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Where Have All The Educated Workers Gone? Education and Structural Transformation in Three Asian Economies

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Where Have All The Educated Workers Gone?
Education and Structural Transformation in Three Asian Economies

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This version updates an earlier UCSB Center for Global Studies Working Paper "Changing patterns in Mincerian Returns to Education and Employment Structure in Three Asian Economies"

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Keywords: Employment Composition, Structural Change, Returns to Education

JEL Classifications: O15, O14, J21, I21, J31.

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1. Introduction

Wage returns to basic education have fallen significantly in the developing world, while returns to higher education have either risen or have not fallen as fast.[1] Inequality is on the rise, and growing inequality between workers and households with differing education levels accounts for more of this increased inequality than any other measured phenomenon (Hasan, 2007). Expanding poor families' access to basic education has been a key means by which governments have attempted to increase equality of opportunity. These trends in the wage-returns to education therefore imply a significant and worrying loss of traction by governments on the distribution of income. Uncovering their causes is therefore extremely important for policy.

This increase in the convexity of the education-wage profile coincides with significant increases in educational attainment. Declining returns to secondary education indicate that the supply of workers with secondary education has outstripped demand. Our objective is to shed some light on why this has occurred, and how this shift in relative wages is associated with changes in the composition of employment.

We argue that the demand for educated workers in India, the Philippines and Thailand grew slowly in the 1990s and early 2000s because employment structures evolved slowly, and not in directions that significantly boosted demand for workers with secondary education. Generalizing only slightly, large declines in agricultural employment were not matched by employment growth in manufacturing and high-skill services, causing a proliferation of workers with secondary education in low-skill services jobs. Demand for secondary-educated workers therefore grew sluggishly. More buoyant relative demand for college graduates in high-skill services lent support to the returns to college. These trends explain why the relationship between education and log-wages is becoming more convex.

Prior studies of shifting education-premiums apply the methods of Katz and Murphy (1992) and Card and Lemieux (2001) to estimate the parameters of relative skills demand functions and the shift in skills demand.[2] With sufficient data these methods can shed light on the elasticities of substitution between different types of workers and identify *when* relative skills

[1] See, for example: 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).

[2] Katz & Murphy's method has been applied to our three countries: (Kijima, 2006)– India; (Hasan and Chen, 2003) – Philippines; and (Richter, 2006)– Thailand. The only application of Card & Lemieux's method to our countries is (Azam, 2009)-India. Unfortunately, in developing country studies, including all those just mentioned, where labor force surveys are conducted infrequently, parameters of the skills demand function must be assumed, not estimated.

demand shifted. However, absent strong aggregation assumptions[3], they do not indicate the relative importance of different sectors of the economy in determining the returns to education.

Instead, we develop and apply decompositions of the returns to education and their shifts. We ask whether changes in the employment shares of industries with differing requirements for educated workers account for the observed shifts in the returns to education. We find that they do not: shifts of workers *between* industries have been too small, and not always in the right direction, to explain practically any of the recent changes in the returns to secondary or tertiary education. Instead, shifting returns are accounted for by changes *within* industries. We therefore use our decompositions to identify which sectors are responsible for the shift in returns, and use institutional information, data from other studies, and detailed employment decompositions to shed light on what changes occurred within these sectors that can be reconciled with the returns decompositions.

On this point, the findings vary significantly across countries. In India, the services sector came to rely more on college graduates and less on secondary graduates, while trends in manufacturing job creation and a construction boom increased demand for workers with less than secondary education. Demand for workers with secondary education therefore fell as the education demand structure polarized around them. With high-end services becoming more education-intensive and intrusive regulations restricting the supply of college graduates, returns to college rose dramatically. Thai manufacturing, in contrast to Indian manufacturing, became more sophisticated, favoring those with upper secondary and college degrees over lower secondary graduates. Thus, as in India, returns to lower-secondary education in Thailand fell, but for different reasons than in India. Meanwhile, a rapid increase in the relative demand for experience in Thailand's financial services eased young college graduates out of good jobs in the wake of the Asian Financial crisis, raising rapidly the returns for mid-career college graduates and depressing those of younger college graduates. In the Philippines, manufacturing employment shrank, while services employment boomed but became increasingly menial. This structural burden drove the returns to all levels of education down.

We emphasize that we do not claim to identify any causal effects, in the econometric sense, of changes in the composition of employment. Doing so would require the resolution of serious endogeneity problems. Because a proper analysis of structural change requires a fairly disaggregated analysis of employment structure, endogenizing the allocation of workers to jobs

[3] There is a strong presumption that labor markets in developing economies are segmented (Fields, 2007), and our results, consistent with this, reveal many instances in which relative wages shift in different directions in different sectors. To the extent that these differences across segments of the labor market reflect structural rigidities, they imply aggregation problems.

requires datasets that are either longitudinal, or offer a large array of high-quality instruments. To our knowledge, datasets from the developing world that offer these features *and* sampling schemes that provide accurate measures of the composition of employment do not exist. Instead, we simply offer an accounting of which sectors of the economy have contributed most to shifting features of the wage distribution, and the quantity and price changes that give rise to this. This accounting is of great value, as it provides a clear picture of how opportunity shifts across sectors and education classes as economies transform.

The clarity achieved should influence two additional lines of research. First, trade liberalization in most developing countries has been followed by rising college premiums, contrary to simple Heckscher-Ohlin logic, and most studies asking why have looked for answers in the manufacturing sector (Goldberg and Pavcnik, 2007). India and the Philippines greatly liberalized trade during our sample time interval, while Thailand did so prior to it. Our decompositions show that the forces shifting the college premium operate primarily in the services sector, not in manufacturing.

Second, recent research highlights the growing role of services in boosting labor productivity growth in developing economies, as well as the potential structural burden on productivity of this trend if services become more menial (e.g. Felipe et al., 2007). Recent work (Autor and Dorn, 2009; Goos and Manning, 2007) has highlighted polarizing employment structures in the developed world as services employment grows in importance. We find a similar polarization in India and the Philippines, due to a structural burden as services employment grows without shifting into more education intensive activities.

