CHANGING PATTERNS IN MINCERIAN RETURNS TO EDUCATION AND EMPLOYMENT STRUCTURE IN THREE ASIAN COUNTRIES

Aashish Mehta*, Jesus Felipe[+], Pilipinas Quising[+], Shiela Camingue[+]

*University of California-Santa Barbara; [+]Asian Development Bank

8 November 2007

Abstract:

We analyze large nationally representative surveys of the labor force from three developing Asian economies (India, the Philippines and Thailand) at two points in time separated by a decade or more. Secondary and tertiary education attainment rose in the interim while the Mincerian education-wage profile became more convex. We document these shifts, allowing for inter-cohort dynamics. Returns to secondary education fell. Returns to college rose for older workers everywhere and for young workers in India, but fell for young Thais and Filipinos. We develop a new decomposition that permits us to attribute the shifting returns to education to the evolving structure of employment and inter- and intra-industry wage patterns. Secondary returns fell sharply in every sector as secondary-educated workers rapidly became available, while employment structures shifted slowly to absorb them. Conversely, rising returns within modern services were instrumental in lifting the returns to tertiary education. More manufacturing jobs will enable the Philippines to leverage higher growth from its human capital stock. Returns to secondary education in India have come to depend less on the manufacturing sector as manufacturing employment growth has been concentrated in low-skill sub-sectors. The inter-cohort divergence in returns to college arises in the Philippines and Thailand because excess young college-educated workers are pushed into low-wage or low-return jobs, while older college graduates are more likely to work in modern services. As modern service employment grows slowly, the largest and growing share of services employment has been in low-wage traditional services. From an employment perspective, "services-led development" therefore appears to be a red herring.

Acknowledgement: This paper grew out of research conducted for preparation of the Asian Development Bank's *Asian Development Outlook 2007*. We are grateful to Frank Harrigan and Ifzal Ali for encouragement, material support and comments. We have benefitted greatly from Rana Hasan's insights and knowledge of the data. Jewelwayne Cayne, Gemma Estrada, Juthathip Jongwanich, Surachai Khitatrakun, Ned Magtibay-Ramos, Dalisay Maligalig, Manuela Prina, Guntur Sugiyarto, Ashish Thapliyal, Saitien Thongplensri, the ADB's education community of practice, and staff at ADB's resident missions provided useful advice, logistical support and help with translation, numbers, comments and criticism. Colleagues at the Philippines' and Thailand's National Statistical Offices, particularly Anon Juntavich, were very helpful with documentation. All errors are our own.

I. Introduction

Studies from several developing countries have noted that the Mincerian wage-education profile has become increasingly convex. In particular, the Mincerian returns[1] to tertiary education have usually risen while the returns to secondary education have typically declined[2]. Our three countries of interest – India, the Philippines and Thailand, are no exceptions to this trend. However, a key finding is that for young Thais and Filipinos, the returns to college have begun to fall already. All of these trends have had a strong influence on wage inequality, which has risen across much of the developing world. Hasan (2007) applies methods developed by Fields (2003) and finds that education is the most important measured variable for statistically explaining the recent growth in inequality in India, Indonesia and the Philippines.

This should make education the most useful policy tool for intervening in income distribution in developing countries. Against this backdrop, declining returns to secondary education represent a substantial and worrying loss of traction by government on the distribution of income. Understanding the cause of this decline is therefore vital. Similarly, identifying the source of the rising returns to tertiary education, and why returns have begun to fall for some workers, will help governments to develop appropriate higher education strategies to maximize the growth dividend that these payoffs promise without overinvesting in an asset that may eventually display diminishing returns. This paper advances our understanding of these issues by examining how changes in the returns relate to the types of jobs and workers available.

This examination of the industrial structure of employment is timely, as a variety of recent international growth stories have generated renewed interest in industrial policy – especially as it relates to the manufacturing sector. Perhaps the most widely cited stories are: Chinese government involvement in directing production and financial intermediation during two and a half decades of high growth; and a widely held view that India's difficulties with infrastructure development are a significant barrier on growth; although there has been growing interest in skills and infrastructure bottlenecks in a variety of other rapidly growing countries. There is also a large literature (Felipe et Al. 2007), linked to the work of Kaldor (1967) documenting the centrality of manufacturing, with its increasing returns to scale, as an engine of

[1] It is by now obligatory in any paper on returns to education to include a disclaimer stating that the choice of the term "return" here is not meaningful – simply conventional. We use the term as shorthand for "the difference in average log-wages paid to those with a particular educational qualification and those without it, controlling for work-experience." In other words, it is a useful statistic for discussing the wage distribution, but not necessarily for deploying public investment. We refer to these limitations later in the text.

[2] For evidence from other developing countries, see Savanti and Patrinos (2005, Argentina), Esquivel and Rodriguez-Lopez (2003, Mexico), Park et Al (2004, China), World Bank/DFID/ ADB (2006, Nepal) and Nguyen (2006, Vietnam).

growth. More recent empirical work, much of it drawn from product level data (see Rodrik, 2006 for a summary) implies that the prospects for growth through diversification and upgrading of manufactures are substantial. Yet, industrialization does require governments and other legal institutions to solve important coordination failures, most vitally in: infrastructure provision; contract enforcement; control of corruption; labor-relations and regulation; financial sector stability; and evolving suitably transferable property rights (especially for land).[3] Distortions in goods markets must also be limited. When the state falls short in these endeavors, one market response has been to shift labor and other resources into services and related activities that are less encumbered by such shortcomings. Such shifts may have great consequence for the returns to education.

These issues have particular resonance in the countries we study. Bannerjee (2006) and Kochar et al (2006) have attributed the growth in India's information technology and IT-enabled services industry in large measure to the availability of highly skilled wokers, and argue that this skill endowment that was created and under-utilized as a result of several decades of inflexible industrial policies. Since these policies have been relaxed, returns to education have shot up, and the modern service sector has accelerated and is credited with having had strong expenditure spillovers. Meanwhile, in terms of income distribution, the key outstanding challenge is to develop better paid employment opportunities for the large majority of less educated workers. In the Philippines, after years of quiet deindustrialization, the government is now pushing human resources development and services-export as key pillars of its development program.[4] This may reflect a resignation to continued coordination problems, or it may, as the government suggests, aim to exploit a legitimate avenue for rapid income and job growth that capitalizes on an abundance of educated labor through service-sector development. In contrast, successive Thai governments have emphasized manufacturing, viewed skills shortages as an impediment to higher value-added manufacturing growth, and promoted secondary and technical education aggressively over the past decade.

Thus, there are now important debates centered on whether services can supplant industrialization as engines of income growth, and what the role of education would be under such a growth strategy. This paper contributes to this debate by asking how the shifting returns to education may be linked with the evolving inter- and intra-industry wage and employment

[3] Some authors would go further. For example, Rodrik (2006) shows that export subsidies and exchange rate management would be welfare enhancing if production of exportable goods involves learning externalities.

[4] For example, the President's 2008 budget speech details at some length the promise of services exports, and the importance of the primary sector, highlights the country's declining competitiveness, and does not refer directly to the manufacturing sector at all.

structures. In particular, we are interested in the role of different sectors of the economy in employing the educated, and in sustaining or shifting the Mincerian returns to schooling.

The results have implications for both growth and income distribution. In terms of growth, the impact of investments in human capital on growth will presumably[5] be higher, the larger the returns to education are. Our results illuminate how these returns are likely to vary with the structure of employment. In terms of distribution - governments keen to use secondary education to lift the bottom of the income distribution will wish to know what economic activities to promote to make this possible.

To conduct this investigation we use raw data from pairs of large labor force surveys drawn on either side of a 10-13 year interval from each of our three countries. Linking the datasets over time required the construction of some new concordances, and required the exhumation of old documentation and datasets. These efforts leave us with well over a half-million sampled members of the labor force. The sampling schemes were designed explicitly to yield unbiased estimates of the structure of employment at the national level, and the sample size permits us to do this with some precision. These features of the data permit groups of workers identified by education, age, industry of employment and occupation to be reliably compared over time. Usefully, the labor forces captured in the dataset together comprise around 17% of the world's labor force.[6]

Our chief methodological contribution is to develop a new decomposition in order to measure the contributions of different sectors of the economy to the returns to education. This identity also attributes the returns to education to the structure of employment and the inter- and intra-sector wage distributions, and allows us to ask how modest adjustments in the employment structure would impact the returns to education. Trivially, it also permits changes in returns over time to be attributed to changes in employment structure and to changes in sectoral wage structures. Aside from this, much of our work is heuristically consistent with the approaches covered by Katz and Murphy (1992) and Katz and Autor (1999).

In brief, we find that the decline in returns to secondary education was an across-the-board phenomenon, and is consistent with a supply-side explanation – the availability of secondary educated workers grew, while employment structures did not shift sufficiently to absorb them at the going relative wage. Returns to tertiary education on the other hand, appear to

[5] Actually two points are presumed: First, that returns will rise under the new employment structure because workers with more schooling will do better, not because those with less will do worse. Second, that any shift in employment structure that lifts the private Mincerian wage-returns will also lift the social return to the investment in human capital. We return to this discussion at the end of the paper.
[6] Calculation based on the World Bank's, World Development Indicators database.

have been driven up almost entirely by rising returns within the "modern services" sector. This sector includes financial services, science, IT, and so on, as opposed to "traditional services", which include transportation, retailing, hospitality, household service, hairdressing and the like. Modern services drive college premiums because they hire the majority of college graduates.

Unfortunately, the employment generation powers of the modern services sector have been greatly exaggerated in public discourse, and the sector disproportionately hires older workers. Thus, while tertiary returns rose for older workers everywhere, younger workers, many more of whom are college educated, have found themselves increasingly employed in traditional services or manufacturing. The consequences of this change vary by country in important ways. India's manufacturing sector, which has rapidly expanded employment, supported the returns of young college graduates, even while a shortage of quality tertiary educated labor appears to have grown more acute in the modern services sector. Tertiary returns for young Indians therefore grew. In Thailand, the most industrially sophisticated country in our sample, the shift of college graduates into manufacturing and traditional services appears to have had little impact on college returns within those sectors. However, the returns to college within modern services themselves have crashed, bringing down the overall return to tertiary training. In contrast, in the absence of manufacturing job creation much of the surge in recent Filipino college graduates cascaded down from the modern services, finding employment residually in the traditional services sector, bringing down the returns to college education in traditional services sharply as they did so. Tertiary returns for young Filipinos have therefore fallen significantly.

Our results imply that services-led employment growth strategies will not help the large majority of workers to obtain high returns to investments in education. The Philippines – the most services intensive economy of the three by far - would raise its returns to schooling substantially by rebalancing its economic portfolio in favor of manufacturing. India – whose miracles in raising value added in services have become perhaps the key piece of evidence cited by boosters of the knowledge economy[7] – has actually seen most of its non-agricultural workers shift into labor intensive manufacturing, not services. And it is in Thailand, which has created more industrial employment and raised the sophistication of its products furthest, that we find that changes in employment structure would have the smallest impact on returns to education. Modern services employ less than a tenth of the workforce in each country, and service sector employment has become less modern and more traditional in its composition. Traditional services pay the lowest wages, after agriculture.

[7] See, for example, Friedman (2007).

The paper is structured as follows: Section II introduces the datasets. Section III delineates the shifts in education attainment; IV describes education policies in our countries; V presents estimates of the returns to education over time and cohort; VI documents the evolving employment structures and shows that these changes on their own would not have boosted demand for educated workers much; and VII introduces a novel decomposition of the Mincerian return which is used to probe the proximate sources of changing Mincerian returns. Section VIII concludes.

II. The datasets

The data utilized throughout this study come from the labor force surveys collected by each country's national statistics agency. We utilize two samples from each country, separated by between 10 and 13 years. The data have several merits. First, they all involve multistage stratified random sampling schemes (using national censuses as sampling frames) designed to deliver unbiased estimates of the national structure of employment, unemployment, education attainment and wages. In fact, as the only datasets so collected, our data are uniquely suitable for the task at hand. Second, the sample sizes are all very large, ranging from 49,902 workers in the Philippines in 1991 to 200,380 in India in 1993. This permits rather precise measurements to be taken on tightly defined sub-groups of the work-force. Third, notwithstanding some changes and adaptations over the years and across countries, the surveys are mostly based on common international classifications and principles of labor force measurement. Consequently, observations of differences over time, and (with great trepidation) across countries, may usefully be made.

Sampling in each country has been undertaken with different frequencies and over time periods of different durations[8]. Further, questionnaires not only differ across countries, but have also changed over the years within countries, especially with regards to how wages and hours worked are recorded. Thus, not all rounds of the labor force surveys could be combined. Industrial and occupational classifications have also been revised considerably over the years, but helpfully most classifications are derived from versions the International Standard Industrial Classification (ISIC) and International Standard Classification of Occupations (ISCO).

[8] For example, the Thai labor force was sampled for one month every quarter since 1985, but for one month three times a year prior to 1985. The Indian sample is usually drawn over the course of a year, roughly every five years.

These differences implied much labor and some compromise. We are restricted in our choice of years, so the historical intervals analyzed do differ across countries. We were forced to develop new concordances to link datasets across years within countries. The concordances do not map to the same occupational classifications in all countries, and at our most disaggregated level of analysis, they map to similar, but not identical industrial classifications. However, at higher levels of aggregation (5 or less sectors in the economy), sector definitions are for all intents and purposes, comparable across countries. In the case of Thailand, the educational classification itself shifted, requiring the construction of yet another concordance. We were forced to use weekly wages in India, daily wages in the Philippines and hourly wages in Thailand. Details regarding the surveys from each country are provided in Appendix I, and the concordances are available from the authors on request.

III. Education Attainment

We begin by examining the distribution of educational attainment in the labor forces of each country. Table 1 presents the cumulative distributions of education attainment amongst workers aged 25-60 and aged 25-30. The use of cumulative distributions permits us to compare education attainment across time and cohorts in terms of first-order dominance. Several trends are observed.

First, all countries' labor forces became considerably more educated. This is true whether the full labor force or only younger workers are considered. Second, the younger cohorts are always more educated than the older. Indeed, the rise in attainment, measured as the rightwards shift in the cumulative distribution, is considerably more pronounced among the young in both India and Thailand, implying that education attainment accelerated in those countries. However, in the Philippines, the shift in attainment for the 25-60 workforce is larger than for the 25-30 group, suggesting that the education expansion in the Philippines may be decelerating.

The schooling system is broken into stages differently in each country, and the level of education completed is recorded differently, complicating international comparisons. This said, in the latest year surveyed in each country, a general hierarchy exists in elementary and lower secondary attainment, with Filipinos being most likely to have completed these levels, followed by Thais, and last Indians.[9] This ranking is confirmed by Barro and Lee's (2000) computations which are presented in the last rows of Table 1.

[9] To see this note from Table 1 that in the last year measured less than 17% of Filipino workers between the ages of 25 and 60 have not completed elementary school (6^{th} grade), compared with around 41% in

Comparisons of college attainment are less meaningful, as a Filipino college graduate entered college after 10th grade and has typically completed only 14 years of schooling post-kindergarten, while the Indians and Thais enter after 12th grade and typically complete 15 and 16 years respectively. Nevertheless, fully 34% of Filipinos have had at least some education beyond 10th grade, while at a generous upper bound no more than 22% of Indians have (as 78-87% of Indians did not complete 10th grade).

Finally, Barro and Lee's figures show that rates of educational attainment rose much faster in the Philippines and Thailand than in India. Our estimates of the educational distribution appear to reflect this finding, and show that with Thai and Filipino primary completion rates fairly high to begin with, rates of secondary expansion have been much higher in these two countries. In India, on the other hand, an abysmal 70% of workers had not completed elementary in 1993, so that while secondary completion rates in India have climbed relatively slowly, India's primary completion rates have had much more room to grow.

While this paper focuses on the consequences of these expansions in the context of structural change, it will be useful to ask why educational attainment changed in such different ways. Certainly, as noted in the previous paragraph, initial conditions play a role simply for numerical reasons– India had too few elementary graduates to increase secondary completion much, while the Philippines and Thailand had less ground to make up in terms of elementary graduation. However, as constitutional amendments extending universal education targets have become quite common (all three of our countries have passed one in the past 20 years) it is useful to ask whether these policies appear to have driven the expansions. In the next section we briefly describe the policy changes, the environment in which they were made, and present data which suggest that rising enrollment rates drove the government commitments, rather than the other way around.

Before moving on, it is important to stress that the above observations are only statements about the number of academic years their students have successfully completed. What they have actually learned is unfortunately not measured in our dataset, as it is in most.

