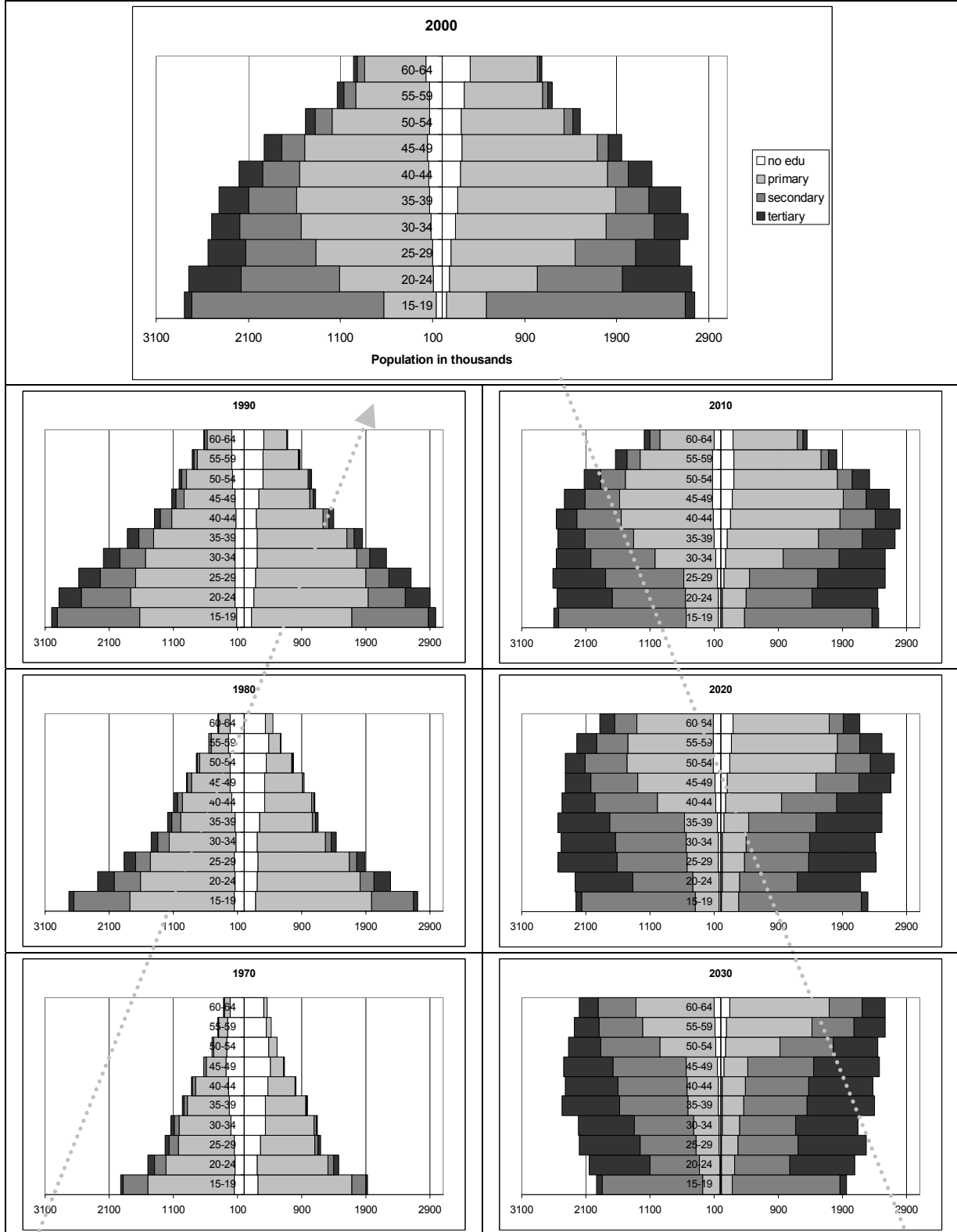
3. Philippines



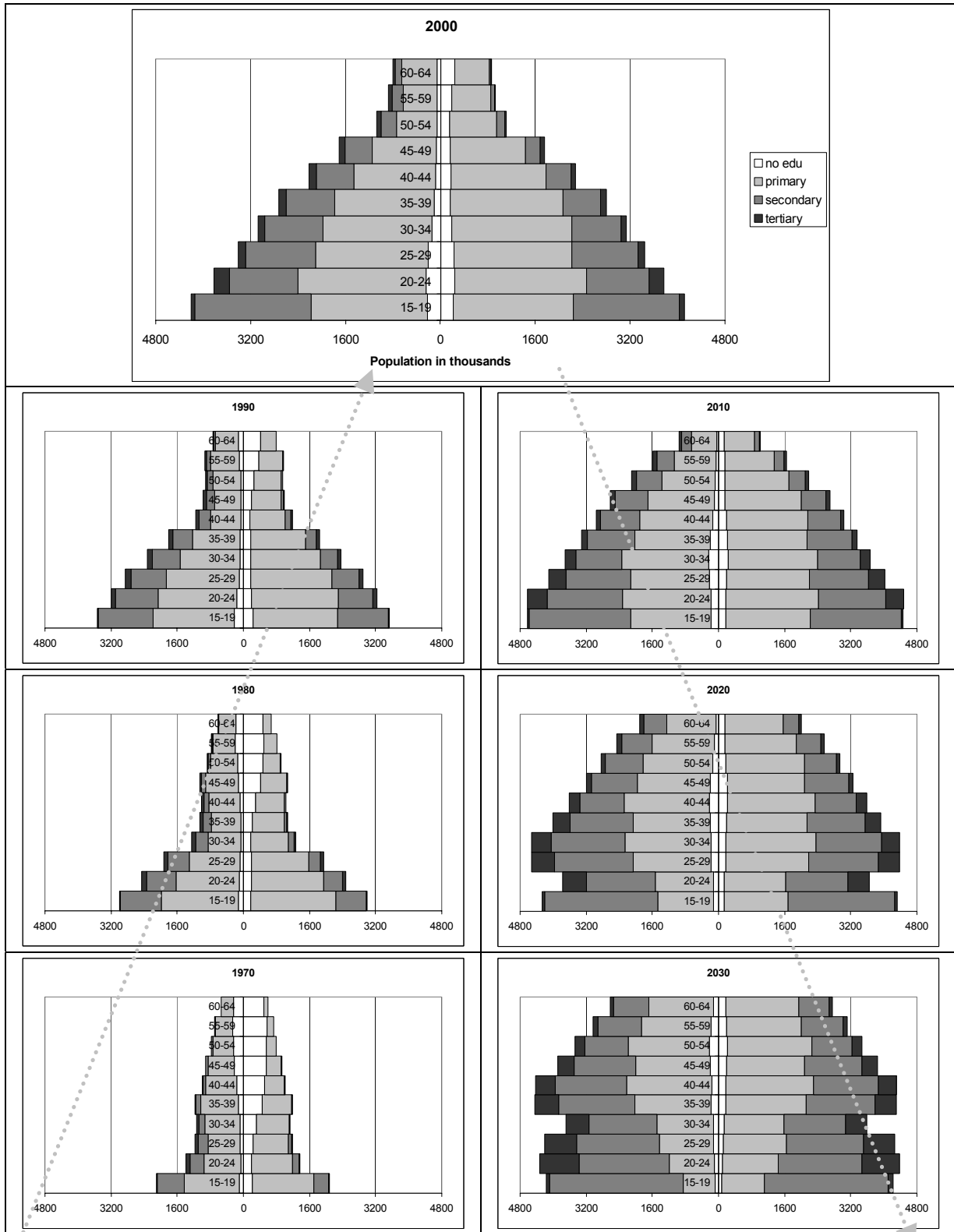
4. Singapore



5. Thailand



6. Vietnam



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