The rest of the paper is structured as follows: Section 2 introduces the dataset. Section 3 describes the educational expansions in our three countries, and the policies that may have influenced them. In section 4, we present estimates of the returns to education, and in section 5 we explain two of the three decompositions we will use. Section 6 uses these decompositions to describe, country by country, how the economies have transformed and locates shifts in the returns to education in their shifting employment structures. These descriptions allow us to comment on some important country-specific debates involving structural transformation. Section 7 applies the labor productivity decompositions of Chenery et al. (1986) and Baumol, et al. (1985) and finds that sectoral rates of labor productivity growth align well with the contributions of sectors to shifting returns to college education. Section 8 discusses the implications of our findings.

2. The Data

We use two rounds of national labor force survey data from India (1993 and 2004), the Philippines (1991 and 2004), and Thailand (1995 and 2005). The data have several merits. First, they use 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. These are the only datasets from these countries from which these estimates can be obtained. Unlike the establishment data utilized in many studies of skills premiums, these household datasets survey workers in both the formal and informal sectors and are useful for measuring outcomes in the largely unskilled, informal services sector. Second, the sample sizes are all large, ranging from 49,902 workers in the Philippines in 1991 to 200,380 in India in 1993. This permits 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 (very carefully) across countries, may usefully be made.

The data have weaknesses as well. Sampling in each country has been undertaken with different frequencies and over time periods of different duration. 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. Finally, revisions of industrial, occupational and educational classifications were sometimes substantial.

These differences implied much labor and some compromise. We have had 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 (9 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.

After many internal consistency tests, we have found only one data problem of note. Roughly 4-6 percent of young Thai lower secondary graduates appear to have been misclassified as not having completed 9^{th} grade in the 1995 survey. This problem could not be resolved by reclassifying workers using the raw data, and, rather than taking ad hoc cleaning measures, we reflect on the impact of this measurement error where relevant. Essentially, it will lead to an

underestimation of the number of lower secondary (LS) graduates and the Mincerian return to lower secondary education in 1995. Its impact on the estimated upper secondary returns is ambiguous.[4]

We have two samples for each country. Analyses that do not involve wage data utilize a sample that includes all members of the work-force. Analyses that do involve wages are conducted on wage or salaried employees only. The Philippines and Thailand surveys identify public employees and we exclude them from the wage sample to avoid inferential problems due to administratively determined wages. This was not possible to do in India, because the survey does not identify public employees.

Finally, we only have data about the number of academic levels that students have successfully completed. What they have actually learned is unfortunately unmeasured in our dataset, as it is in most.

3. Education Policy and the Supply of Educated Workers

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. Education levels rose in all countries and for all cohorts. Moreover, the rise in attainment, measured as the rightward shift in the cumulative distribution, is considerably more pronounced among the young than among the old in both India and Thailand, implying accelerating education attainment. In contrast, in the Philippines, the shift in attainment for workers aged 25-60 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, by Indians. While differences in the existence and duration of upper secondary education complicate inter-country comparisons of the supply of equivalent college graduates, it appears indisputable that India lags both Thailand and the Philippines in this regard. These rankings are confirmed by Barro and Lee's (2001) computed average years of schooling which are presented in the last rows of Table 1.

[4] This downward bias results not simply from the pure attrition bias that would result if the measurement error were uncorrelated with education, but because the presumably higher earnings of the misallocated lower secondary graduates inflate the earnings of those without lower-secondary education.

While this paper focuses on the consequences of these large supply expansions in the context of structural change, it will be useful to ask why educational attainment changed in such different ways. Certainly, initial conditions play a role simply for numerical reasons– India had fewer elementary graduates than Thailand and the Philippines to push through secondary school. However, as constitutional amendments extending universal education targets have become quite common, it is useful to ask whether these policies appear to have driven the expansions.

The Philippines and Thailand introduced legislative changes to promote secondary education. The Constitution of the Philippines (1987) committed the state to provide quality 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 (see, for example, Prina, 2007), 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 in part to meet demand from prospective emigrants. Maglen and Manasan (1998) argue that the constitutional expansions in Filipino educational rights led to a shift towards public secondary education. A general downwards trend in the quality of Filipino education is widely discussed, but does not appear in the TIMMS (2003) data.

Historically, Thailand has had a difficult time expanding access to education, especially in rural areas. Booth (1999) reports that the limited availability of 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 introduced the right to 12 years of free, quality basic education, and the 1999 Education Act 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 (but anywhere between 1 and 3). This system 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 the percentage of workers aged 25-30 with tertiary vocational diplomas expanded from 3.6% in 1995 to 7.4% in 2005. We do not analyze the returns to vocational training in this paper, because our data do not permit us to distinguish between degrees earned over 1, 2 and 3 years.

Education policy in India has followed a different route. While by law education is free and compulsory up to the age of 14, 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 environments. 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 (PRATHAM, 2005; PROBE, 1999). 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.[5]

Meanwhile, India has developed a few very highly regarded tertiary institutions. Graduates from elite publicly supported science and technology institutes command impressive salaries. 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. Our data show that in 2004, tertiary enrollment rates were around 14%, and only around 8% of the Indian labor force was college educated.

To gain an appreciation of the impact of the constitutional and legal changes in Thailand and the Philippines on the supply of workers with secondary education, Figure 1 charts imputed cohort-specific graduation rates. This is the percentage of workers who, based on their age, should have completed lower secondary school in a particular year, report having done so in the latest survey.[6] Thailand overtook the Philippines in lower secondary completion rates by the early 1990s. The graph also shows that Thailand's massive expansion in secondary completion rates began in the early 1990's, well in advance of the constitutional change, and contemporaneous with the peak of the country's economic boom. Similarly, the legal changes in the Philippines did not perturb greatly the already steady upwards progression of secondary completion. It is, of course, possible that the rise in graduation rates would have abated without these policy shifts.

[5] World Bank, World Development Indicators.
[6] These are unbiased estimates of the actual completion rate if 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.

4. Mincerian Returns to Education

We ran regressions, for each country-year sample of wage workers, of log-wages on dummies capturing completed education levels, experience, experience-squared, and interactions of experience and the educational dummies. The typical restriction that the returns to education are independent of experience was rejected in each country and survey year, with the null hypotheses carrying p-values of zero. This implies that educated workers of different cohorts are not, as Katz and Murphy (1992) and others applying their methods assume, perfect substitutes for each other, and that the returns to education are subject to important dynamic considerations across time and cohorts. For the rest of the paper, we therefore estimate returns from two sub-samples of workers that possess a target number of years of experience (plus or minus two years) and we do not otherwise control for imputed years of work experience.