IV. Education Policies

The Philippines and Thailand both introduced legislative changes to promote secondary education. The Constitution of the Philippines (1987) committed the state to provide quality

---

Thailand (also 6th grade) and over 49% in India (5th grade). Similarly, for lower secondary - 46% have not completed 10th grade in the Philippines, at least 64% haven't finished 9th grade in Thailand, and over 77% have not passed 10th grade in India.

affordable education at all levels to all persons, and Republic Act 6655 (1988) followed this up with a policy of free secondary education. Education policy in the Philippines since the late 1970s has been driven by an explicit government policy to promote emigration as an alternative to local job creation[10], and a source of income (recorded transfers from migrants are as high as 10% of GDP). Private vocational colleges, many of which operate as little more than diploma mills, have mushroomed to meet demand from prospective emigrants. In combination with a trend towards opening state colleges (there were 19 of them in 1987, but 111 in 2006[11]), this has facilitated a sharp expansion in tertiary education. It is critical, in interpreting our numbers, to note that a number of authors conclude that this shift has been accompanied by a polarization in the quality of tertiary institutions (perhaps attesting to the serious quality problems, the college dropout rate amongst 25-30 year-olds implied by Table 1 was 45% [=(79.0-61.8)/(100.0-61.8)] in 2004, up from 41% in 1991), and has added to massive strains on education budgets, drawing resources away from basic education.[12] It is also widely held that a bilingual education policy launched in 1974 permitting "local vernaculars…as auxiliary to the media of instruction, but only when necessary to facilitate understanding of concepts being taught in English and Filipino" (Quisumbing 1989, p311) has led to an inter-cohort decline in English proficiency.

Thailand has historically had a difficult time expanding access to education, especially in rural areas. Booth (1999) reports that limited availability of especially secondary graduates was viewed as a serious problem in the early 1990s, as low-skill manufacturing boomed, returns to secondary education rose, and manufacturing companies attempted to move up the value chain. The 1997 constitution created a right to 12 years of free, quality basic education, and the Education Act, (1999) extended mandatory schooling levels from six to nine years.

Thailand also has a system of vocational training, consisting roughly of 3 years of vocational upper secondary (US) education (parallel to the traditional upper secondary system), followed by an optional tertiary diploma taking (usually) 2 years. This has been promoted by the government over the past decade. While a change in educational categorizations applied across survey years prevents us from examining how fast the prevalence of vocational US education has expanded, Table 1 shows that percentage of workers aged 25-30 with tertiary mostly-vocational diplomas expanded from 3.6% in 1995 to 7.4% in 2005.

[10] Prina, 2007 provides a historical overview of the program and summarizes studies of its effects..
[11] Commission on Higher Education, available: http://www.ched.gov.ph/hes/index.html
[12] Maglen and Manasan, 1998.

Education policy in India has followed a different route. While by law education is free and compulsory up to the age of 14[13], the intent and implementation of the law are quite different. Only 62% of the labor force aged 25-60 had completed primary school in 2004. Primary enrollment and attendance rates have been extraordinarily low, particularly in rural areas, and amongst socially marginalized communities in both rural and urban environs. The chief causes appear to be the abysmal quality of the primary education system, and the existence of sometimes prohibitive hidden charges levied by public schools (PROBE report, 1999; Pratham, 2005). A sharp quality divide has emerged between public and private education, and a boom in urban working class incomes during the last decade has led to even tighter bottlenecks in admission to private schools. In fact, over the past 6 years private schools catered to roughly 42% of India's secondary students, as compared with 20% in the Philippines and 11% in Thailand.[14]

Meanwhile, India has cultivated a few very highly regarded tertiary institutions. Graduates from elite publicly supported science and technology institutes command impressive salaries, and aspirations of entry to these institutions are high. Good private colleges are also oversubscribed, as evidenced by the dramatic increases in unofficial admission fees through the 1990s. Indeed, with the fees charged by many institutions capped, a shortage of college seats is widely observed. Notwithstanding the sizable contribution of the tertiary educated to Indian output, enrollment rates are currently around 14%, and only around 8% of the Indian labor force is college educated.

Under these conditions, and given substantial returns to secondary education in the initial period analyzed (confirmed in later sections of this paper), it is perhaps not so surprising that secondary completion grew rapidly in the Philippines and Thailand, but only slowly in India.

We were able to gain an appreciation of the impact of the constitutional and legal changes in Thailand and the Philippines using our data. To do so we first imputed the year that each worker would have graduated from lower secondary school presuming that they entered school at the usual age and did not repeat grades. Next, we used these data to calculate graduation-year-specific completion rates the fraction of workers who should have graduated in a given year who have in fact graduated).[15] To eliminate grade repeaters, we consider only persons

[13] India's 1950 constitution directed state governments to provide free and compulsory education to all children up to the age of 14 by 1960. The 86th amendment to the constitution, which was passed in 2002, redundantly commits the governments to providing free and compulsory education to children between the ages of 6 and 14. This typically covers grades 1-8.

[14] World Bank, World Development Indicators.

[15] These are unbiased estimates of the actual completion rate under one identifying assumption – that the probability of remaining in the sample (not dying, emigrating or refusing to participate in the survey) is independent of whether a worker graduated or not. Identifying a structural shift around the time of

over the age of 19 for calculating lower secondary (LS) completion rates in the Philippines, and over 18 and 21 for LS and upper secondary (US) completion rates in Thailand. The results, presented in Figure 1, show completion rates in Thailand overtaking those in the Philippines by the early nineteen nineties and confirm the suggestion that attainment is decelerating in the Philippines. They also show that Thailand's massive expansion in secondary completion rates began in the early nineteen nineties, well in advance of the constitutional change, and contemporaneous with the pre-Asian crisis boom. Similarly, the legal changes in the Philippines did not perturb the already steady upwards progression of secondary completion. However, Maglen and Manasan (1998) argue that the expanded Filipino entitlement led to a shift towards public secondary education and dilution of the quality of both primary and secondary public education. Consistent with this, Yamauichi (2005) finds the returns to private schooling exceed those to public in the Philippines (and also in Thailand).

These results suggest that rather than igniting an acceleration in attainment rates, policy changes primarily helped to ensure affordability and, perhaps, equality of access.

V. Unconditional Mincerian Returns

As rising education levels appear to have been largely driven by demand from students and their families (rather than policy driven shifts in the supply of schooling), we turn to estimates of the wage benefits of schooling to ask whether this demand for education can be associated with employers' willingness to pay for educated workers.

We estimate returns by regressing log-wages on education levels and imputed labor market experience. Our sample is restricted to non-student employees aged 15-60. Most studies of Mincerian returns assume that the rate of return to education is independent of the cohort analyzed. Algebraically, this is achieved by suppressing interaction terms between education and experience on the RHS of the log-wage equation. However, education and work experience may be complements in the production of human capital. The composition of employment, production technology, human resources norms, and school quality may well have changed over time as well while there are considerable time lags in the education of workers. All of these factors imply that returns are likely to vary by cohort. Indeed – the focus of this study, on the linkage between evolving employment structure and returns to education, requires that these inter-cohort dynamics be considered explicitly.

---

constitutional change requires a weaker assumption – that any relationship between sample selectivity and lower secondary completion has been stable over time. We also note that the method yields between 1,000-2,500 observations for each year-specific graduation rate. Given graduation rates are mostly far from 50%, fairly precise estimates are expected.

We therefore begin by regressing log-wages on dummies capturing the highest level of education completed, work experience imputed in the usual fashion, the square of imputed work-experience, and interactions between the education dummies and work experience. Inadequacies in the data precluded reliable estimates of the returns to primary education, so the analysis focuses on secondary and tertiary education levels. These middle and higher levels of the school system are, anyway, where the policy debate lies, universal primary education being an established goal of just about every development practitioner for reasons that go far beyond the structure of employment.

Table 2 presents F-tests of the null that returns to schooling and experience are separable in each of our six samples (i.e. that the education-experience interaction terms are statistically insignificant). The null is rejected resoundingly in each case. This suggests strongly that the returns to education are subject to very important dynamic considerations, not just over time, but between cohorts. This suggests that educated workers of different cohorts are not perfect substitutes for each other.[16] As returns to education and experience are interdependent, all further analysis in this study utilizes the full set of interaction terms.

Table 3 provides annualized returns to post-primary education, calculated post-estimation for workers of two different cohorts – recent entrants (those with 5 years of experience), and mid-career workers (with 20 years of experience). Asterisks denote those education-experience groups that experienced statistically significant changes in returns.

Three trends in the lower and upper secondary returns are noteworthy. First, they were moderate to high in all countries and both experience levels in the initial period, consistent with the view that the subsequent expansions in attainment were market driven. Second, all statistically significant changes in returns to secondary education were negative. Third, trends in returns differ sharply across cohorts. For younger workers, a significant decline is seen in returns to lower and upper secondary education in every country. In contrast, even though secondary returns declined for mid-career workers as well, they did not do so in every country-education group, and the declines are always smaller than they are for the recent entrants. Moreover, mid-career workers' secondary returns are almost always higher than those of new entrants. All three of these trends are consistent with the view that supplies of secondary educated workers grew faster than demands for them, and that the resultant downwards pressure on returns has been stronger for younger workers.

[16] Katz and Murphy (1992), estimate elasticities of substitution in the US labor force between high school and college equivalent educated workers and between workers with 25-35 and 1-5 years of experience, that are inconsistent with perfect substitution. Katz and Autor (1999) concur. Time series data from developing countries are insufficient to measure this parameter.

Turning to tertiary education, matters become considerably more nuanced. In the Philippines and Thailand, the returns to tertiary education rose for mid-career workers but actually fell for new entrants. In India, however, they rose for both groups, and more sharply among the young. Clearly, with supplies of graduates having increased, the rise in tertiary returns for some groups cannot be explained in terms of supply-side movements.

This said, the *differences* between India and Thailand's trends in tertiary returns for recent entrants are quite consistent with their differing expansions in the supply of tertiary educated recent entrants. Specifically, Table 1 implies that amongst workers 25-30 years of age the share of college graduates in India grew by 2.6 percentage points (from 6.8% to 9.4%) while in Thailand the share of tertiary graduates grew much faster – college graduates' share grew by 10.3 points (to 16.5%) and diploma holders' share grew 4.8 points. This could explain the much greater downward pressure on tertiary returns in Thailand relative to India. In the Philippines, the share of college graduates grew only 1.6 points (albeit to 21%), but the share reporting incomplete college education grew from an already high 13.9% to 17.2%. If college dropouts are close substitutes for college graduates, then the Filipino expansion in college dropouts would also be consistent with the divergent cross country trends in young workers' tertiary returns. It follows that the limits placed by regulation on expansions in tertiary education in India (presuming, as almost every observer does, that they are binding) could be keeping tertiary returns up, while any scarcity of tertiary-educated recent entrants in Thailand and the Philippines has become less acute over time.

Finally, it is worth emphasizing the relative buoyancy of returns amongst mid-career workers compared to new entrants. As Katz and Murphy have noted (p.73), this phenomenon is "suggestive of the 'active labor market' hypothesis of Freeman (1975) in which changes in the labor market show up most sharply for new entrants because more senior workers are insulated by labor market institutions, such as seniority layoff systems, and valuable firm-specific capital." We note also that more educated older workers may have acquired more firm-non-specific human capital on the job that justifies the resilience of their returns.

To recap our findings and pose some leading questions: Supply side explanations are consistent with the fall in secondary returns observed in all countries. We argue that such explanations will appear more credible if the trend was not specific to particular sectors of the economy, and will therefore examine the trends within economic sectors. Differences in the pace of tertiary expansion also help to explain the greater downwards pressure on young workers' tertiary returns in the Philippines and Thailand, relative to India. However, supply side explanations alone stand in contradiction to the increase in tertiary returns for the young in India

and mid-career workers in all countries.[17] Clearly firms in at least some sectors of the economy must have raised pay scales for the tertiary educated. In the next section, we therefore ask whether sectors that have historically used more educated workers have increased their employment shares, and whether such structural shifts can "account for" the significant increase in the prevalence of secondary and tertiary educated labor. After that, we will ask which sectors have contributed to these patterns in returns by rewarding the educated with more jobs or higher pay.

Some Caveats and alternative interpretations:

It is important not to treat these wage differentials as estimates of the return on investments in education. Most obviously, direct schooling costs are unmeasured, and the results only capture wage differentials at a single point in time. There are also serious potential econometric pitfalls in ascribing the earnings differentials to training due to endogeneity of schooling and unobserved school and student quality. Changes in these unobserved variables could drive the changes in returns as well.

Unfortunately, inter-temporal measurements of quality are hard to come by, and commonly used proxies are hard to interpret. However, the Philippines and Thailand did participate in two distinct international surveys of secondary school academic achievement – one in 1983/4 and another in 1994. Gundlach and Woessmann (2001) have combined the results to these international surveys using information from other "bridge" countries and surveys to calculate inter-temporally comparable indices of academic achievement. They conclude that the average Thai students' math skills improved slightly, while their science skills fell – hardly the type of result that would drive returns to secondary education down sharply.

In the Philippines, on the other hand, Gundlach and Woessman find a serious decline in science scores during the 1980s and early 1990s (math scores were not available in the first round), consistent with Maglen and Manasan's (1998) claim that the universalization of secondary education in 1987-1988 led to increased pressure on public schools. Moreover, Table 1 actually implies that high-school dropout rates for workers 25-30 (who in the 1991 sample

[17] Katz and Murphy (1992) show that testing such simple hypotheses regarding the feasibility of relative supply based explanations of relative wage movements requires that CRS and hicks-neutral technical change be assumed. It is to be understood that statements in our paper regarding supply-driven explanations are heuristic, and are valid only under these maintained assumptions. However, unlike Katz and Murphy, who derive formal tests on relative price and quantity vectors under the assumption that labor types are the only inputs into a concave aggregate production process, we do not test formal hypotheses and consider only relative quantity and price pairs. This is because the role of other unmeasured inputs (land and capital) could be substantial.

would have completed high-school before 1987 but in 2004 would have completed it after) actually declined over time. This is compatible with, but need not suggest deteriorating quality. However, by-cohort functional literacy levels reported by Philippine National Statistics Office in 1994 hint that elementary school quality may have improved slightly following the end of the Marcos regime. Similarly the Trends in International Mathematics and Science Survey, shows Filipino test scores improving slightly between 1999 and 2003. Thus, clear statements about the performance of Filipino schools over the sample are difficult to make.

There has until recently been no systematic attempt to track school quality in India. Assessments of recent government programs to improve public schools, however, do indicate substantial heterogeneity in the changes in educational outcomes over time (World Bank 2003, Glinskaya & Jalan 2003). These studies show that while there have been improvements in attainment, especially amongst girls, learning outcomes have been slower moving, and caste differences remain apparent in all measured education outcomes. Shifts in quality in the large private school segment and in districts not covered by these programs remain unmeasured.

In sum, we are unable to rule out the interpretation that the decline in secondary returns in India or the Philippines could have been driven by a decline in quality. However, in Thailand, there is little reason to suspect it.

Given unobserved heterogeneity in school and student quality, and the endogeneity of schooling decisions, wage returns are almost certainly biased estimates of the causal impact of education on earnings (Card, 2001). While there is a large and growing literature on how to deal with this problem, the solutions rely on either the availability of suitable instruments for schooling, or control groups (twins or randomized selection into treatments). Unfortunately, the labor force surveys do not afford such instruments or controls. Notwithstanding this shortcoming, given the focus of the paper on the interrelationship between employment structure and education, these nationally representative surveys are the only datasets suitable for this analysis. Moreover, endogeneity of schooling could bias estimated causal returns up or down, depending on what influences schooling decisions[18], so it is not clear what the direction of such bias might be. Nevertheless, it is to be clearly understood that our OLS estimates of Mincerian returns are not intended to capture the treatment effects of schooling.

[18] Specifically, Card (2001) essentially argues that positive correlations between unobserved academic ability and labor productivity would bias estimated returns upwards. Yet, studies seeking to correct for endogeneity bias generally find even higher returns. Some authors (e.g. Bedi & Gaston, 1997) have argued that income and family background are important constraints on attainment, and argue that this explains why natural experiments – which eliminate such selectivity - arrive at higher returns. These authors assumption appears to be that the poor obtain higher returns than the rich. Bingley, Christensen and Walker (2005) include an informative comparison of the different types of estimates of returns.

Finally, we note that the endogeneity of schooling is irrelevant to the comparative statics exercise at the heart of this study, which asks how reallocations of employment across sectors would alter the returns given a *fixed* distribution of education. This is unlike most studies which are interested in the impact of more education on income growth.

VI. Shift-Share Analysis

Given strong evidence that the returns to education have become more convex, and that educated workers have become more abundant, the rest of this paper is dedicated to determining whether these shifts can be attributed to the changing structure of employment. Figure 2 depicts the distribution of educated within the 3 broadest sectors of the national accounts and the unemployed. In terms of first order dominance, agricultural workers are the least educated, followed by industrial workers. The unemployed and service sector workers are the most educated. Thus, it is possible, prima facie, that shifting employment structures out of agriculture have drawn education levels upwards. This section takes the first step in exploring this possibility, by summarizing, through a common decomposition (Berman et Al., 1994), where the net additional educated workers have found work.