Table 2 provides annualized returns to secondary and tertiary education levels for wage-workers of two cohorts – young workers (those with 7 +/-2 years of experience), and mid-career workers (with 20 +/-2 years of experience). Given the age cutoffs for sampling, seven is the minimum number of years of experience at which lower secondary returns can be reliably measured in all three countries. Inadequacies in the data precluded reliable estimates of the returns to primary education, so the analysis focuses on secondary and tertiary education levels. These are anyway the levels that will expand most aggressively and are therefore most interesting in a study of education quantity.

Four trends in the lower and upper secondary returns are noteworthy. First, they were moderate to high in all countries and for workers of both experience levels in the initial period, consistent with the view that the subsequent expansions in attainment were market driven. Second, they fell - all statistically significant changes in returns to secondary education were negative.[7] Third, the erosion in secondary returns is a much starker phenomenon amongst the young. Fourth mid-career workers' secondary returns are almost always higher than those of young workers. All four trends are consistent with the view that the supply of secondary educated workers grew faster than the demand for them, and that the resultant downward pressure on returns has been stronger for younger workers. This is, as Card and Lemieux (2001) demonstrate, and Azam (2009) has confirmed in the Indian case, consistent with a model in which similarly educated younger and older workers are imperfect substitutes. The trends illustrate the policy

[7] The misclassification of some young Thai lower-secondary graduates as not having those degrees implies that we have most probably underestimated the returns to lower secondary education in 1995, and therefore underestimated the decline in lower secondary returns over time. The key qualitative results are therefore probably reliable for young lower secondary graduates. The effect of the misclassification on estimated upper secondary returns is ambiguous, and would depend on whether the misclassified LS graduates earned above- or below-average wages.

concern motivating our analysis – expanding access to secondary education has become a less powerful instrument for altering the distribution of income.[8]

Trends in tertiary returns are more nuanced. Mid-career workers everywhere saw their returns to college remain unchanged or rise. Tertiary returns for younger workers rose substantially in India, held constant in Thailand, and fell in the Philippines. College returns in the Philippines were much less buoyant than in India or Thailand. With the supply of graduates having increased, the experience with tertiary returns for all groups, except young Filipinos, cannot be explained in terms of supply-side movements alone. A central question tackled in the rest of this paper is, therefore, why college returns moved in different ways in different countries.

The interpretation of relative wage movements can be complicated by changes in unionization rates and public sector employment, which tend to drive up the relative wages of less-educated workers. If these institutions increased in importance over time this could explain why education-wage premiums fell. We have sharply reduced such problems by dropping public employees from our wage-sample in the Philippines and Thailand. Both India and the Philippines experienced declining shares of unionized employees – changes that should have pushed education-wage premiums up (Katz and Autor, 1999).[9, 10] Unionization in Thailand is sufficiently uncommon that it is unlikely to influence the wage distribution significantly.[11] These institutional changes are therefore unlikely to explain the declines in returns to secondary education anywhere, or the declining returns to college in the Philippines. Increased labor market flexibility could provide a qualitatively viable alternative interpretation for the rising college wage-premium amongst young Indians (Kijima, 2006; Nagaraj, 2004), but only if these shifts in returns are associated with relative wage movements in sectors that were previously heavily regulated (e.g. manufacturing and high-end services).

One other alternative explanation for falling returns to education is a decline in education quality. Mehta et al. (2007) provide as much evidence on this as is available. They find that Thailand's performance on international tests improved over time. India, by the mid 1990s was reporting such atrocious school performances (PROBE, 1999) that further deterioration seems implausible. Only in the Philippines, where some declines in test scores and a shift from private

[8] Of course, in India, where the majority of even young workers do not have a middle school education, falling returns to middle school and lower secondary school may reduce inequality.
[9] (Anant et al., 2006) point to increasing casualization of labor, while the ILO's LABORSTA database reports a slight decrease in the number of public employees over our sample period. Data on union membership in India is patchy at best.
[10] (Felipe and Lanzona Jr., 2006) show declining unionization in the Philippines between 1993 and 2002, and cite government documents demonstrating increased casualization.
[11] (Chandoevwit, 2004) reports that 2.9 percent of private wage earners were unionized in 1998.

to lower quality public schools are reported, is it likely that declining school quality has contributed to the decline in 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. 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 are inconsistent with the increase in tertiary returns for the young in India and mid-career workers in all countries. The next two sections are dedicated to working out how the allocation of differently educated workers across sectors and their remunerations have changed over time and the extent to which this can account for trends in returns to education.

5. Decomposing Education Intensity and the Returns to Education

We present two sets of decompositions in this section. The first is an education shift-share analysis common in the literature (Berman et al., 1994). Figure 2 suggests why the exercise might be useful. It shows, in all three countries, that in terms of first order dominance, agricultural workers are the least educated, followed by industrial workers, while the unemployed and service sector workers are the most educated. Thus, it is possible, prima facie, that shifting employment structures out of agriculture account for rising education levels.

To examine this further, let *e* index the education level, *s*=1,…,*S* index sectors, which could include unemployment. Sector *s*'s employment share is α_s, the fraction of workers in sector *s* that are educated at least to level *e* is $\lambda_{e,s}$, and the fraction of all workers are e-educated is λ_e. For a sub-sectoral analysis, only workers within that sector would be considered and *S* would be the number of sub-sectors in the sector. Algebraically, $\lambda_e \equiv \sum_s \alpha_s \lambda_{e,s} \equiv \sum_s \Omega_{e,s}$, and $\Omega_{e,s} \equiv \alpha_s \lambda_{e,s}$ is sector *s*'s contribution to national *e*-education intensity. Time differencing yields:

$$(1)\quad \Delta\lambda_e \equiv \sum_s \Delta\left(\alpha_s \lambda_{e,s}\right) \equiv \sum_s \Delta\Omega_{e,s} \equiv \sum_s \lambda_{e,s}\Delta\alpha_s + \alpha_s \Delta\lambda_{e,s} \equiv \mathrm{A}_e + \Lambda_e ;$$

The identity says that adjustment to a more educated workforce takes place through a *between*-sector shift in employment composition towards education-intensive sectors (A_e), and through absorption of educated workers through increasing education intensity *within*-sectors (Λ_e). If A_e is large relative to $\Delta\lambda_e$ we will conclude that educational intensification, viewed through the prism of an *S*-sector decomposition, is closely associated with shifting employment structure. If

Λ_e is large, the opposite would be true, and many authors have found this to be the case (Autor et al., 1998; Berman, et al., 1994; Kijima, 2006).