Let e index the education level, s=1,…,S index sectors and t index time. Then, for example, we can decompose the share of workers of with education level greater than or equal to e in the labor force as follows:

$$(1) \qquad \lambda_{e,t} \equiv \sum_{s} \alpha_{s,t} \lambda_{e,s,t} \; ;$$

where $\alpha_{s,t}$ is sector s's employment share, $\lambda_{e,t}$ is the fraction of the employed labor force with at least education level e, and $\lambda_{e,s,t}$ is the fraction of workers in sector s who have completed at least e. Label $\Omega_{e,s,t} \equiv \alpha_{s,t} \lambda_{e,s,t}$ sector s's contribution to national e-education intensity. Using Δ to express changes in variables over time, the time-difference of (1) can be expressed as:

$$(2) \qquad \Delta\lambda_{e,t} \equiv \sum_{s} \Delta\left(\alpha_{s,t} \lambda_{e,s,t}\right) \equiv \sum_{s} \Delta\Omega_{e,s,t} \equiv \sum_{s} \lambda_{e,s,t-1} \Delta\alpha_{s,t} + \alpha_{s,t} \Delta\lambda_{e,s,t} \equiv \mathrm{A}_{e,t} + \Lambda_{e,t}$$

The first two identities say that the all new e-educated workers must be absorbed into the employment structure. The contributions of each sector to the e-intensity of the employment structure must adjust to make this happen. The third identity says that each sector's adjustment in contribution is the additive result of the change in the sector's e-education intensity (holding the sector's employment share constant) and its expansion in employment in the sector (holding its e-

intensity constant). The fourth identity names these summations: $A_{e,t}$ is the quantity of new e-educated workers that would have been required by shifting employment shares between sectors, if each sector did not change its education profile; $\Lambda_{e,t}$ is the quantity of new e-educated workers that were absorbed by raising education utilization within sectors. In other words, $A_{e,t}$ is the structurally "accounted for" increase in e-educated workers, or the shift absorbed by moving workers between sectors. $\Lambda_{e,t}$ is residual – that portion of increased education intensity "not accounted" for by structural change, but rather absorbed within sectors. We also note that if $\Delta\Omega_{s,t}/\alpha_{s,t-1}$, is large relative to other sectors, then sector *s* can be said to have absorbed the *e*-educated disproportionately. It will be useful to know which sectors played this role in which countries. If $A_{e,t}$ is large relative to $\Delta\lambda_{e,t}$ we will conclude that educational intensification, viewed through the prism of a *S*-sector decomposition is closely associated with shifting employment structure. If $\Lambda_{e,t}$ is large, the opposite would be true, and many authors have found this to be the case (Bound et Al, 1994; Autor et Al, 1998, Kijima, 2006). We also note that if the disaggregation is crude (i.e. if *S* is small), the risk is high that important changes in employment structure that take place within sectors will be missed. It is therefore important to conduct the analysis at various levels of disaggregation.

Table 4 present a highly aggregated application of decomposition (2) to account for rising LS completion rates, with *S=6*. All members of the workforce are included. The unemployed are treated as a sector, services are split into modern and traditional services (identified using concordances presented in Appendix II that vary slightly by country, which we developed by ranking sectors according to LS intensity), and the industrial sector is split into manufacturing and non-manufacturing (mining, utilities and construction).

The first three columns for each country present the evolving employment structure. Five trends stand out. First, agriculture's employment share has been declining very rapidly, most probably reflecting exhaustion of the land frontier. The Philippines ran out of new arable land in the 1970s. Thailand did so by 1980 (FAO, 1998), as did most regions of India. These figures also imply that labor shares displaced into agriculture by the Asian crisis have since been reabsorbed into the non-agricultural sector. Second, while industrial employment in India has outstripped services employment (driven by a boom in construction and low-skill manufacturing), and Thailand has increased manufacturing employment as well, manufacturing employment in the Philippines has been shrinking. Felipe and Estrada (2007) document that this de-industrialization is occurring at a very low level of per capita GDP and argue that Filipino deindustrialization

cannot be explained in terms of the Asian crisis alone. These numbers also imply that from the employment perspective, India is becoming a manufacturing, not a service economy. Third, unemployment has risen in all three countries.

And fourth – and perhaps most important - services employment in all three countries is growing proportionally faster in the traditional, not the modern services. This implies that the aggregate services sector is becoming more traditional. In fact, notwithstanding an unmistakable boom in the value-added by modern services in all three countries, the sector has increased its employment share by barely one percentage point in a decade.

The next three columns of the table depict LS-education intensities, which have risen in all sectors in all countries. Unsurprisingly, in every country and in all periods, modern services are the most intensive users of LS graduates. In India, in both years, traditional services are next, followed by manufacturing. However, in both the Philippines and Thailand, LS intensity in manufacturing exceeds that of traditional services. This is consistent with manufacturing labor productivity and output composition data presented in Felipe and Estrada (2007), which show that the Philippines and Thailand produce more sophisticated manufactured goods than India[19].

The next 5 columns, which implement decomposition (2), show that structural change at the 6-sector level could absorb scarcely one quarter of the net increase in LS graduates at existing LS intensities. The sectors that contributed most intensively (i.e. relative to their employment shares – last column in Table 4) to absorbing educated workers vary across countries in interesting ways. In India, it is unemployment, followed by modern services. In Thailand, it was unemployment, followed by manufacturing (and modern services close behind). In the Philippines, it is traditional services and unemployment that together absorb over 75% of new graduates. That modern services would have a high relative contribution to the absorption of secondary educated workers in India and Thailand is perhaps not surprising given that their LS-intensities are high by construction. Nor is it discomfiting that Thailand's manufacturing sector, with its moderate LS-intensity and substantial job creation would come in strongly. However, in the Philippines, it is traditional services, despite being much less LS-intensive than manufacturing and despite the fact that it was constructed to be less education intensive than modern services, which absorbs new LS graduates at the highest rate. These findings reinforce the impression that traditional Filipino services provide minimal employment for educated workers who cannot find work in manufacturing or modern services. Data presented in the next section show that wages in

[19] However these data also show manufacturing labor productivity growing fast in India and Thailand, but stagnating in the Philippines.

traditional services, conditional on education, are usually the second lowest available, after agriculture.

These results imply that changes in demand brought about by structural change at the 6-sector level, and utilization of differently educated workers within each sector constant, account for between one quarter and one third of the increased supply. To examine the possible role of aggregation in driving this result, we conducted the same analysis using both more and less disaggregated employment classifications. Table 5 presents $A_{e,t}/\Delta\lambda_{e,t}$ and $\Lambda_{e,t}/\Delta\lambda_{e,t}$ for decompositions calculated at several education levels, classifying jobs in 4 ways: (i) into the 3 traditional sectors of the national accounts (Agriculture, Industry, Services) and unemployment; (ii) into the 6 sectors just examined; (iii) into between 24 and 26 sectors (including unemployment) depending on the country; and (iv) between 28 and 103 occupations (including unemployment), also depending on country. The manner in which occupations and sectors were classified in the raw data during one or both years was the key limiting factor in terms of how disaggregated a view could be obtained. Sample size in 2004 also precluded disaggregating further in the case of India's occupational structure.

Table 5 shows that disaggregation does not considerably increase the share of LS-intensity accounted for by shifting employments shares. Moreover, the same result is confirmed, with the exception of Filipino college graduates, for every other level of education in each country. These results imply that structural change conceived in broad brush-strokes would not have generated adequate additional demand for educated workers to absorb them at going wage premiums. This is consistent with falling secondary returns, but implies that a far more refined explanation is required to explain why tertiary returns have risen for some groups.

Some specific observations on the growth and role of specific sectors and subsectors (tables not included) will prove useful. First, seeking an explanation for the rising LS intensity in traditional Filipino services (Table 4), we examined the education intensity and composition of traditional services in the Philippines. The composition has not changed much, so structural change within the sector does not explain its rising LS-intensity. While employment in LS-intensive retailing has grown, less LS-intensive jobs in the transport and personal services sectors have grown almost as fast. A similar pattern explains why a 4-sector decomposition can account for 68% of growth in Filipino college intensity. Many more college educated Filipinos were absorbed into traditional (education unintensive) services, which is why the between-sector shares decline as the sector is disaggregated into modern and traditional components. Also – the large between-occupation share of Filipino college intensity is explained by a sharp rise in the number of Filipinos working as clerks, a rise in the share of salespeople with college degrees, and a

presumably related rise in the fraction of general managers that have college degrees. In short, rising Filipino college intensity appears to be explained by increasingly top-heavy management structures and a channeling of college graduates into a rapidly expanding retail sector.

The Indian and Thai employment data share important features. Manufacturing's employment share is growing. Construction is booming, at least in India, while the apparent construction slowdown in Thailand is relative to the pre-Asian Crisis construction boom. Wholesale trade is on the rise. Growth of the transport sector in this context probably reflects demand side factors, rather than just growing labor supply (as it appears to in the Philippines). Even in Thailand, where transport's employment share fell slightly, crudely disaggregating employment data by profession shows a falling share of taxi drivers, and a rising share of truck drivers. This suggests services employment growth in support of industrialization and construction, not for its own sake.

Finally, it is in India, where the returns to education suggest the greatest scarcity that we find evidence that sub-sectors are now making do with less educated workers than before. First, the percentage of household and personal services workers in India with at least LS-degrees declined by 2.5 points, suggesting that secondary graduates are starting to find better employment opportunities. Second, and quite surprising, the share of business services workers with LS degrees shrank. This is surprising because the sector should include India's much feted IT enabled services. While it is difficult to know quite what to make of this, we note that employment in the subsector has more than doubled in absolute terms, and that the sector contains a large and diverse set of services besides IT. These include auxiliary activities like equipment rental and photocopying, much of which may have been outsourced by Indian firms lately. These are probably education unintensive jobs. If this is what explains falling education levels within business services, it means that these jobs comprise a high share of business service jobs. In this case, high-skill business services must have employed far less than 0.9% of India's labor force in 2004. Indeed, the National Association of Software and Services Companies reports that together IT and IT-enabled services provided direct employment to 1.3 million workers in 2006 – a large number of jobs, but less than 0.3% of total employment.[20]

VII. Mincerian Returns and Employment Structure

So far, we have established that the returns to secondary education fell while secondary-educated workers became abundant, and that the returns to tertiary education were much more

[20] http://www.nasscom.in/Nasscom/templates/NormalPage.aspx?id=51041

buoyant, especially for mid-career workers. The following decompositions help to ascertain the sectoral sources of these movements.

Restricting attention to workers of a particular experience level, the unconditional Mincerian return to the e^{th} level of education can be written as:

(3) $\beta_e \equiv \overline{w}_e - \overline{w}_{e-1}$;

where $\overline{w}_e$ is the average log-wage of employees with the e^{th} degree, and $\overline{w}_{e-1}$ is that of employees with one less level of schooling. Partitioning employees according to sectors ($s=1,..,S$), let $P(s|e)$ be the probability that a worker is in sector s conditional on having education level e, and $\overline{w}_{s,e}$ be the average log wage paid to workers in sector s with education level e. Then, the average log-wages for each education group can be expressed as the probability-weighted average of the average log-wages within sectors: $\overline{w}_e \equiv \sum_{s=1}^{S} P(s \mid e)\overline{w}_{s,e}$. Substituting this expression into (3); and then subtracting and adding the expression: $\sum_{s=1}^{S} P(s \mid e)\overline{w}_{s,e-1}$, yields the following.

(4) $$\beta_e \equiv \sum_{s=1}^{S} P(s \mid e)\left[\overline{w}_{s,e} - \overline{w}_{s,e-1}\right] + \sum_{s=1}^{S} \overline{w}_{s,e-1}\left[P(s \mid e) - P(s \mid e-1)\right]$$

Next, to render sector contributions invariant to the units in which wages are measured[21], we subtract a term that is identically equal to zero by construction: $\overline{w}_{e-1}\sum_{s=1}^{S}\left[P(s \mid e) - P(s \mid e-1)\right]$. Grouping this with our second summation in (4) yields:

(5) $$\begin{aligned}\beta_e &\equiv \sum_{s=1}^{S} P(s \mid e)\left[\overline{w}_{s,e} - \overline{w}_{s,e-1}\right] + \sum_{s=1}^{S}\left[\overline{w}_{s,e-1} - \overline{w}_{e-1}\right]\left[P(s \mid e) - P(s \mid e-1)\right] \\ &\equiv \sum_{s=1}^{S} P(s \mid e)\beta_{e,s} + \sum_{s=1}^{S} \overline{\omega}_{s,e-1}\gamma_{s,e}\end{aligned}$$

This formulation is intuitive. The difference in log-wages within a sector (which we denote $\beta_{e,s}$ in the second line of (5)) is simply the Mincerian return to education level e within sector s. Thus the first summation is a conditional-employment-share-weighted average of returns within sectors. The difference in conditional probabilities in the second summation

[21] Each contribution to the second summation in (4) is sensitive to the units in which wages are measured (i.e. $\overline{w}_{s,e-1}$ is expressed in log currency units). In going from (4) to (5) we normalize these contributions, converting the industry log-wage (expressed in currency units) into a unitless industry-wage-premium (expressed in percent).

(denoted $\gamma_{s,e}$ in the second line) is the increased probability of employment in sector *s* if one obtains education level *e*, relative to stopping at *e-1*. The factor $\overline{\varpi}_{s,e-1} \equiv \overline{w}_{s,e-1} - \overline{w}_{e-1}$ is simply the premium in base wages that the sector pays even workers without education e. Note that $\sum_s \gamma_{s,e} \equiv 0$ by definition. Hence, the second summation adds to the returns to education level *e* if *e* increases the propensity of workers to obtain employment in sectors that pay above average wages. Putting the terms together, we find the contribution of sector *s* to the returns to education level *e*: $C_{s,e} \equiv P(s \mid e)\beta_{e,s} + \overline{\varpi}_{s,e-1}\gamma_{s,e}$. This contribution will be large if sector s: (i) employs many *e* workers (i.e. *P(s|e)* is large); (ii) pays a high return ($\beta_{e,s}$) to *e* workers; and (iii) pays high relative base-wages ($\overline{\varpi}_{s,e-1}$) if the sector favors *e* workers over *e-1* workers ($\gamma_{s,e} > 0$) or vice versa.

Consideration of two polar cases helps with intuition. Suppose that *S* is arbitrarily large so that our decomposition splits the jobs/sectors in the economy according to every conceivable characteristic, and that the *e* educated are uniform in their human capital endowments. In the first case, assume that labor markets are perfectly efficient. This implies that there are no sector-wage premiums ($\overline{w}_{s,e-1} = \overline{w}_{e-1}, \forall s$). In this case the second summation in (4) disappears, and returns depend entirely on returns within sectors (which will all be equal). Further, because all job characteristics are accounted for, this implies that the return is derived entirely from the productive effects of education in each job. In this case, a sector contributes to the returns to education by giving workers the opportunity to deploy their education productively. These assumptions reflect Becker's (1964) basic human capital model, and we will accordingly refer to the first summation of (4) as the *Human Capital* effects..

A simple model on the other extreme is Thurow's (1975) *Job Competition Model*. Under the most extreme assumptions, (which Thurow himself states are unrealistic but nevertheless didactically useful), wages are tied only to jobs and are inflexible. In this case, the return to education arises entirely because it improves a worker's odds of obtaining a high-wage job. In the context of our decomposition, $\beta_{s,e} = 0, \forall s$ and the entire return to education is accounted for by the second summation.[22] Moreover, under

[22] This contrasting of human capital and job competition theories is not new. Thurow himself contrasts his Job Competition models with what he calls wage-competition, and is clearly human capital theory. McGuinness (2006), in an excellent survey of the literature on overeducation posts these two views as extremes on a range of models differentiated by the degree of wage-flexibility assumed. However, the

this view the data offer no clues as to whether the sector permits the productive deployment of human capital, as wages are rigid. All that is knowable is which sectors pay higher wages and which tend to employ the educated.[23]

Identity (4) permits a sector to contribute substantially simply because it employs a lot of educated workers (because *P(s|e)* is big). While it is helpful to identify sectors with this absorptive capacity, we would also like to examine the likely impact on the returns to education of perturbations of the employment structure. In order to do so, we introduce the marginal probabilities of a randomly drawn worker having education *e* (*P(e)*) or working in sector *s* (*P(S)*). Then, applying Bayes rule: $P(s \mid e) \equiv P(e \mid s)P(s)/P(e)$, (5) can be rewritten as:

$$(6) \qquad \beta_e \equiv \sum_{s=1}^{S} P(s)\left\{ \frac{P(e \mid s)}{P(e)} \beta_{e,s} + \overline{\varpi}_{s,e-1}\left[\frac{P(e \mid s)}{P(e))} - \frac{P(e-1 \mid s)}{P(e-1))} \right] \right\} \equiv \sum_{s=1}^{S} P(s)\widetilde{C}_{s,e}$$

Here $\widetilde{C}_{s,e} \equiv C_{s,e}/P(s)$ is the rate of contribution of each job/employee in sector *s* (where each job/employee has probability mass 0). It is the rate at which the unconditional return to education level *e* would increase as employment in sector *s* is increased – holding wages, returns within sectors, the supply of educated workers, and the educational profiles of sector-employees fixed. Thus, increasing sector A's employment share at the expense of sector B's would boost the returns to education level *e* if and only if $\widetilde{C}_{A,e} > \widetilde{C}_{B,e}$. Interpretations of the terms within the brace in (6) are analogous to those in (5), adapted for scale effects.

This basis for comparison is only valid for small perturbations of employment structure. There are two reasons for this. First, the ceteris paribus assumptions are inherently partial equilibrium in nature. Wages are likely to adjust to large structural changes. Second, large changes in sector employment shares cannot be accommodated arithmetically if the educational profiles of sectors, the sector profiles of workers in education groups, and the overall supply of

---

algebraic decomposition of the unconditional returns to education into these two components has, to the best of our knowledge, not been empirically proposed before.

[23] In practice, S will never be large enough, and human capital will never be well measured enough to actually utilize this scheme to test these theories against each other. If wages in jobs are positively correlated with their typical employees' education levels, then the smaller S is relative to the actual number of unique jobs in an economy, the larger the probability of falsely rejecting the Job Competition Model becomes.

educated workers remain constant.[24] Nevertheless, the results do indicate which sectors' employment growth would increase the returns to investments in education.

We also note that this thought experiment assumes that the marginal jobs created within each sector will have the same characteristics as those already existing in the sector. While this is unrealistic, the assumption that a sector can generate more jobs that are similar to those it already provides is intuitively plausible. Moreover, if the new jobs differ from the old jobs, it is not obvious whether they would increase or reduce the sector's average contribution to schooling returns.

For this reason, because the supply of education grew, and because other forces can influence wage structures, the contribution of specific sectors to the returns to schooling may have shifted over time. To develop this idea, note that differencing (5) and rearranging terms, yields estimates of how much of the shift in returns can be attributed to the changing pattern of employment measured at S-sectors of disaggregation:

$$(7) \qquad \Delta\beta_s \equiv \sum_{s=1}^{S} \widetilde{C}_{s,e}^{\,t=0} \Delta P(s) + \sum_{s=1}^{S} P(s)^{t=1} \Delta \widetilde{C}_{s,e} \; ;$$

where the superscripts *t=0* and *t=1* indicate the initial and subsequent years, and the Δ operator takes the change in the variable between years. The first summation is the increase in returns that the observed change in employment shares would have generated, holding the sectors' rates of contribution constant at their initial levels.[25] We label this the *structurally expected change* in returns, and the second summation the *residual change* in returns. Structural change can be said to account for the change in returns if the structurally expected change is similar to the observed change, and the residual is close to zero. Conversely, when the bulk of the change is residual, this implies a change in rates of contribution. This is what is expected if the marginal jobs created within sectors are different to the average jobs that they contained previously.

Finally, we can difference (4) between time periods and rearrange terms to decompose the *shifts in returns* to education over time:

$$(8) \qquad \Delta\beta_e \equiv \sum_{s=1}^{S} \left[P^{t=1}(s \mid e) \Delta\beta_{e,s} + \beta_{e,s}^{t=0} \Delta P(s \mid e) + \gamma_{s,e}^{t=1} \Delta \overline{\varpi}_{s,e-1} + \overline{\varpi}_{s,e-1}^{\,t=0} \Delta\gamma_{s,e} \right];$$

[24] A more precisely defined and therefore arithmetically correct measure of the shift is obtainable by direct simulation if we specify exactly how the limited supplies of workers of different education types will be counterfactually reallocated across sectors. This is certainly doable on the basis of the information gleaned from our decompositions. However it gives rise to too many possible simulation scenarios, the veneer of numeric precision is not empirically appropriate, and the specific simulations could not concord with any specific policy suggestion.

[25] Note that the time subscripts of each pair of terms in (4) could be inverted yielding an equally valid decomposition. The same is true of equation (5) below. In all cases, we examined both decompositions. Where we found no qualitative difference we only report one set of results.

This decomposition says that the unconditional returns to education level *e* will rise whenever any of the four now familiar factors rise.

Implementing these decompositions requires that their basic elements be measured conditional on experience. Post-estimation results from regressions are used for this purpose. For each year: the $\beta_{e,s}$ and $\overline{w}_{s,e-1}$ specific to cohorts are calculated in the usual way from a Mincerian regression which allows for education-experience interaction terms, and all slopes and intercepts to vary by sector; *P(s|e)* and *P(s|e-1)* is calculated from a multinomial logit regression of sector choice on education and experience[26]; *P(s)* is likewise calculated from a multinomial logit regression without experience; and $\overline{w}_{e-1}$ is backed out of the same regressions used to calculated the returns estimated in table 3. Sampling weights are used in all regressions, but owing to the number of regression residuals involved, no attempt is made to control for self selection into sectors.[27]

Before proceeding, it is necessary to ensure that the estimated decompositions do add up to approximate the unconditional returns to schooling measured in Table 3 and their change over time. Figure 3a plots the unconditional return on the horizontal axis, and the added up value of the decomposed return on the Y-axis (for each year, country, level of secondary or tertiary schooling and both 5 and 20 years of experience). All points fall close to the 45° line, indicating that the decomposition accounts for the returns rather well. Figure 3b plots the observed and recomposed change in returns over time, and confirms that the decomposition over time performs well also.

We now turn to the aggregated decomposition results in Tables 6a-c and some specific examples in Tables 7a-c in order to explain, proximately, why there are returns to education. We begin by noting that, with exceptions, the returns to education at most levels do not derive from the improved chances they provide of obtaining jobs in sectors paying wage premiums (i.e. the *Job Competition* effects in Table 6a-c are rather small, while the *Human Capital* effects account for the majority of the aggregated returns). This is not because of an absence of sector wage premia $\left(\overline{\varpi}_{e-1,s}\right)$, which can be rather large. For example, a young Thai US graduate in 2005 earned 28% more than average if they obtained a modern services job and 21% less than average

[26] Logit was used in this version of the paper for practical reasons. Probit estimates are preferred, as they are not "independent of other alternatives", and will be implemented eventually.

[27] Intuitively, if workers with higher econometrically unobserved ability are filtered into sectors paying higher returns (or wage premiums), failure to correct for either should bias our estimates within these sectors of returns (or wage premiums) upwards. The opposite would be true for sectors that employ the less able.

if they remained in agriculture (see the sector-wage premium column in the decomposition of college returns in Table 7). Rather, the result arises because the changes that education brings in the probability of obtaining employment in different sectors are too small to make these premiums important in aggregate (see the adjacent $\gamma_{e,s}$ and $\overline{\varpi}_{e-1,s}\gamma_{e,s}$ columns).

The exceptions to this characterization all come from the modern services sector. The odds of obtaining employment in the sector are significantly improved by the possession of a college degree in every worker-group analyzed, as well as by the possession of a LS or US degree amongst mid-career Thai workers and all Indian workers. Of these groups, younger Filipino college graduates, and older Indian LS and US grads hired into the sector qualify for a sufficiently large base wage premium that job competition effects provide an economically significant boost to returns (notice the sector's large values of $\gamma_{s,e}$, and of $\overline{\varpi}_{s,e-1}\gamma_{s,e}$ relative to $C_{s,e}$ in table 7). These exceptions align quite well with Thurow's (1975) description of how this situation might arise: the Philippines has more unemployment than India; secondary education is more abundant amongst the young than the old; and secondary education is most abundant in the Philippines, followed by Thailand, and then India. It is therefore numerically logical that if employers in modern services shortlist applicants on the basis of degrees, the resulting job queues in the sector would clear by hiring only the college educated in the Philippines, would have to permit some LS and US graduates into mid-career Thai jobs, and would also take on some LS and US graduates into Indian jobs for all experience levels. Indeed, informal interviews of call center managers in both countries revealed a much higher propensity to hire US graduates in India relative to the Philippines, where college degrees are almost a universal prerequisite.

Other than these exceptions at frontier levels of education, the aggregate returns to education derive almost entirely from the fact that education carries returns within sectors. Ranking sectors according to the returns they pay, however, is not easy, other than to note that agricultural employment yields low returns to secondary education.

We next ask why the returns have shifted, and start with secondary education. Table 6 shows that structural change predicts more or less none of the changes in the returns to education (i.e. the structurally expected changes in returns are small, and the residual changes are big). In other words, the rates of contribution have shifted significantly.

Turning first to secondary education: Table 6 shows that in every country, returns to middle, lower secondary and (with a few more exceptions) upper secondary education declined because rates of contribution of almost every sector to the returns declined. Moreover, this trend is more pronounced amongst younger workers. It also shows that, especially for the young,

falling returns within sectors also account for most of the decline in sectoral contributions in every sector, in every country. This group of findings is highly suggestive that an across the board change in market conditions was responsible for the decline in secondary returns. Combined with other findings in this paper, specifically: the fact that returns fell as secondary educated workers became relatively common; the crude calculations presented earlier showing secondary education levels rising much faster than changing employment structure would appear to warrant; and the fact that the change in returns more severely affected young secondary graduates (who experienced a larger relative supply increase than the old); these observations appear consistent with the view that the returns to lower secondary education declined in large measure because secondary educated workers became less scarce as the structure of employment did not shift adequately to absorb the increased supply at prevailing relative wages. Under this view, the relative buoyancy of the returns for older workers in the face of this supply shift reflects their imperfect substitutability with younger workers.

The decompositions also help to determine the proximate causes of the shifts observed in returns to tertiary education. Table 6 shows that the modern services sector contributed to the returns to tertiary education at the highest rate in every year and country. Table 7 shows that in all countries and years returns to college within the modern services sector account for around 3/4 of the return to tertiary education (i.e. $P(ModServ, Coll)\beta_{ModSer,Coll} \approx 0.75\beta_{Coll}$). This is because, notwithstanding the sector's low overall employment share $(P(s))$, it hires the large majority of college graduates $(0.5 < P(ModServ \mid College) < 0.85)$, in all countries, and pays a modest wage-premium.

Older college graduates are also around 20-25 percentage points more likely to work in the sector. Thus, changes in the sector (skills biased technical change, for instance) should have a bigger impact on the returns to college for older workers than younger workers.

Against this employment structure, the returns to college within the modern services sector rose significantly over our sample period for every cohort-country group that saw the overall tertiary returns rise. Thus, Table 7 shows that for these groups changes *within* modern services account for almost the entire change in the aggregate return to tertiary education ($\Delta C_{ModServ,College} \approx \Delta\beta_{College}$ if $\Delta\beta_{College} > 0$). It also shows that roughly the whole change in the sector's contribution occurred because the returns to college education rose within the sector.

As noted earlier, there are only two cases where tertiary returns fell - young Thai and Filipino workers. Table 7 shows that the reasons for this are quite distinct. The probability of a young college graduate working in modern services fell by almost 10 percentage points in

Thailand and by 6 percent in the Philippines. In Thailand, this was compounded by a 7.6 percentage point fall in the returns to college within modern services. Moved by these two changes, the entire drop in returns to tertiary education amongst young Thai workers can be accounted for by changes in modern services.[28]

In contrast to their Thai counterparts, with modern services jobs growing very little and manufacturing employment ebbing, the surge of college graduates in the Philippines was redirected exclusively into traditional services. Traditional services' employment share amongst young college grads grew 8 percentage points to 29%. Meanwhile, the returns to college within traditional services crashed by a precipitous 20 percentage points.[29] This crash in college returns within traditional services accounts for most of the decline in returns to college for young Filipinos. Their mid-career peers in the traditional services sector did not experience this substantial decline in tertiary returns. Perhaps seniority acted as a shield here too.

To summarize the behavior of college returns - wherever returns they rose, they did so almost exclusively because the relative wages of college-educated modern services workers rose. For young Thai workers they also fell mostly because the returns in this sector fell. But they also fell in part because getting a job in this sector became more difficult, and workers unable to do so were pushed into lower return sectors. In the Philippines, however, even though the returns in modern services rose slightly, a rush of college grads into traditional services was met with a large decline in returns within that sector.

Finally, we compare the roles of different sectors in promoting returns to education. Clearly more modern services jobs, if they could be generated, would increase returns to most levels of education, as modern services jobs have the highest rates of contribution. However, as modern services seem to increase employment slowly, we focus on manufacturing and traditional services. In Thailand, which has both grown and modernized its manufacturing sector, the likely influence on the returns to education of tweaking the employment structure is small. This is because the rates of contribution do not differ substantially between manufacturing and traditional services, perhaps reflecting a reasonably efficient labor market at work. In India, LS returns in

[28] From Table 7, the share of the decline in returns accounted for by modern services is ((0.158-0.111)/(0.299-0.259)) which is greater than one.

[29] Two hints regarding the likely cause of this crash are available. First – college graduates became less scarce. Second – our data show a notable rise in the share of managers and supervisors in the Philippines, and the Commission on Higher Education reports that in 2002-2003, 28% of new college graduates had degrees in business administration or related areas. It appears likely that faced with a rise in the numbers of such candidates, menial positions were recategorized to fit these educational profiles. Discussions with employers confirmed this impression, and the Bureau of Labor and Employment Statistics' own Occupational Wages Survey from June 2004 shows that practically every supervisory position in the sector now requires a college degree.

manufacturing in 1993 exceeded returns in traditional services by a reasonable margin. However, over the past 11 years, India's manufacturing sector has developed a very large number of new jobs, most of which went to workers with very little education working in the informal sector.[30] Thus the fortunes of LS graduates have become increasingly divorced from the manufacturing sector.

In contrast, across age groups and years, the rate of contribution of manufacturing to the LS returns in the Philippines is higher than any other sector. The immediate implication is that in this country more manufacturing jobs and less traditional service sector jobs would increase the returns to education.

Finding that an increase in Filipino manufacturing employment would raise secondary returns, however, is on its own an insufficient basis for concluding that such a perturbation of employment structure would increase economic output. After all, the Mincerian return is nothing more than a relative price, and as such, could rise because the new employment structure results in less educated workers being paid less. Under the usual wage-equals-marginal-productivity assumptions, the impact on output of such a shift would be negative. Fortunately, Tables 7a-c show that this need not be a concern. Traditional service jobs pay lower wages than manufacturing at every education level. Thus, growth in Filipino manufacturing employment would increase secondary returns because it would lift the wages of the more educated, not depress those of the less educated.

VIII. Discussion

Education attainment rose in the Philippines, India and Thailand over the past 10-13 years. At the same time, returns to secondary education fell everywhere; returns to tertiary education rose for mid career workers in all countries and for the young in India; and tertiary returns fell in the Philippines and Thailand. The data available do not permit reasonable conclusions to be drawn on whether school quality or student preparedness shifted over the period, and therefore whether these trends have a role to play in explaining shifting returns. We have made the case that declining returns resulted from supply expansions which pushed more educated workers into employment structures that were changing slowly. Thus secondary returns fell economy-wide. In contrast, we have also shown that rising tertiary returns can be accounted for almost entirely by an increase in the returns to tertiary education within the modern services sector. While tertiary returns typically rose in manufacturing as well, most college graduates work in modern services, so it is this sector's hiring practices that mainly drive college returns.

[30] Mehta and Mukhopadyay (2007) present evidence on this derived from the current dataset.

These results are not supportive of the notion that countries can target widely distributed income growth through expansions in higher education and services. For employment in the modern services sector is not very elastic, and the sector has historically been a more important source of employment for midcareer college graduates than youth. New educated workers have therefore increasingly found employment in low wage jobs outside the sector (the Philippines) or within the sector (Thailand). The composition of services employment in all three countries has shifted in favor of traditional activities, which historically have not relied heavily on an especially educated workforce.

This said, our results do not rule out the possibility that services-led *aggregate* growth strategies can boost incomes in other sectors of the economy through expenditure multipliers. Whether they have historically done so or not varies across countries. Felipe et al (2007) show that in the Philippines manufacturing output growth is much more highly associated with growth in the rest of the economy than is services growth. This is true in India as well, though the differences are smaller. The comparison is reversed in Thailand. Felipe et al also find employment elasticities of services output growth of 0.59 in Thailand, and 1.01 in the Philippines, implying rapid labor productivity growth in Thai services, but none in the Philippines. These results comport well with ours: the Philippines needs to shift out of services employment; it is good news that India is industrializing; and Thailand's employment structure appears better-balanced.

The results have fairly strong country-specific policy implications. First, they suggest that expansions in the number of educated workers, especially the college-educated, can rapidly run into diminishing returns, as high return jobs grow more slowly. Other authors have found college premiums to be the leading contributor to rising Indian wage inequality, and there is a consensus that this growing inequality is causing social unrest. Reduced restrictions on university fees (accompanied by scholarship programs) and judicious reductions in college regulation should result in more colleges being set up (the demand for additional seats is certainly there), and more graduates. Our results suggest this will yield reductions in wage differentials between college and high-school graduates – as has already happened in the Philippines and Thailand. This result is not trivial, because endogenous growth models do hold out the possibility that returns to education might not exhibit diminishing returns. Our results for young Filipinos and Thais suggest strongly that they do, at least in so far as private wage returns are concerned.