Our second set of decompositions link the Mincerian returns to education, and their changes, to the employment and inter- and intra-industry wage structures. For brevity we present only the decompositions and their interpretations. We have presented derivations in Mehta et al. (2007).

Restricting attention to workers of a particular experience level, denoting average log wages of workers with education level *e* by $\overline{w}_e$, and suppressing (for notational convenience only) terms to scale by the number of years of schooling in a level, the Mincerian return to the e^{th} level of education, $\beta_e \equiv \overline{w}_e - \overline{w}_{e-1}$, can be decomposed as:

$$\begin{aligned}\beta_e &\equiv \sum_{s=1}^{S} P(s \mid e)\left[\overline{w}_{s,e} - \overline{w}_{s,e-1}\right] + \sum_{s=1}^{S}\left[\overline{w}_{s,e-1} - \overline{w}_{e-1}\right]\left[P(s \mid e) - P(s \mid e-1)\right] \\ &\equiv \sum_{s=1}^{S} P(s \mid e)\beta_{e,s} + \sum_{s=1}^{S}\overline{\varpi}_{s,e-1}\gamma_{s,e} = \sum_{s=1}^{S} C_{s,e}\end{aligned} \quad ; \tag{2}$$

where *P(s|e)* is the probability that a worker is in sector *s,* conditional on having education level *e,* and $\overline{w}_{s,e}$ is the average log wage paid to workers in sector *s* with education level *e*.

The first summation is a weighted average of the returns within sectors $\left(\beta_{e,s}\right)$, where sectors' weights are the fractions of the e-educated they employ $\left(P(s \mid e)\right)$. We call this the *price effect* of education. The second summation captures an *allocative effect* that adds to the returns to education level *e* whenever continuing from education level *e-1* to level *e* increases the probability of workers obtaining employment in particular sectors $\left(\gamma_{s,e} \equiv P(s \mid e) - P(s \mid e-1)\right)$ that pay above average base wages $\left(\overline{\varpi}_{s,e-1} \equiv \overline{w}_{s,e-1} - \overline{w}_{e-1}\right)$.[12] The *contribution of sector s to the returns to education level e* is then $C_{s,e} \equiv P(s \mid e)\beta_{e,s} + \overline{\varpi}_{s,e-1}\gamma_{s,e}$. It 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 a large positive wage-premium ($\overline{\varpi}_{s,e-1}$) if it favors *e* workers over *e-1* workers ($\gamma_{s,e} > 0$).

Next, we define $\tilde{C}_{s,e} \equiv C_{s,e} / P(s)$ as the *rate of contribution* of each job in sector *s* (each job has probability mass 0), so that $\beta_e \equiv \sum_{s=1}^{S} P(s)\tilde{C}_{s,e}$. The decomposition has two uses.

[12] See Mehta et al., (2007) for a discussion of possible interpretations of allocative and price effects under different theories of wage determination.

First, rates of contribution per job that differ significantly by sector are consistent with two stories. Either (i) the returns to education depend upon the composition of employment, or (ii) some sectors attract and reward workers who possess characteristics that are unmeasured in the data but are positively correlated with education, more than other sectors – or both.

Second, if the former interpretation is even partially correct, we note that marginally 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 $\tilde{C}_{A,e} > \tilde{C}_{B,e}$. To highlight the limitations of this exercise denote the marginal probabilities of a randomly drawn worker having education *e* - (*P(e)*) or working in sector *s* - (*P(s)*), and apply Bayes' rule, to (2). This yields:

$$(3) \qquad \beta_e \equiv \sum_{s=1}^{S} P(s)\left\{ \frac{P(e \mid s)}{P(e)} \beta_{e,s} + \overline{\varpi}_{s,e-1}\left[\frac{P(e \mid s)}{P(e))} - \frac{P(e-1 \mid s)}{P(e-1))} \right] \right\} \equiv \sum_{s=1}^{S} P(s)\tilde{C}_{s,e}$$

This says that $\tilde{C}_{s,e}$ is fixed if and only if sector wage premiums, returns within sectors, the supply of educated workers, and the educational distribution of sector-employees are fixed also. This condition cannot be met arithmetically if perturbations in employment structure are large, and it may not be met if the new jobs added in a sector differ from existing jobs in the sector. However, as there is no good reason to presume that the marginal jobs would have lower (or higher) returns than average jobs, a neutral assumption is probably the best starting point. Nevertheless, we will consider the outcome of this exercise only when rates of contribution differ greatly across sectors. Similar exercises are, of course, common in the empirical literature on structural transformation and labor productivity, and are subject to the same caveats.[13]

Decompositions (2) and (3) account for the *level* of the return to education. We would like to know the extent to which the demands of an economy where workers are shifting across sectors can account for this change. To examine this, we difference (3) to yield:

$$(4) \qquad \Delta\beta_s \equiv \sum_{s=1}^{S} \tilde{C}_{s,e} \Delta P(s) + \sum_{s=1}^{S} P(s) \Delta \tilde{C}_{s,e} \; ;$$

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. We call this the *compositionally expected change* in returns, and the second summation the *residual change* in returns. Structural change "accounts" for the change in returns if the compositionally expected change is similar to the observed change.

Finally, time-differencing (2) yields

[13] Mehta, et al.(2007) explain why this comparative statics exercise is invalid for large shifts in employment structures..

$$(5) \qquad \Delta\beta_e \equiv \sum_{s=1}^{S}\left[P^{t=1}(s \mid e)\Delta\beta_{e,s} + \beta_{e,s}^{t=0}\Delta P(s \mid e) + \gamma_{s,e}^{t=1}\Delta\overline{\varpi}_{s,e-1} + \overline{\varpi}_{s,e-1}^{t=0}\Delta\gamma_{s,e}\right] \equiv \sum_{s=1}^{S}\Delta C_{s,e} \ .$$

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

Implementing decompositions (1)-(5) requires that their basic elements be measured conditional on experience. To ensure that we decompose the returns measured in Table 2, we restrict ourselves to the same sub-samples from which they are estimated, and use tabulations of wages and employment across sectors and education classes. Sampling weights are used everywhere to reflect the population. No attempt is made to control for self selection into sectors, as the sectors are many, and reasonable exclusion restrictions to identify a switching model are not available.[14]