Second, also in India, recent concerns regarding skills-biased technical change and the surprisingly skills- and capital-intensive profile of Indian manufacturing (see Kochar et al 2006) appear somewhat misplaced. Of late, Indian manufacturing has generated mostly low-skill, low

productivity jobs in the informal sector. These jobs do not make much of an impression in total value added as productivity is low, or, obviously, in formal sector employment data. This explains why the contributions of manufacturing to the returns to secondary education have been falling. Distinctions between our results and theirs may arise because the UNIDO data they use do not reflect informal manufacturing employment adequately.

Moreover, *if* rising convexity in the Mincerian profile and higher utilization of educated workers imply the influence of skills biased technical changes[31], then it is much easier to see which technologies are likely to be responsible. Our returns-decompositions show that the source of skills biased technical change as a driver of inequality is likely to reside almost exclusively in the modern services sector. Technology changes in manufacturing have not affected inequality much through tertiary returns thus far, as manufacturing employs few tertiary educated workers. However, this situation is changing. Given large recent changes in the composition of modern services with the advent of new computing and outsourcing technologies, the root causes of much of these changes begin to seem substantially less mysterious. In this respect, Autor et al's (1998) analysis of the role of computers in explaining growing US wage inequality suggests similarities across developed and developing economies.

Third, the Philippines government will need to redouble its efforts to support the manufacturing sector. Services-led growth will probably yield more rapidly decreasing returns to education as the composition of services continues to shift towards the traditional. In this regard, tackling physical infrastructure shortfalls, bringing down prohibitive electricity prices and reducing transactions costs arising from rent seeking especially for manufactured goods reliant on external markets continue to be the key policy challenges.

Before concluding, it is worth touching on a question that in part motivated our analysis. Pritchett (1996), amongst others[32], finds a negative and significant relationship between growth in countries' average education levels and their per-capita output. Unable to reconcile the negative social rate of return to education implied by this macroeconomic result with the large positive private returns documented by numerous microeconomic studies, Pritchett asks "Where has all the education gone?"

There are essentially two responses to Pritchett's paradox in the literature. First, other authors have argued that macroeconomic observation results from measurement errors and other data problems – in effect that the evidence that social returns are smaller than private returns is

[31] Kijima (2006) for example, presumes that it does. However, other explanations of these trends also exist.
[32] Benhabib and Spiegel (1994) and Islam (1995).

invalid.[33] When we have argued that shifts in employment structure that increase the returns to education will be good for growth, we have assumed that increasing private returns will be accompanied by increased social returns. The implications for understanding economic growth of this comparative statics exercise, we must acknowledge, are not quite as clear if they are not.

Second, Pritchett suggests that some of the high private returns may be derived from activities that do not yield social returns (i.e. from rent-seeking). Our study, which asks the related question – "Where have all the educated workers gone?" provides a basis for considering this view.

First, we doubt that illegal rents are likely to have driven much of the calculated returns, both because the sliver of society receiving bribe money is probably quite thin, and because such moneys are unlikely to be reported on labor force surveys. This being said, socially unproductive but legal activities do provide legitimate employment for very large numbers. For example, the poor state of transport planning in the Philippines has contributed to a proliferation of drivers. Combined with lax emissions controls this has raised the marginal productivity of maids (to clean homes that are daily coated in soot released from the tailpipes of the drivers' vehicles, and undertake shopping trips that are take too long due to the excessive number of cars on the road). Indeed, using the same dataset as this study, Mehta and Felipe (2007) find that maids' share of female non-agricultural employment in the Philippines rose from 10.3% to 11.6%, while drivers' share of male non-agricultural employment rose from 14.4% to an absurd 17.5% between 1991 and 2004. However the study also finds that returns to schooling in these professions are an abysmal 0-2% per year of schooling. Despite this, the education levels in these professions have climbed. This squares perfectly with the results in the current study, which show that returns within Filipino traditional services have fallen, presumably reflecting a proliferation of low return jobs. In other words, if educational attainment growth in a country does not deliver a social return, and this is due to misallocation, this is likely to be accompanied by growth in low quality jobs and private returns are likely to fall over time. This is a testable, near-necessary condition (at least practically) of Pritchett's theory.

Finally, one conundrum raised by this study, is that despite having a more educated domestic labor force and lackluster employment growth in education-intensive sectors, the returns to education are higher in the Philippines than in the other two sample countries. Many local commentators attribute this to a high level of credentialism which arises as a means of reducing the cost of sorting large pools of applicants for scarce jobs. While the few rigorous studies seeking evidence of credentialism have not found it (Glewwe, 2002; Hanushek and Woessman

[33] See Krueger and Lindahl (2001) and Hanushek and Woessman (2007).

2007), they do not seek it in partitions of the labor market. Our results on job competition effects hint that any role for job rationing mechanisms, including screening, is likely to be localized to portions of the education and job distribution. Studies analogous to those surveyed by Glewwe (2002), but trained on these specific levels of schooling and economic sectors, could be helpful in clarifying these matters.

In the end, this study yields four primary lessons. First, education expansions do not always increase dynamism in job creation and upgrading. Second, as education levels rise, policies expanding access to education lose traction on the wage distribution. Third, this loss of traction is exacerbated when job upgrading is poor. While such statements may seem obvious, much energy has been poured into arguments to suggest that technological progress has increased the service sector's actual and potential contribution to job upgrading. Our fourth result rules this out: None of our countries' experiences suggest that services-led job-creation strategies can contribute to widespread job upgrading, although the sector's impact on the welfare of small and inelastic group of modern service workers has been enormous. Governments seeking to reduce inequality and poverty will therefore need to pay careful attention to constraints on dynamism in labor markets. In a second best world these constraints need not lie in the labor market itself. Given that modern services jobs don't grow fast, and that traditional service jobs by their very nature don't offer great scope for upgrading, such dynamism will have to derive greater momentum from manufacturing. A variety of innovative new studies have argued that the potential for output growth through manufacturing upgrading is potentially far larger than previously believed (Rodrik, 2006). Old lessons, it would appear, bear repeating.

References

Autor, D., L. Katz & A. Krueger. 1998. Computing inequality: have computers changed the labor market? *Quarterly Journal of Economics* 113, 1169-1213.

Banerjee, A. 2006. The paradox of Indian growth: A comment on Kochar et al. *Journal of Monetary Economics*, 53, 1021-1026.

Barro, R. J. and J-W Lee. 2000. International data on educational attainment: updates and implications. Center for International Development Working Paper 42, Harvard.

Becker, G. 1964. *Human Capital: A theoretical and empirical analysis with special reference to education.* New York: Columbia University Press.

Bedi, A.S. and Gaston, N. (1997). Returns to Endogenous Education: The case of Honduras. *Applied Economics*, 29, 519-28.

Berman, E., J. Bound and Z. Griliches (1994). Changes in the Demand for Skilled Labor within U.S. Manufacturing: Evidence from the Annual Survey of Manufacturers. *Quarterly Journal of Economics* 109(2): 367-397.

Bingley, P., Christensen, K. & Walker, I. (2005). Twin-based Estimates of the Returns to Education: Evidence from the Population of Danish Twins. Aarhus Business School, Department of Economics Working Paper.

Booth, Anne. December 1999. Education and Economic Development in Southeast Asia. Myths and Realities. *ASEAN Economic Bulletin*, Vol. 16, No. 3, 290-306.

Card, D. 2001. Estimating the Return to Schooling: Progress on some persistent econometric problems. *Econometrica* 5:1127-1160.

Esquivel, G. & J.A. Rodriguez-Lopez. 2003. Technology, trade and wage inequality in Mexico before and after NAFTA, *Journal of Development Economics*, 72, 543-565.

Felipe, J. & G. Estrada. 2007. Benchmarking developing Asia's manufacturing sector. Asian Development Bank Working Paper 101. Manila.

Felipe, J., M. Leon-Ledesma, M. Lanzafame, & G. Estrada. 2007. Sectoral engines of growth in developing Asia: stylized facts and implications. Economics and Research Department Working Paper 107 (Asian Development Bank, Manila).

Fields, G. 2003. Accounting for Income Inequality and Its Changes: A New Method with Application to the Distribution of Earnings in the United States. *Research in Labor Economics* 22:1-38.

Freeman, R.B. (1975). Overinvestment in College Training? *Journal of Human Resources* 10(3): 287-311.

Friedman, T. 2007. *The world is flat: A brief history of the 21st century*. 1st Picador Edition. Picador, New York.

Glewwe, Paul. 2002. Schools and Skills in Developing Countries: Education Policies and Socioeconomic Outcomes. *Journal of Economic Literature*, Vol. 40, No. 2, 436-482.

Gundlach, E. & Woessmann, L. 2001. The fading productivity of schooling in East Asia. *Journal of Asian Economics*, 12: 401-417.

Hanushek, Eric A. and Ludger Woessmann. 2007. The Role of School Improvement in Economic Development. *National Bureau of Economic Research Working Paper 12832*.

Hasan, R. 2007. Inequality in Asia, in *Key Indicators 2007,* (Asian Development Bank)*.*

Islam, Nazrul. 1995. Growth Empirics: A Panel Data Approach. *Quarterly Journal of Economics*, Vol. 110, No. 4, 1127-1170.

Jalan, J. & Glinskaya, E. 2003. Improving primary school education in India: An impact assessment of DPEP-Phase I. Mimeo.

Kaldor, N., 1967. *Strategic factors in economic development*. New York State School of Industrial and Labor Relations, Cornell University: Ithica, New York.

Katz, L. & D. Autor. 1999. Changes in the wage structure and earnings inequality. In: Ashenfelter, O. & D. Card (eds.) *Handbook of Labor Economics*. Elsevier, Amsterdam, 1463-1555.

Katz, L.F. & K.M. Murphy. 1992. Changes in relative wages, 1963-1987: supply and demand factors. *Quarterly Journal of Economics*, 107(1):35-78.

Kochar, K., U. Kumar, R. Rajan, A. Subramanian & I. Tokatlidis. 2006. India's pattern of development: What happened, what follows? *Journal of Monetary Economics* 53, 981-1019.

Krueger, A. and M. Lindahl. 2001. Education for Growth: Why and for whom? *Journal of Economic Literature*, Vol. 39, No. 4, 1101-1136.

Maglen, L. & R. Manasan. 1998. *Education costs and financing in the Philippines*. Asian Development Bank, Manila.

McGuinness, Seamus, 2006. Overeducation in the Labour Market. *Journal of Economic Surveys,* Vol. 20, No. 3, 387-418.

Mehta, A. & H. Mukhopadyay, 2007. India. In *Asian Economic Outlook 2007*. Asian Development Bank, Manila.

Nguyen, B.T., J.W. Albrecht, S. Vroman, & M.D. Westbrook. 2007. A quantile regression decomposition of urban-rural inequality in Vietnam. *Journal of Development Economics* 83(2): 466-90.

Park, A., X. Song, J. Zhang, and Y. Zhao. 2004. The growth of wage inequality in urban China, 1988 to 1999. Mimeo. Dept. of Economics, University of Michigan-Ann Arbor.

Pratham. 2005. Annual Status of Education Report. Pratham Resource Center, Mumbai.

Prina, M. 2007. Human capital policies and development: the Philippines case since 1974. Dissertation. Universita' Cattolica Del Sacro Cuore, Milano.

PROBE Team. 1999. *Public Report on Basic Education in India*. Oxford: Oxford University Press.

Pritchett, Lant. 1996. Where Has All the Education Gone? *World Bank Policy Research Working Paper 1581*.

Quisumbing, L. 1989. The DECS bilingual education policy. In M.C. Sutaria, J.S. Guerrero and P.M. Castano (eds.) *Philippine education: vision and perspectives*. National Bookstore Inc., Manila.

Rodrik, D. 2006. Industrial development: stylized facts and policies. (in *Industrial Development for the 21st Century*. United Nations Department of Economic and Social Affairs*)*.

Savanti, M.A. and H.A. Patrinos. 2005. Rising returns to schooling in Argentina, 1992-2002: Productivity or credentialism? World Bank Policy Research Working Paper 3714.

Thurow, L.C. (1975). *Generating Inequality*. New York: Basic Books.

World Bank, Department for International Development (DFID) and Asian Development Bank (ADB). 2006. *Nepal: Resilience amidst conflict: An assessment of poverty in Nepal, 1995-96 and 2003-04*. Report No.34834-NP. World Bank, Washington, DC.

World Bank. 2003. *A Review of Educational Progress and Reform in the District Primary Education Program (Phases I and II)*. Washington, DC.

Yamauchi, F. 2005. Why do schooling returns differ? Screening, private schools, and labor markets in the Philippines and Thailand. *Economic Development and Cultural Change* 53, 959-981.

Appendix I: Description of Datasets

Country	India	Philippines	THAILAND
Numbers of observations	▪ Labor force : ▪ Employees :	▪ Labor force : ▪ Employees :	▪ Labor force : ▪ Employees :
Sampling Scheme	▪ Stratified Multi-stage Sampling ▪ First Stage Units (FSUs) : 1991 census villages in the rural sector and Urban Frame Survey blocks in the urban sector ▪ Ultimate Stage Units (USUs) : households in both sectors	▪ Primary strata: 17 regions of the country ▪ Further stratification within region using geographic groupings (provinces and cities) ▪ Primary Sampling Units (PSUs) : barangays or combination of barangays with at least 500 households ▪ PSUs further subdivided into enumeration areas (EAs - areas with about 150 households) ▪ Households selected within sampled EAs	▪ Stratified Two - Stage Sampling ▪ Strata: Provinces. There were altogether 76 Strata. Each stratum was divided into two parts, namely municipal areas and non-municipal areas ▪ Primary and secondary sampling units: **Blocks** for municipal areas, **villages** for non-municipal areas
Sample Period	▪ July 1993 – June 1994 ▪ Jan-June 2004	▪ Aug-October 1991 ▪ Aug-October 2004	▪ Aug-October 1995 ▪ Aug-October 2005
Industrial Classification	▪ 1993/94 – 3-digit Revised National Industrial Classification of all Economic Activities 1987 ▪ 2004 – 5-digit National Industrial Classification 1998 based on ISIC Rev. 3	▪ 1991 - 3-digit 1977 Philippine Standard Industrial Classification based on ISCO 68 ▪ 2004 - 2-digit 1994 Philippine Standard Industrial Classification based on ISCO 88	▪ 1995 - 4-digit Thailand Standard of Industrial Classification 1972 based on ISIC Rev. 1 (1958) ▪ 2005 - 4-digit TSIC 2001 based on ISIC Rev. 3 (1989)
Occupational Classification	3-digit National Classification of Occupations 1968	▪ 1991 - 3-digit 1977 Philippine Standard Occupational Classification based on ISIC 68 ▪ 2004 - 2-digit 2003 Philippine Standard Occupational Classification based on ISIC Rev. 3	▪ 1995 - 4-digit based on ISCO-58 ▪ 2005 - 4-digit based on ISCO-88 ▪ 1995 and 2005 datasets converted to ISCO 68 for concordance
Computation of Wages	Cash and in-kind wage and salary earnings per week of employed persons	Basic pay per day in cash covering only salaries and wages of employed persons	Wage questions differ across years. All wages converted to hourly wages.
Treatment of Migrant Workers	▪	▪ HH members away at the time of visit and are not expected to return to their place of residence within 1 year or less are excluded.	▪

Appendix II: Sector Classifications

5 Sector Classification	India – 25 sectors	Philippines – 23 sectors	Thailand – 23 sectors
Agriculture (including Fishing, Hunting and Forestry)	Agriculture, Hunting & Forestry	Agriculture, Hunting & Forestry	Agriculture, hunting & forestry
	Fishing	Fishing	Fishing
Non-manufacturing	Mining & Quarrying	Mining & Quarrying	Mining and Quarrying
	Utilities	Electricity, Gas & H2O Supply	Electricity, Gas and Water Supply
	Construction	Construction	Construction
Manufacturing	Manufacturing	Manufacturing	Manufacturing and Repair
Traditional Services	Retail	Wholesale Trade	Retail Trade
	Transportation	Retail Trade	Transportation
	Household and Personal Services	Transportation	Personal and HH Services
	Hotels & Restaurants	Recreational & Cultural Services	Hotels and Restaurants
	Social Work & Other Community Services	Personal and HH Services	Wholesale Trade
	Wholesale Trade	Hotel & Restaurants	Recreational and Cultural and Cultural Srvices
	Recreational & Cultural Services	Sanitary & Similar Services	Warehousing
			Sanitary and Similar Activities
Modern Services	Warehousing	Communications	Public Administration and Defense
	Sanitary & Similar Services	Banking	Education, Scientific and Research
	Repair	Nonbank Financial Intermediation	Health and Medical Services
	Public Administration & Defense	Insurance	Social Work, and other Social and Community services
	Education, Scientific & Research	Real Estate	Communication
	Health & Medical	Business Services	Financial intermediation
	Communications	Public Administration & Defense	Real Estate
	Financial Intermediation	Education	Business Activities incl renting
	Real Estate	Health, Social & Community services, nec	Insurance
	Business Services	Extraterritorial Organization;	
	Insurance		
	Extra-territorial Org & Bodies		

Table 1. Cumulative Distributions of Education Attainment Amongst Workers by Country, Year

Philippines		**Workers Age 25-60**		**Workers Age 25-30**	
Education Level	Grade	1991	2004	1991	2004
None		3.4	2.1	1.4	1.5
Incomplete Elementary		23.5	16.9	13.1	11.3
Elementary	6	47.2	33.7	31.1	22.8
Incomplete L. Secondary		58.3	45.5	43.5	34.8
Lower Secondary	10	76.2	69.4	66.7	61.8
Incomplete College		86.1	83.6	80.6	79.0
College/Grad. School	14	100.0	100.0	100.0	100.0
Millions of workers		17.80	26.22	4.16	6.24
B&L's Average Years of Schooling (Age 25+)		1990 7.06	1995 7.33	2000 7.62	

Thailand		**Workers Age 25-60**		**Workers Age 25-30**	
Education Level	Grade	1995	2005	1995	2005
None		4.2	3.2	1.8	1.6
Incomplete Elementary		66.9	41.1	34.9	4.6
Elementary	6	78.6	64.0	68.2	39.4
Lower Secondary	9	85.6	74.9	79.0	57.7
Upper Secondary	12	91.5	85.2	90.2	76.1
Diploma*	14	94.1	88.9	93.8	83.5
College/Grad. School	16	100.0	100.0	100.0	100.0
Millions of workers		23.77	28.96	5.99	5.86
B&L's Average Years of Schooling (Age 25+)		1990 5.35	1995 5.73	2000 6.10	

India		**Workers Age 25-60**		**Workers Age 25-30**	
Education Level	Grade	1993	2004	1993	2004
None		61.3	49.2	55.0	39.7
Elementary	5	72.4	62.4	67.0	53.3
Middle School	8	82.9	77.5	79.6	72.8
Lower Secondary	10	90.3	86.6	88.1	84.1
Upper Secondary	12	94.2	91.6	93.2	90.6
College/Grad.School	15	100.0	100.0	100.0	100.0
Millions of workers		212.9	267.4	59.6	70.4
B&L's Average Years of Schooling (Age 25+)		1990 3.68	1995 4.16	2000 4.77	

*The Thai schooling stream splits at upper secondary school, with students having the option of taking vocational or traditional US degrees, followed by either a 1-2 year diploma, 3-4 year college degree, or both. For purposes of this paper, we pool vocational and traditional US graduates. In calculating the cumulative distributions for this table (but not for estimating returns) we treat diplomas as incomplete college degrees.

Table 2

F-tests on the Independence of the Returns to Education and Experience

Year	F-stat	Numerator df	Denominator df	P-value
India				
1993	162.17	5	77339	0.00
2004	177.92	5	39830	0.00
Philippines				
1991	33.8	6	23130	0.00
2004	6.6	6	33773	0.00
Thailand				
1995	51.07	5	36109	0.00
2005	156.19	5	47401	0.00

Table 3

Simple Returns to Education by Work Experience

Education level	Experience=5			Experience=20		
India	**1993**	**2004**		**1993**	**2004**	
Middle School	0.061	0.057		0.105	0.102	
Lower Secondary	0.139	0.068	**	0.269	0.211	**
Upper Secondary	0.192	0.120	**	0.149	0.155	
College	0.215	0.324	**	0.177	0.276	**
Philippines	**1991**	**2004**		**1991**	**2004**	
Lower Secondary	0.176	0.103	**	0.156	0.093	**
College	0.313	0.274	**	0.261	0.303	**
Thailand	**1995**	**2005**		**1995**	**2005**	
Lower Secondary	0.070	0.019	**	0.152	0.100	**
Upper Secondary	0.150	0.069	**	0.159	0.141	*
Diploma	0.194	0.140	**	0.202	0.250	**
College	0.310	0.287	*	0.248	0.363	**

** fall in annualized returns significant at 5% level,
* fall statistically significant at 10% level
Standard errors (not shown) were calculated using the delta method.

Table 4
Shift-share Analysis by 5 Sectors Unemployment
(Education Level: At least lower secondary)

Education Levels	Employment Share ($\Sigma\alpha_{s,t} \equiv 1$)			Intensity ($\lambda_{e,s,t}$)			Decomposition		Sectoral Contribution		
India	**1993**	**2004**	**Change**	**1993**	**2004**	**Change**	**Between ($\Sigma\lambda\Delta\alpha \equiv A$)**	**Within ($\Sigma\alpha\Delta\lambda \equiv \Lambda$)**	**Point ($\Sigma\Delta\Omega_{e,s,t} \equiv \Delta\lambda_{e,t}$)**	**Percent ($\Delta\Omega_{e,s,t}/\Delta\lambda_{e,t}$)**	**Relative to Emp. Share ($\Delta\Omega_{e,s,t}/\alpha_{e,t-1}$)**
Agriculture	0.587	0.502	-0.085	0.071	0.105	0.035	-0.006	0.017	0.011	0.232	0.02
Manufacturing	0.105	0.119	0.014	0.207	0.236	0.028	0.003	0.003	0.006	0.126	0.06
Non-manufacturing	0.048	0.075	0.027	0.143	0.142	-0.002	0.004	0.000	0.004	0.077	0.08
Traditional Services	0.141	0.162	0.021	0.235	0.288	0.052	0.005	0.008	0.013	0.273	0.09
Modern Services	0.081	0.089	0.009	0.653	0.697	0.043	0.006	0.004	0.010	0.194	0.12
Unemployed	0.038	0.052	0.014	0.423	0.405	-0.019	0.006	-0.001	0.005	0.099	0.13
Aggregate	**1.000**	**1.000**	**0.000**	**0.172**	**0.222**	**0.049**	**0.017**	**0.032**	**0.049**	**1.000**	
Philippines	**1991**	**2004**	**Change**	**1991**	**2004**	**Change**	**Between**	**Within**	**Point**	**Percent**	**Relative to Emp. Share**
Agriculture	0.399	0.315	-0.084	0.180	0.250	0.070	-0.015	0.022	0.007	0.056	0.02
Manufacturing	0.098	0.087	-0.011	0.518	0.634	0.116	-0.006	0.010	0.004	0.035	0.04
Non-manufacturing	0.054	0.055	0.001	0.402	0.496	0.093	0.000	0.005	0.005	0.044	0.09
Traditional	0.259	0.319	0.059	0.467	0.609	0.142	0.028	0.045	0.073	0.596	0.28
Modern Services	0.100	0.113	0.013	0.904	0.917	0.013	0.012	0.001	0.014	0.111	0.14
Unemployed	0.090	0.112	0.022	0.595	0.651	0.056	0.013	0.006	0.019	0.157	0.21
Aggregate	**1.000**	**1.000**	**0.000**	**0.409**	**0.532**	**0.122**	**0.032**	**0.090**	**0.122**	**1.000**	
Thailand	**1995**	**2005**	**Change**	**1995**	**2005**	**Change**	**Between**	**Within**	**Point**	**Percent**	**Relative to Emp. Share**
Agriculture	0.503	0.406	-0.097	0.072	0.193	0.120	-0.007	0.049	0.042	0.232	0.08
Manufacturing	0.136	0.166	0.030	0.326	0.544	0.217	0.010	0.036	0.046	0.254	0.34
Non-manufacturing	0.064	0.057	-0.007	0.235	0.327	0.092	-0.002	0.005	0.004	0.019	0.06
Traditional Services	0.199	0.243	0.045	0.317	0.481	0.165	0.014	0.040	0.054	0.301	0.27
Modern Services	0.087	0.114	0.026	0.804	0.869	0.065	0.021	0.007	0.029	0.159	0.33
Unemployed	0.011	0.014	0.003	0.311	0.692	0.380	0.001	0.005	0.006	0.035	0.55
Aggregate	**1.000**	**1.000**	**0.000**	**0.232**	**0.413**	**0.180**	**0.037**	**0.143**	**0.180**	**1.000**	

Table 5

Shift-share Analysis Between and Within Sectors and Occupations, by Education Levels

Education Levels	3 Sectors + Unemployment.		5 Sectors + Unemployment.		Many sectors + Unemployment		Occupation	
No. of Sectors (*S*)					25+1		102+1	
India	% **Between**	% **Within**	% **Between**	% **Within**	% **Between**	% **Within**	% **Between**	% **Within**
Middle	0.231	0.769	0.212	0.788	0.236	0.764	0.243	0.757
Lower Secondary	0.388	0.612	0.351	0.649	0.41	0.59	0.377	0.623
Upper Secondary	0.342	0.658	0.307	0.693	0.396	0.604	0.314	0.686
College	0.303	0.697	0.272	0.728	0.378	0.622	0.291	0.709
No. of Sectors (*S*)					23+1		27+1	
Philippines	% **Between**	% **Within**	% **Between**	% **Within**	% **Between**	% **Within**	% **Between**	% **Within**
Sec	0.293	0.707	0.264	0.736	0.282	0.718	0.284	0.716
College	0.684	0.316	0.548	0.452	0.429	0.571	0.760	0.240
No. of Sectors (*S*)					23+1		64+1	
Thailand	% **Between**	% **Within**	% **Between**	% **Within**	% **Between**	% **Within**	% **Between**	% **Within**
LowSec	0.187	0.813	0.208	0.792	0.207	0.793	0.22	0.78
UpSec	0.202	0.798	0.224	0.776	0.218	0.782	0.237	0.763
Diploma	0.223	0.777	0.252	0.748	0.227	0.773	0.215	0.785
College	0.198	0.802	0.229	0.771	0.203	0.797	0.125	0.875

Table 6a: India: Returns Decompositions

		5 years of experience					20 years of experience				
			Rates of Contribution $(\widetilde{C}_{s,e})$					Rates of Contribution $(\widetilde{C}_{s,e})$			
	Identity (6)	P(s)	Middle	LS	US	College	P(s)	Middle	LS	US	College
	Agriculture	0.397	0.024	0.056	0.020	0.034	0.494	0.038	0.115	0.049	0.032
	Manufacturing	0.183	0.122	0.215	0.317	0.211	0.140	0.188	0.271	0.171	0.122
	Non-Manufacturing	0.099	0.109	0.011	0.007	0.267	0.097	0.066	0.172	0.049	0.035
	Trad. Services	0.154	0.087	0.135	0.359	0.087	0.123	0.146	0.187	0.146	0.110
	Modern Services	0.166	0.048	0.248	0.383	0.679	0.147	0.185	0.712	0.538	0.816
1993	*Recomposed Return*	1.000	*0.064*	*0.125*	*0.186*	*0.205*	1.000	*0.096*	*0.239*	*0.150*	*0.170*
	Identity (5)			Total contribution					Total contribution		
	Human Capital ($\sum P(s\|e)\beta_{s,e}$)		0.061	0.110	0.171	0.190		0.068	0.165	0.115	0.149
	Job Competition ($\sum \omega_{s,e}\, \gamma_{s,e}$)		0.003	0.015	0.015	0.015		0.028	0.073	0.035	0.021
	Recomposed Return		*0.064*	*0.125*	*0.186*	*0.205*		*0.096*	*0.239*	*0.150*	*0.170*
			Rates of Contribution $(\widetilde{C}_{s,e})$					Rates of Contribution $(\widetilde{C}_{s,e})$			
	Identity (6)	P(s)	Middle	LS	US	College	P(s)	Middle	LS	US	College
	Agriculture	0.269	0.038	0.043	0.030	0.059	0.376	0.050	0.109	0.098	0.037
	Manufacturing	0.214	0.086	0.085	0.090	0.328	0.153	0.098	0.270	0.116	0.171
	Non-Manufacturing	0.154	0.045	-0.018	0.036	0.131	0.155	0.082	0.054	0.057	0.070
	Trad. Services	0.200	0.090	0.097	0.126	0.138	0.164	0.148	0.226	0.106	0.130
	Modern Services	0.162	0.044	0.140	0.287	0.951	0.153	0.148	0.501	0.522	1.237
2004	*Recomposed Return*	1.000	*0.061*	*0.069*	*0.105*	*0.288*	1.000	*0.093*	*0.204*	*0.160*	*0.261*
	Identity (5)			Total contribution					Total contribution		
	Human Capital ($\sum P(s\|e)\beta_{s,e}$)		0.059	0.060	0.087	0.263		0.072	0.153	0.114	0.235
	Job Competition ($\sum \omega_{s,e}\, \gamma_{s,e}$)		0.002	0.010	0.018	0.025		0.021	0.051	0.046	0.026
	Recomposed Return		*0.061*	*0.069*	*0.105*	*0.288*		*0.093*	*0.204*	*0.160*	*0.261*
			Change in Rates of Contribution $(\Delta\widetilde{C}_{s,e})$					Change in Rates of Contribution $(\Delta\widetilde{C}_{s,e})$			
	Inputs to Identity (7)	ΔP(s)	Middle	LS	US	College	ΔP(s)	Middle	LS	US	College
	Agriculture	-0.128	0.013	-0.012	0.011	0.025	-0.118	0.012	-0.006	0.048	0.005
	Manufacturing	0.031	-0.035	-0.130	-0.227	0.116	0.013	-0.090	-0.001	-0.056	0.048
	Non-Manufacturing	0.054	-0.064	-0.029	0.029	-0.137	0.058	0.016	-0.117	0.007	0.036
	Trad. Services	0.046	0.003	-0.038	-0.233	0.050	0.041	0.001	0.039	-0.040	0.020
	Modern Services	-0.004	-0.004	-0.108	-0.096	0.273	0.006	-0.038	-0.211	-0.016	0.420
		0.000					*0.000*				
Change: 1993-2004	*Identity (7)*			Total contribution to change					Total contribution to change		
	Struct. expected change		0.010	0.005	0.023	0.018		0.009	0.012	0.008	0.009
	Residual change		-0.014	-0.061	-0.103	0.065		-0.012	-0.046	0.002	0.082
	Total Change in Return		*-0.004*	*-0.055*	*-0.081*	*0.083*		*-0.003*	*-0.035*	*0.010*	*0.091*
	Identity (8)										
	∑P(s|e)Δβ		-0.005	-0.042	-0.082	0.073		0.005	-0.01	-0.001	0.085
	∑β Δ P(s|e)		0.002	-0.008	-0.001	0.000		-0.001	-0.002	0.000	0.001
	∑*γΔω*		0.000	0.005	0.004	0.007		-0.003	-0.001	0.005	0.000
	∑*ωΔγ*		-0.001	-0.01	-0.001	0.004		-0.004	-0.021	0.006	0.006
	Total Change in Return		*-0.004*	*-0.055*	*-0.081*	*0.083*		*-0.003*	*-0.035*	*0.010*	*0.091*

Tables 6b: Philippines: Returns Decompositions

		5 years of experience			20 years of experience		
			Rates of Contribution $(\widetilde{C}_{s,e})$			Rates of Contribution $(\widetilde{C}_{s,e})$	
	Identity (6)	P(s)	LS	College	P(s)	LS	College
	Agriculture	0.166826	-0.016	0.058	0.2019	0.079	0.072
	Manufacturing	0.18884	0.342	0.004	0.16915	0.282	0.031
	Non-Manufacturing	0.082796	0.085	0.088	0.10969	0.045	0.064
	Trad. Services	0.351303	0.276	0.328	0.29634	0.212	0.129
	Modern Services	*0.210236*	0.094	0.677	0.22291	0.113	0.612
1991	*Aggregate Return*	1.000	*0.186*	*0.275*	1.000	*0.157*	*0.202*
	Identity (5)		Total contribution			Total contribution	
	Human Capital ($\sum P(s\|e)\beta_{s,e}$)		0.17719	0.2092		0.13715	0.1733
	Job Competition ($\sum \omega_{s,e}\ \gamma_{s,e}$)		0.00863	0.0662		0.01962	0.0282
	Aggregate Return		*0.186*	*0.275*		*0.157*	*0.202*
			Rates of Contribution $(\widetilde{C}_{s,e})$			Rates of Contribution $(\widetilde{C}_{s,e})$	
	Identity (6)	P(s)	LS	College	P(s)	LS	College
	Agriculture	0.123602	0.012	0.086	0.16952	0.092	0.070
	Manufacturing	0.183856	0.181	0.037	0.14882	0.141	0.071
	Non-Manufacturing	0.075915	0.049	0.042	0.11186	0.044	0.033
	Trad. Services	0.409813	0.126	0.193	0.34349	0.100	0.142
	Modern Services	0.206814	0.052	0.659	0.22632	0.071	0.840
2004	*Aggregate Return*	1.000	*0.101*	*0.236*	1.000	*0.092*	*0.265*
	Identity (5)		Total contribution			Total contribution	
	Human Capital ($\sum P(s\|e)\beta_{s,e}$)		0.09766	0.1983		0.07508	0.2323
	Job Competition ($\sum \omega_{s,e}\ \gamma_{s,e}$)		0.00306	0.0375		0.01669	0.0328
	Aggregate Return		*0.101*	*0.236*		*0.092*	*0.265*
		ΔP(s)	Change in Rates of Contribution $(\Delta\widetilde{C}_{s,e})$		ΔP(s)	Change in Rates of Contribution $(\Delta\widetilde{C}_{s,e})$	
	Inputs to Identity (7)		LS	College		LS	College
	Agriculture	-0.043	0.027	0.028	-0.032	0.013	-0.002
	Manufacturing	-0.005	-0.161	0.033	-0.020	-0.141	0.040
	Non-Manufacturing	-0.007	-0.036	-0.046	0.002	-0.002	-0.031
	Trad. Services	0.059	-0.151	-0.136	0.047	-0.112	0.013
	Modern Services	-0.003	-0.042	-0.018	0.003	-0.042	0.229
		0.000			*0.000*		
Change: 1991-2004	*Identity (7)*		Total contribution			Total contribution	
	Structurally expected change		0.014	0.014		0.002	0.005
	Residual change		-0.099	-0.053		-0.067	0.058
	Total Change in Return		*-0.085*	*-0.040*		*-0.065*	*0.064*
	Identity (8)						
	∑P(s|e)Δβ		-0.085	-0.034		-0.063	0.053
	∑β Δ P(s|e)		0.005	0.023		0.001	0.006
	∑γΔω		0.006	-0.022		0	0.003
	∑ωΔγ		-0.012	-0.007		-0.003	0.001
	Total Change in Return		*-0.085*	*-0.040*		*-0.065*	*0.064*