6. Returns to education and employment structure

Our primary classification scheme splits the employed labor force into eight sectors: agriculture, mining & quarrying, construction, utilities, relatively low-skill manufacturing ("L Manufacturing" in the tables), high-skill (H) manufacturing, relatively low-skill (L) services, and high-skill (H) services. Sub-sectors were assigned to these skill categories based upon the fraction of their workforce that had completed lower-secondary (LS) education in the initial year of our analysis (See Appendix for components of our eight sectors). We use lower cutoffs for manufacturing than services because education levels are much higher in services (Figure 2). The cutoffs also vary by country. For example, Thailand has a much more sophisticated manufacturing mix than India. Accordingly, transportation equipment is a relatively low-skill manufacturing activity in Thailand but a relatively high-skill activity in India. Maintaining a common classification would have left India with practically no high-skill manufacturing, reducing by construction the scope for observing any effects of manufacturing upgrading on returns to education in India. The composition of service activity is more constant across countries, as one might expect of mostly non-tradable activities, than the composition of manufacturing is. Accordingly, the mapping of sub-sectors to low- and high-skill Services is essentially the same across countries.

6.1 General Findings

[14] If workers with higher econometrically unobserved ability are filtered into sectors paying higher returns (or sector-wage premiums), failure to correct for this should bias our estimates of returns within these sectors (or sector-wage premiums) upwards.

Before describing our results separately for each country, we highlight five findings that will reappear in each. First, viewed through identity (1) at several degrees of disaggregation, transformations in the industrial employment structure are far too small to absorb the rising numbers of educated workers.

Second, viewed through the lens of an 8-sector decomposition using identity (4), transformations in the industrial employment structure are too small, and often in the wrong direction, to account for shifts in the returns to education (Table 3).

Third, the decomposition of returns into price and allocative effects, per identity (2), suggests that education inflation has influenced the returns to education. In particular, if the probability of employment in high-wage sectors is positively correlated with observed education, then the allocative effects of education are expected to matter most at critical levels of schooling under job competition and some assignment models.[15] The critical level of schooling in a cohort is the level at which employers, working their way down the education ladder in search of skilled workers for skill intensive jobs, will stop. Empirically, this is likely to correspond to the level of education for which allocative effects account for the largest share of the returns. If there is education inflation, the critical education levels should be higher in more educated cohorts, and if the critical education level doesn't shift discretely, the share of returns accounted for by allocative effects should rise. Table 4 confirms this expectation: the empirically determined critical education levels increase weakly over time and are higher for young cohorts. Moreover, whenever the critical education level for a cohort does not shift over time, the share of its return that is accounted for by allocative effects rises. Allocative effects can be large, accounting for over 40% of the returns to education in some cases. While this does not imply support for any theory of labor market clearance over any other, it does mean that the returns to education within a sector are an inadequate measure of the contribution of a sector to the private returns to education.[16]

Fourth, applying identity (2), high-skill services account for the bulk of the returns to college education for all cohorts and countries (the top panel of Table 5). The middle panel of Table 5 demonstrates why – a large share of college graduates are employed in that sector. However, again consistent with education inflation, that share tends to be smaller in the younger and more educated cohort, smaller in the subsequent year, and smaller in the more educated countries. All three trends suggest that the capacity of the private high-skilled services sector to provide jobs for educated workers is limited.

[15] The notion of critical education levels is foreign to human capital theory.
[16] See Mehta et al., (2009b) for more.

These common observations make it all the more interesting that the sectors *shifting* the returns to college the most vary across countries (Table 5, bottom panel). In India, where the relative supply of college graduates is the smallest, the share of college grads working in high-skill services was the highest and high-skill services is practically the only sector driving the returns to college up. In Thailand, manufacturing plays a greater role in driving the returns to college than it does in India. In the Philippines, the country with the most college graduates, low-skill services and construction drag the returns to college down for the young, while mid-career workers returns don't shift.

Finally, the fifth set of findings concerns the rates of contributions (per job) to the returns to education, calculated from identity (3). Table 6 provides the rates of contribution of the five major sectors for young workers in the latest survey year. Rates of contribution vary significantly across sectors. This is consistent with the view that returns to education will depend upon the structure of employment, but also with the view that some sectors simply seek to attract workers with higher unobserved skills that are correlated with education. Nationally representative longitudinal surveys of workers would help to determine which interpretation is correct.

Table 6 also shows that while high-skill services have the highest rates of contribution to returns to college everywhere, the rankings of the rates of contribution of the manufacturing sectors and low-skill services to all levels of education vary by country. This is a first indication that industrialization may have different effects on returns to education in different countries.

These last few observations motivate the rest of our analysis, which focuses on the dissimilar aspects of our countries' development experiences**.** We focus on four generic questions in each country. (1) How did employment shift across sectors?; (2) Where did the net influx of newly educated workers find jobs?; (3) Why have the returns to secondary education fallen?; and (4) Why did returns to college shift as they did? In addition, we take on one question specific to the transformation of each country.

6.2 India

Most Indian workers are not highly educated. Many of them are too old to return to school, and in any case, sufficient schools to handle such a task do not exist. The majority of these workers currently labor in agriculture, where labor productivity is low and notoriously slow-growing. Accordingly, our country-specific question is whether non-farming jobs are being created that would employ the less educated.

Table 7 answers this, and our first two generic questions. Note that all table entries referenced in our discussions appear in bold for ease of reference. References to columns are

made in the text whenever a fact or figure is discernible in the tables. When no reference is made in the text to a specific column, it is to be understood that the statement is based on figures derived by us from the labor force surveys, but that we have not provided the associated detailed table for reasons of brevity.

We begin with employment shares. The top panel of Table 7 shows that agriculture's share of aggregate employment in India diminished by 8.5 percentage points as workers were funneled into (in declining order of importance) construction, low-skill services, unemployment, low-skill manufacturing and then high-skill services (Column 3; henceforth: c3). A construction boom is self-evident. The modest uptick in manufacturing employment is driven by two trends: growing demand for inputs to this construction boom; and a boom in textiles. Mehta and Mukhopadhyay (2007) use labor force and value added data to argue that high-skill services exports have boosted the rest of the economy through a construction boom, and an attendant increase in demand for inputs to construction, complementary consumer durables and other capital goods. Accordingly, we find that 25.9% of the manufacturing jobs created were in two sectors that produce inputs to construction. We also measure just over 5 million new jobs in textiles (accounting for 43.9% of new manufacturing jobs). These are only slightly offset by a decline of some 910,000 jobs in the apparel sector.