Table 6c: Thailand: Returns Decompositions

		5 years of experience					20 years of experience				
			Rates of Contribution $(\widetilde{C}_{s,e})$					Rates of Contribution $(\widetilde{C}_{s,e})$			
	Identity (6)	P(s)	LS	US	Diploma	College	P(s)	LS	US	Diploma	College
	Agriculture	0.060	0.050	0.067	0.033	0.033	0.122	0.123	0.057	0.016	0.016
	Manufacturing	0.402	0.075	0.104	0.167	0.204	0.282	0.121	0.082	0.216	0.135
	Non-Manufacturing	0.102	-0.039	0.224	0.156	0.156	0.153	0.118	0.164	0.066	0.039
	Trad. Services	0.229	0.131	0.175	0.157	0.179	0.211	0.166	0.176	0.119	0.147
	Modern Services	0.207	0.063	0.135	0.324	0.764	0.233	0.180	0.309	0.429	0.695
1995	*Aggregate Return*	1.000	*0.072*	*0.137*	*0.188*	*0.299*	1.000	*0.145*	*0.163*	*0.198*	*0.239*
	Identity (5)				Total contribution					Total contribution	
	Human Capital ($\sum P(s\|e)\beta_{s,e}$)		0.072	0.131	0.171	0.285		0.122	0.149	0.173	0.219
	Job Competition ($\sum \omega_{s,e}\, \gamma_{s,e}$)		0.000	0.005	0.017	0.015		0.023	0.014	0.025	0.019
	Aggregate Return		*0.072*	*0.137*	*0.188*	*0.299*		*0.145*	*0.163*	*0.198*	*0.239*
			Rates of Contribution $(\widetilde{C}_{s,e})$					Rates of Contribution $(\widetilde{C}_{s,e})$			
	Identity (6)	P(s)	LS	US	Diploma	College	P(s)	LS	US	Diploma	College
	Agriculture	0.060	0.050	0.050	-0.017	0.067	0.124	0.089	0.089	0.040	0.040
	Manufacturing	0.404	0.012	0.042	0.143	0.183	0.318	0.094	0.120	0.296	0.167
	Non-Manufacturing	0.062	-0.032	-0.016	0.339	0.323	0.103	0.078	0.078	0.398	0.184
	Trad. Services	0.235	0.068	0.102	0.158	0.213	0.217	0.102	0.129	0.157	0.171
	Modern Services	0.239	0.013	0.080	0.075	0.465	0.239	0.075	0.230	0.322	0.896
2005	*Aggregate Return*	1.000	*0.025*	*0.062*	*0.133*	*0.259*	1.000	*0.088*	*0.140*	*0.251*	*0.328*
	Identity (5)				Total contribution					Total contribution	
	Human Capital ($\sum P(s\|e)\beta_{s,e}$)		0.023	0.056	0.122	0.226		0.076	0.122	0.234	0.296
	Job Competition ($\sum \omega_{s,e}\, \gamma_{s,e}$)		0.002	0.005	0.011	0.032		0.012	0.017	0.017	0.032
	Aggregate Return		*0.025*	*0.062*	*0.133*	*0.259*		*0.088*	*0.140*	*0.251*	*0.328*
		ΔP(s)	Change in Rates of Contribution $(\Delta\widetilde{C}_{s,e})$				ΔP(s)	Change in Rates of Contribution $(\Delta\widetilde{C}_{s,e})$			
	Inputs to Identity (7)		LS	US	Diploma	College		LS	US	Diploma	College
	Agriculture	0.000	0.000	-0.017	-0.050	0.033	0.002	-0.034	0.031	0.024	0.024
	Manufacturing	0.002	-0.062	-0.062	-0.023	-0.021	0.036	-0.026	0.038	0.080	0.032
	Non-Manufacturing	-0.040	0.007	-0.241	0.183	0.167	-0.050	-0.040	-0.086	0.332	0.145
	Trad. Services	0.006	-0.063	-0.073	0.000	0.034	0.006	-0.065	-0.047	0.038	0.024
	Modern Services	0.032	-0.050	-0.056	-0.249	-0.299	0.006	-0.105	-0.079	-0.107	0.201
		0.000					*0.000*				
Change:											
1995-	*Identity (7)*				Total contribution to change					Total contribution to change	
2005	Structurally expected change		0.005	-0.003	0.005	0.020		0.001	-0.002	0.008	0.008
	Residual change		-0.052	-0.072	-0.060	-0.060		-0.056	-0.022	0.045	0.081
	Total Change in Return		*-0.047*	*-0.075*	*-0.055*	*-0.040*		*-0.055*	*-0.024*	*0.053*	*0.089*
	Identity (8)										
	$\sum P(s\|e)\Delta\beta$		-0.046	-0.072	-0.056	-0.068		-0.042	-0.019	0.021	0.058
	$\sum \beta\, \Delta\, P(s\|e)$		-0.003	-0.003	0.007	0.009		-0.004	-0.008	0.040	0.018
	$\sum \gamma\Delta\omega$		0.000	-0.004	0.001	0.018		-0.005	-0.001	-0.004	0.005
	$\sum \omega\Delta\gamma$		0.002	0.004	-0.006	0.000		-0.005	0.004	-0.004	0.008
	Total Change in Return		*-0.047*	*-0.075*	*-0.055*	*-0.040*		*-0.055*	*-0.024*	*0.053*	*0.089*

Table 7a:Decomposed Mincerian Returns – India

Identity (5)		1993							2004						
		Human Capital Effects			***Job Competition Effects***			***Total***	***Human Capital Effects***			***Job Competition Effects***			***Total***
		$P(s\|e)$	$B_{s,e}$	$P(s\|e)\beta_{s,e}$	$\gamma_{s,e}$	$\omega_{s,e}$	$\omega_{s,e}\,\gamma_{s,e}$	$C_{s,e}$	$P(s\|e)$	$B_{s,e}$	$P(s\|e)\beta_{s,e}$	$\gamma_{s,e}$	$\omega_{s,e}$	$\omega_{s,e}\,\gamma_{s,e}$	$C_{s,e}$
Lower Secondary, 5 years experience	Agriculture	0.145	0.061	*0.009*	-0.082	-0.161	*0.013*	0.022	0.150	0.002	*0.000*	-0.051	-0.223	*0.011*	0.012
	Manufacturing	0.296	0.129	*0.038*	0.030	0.035	*0.001*	0.039	0.269	0.064	*0.017*	0.010	0.104	*0.001*	0.018
	Non-Man.	0.104	0.055	*0.006*	-0.014	0.326	*-0.005*	0.001	0.147	0.016	*0.002*	-0.023	0.220	*-0.005*	-0.003
	Trad. Services	0.237	0.088	*0.021*	-0.003	0.000	*0.000*	0.021	0.281	0.069	*0.019*	0.016	-0.006	*0.000*	0.019
	Modern Services	0.217	0.166	*0.036*	0.068	0.076	*0.005*	0.041	0.153	0.135	*0.021*	0.048	0.047	*0.002*	0.023
	Aggregate	*1.000*		*0.110*	*0.000*		*0.015*	*0.125*	*1.000*		*0.060*	*0.000*		*0.010*	*0.069*
Lower Secondary, 20 years experience	Agriculture	0.114	0.105	*0.012*	-0.084	-0.532	*0.045*	0.057	0.138	0.089	*0.012*	-0.060	-0.481	*0.029*	0.041
	Manufacturing	0.225	0.160	*0.036*	0.008	0.216	*0.002*	0.038	0.203	0.204	*0.041*	-0.002	0.096	*0.000*	0.041
	Non-Man.	0.079	0.246	*0.019*	-0.019	0.151	*-0.003*	0.017	0.118	0.111	*0.013*	-0.027	0.176	*-0.005*	0.008
	Trad. Services	0.188	0.134	*0.025*	-0.018	0.119	*-0.002*	0.023	0.247	0.149	*0.037*	0.002	0.105	*0.000*	0.037
	Modern Services	0.395	0.185	*0.073*	0.112	0.284	*0.032*	0.105	0.294	0.169	*0.050*	0.086	0.311	*0.027*	0.077
	Aggregate	*1.000*		*0.165*	*0.000*		*0.073*	*0.239*	*1.000*		*0.153*	*0.000*		*0.051*	*0.204*
College, 5 years experience	Agriculture	0.025	0.022	*0.001*	-0.021	-0.622	*0.013*	0.013	0.023	0.072	*0.002*	-0.023	-0.608	*0.014*	0.016
	Manufacturing	0.197	0.204	*0.040*	-0.017	0.089	*-0.002*	0.039	0.227	0.309	*0.070*	0.001	0.052	*0.000*	0.070
	Non-Man.	0.060	0.441	*0.026*	-0.004	-0.028	*0.000*	0.027	0.063	0.330	*0.021*	-0.014	0.048	*-0.001*	0.020
	Trad. Services	0.120	0.114	*0.014*	-0.032	0.007	*0.000*	0.013	0.151	0.170	*0.026*	-0.038	-0.049	*0.002*	0.028
	Modern Services	0.597	0.182	*0.109*	0.074	0.054	*0.004*	0.113	0.536	0.270	*0.145*	0.074	0.134	*0.010*	0.155
	Aggregate	*1.000*		*0.190*	*0.000*		*0.015*	*0.205*	*1.000*		*0.263*	*0.000*		*0.025*	*0.288*
College, 20 years experience	Agriculture	0.014	0.174	*0.002*	-0.015	-0.899	*0.013*	0.016	0.015	0.165	*0.002*	-0.019	-0.602	*0.012*	0.014
	Manufacturing	0.107	0.177	*0.019*	-0.018	0.103	*-0.002*	0.017	0.122	0.218	*0.027*	-0.007	0.062	*0.000*	0.026
	Non-Man.	0.033	0.124	*0.004*	-0.004	0.148	*-0.001*	0.003	0.036	0.298	*0.011*	-0.012	-0.017	*0.000*	0.011
	Trad. Services	0.068	0.155	*0.011*	-0.027	-0.113	*0.003*	0.014	0.094	0.192	*0.018*	-0.034	-0.093	*0.003*	0.021
	Modern Services	0.778	0.145	*0.113*	0.064	0.112	*0.007*	0.120	0.733	0.242	*0.177*	0.073	0.165	*0.012*	0.189
	Aggregate	*1.000*		*0.149*	*0.000*		*0.021*	*0.170*	*1.000*		*0.235*	*0.000*		*0.026*	*0.261*

Table 7b:Decomposed Mincerian Returns – Philippines

Identity (5)		1991							2004						
		Human Capital Effects			***Job Competition Effects***			***Total***	***Human Capital Effects***			***Job Competition Effects***			***Total***
		$P(s\|e)$	$B_{s,e}$	$P(s\|e)\beta_{s,e}$	$\gamma_{s,e}$	$\omega_{s,e}$	$\omega_{s,e}\,\gamma_{s,e}$	$C_{s,e}$	$P(s\|e)$	$B_{s,e}$	$P(s\|e)\beta_{s,e}$	$\gamma_{s,e}$	$\omega_{s,e}$	$\omega_{s,e}\,\gamma_{s,e}$	$C_{s,e}$
Lower Secondary, 5 years experience	Agriculture	0.132	0.058	*0.008*	-0.057	0.180	*-0.010*	-0.003	0.117	0.025	*0.003*	-0.061	0.025	*-0.002*	0.001
	Manufacturing	0.269	0.175	*0.047*	0.030	0.576	*0.017*	0.065	0.239	0.112	*0.027*	0.022	0.296	*0.007*	0.033
	Non-Man.	0.101	0.062	*0.006*	0.001	0.825	*0.001*	0.007	0.099	0.031	*0.003*	0.001	0.469	*0.001*	0.004
	Trad. Services	0.433	0.238	*0.103*	0.012	-0.465	*-0.006*	0.097	0.489	0.115	*0.056*	0.026	-0.184	*-0.005*	0.051
	Modern Services	0.066	0.202	*0.013*	0.013	0.484	*0.006*	0.020	0.056	0.158	*0.009*	0.011	0.176	*0.002*	0.011
	Aggregate	*1.000*		*0.177*	*0.000*		*0.009*	*0.186*	*1.000*		*0.098*	*0.000*		*0.003*	*0.101*
Lower Secondary, 20 years experience	Agriculture	0.103	0.067	*0.007*	-0.052	-0.173	*0.009*	0.016	0.103	0.031	*0.003*	-0.059	-0.210	*0.012*	0.016
	Manufacturing	0.269	0.153	*0.041*	0.026	0.246	*0.006*	0.048	0.216	0.083	*0.018*	0.018	0.170	*0.003*	0.021
	Non-Man.	0.130	0.047	*0.006*	-0.002	0.502	*-0.001*	0.005	0.141	0.035	*0.005*	0.000	0.361	*0.000*	0.005
	Trad. Services	0.359	0.176	*0.063*	0.001	-0.171	*0.000*	0.063	0.426	0.083	*0.035*	0.017	-0.069	*-0.001*	0.034
	Modern Services	0.138	0.143	*0.020*	0.027	0.202	*0.005*	0.025	0.114	0.120	*0.014*	0.023	0.104	*0.002*	0.016
	Aggregate	*1.000*		*0.137*	*0.000*		*0.020*	*0.157*	*1.000*		*0.075*	*0.000*		*0.017*	*0.092*
College, 5 years experience	Agriculture	0.027	0.157	*0.004*	-0.026	-0.208	*0.005*	0.010	0.022	0.249	*0.005*	-0.024	-0.221	*0.005*	0.011
	Manufacturing	0.135	0.131	*0.018*	-0.033	0.511	*-0.017*	0.001	0.132	0.117	*0.015*	-0.027	0.323	*-0.009*	0.007
	Non-Man.	0.056	0.221	*0.012*	-0.011	0.451	*-0.005*	0.007	0.042	0.157	*0.007*	-0.014	0.243	*-0.003*	0.003
	Trad. Services	0.210	0.445	*0.093*	-0.056	-0.394	*0.022*	0.115	0.291	0.246	*0.072*	-0.050	-0.149	*0.007*	0.079
	Modern Services	0.572	0.142	*0.082*	0.127	0.481	*0.061*	0.142	0.514	0.193	*0.099*	0.115	0.323	*0.037*	0.136
	Aggregate	*1.000*		*0.209*	*0.000*		*0.066*	*0.275*	*1.000*		*0.198*	*0.000*		*0.037*	*0.236*
College, 20 years experience	Agriculture	0.013	0.343	*0.004*	-0.022	-0.451	*0.010*	0.015	0.013	0.205	*0.003*	-0.023	-0.410	*0.009*	0.012
	Manufacturing	0.085	0.175	*0.015*	-0.046	0.209	*-0.010*	0.005	0.079	0.195	*0.015*	-0.034	0.140	*-0.005*	0.011
	Non-Man.	0.045	0.232	*0.010*	-0.021	0.159	*-0.003*	0.007	0.040	0.204	*0.008*	-0.025	0.175	*-0.004*	0.004
	Trad. Services	0.108	0.265	*0.029*	-0.063	-0.154	*0.010*	0.038	0.168	0.254	*0.043*	-0.064	-0.097	*0.006*	0.049
	Modern Services	0.749	0.153	*0.115*	0.153	0.140	*0.021*	0.136	0.701	0.233	*0.164*	0.147	0.181	*0.027*	0.190
	Aggregate	*1.000*		*0.173*	*0.000*		*0.028*	*0.202*	*1.000*		*0.232*	*0.000*		*0.033*	*0.265*