The above job creation trends favor workers without LS education. Less than 20% of textile workers have LS education, and this figure falls to around 13% in construction and sectors manufacturing inputs to construction. At least in employment terms this indicates a reversion to comparative advantage for a poorly educated country that has recently opened up to trade. It also provides some reassurance in the face of other analyses that have commented on India's overly skill-intensive pattern of industrialization (Kochhar et al., 2006).[17] Almost 70% of new manufacturing jobs in India went to workers without LS degrees.

Where have the educated workers gone? The top panel of Table 7 shows that the share of the labor force with LS degrees rose 4.9 percentage points to 22.2% (c5 and c6 respectively). Out of this 4.9 point increase, 1.6 points (c7) or 32.7% of it (see c2 in the bottom right panel of Table 7) could be absorbed by the shifting employment structure without increasing the use of LS graduates within sectors. Of the net influx of LS-grads, 30% were absorbed into low-skill

[17] Reconciling our results with Kochhar et al.'s goes beyond the scope of the paper, but it may be that our inclusion of four more years of data, coincident with the acceleration of the construction boom, can explain the difference. Another possibility that is difficult to assess from their footnotes, is that when estimating the skill intensity of Indian employment Kochar et al. may be using not just manufacturing, but industrial and services employment.

services, and that the next biggest draw was agriculture (c10). High-skill services was the third biggest draw, because its employment share remains small (c1-c3).

Although high-skill services are relatively unimportant for LS graduates, they matter a great deal for college and US graduates. The sector absorbed 28% of the new US graduates, and 36% of the new college graduates (c3 and c4 of the bottom left panel of Table 7). Given that the sector's employment share grew slower than educational attainment, this implies, by Bayes' Rule, a rapid rise in education intensity in the sector. We will show below how this trend, in combination with low-skill manufacturing job creation favoring those without LS education, left LS graduates facing anemic demand for their training and falling returns.

We also check whether the modest (32.7%, see above) share of LS-education absorption attributable to shifts in employment structure is an artifact of aggregation. The bottom panel of Table 7 (c5-c8) shows the analogous figures for all four education levels, and 6 classification schemes. Five of these are industrial classifications of varying degrees of aggregation (see the notes to Table 7). We also use a 92-occupation classification in deference to studies that show that the evolution of occupational structure parallels shifts in demand for educated workers closely (Goos and Manning, 2007; Murphy and Welch, 1993). We find that regardless of education level or classification scheme, only 20-40% of the increase in educated labor supply could be absorbed by shifting employment structures.

Summing up, shifts in employment structure created many jobs for the less educated, especially in manufacturing. The bulk of the (net) new LS grads therefore moved into sectors that did not historically hire many LS graduates – especially low-skill services and agriculture, pulling up education levels within these sectors. US and college graduates mainly found work in high-end services. However, because employment in the sector grew slowly, this squeezed out less-educated workers.

We turn now to our third and fourth questions - why did returns to secondary education in India fall and returns to college rise? To illustrate how decomposition (5) works, we present results in detail for three education levels for young workers and one level for mid-career workers in Table 8. The decompositions show that three forces shifted returns to education in India: (i) higher education supply, (ii) movement down the skill ladder (in employment terms) in manufacturing, and (iii) a growing preference for college education in high-skill services. We have already documented that (i) and (ii) occurred, and each is reflected in Table 7, while (iii) will be directly observable from Table 8. We also note that when (ii) and (iii) happen together, this implies a polarization in skill requirements – LS graduates fall out of favor both in manufacturing and high-skill services.

All three forces are required to explain the shifts in returns to secondary education. Returns to LS and US education for the young crashed in India, because they fell in most sectors (c1), as expected when the education supply expands. This explains 6.2 points of the 7.1 point decline returns to LS education and 5.7 points out of a 6.2 point decline in returns to US education (c5). High skill services play a crucial role – returns to LS education in the sector collapsed, accounting for over half of the drop in LS returns (c1 & c5), while returns to US education in the sector held firm. This is consistent with growing skill requirements in HS services. Moreover, 10.5% of LS graduates and 15.7% of US graduates also got eased out of low-skill manufacturing and high-skill services, finding work in low-skill services and construction (c2). These trends, which contributed a 1.6 point decline in returns to LS education (c6) are consistent with deskilling in low skill manufacturing and skill upgrading in high-skill services. Thus, the sectors most responsible for shifting returns to secondary education were low-skill manufacturing and high-skill services (c9). As the skill requirements of the former sector fell and those of the latter rose, secondary educated workers were caught in between a polarizing skill demand profile and saw their returns collapse.

Returns to college for young Indians rose 7.3 points, almost entirely because returns rose within sectors, notably within high-skill services. However, the share of college graduates finding work in the sector shrank, reducing the contribution of the sector to shifting tertiary returns somewhat (c2 & c6). This suggests that despite large increases in returns to education within high-skill services, the sector's absorptive capacity is very low. The factors driving returns to college for mid-career workers (not shown) are qualitatively the same.

Finally, the forces holding mid-career workers' returns to US education in place are themselves interesting. Rising returns to US education within services were counteracted by crashing returns within manufacturing and agriculture (c1 & c5). Coupled with movements in employment shares (c2) the trends are consistent with relative demand for US graduates rising in services and falling in manufacturing.

To summarize: India's employment structure is polarizing in terms of its skill requirements. Its dynamic but small high-skill services sector has increased its demand for college educated workers, while rapid expansion in low-skill manufacturing and construction is creating jobs for workers with less than a lower secondary education. Young LS-educated, and to a lesser extent US-educated workers, therefore increasingly find themselves less in demand, obtain lower returns, and often end up employed in low-skilled services. The observed increase in the returns to college and decline in returns to secondary education follow naturally from these trends.

6.3 Thailand

Our policy question in Thailand is whether the perceived shortage of secondary educated workers (Booth, 1999) has been alleviated. Table 2 shows that returns to LS education for the young fell from 12% in 1995 to 4% by 2005, suggesting that it has been. However, despite a significant expansion in college graduation, the returns to college for young Thais remained substantial, at 19.7%, and those for mid-career workers rose to 26.5%. These trends imply that young secondary graduates are no longer scarce, but that more experienced college graduates are.