Table 7c:Decomposed Mincerian Returns –Thailand

Identity (5)		1995							2005						
		Human Capital Effects			***Job Competition Effects***			***Total***	***Human Capital Effects***			***Job Competition Effects***			***Total***
		$P(s\|e)$	$B_{s,e}$	$P(s\|e)\beta_{s,e}$	$\gamma_{s,e}$	$\omega_{s,e}$	$\omega_{s,e}\,\gamma_{s,e}$	$C_{s,e}$	$P(s\|e)$	$B_{s,e}$	$P(s\|e)\beta_{s,e}$	$\gamma_{s,e}$	$\omega_{s,e}$	$\omega_{s,e}\,\gamma_{s,e}$	$C_{s,e}$
Lower Secondary, 5 years experience	Agriculture	0.038	0.013	*0.001*	-0.026	-0.094	*0.002*	0.003	0.101	0.005	*0.000*	-0.035	-0.063	*0.002*	0.003
	Manufacturing	0.513	0.057	*0.029*	0.004	0.102	*0.000*	0.030	0.512	0.006	*0.003*	0.026	0.074	*0.002*	0.005
	Non-Man.	0.099	-0.015	*-0.001*	-0.015	0.186	*-0.003*	-0.004	0.075	0.007	*0.001*	-0.015	0.142	*-0.002*	-0.002
	Trad. Services	0.256	0.128	*0.033*	0.014	-0.161	*-0.002*	0.030	0.265	0.069	*0.018*	0.014	-0.130	*-0.002*	0.016
	Modern Services	0.093	0.114	*0.011*	0.024	0.102	*0.002*	0.013	0.047	0.018	*0.001*	0.010	0.176	*0.002*	0.003
	Aggregate	*1.000*		*0.072*	*0.000*		*0.000*	*0.072*	*1.000*		*0.023*	*0.000*		*0.002*	*0.025*
Lower Secondary, 20 years experience	Agriculture	0.046	0.080	*0.004*	-0.036	-0.311	*0.011*	0.015	0.102	0.048	*0.005*	-0.037	-0.163	*0.006*	0.011
	Manufacturing	0.337	0.104	*0.035*	-0.009	0.071	*-0.001*	0.034	0.424	0.068	*0.029*	0.018	0.051	*0.001*	0.030
	Non-Man.	0.114	0.157	*0.018*	-0.023	-0.003	*0.000*	0.018	0.099	0.077	*0.008*	-0.021	0.004	*0.000*	0.008
	Trad. Services	0.250	0.144	*0.036*	0.006	-0.068	*0.000*	0.035	0.244	0.089	*0.022*	0.012	0.050	*0.001*	0.022
	Modern Services	0.253	0.118	*0.030*	0.062	0.198	*0.012*	0.042	0.132	0.100	*0.013*	0.028	0.173	*0.005*	0.018
	Aggregate	*1.000*		*0.122*	*0.000*		*0.023*	*0.145*	*1.000*		*0.076*	*0.000*		*0.012*	*0.088*
College, 5 years experience	Agriculture	0.003	0.508	*0.001*	-0.002	-0.296	*0.001*	0.002	0.009	0.199	*0.002*	-0.009	-0.211	*0.002*	0.004
	Manufacturing	0.181	0.459	*0.083*	-0.049	0.010	*0.000*	0.082	0.223	0.318	*0.071*	-0.063	-0.052	*0.003*	0.074
	Non-Man.	0.051	0.344	*0.018*	-0.009	0.165	*-0.001*	0.016	0.040	0.484	*0.019*	-0.004	-0.105	*0.000*	0.020
	Trad. Services	0.158	0.232	*0.037*	-0.045	-0.087	*0.004*	0.041	0.218	0.231	*0.050*	-0.020	0.025	*-0.001*	0.050
	Modern Services	0.608	0.240	*0.146*	0.104	0.116	*0.012*	0.158	0.511	0.164	*0.084*	0.096	0.284	*0.027*	0.111
	Aggregate	*1.000*		*0.285*	*0.000*		*0.015*	*0.299*	*1.000*		*0.226*	*0.000*		*0.032*	*0.259*
College, 20 years experience	Agriculture	0.002	0.334	*0.001*	-0.002	-0.541	*0.001*	0.002	0.005	0.333	*0.002*	-0.009	-0.349	*0.003*	0.005
	Manufacturing	0.059	0.546	*0.032*	-0.036	-0.145	*0.005*	0.038	0.098	0.483	*0.047*	-0.061	-0.099	*0.006*	0.053
	Non-Man.	0.029	0.328	*0.010*	-0.013	0.272	*-0.003*	0.006	0.028	0.622	*0.017*	-0.010	-0.125	*0.001*	0.019
	Trad. Services	0.077	0.327	*0.025*	-0.048	-0.130	*0.006*	0.031	0.107	0.343	*0.037*	-0.033	-0.024	*0.001*	0.037
	Modern Services	0.832	0.182	*0.152*	0.099	0.101	*0.010*	0.162	0.763	0.254	*0.194*	0.113	0.182	*0.021*	0.214
	Aggregate	*1.000*		*0.219*	*0.000*		*0.019*	*0.239*	*1.000*		*0.296*	*0.000*		*0.032*	*0.328*

Figure 1: LS and US completion rates by year of completion

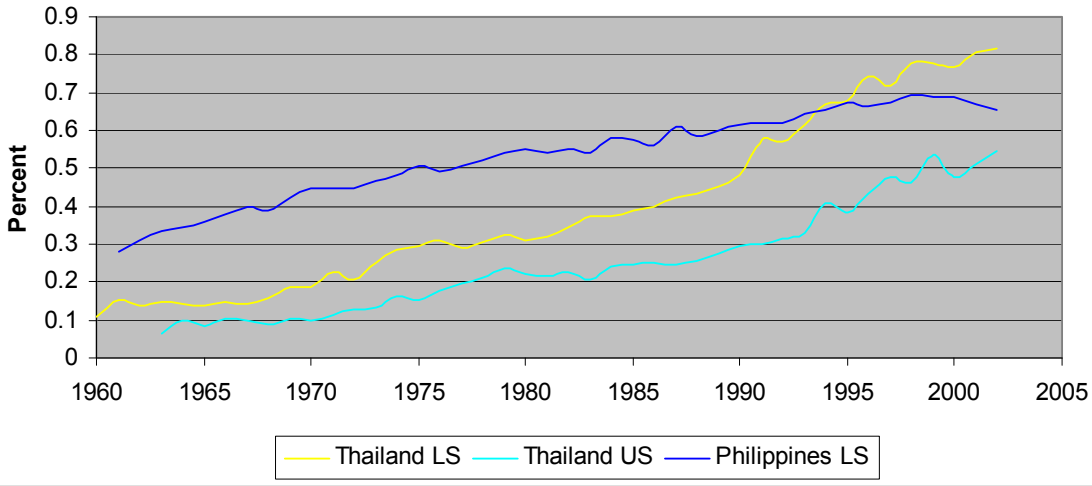
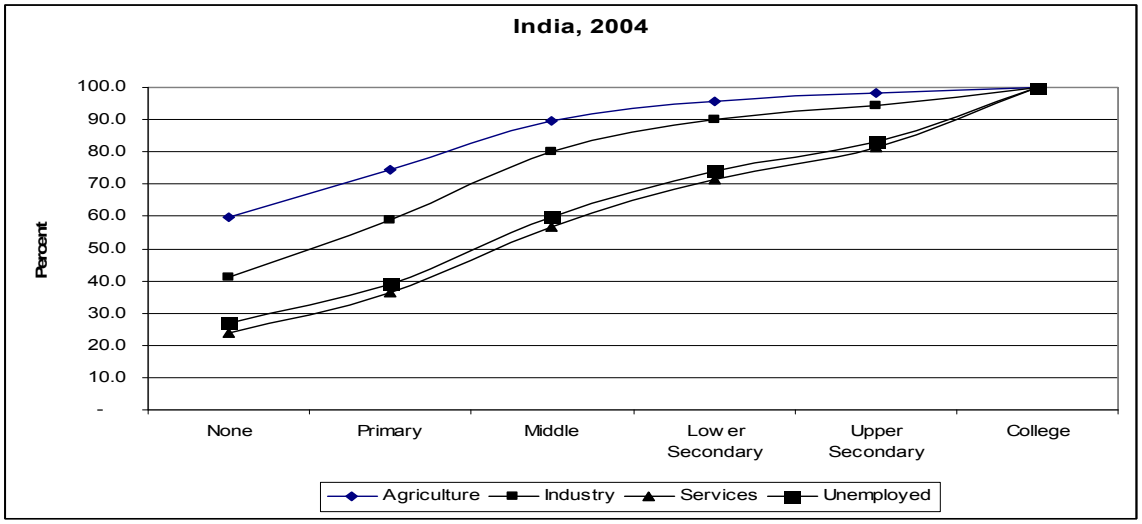
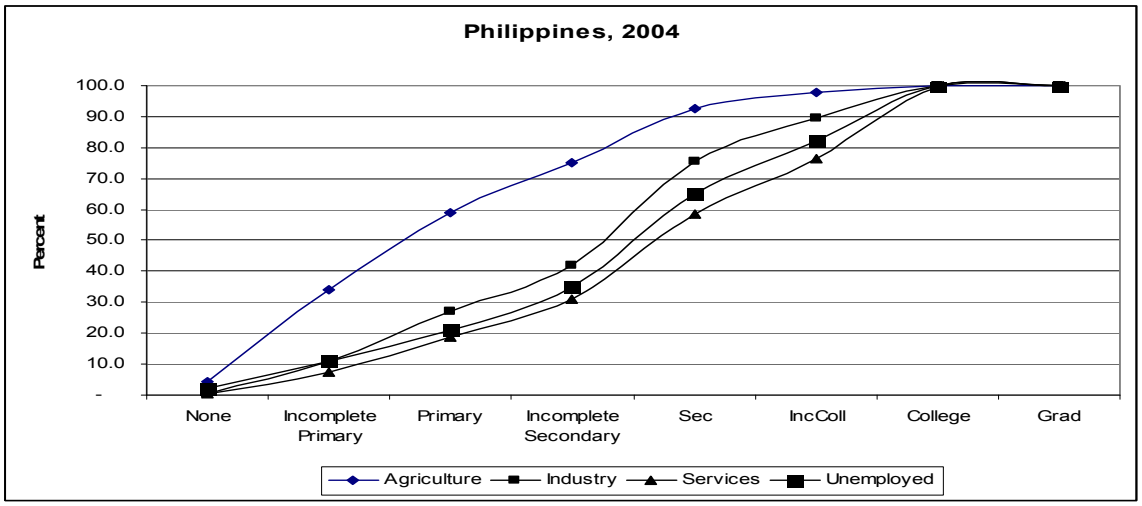
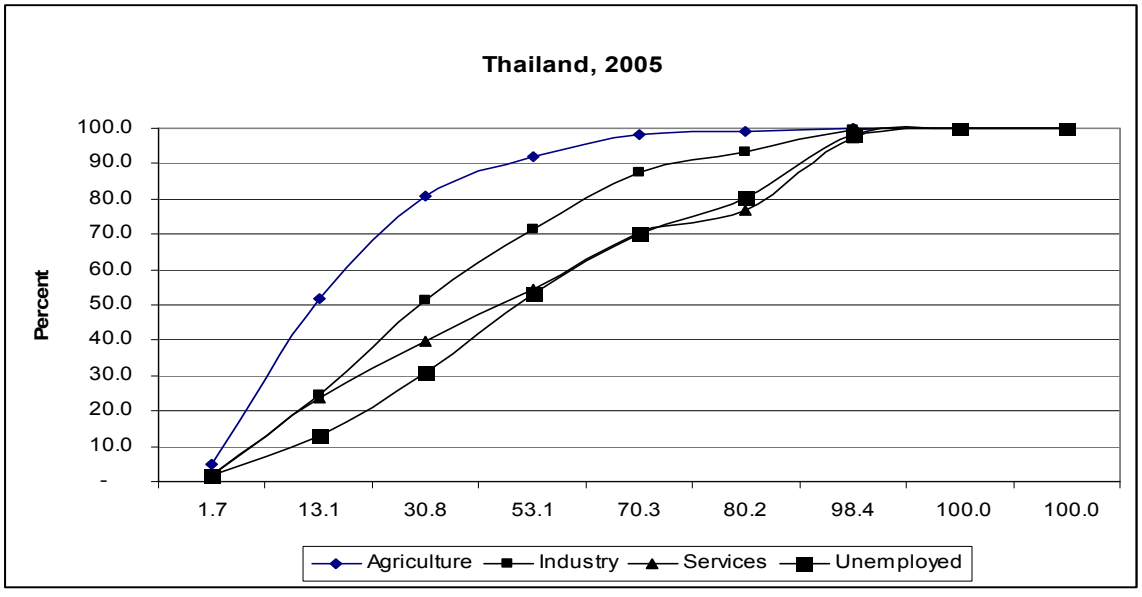


Figure 2: Cumulative distribution of education, by sector.







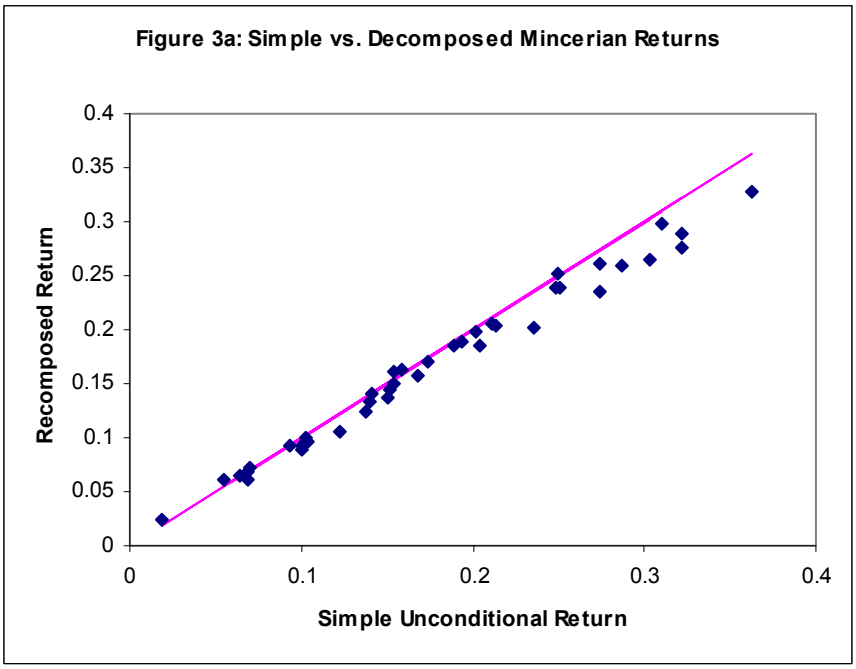


Figure 3a: Simple vs. Decomposed Mincerian Returns
Recomposed Return
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
0.1
0.2
0.3
0.4
Simple Unconditional Return

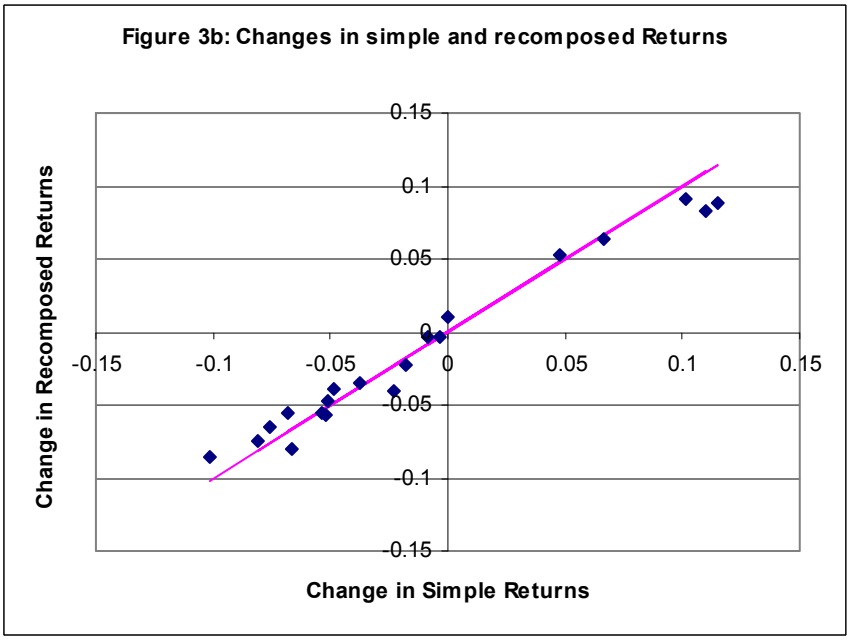


Figure 3b: Changes in simple and recomposed Returns
Change in Recomposed Returns
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
-0.15
-0.1
-0.05
0
0.05
0.1
0.15
Change in Simple Returns