In answering our four generic questions we will argue that these trends reflect (i) an increased supply of educated workers; (ii) a flight to experienced college graduates in the financial sectors, perhaps as a consequence of the Asian Crisis; and (iii) an upgrading of the manufacturing product mix that shifts demand in favor of more educated and experienced workers;. We have documented (i) already, and (ii) will reveal itself in the decompositions of the returns to college. As for (iii): the upgrading of Thailand's manufacturing product mix has been well documented. For example, Athukorala and Suphachalasai (2004) show that the export share of transport equipment grew rapidly while that of apparel tapered off; trends that are mirrored in our employment data. The share of low-skilled manufacturing employment made up of textiles and apparel work shrank from 31.6% to 23.6%, while that of transport equipment rose from 11.4% to 16.1%. Workers manufacturing transport equipment are twice as likely to have a college education as textile and apparel workers. These facts lead us to expect some support for higher-education demand from low-skill manufacturing.

So, where has the net influx of educated workers found work? The top panel of Table 9 shows Thais leaving agricultural employment in droves, and finding work in low-skill services, low-skill manufacturing, high-skill services and high-skill manufacturing, in that order (c1-c3). Services have twice the employment share of manufacturing and therefore employed more graduates at every level (c4-c6 of the same panel). Moreover, college intensity rose more in services than in manufacturing (not shown), further increasing the number of college graduates absorbed into services.

The robust expansion of manufacturing and low-skill services, together with the low initial education levels in these sectors (around 32% of workers in these sectors had LS degrees in 1995), explains why only 15-25% of the increase in national education intensity at every level of education could be absorbed by changes in employment shares. This result (table not shown) is obtained from decomposition (1) regardless of the level of occupational or industrial disaggregation at which the shift-share analysis is conducted. Thus, as with the other countries,

shifts in Thailand's employment structure are unlikely to have directly boosted demand for educated workers.

Why did the returns to secondary education fall? Sharp falls in returns within all sectors, except for high-skill services, account for practically the entire drop in returns to LS and US education for young workers (Table 9, middle panel, c1, c5, c6 & c10). This is consistent with Thailand's sharply increased supply of secondary graduates and its relatively small shift in employment towards education intensive sectors.

The contributions of the manufacturing sector to shifting returns to secondary education in India and Thailand provide an illuminating contrast. As we have shown, India's reversion to lower skilled employment within manufacturing contributed to a decline in the returns to secondary school by increasing the utilization of those with less than secondary education. The process of manufacturing upgrading in Thailand also contributed to declining returns to LS education (Table 9, middle panel, c5 & c10), but for the opposite reason - it was accompanied by an explosion in the hiring of young US graduates and mid-career secondary graduates at the expense of young LS graduates. The manufacturing sector's employment share fell 11 points amongst young LS graduates (reflected in c2), while rising 13 points among young US graduates (reflected in c7), and 15-18 points among mid-career LS and US graduates (not shown). Thus, manufacturing climbed down the skill ladder in India, up it in Thailand, and both trends reduced the returns to LS education. The link between industrialization and secondary education appears to depends upon what is being manufactured.

Why the returns to college education rise for mid-career workers, but hold firm for the young? Certainly the difference could be explained by the larger increase in college graduates amongst the young, and falling within-sector college returns for the young are consistent with this (reflected in c1 of the bottom panel of Table 9). However, our decompositions also reveal a potentially complementary explanation – a flight to experience in financial services. To capture this, the decomposition in the bottom panel of Table 9 splits high-skill services into the FIRE sectors (Finance, Insurance and Real Estate) and the non-FIRE high-skill sectors.

For mid-career college graduates, the FIRE sectors' employment share rose 13 points while that of the non-FIRE sectors crashed 22 points; conversely, for the young the FIRE sector's share fell 5 points and non-FIRE sectors share grew by 8 points (not shown). Thus, the FIRE sectors came to rely much more heavily on experience, and young college graduates lost access to the sector (reflected in c2 & c7). These shifts appear to reflect increased demand for experienced college graduates in the FIRE sector: the returns to college within the FIRE and non-FIRE sectors

fell 4 points for the young, while those within the FIRE sector rose 7.4 points for mid-career workers (reflected in c1 & c6).

This trend towards experience is replicated within manufacturing, where more young college grads are shifted from high-skill to low-skill manufacturing (reflected in c2 & c5), while mid-career college graduates move in the opposite direction (reflected in c7 & c10). One interpretation is that there was a flight-to experience in the wake of the Asian Crisis. Another is that it is simply a normal result of education inflation – good jobs became the exclusive domain of the most educated and experienced.

The above begs one question: if young college graduates became abundant, and they were squeezed out of lucrative financial and high-skill manufacturing jobs, why didn't their returns fall substantially? The algebraic answer appears to be that the FIRE and non-FIRE sector-wage premiums rose by 11 and 15 percentage points respectively, and that a college education still raises the odds of finding work in either sector (reflected in c3).

Summing up, rising education levels put downwards pressure on returns to education for all groups in Thailand. This was compounded for young LS graduates by a movement up the skill ladder away from LS education in manufacturing, and an increase in demand for experienced college graduates in the financial and high-skill manufacturing sectors. The latter lifted the returns for mid-career college graduates.

6.4 The Philippines

With chronically high unemployment, and a history of relative stagnation in the manufacturing sector, the Philippines government has emphasized the role of services development in its Medium Term Development Plan (Government of Philippines, 2004) as a means of employing the country's highly-schooled labor force. Our policy question in the Philippines is whether this strategy is advisable. In the process of answering our four generic questions we will show that it is not.

We begin, once more, with employment shares. With no new land to cultivate and population growth rates of approximately 2.2% per annum over our sample period, large transfers of the population out of agriculture were inevitable. Non-agricultural job creation trends in the Philippines contrast markedly with those in India and Thailand. Whereas manufacturing's employment share grew in the latter two countries, it shrank in the Philippines (Table 10, top panel, c3). Small gains in high-skill manufacturing's employment share were wiped out by a large decline in low-skill manufacturing's share. Meanwhile high-skill services employment

grew slowly, and momentum in construction was interrupted by the Asian financial crisis. Thus, an increasingly educated workforce was funneled into low-skill services and unemployment.

Given this skewed job creation pattern, where were the educated absorbed? Unsurprisingly, low-skill services absorbed more than half of the net new LS and college graduates (c4 & c5). The sector, whose initial 26% employment share is less than half those figures, is therefore an emerging destination for new graduates. A rather troubling 15.7% and 18.8% of the net influx of LS and college graduates ended up unemployed (c4 & c5). Relative to their employment shares, high-skill services and high-skill manufacturing did absorb a fair number of college graduates, but the sectors together accounted for only 13% of employment in 2004 (c2). Finally, as low-skill manufacturing employment shrank, the sector actually *added* to the share of the LS- and college-educated workforce seeking jobs in other sectors (indicated by the negative entries for the sector in c4 & c5). Thus the new educated workers had to mainly be absorbed in low-skill services and unemployment.

Our returns decompositions attribute falling returns to LS education for both groups and falling returns to college for the young to three forces: (i) increased education supply, (ii) deindustrialization, and (iii) a stagnation of low skill services in menial jobs.

The second panel of Table 10 uses identity (5), and shows that the decline in returns to LS education for both groups is driven mainly by a fall in the returns to LS education in most sectors (c1 & c6). This suggests the across the board effects of a supply increase. In fact, for mid-career LS graduates, falling returns in all big sectors account for the entire fall in returns (c6 & c10). Falling returns in low skill services, the largest employer of LS graduates, accounts for much of the decline in returns for both experience groups, and declining returns in low-skill manufacturing plays a role for the mid-career group (c6). Both age-groups were eased out of low-skill manufacturing jobs (c2 & c7), as deindustrialization continued, and the share of young LS graduates working in low-skill services grew 11 points to 55%. This compares with 29-30% shares in India and Thailand. The sectors that contribute the most to the decline in LS returns are, therefore, low-skill manufacturing and low-skill services (c5 & c10).

Why did college returns fall for the young, but hold for mid-career workers? Deindustrialization and rising supplies pushed mid-career college graduates out of low skill manufacturing and high-skill services into low-skill services (reflected in c7). Otherwise precious little changed for them. Adjustments were sharper for young college graduates. Falling returns within sectors (c1) and falling sector-wage premiums (c3) dragged their returns down, while more jobs for them in higher return and higher wage sectors (c2 & c4) prevented their return from falling sharply. Returns within sectors were driven down mainly by low-skill

services (c1), even as deindustrialization pumped up the sector's employment share in this group from 29.4% to 36.7% (reflected in c2).

Base-wage premiums fell within high-skill services (and college education helps to obtain jobs in this sector) and rose within low-skill services (college increases the odds of finding a job outside that sector) (c3). The increase raised the sector's base-wage premium from negative 35% to negative 13.4% - hardly an endorsement of the sector's capacity to create meaningful work for educated workers. Meanwhile, falling base-wage premiums in high skill services are consistent with the claim that workers without college degrees are increasingly able to obtain only the most menial jobs in the high-skill services sector.[18] Corroborating this, a 2004 survey by the Philippines Bureau of Labor and Employment Statistics shows that very few openings for positions common in the formal high-skill services sector entertain applications from non-college graduates.

What does the above analysis tell us about the advisability of services led employment strategies in the Philippines? First, it must be recognized that services employment in the country is becoming less skill-intensive. The share of services employment that comes from low-skill sub-sectors grew from an already large 72.1% in 1993 to 73.8% in 2004, and the high-skill sub-sectors are reducing their intake of LS graduates. Indeed, Felipe and Mehta (2007) show, using decomposition (1) and 17 services sub-sectors, that holding education levels constant within service sub-sectors, the Philippines services sector would have needed less LS graduates in 2004 than it did in 1991. There is no evidence, in any of our three countries, to suggest that high-skill services can become a large sector in employment terms.[19] Second, we have shown that falling returns to LS education within low-skill services account for almost all the decline in the overall returns to LS education for young workers. Third, while young workers' returns to college education within low-skill services fell sharply, returns in high-skill services rose a little bit. This implies either that seemingly equally educated workers employed in these sectors are not interchangeable or that the labor markets they draw on are segmented for some other reason. Thus, even if job creation in high-skill services could be accelerated, it is not clear that such jobs could utilize workers currently employed in low-skilled services. Fourth, low-skill services pay lower wages than every other sector except agriculture (not shown).

One final concern with services-led development is that shifting to a more manufacturing-based employment structure would raise the returns to LS education. The bottom panel of Table 10 provides the rates of contribution to LS returns of the four manufacturing and

[18] See, for example, the 2000 report of the Presidential Commission on Higher Education.
[19] See Magtibay-Ramos et al.'s (2008) analysis of the Philippines Business Process Outsourcing industry.

service sub-sectors, calculated per identity (4). Manufacturing jobs, especially those in high-skill manufacturing, contribute to LS returns at a higher rate than services jobs, and that they do so in both years and for both age groups. It follows that, ceteris paribus, an employment structure involving more manufacturing jobs and less low-skill services jobs would yield a higher payoff to the Philippines' investments in LS education.

Our results recall the advice of a panel of experts on structural transformation and development, including Gustav Ranis and John Fei, commissioned by the ILO (1974) to exhaustively review the Philippines development plans. The panel proposed "the mobilization of the rural sector and the promotion of a labor-intensive industrial export drive as that twin development strategy package which the mission believes to be essential to bring about rapid growth, fuller employment and a more equitable distribution of income" (p. 4); and concluded that "…formal education does not constitute a bottleneck to our proposed development strategy for the Philippines" (p. 303). Between 1971 and 2004, manufacturing's employment share shrank from 11.1% to 8.7%.

7. Labor Productivity and Employment Composition

We next turn to data on labor productivity seeking patterns that may help explain or corroborate the explanations for shifting returns proposed in the previous section. These calculations combine sectoral value added data from each country's national income accounts with employment figures from the labor force surveys. Table 11 decomposes the aggregate annualized rate of labor productivity growth as suggested by Chenery et. al. (1986, p. 237). Denoting the sector s, the time rate of change ^, labor productivity y, the sector's share in value added ρ_s, and its share in employment α_s the decomposition is:

$$\hat{y} = \sum_s \rho_s \hat{y}_s + \sum_s \rho_s \hat{\alpha}_s \; ; \tag{6}$$

where the first summation captures the effects of labor productivity growth within sectors, and the second captures the effects of shifting workers into more productive sectors (Baumol's so-called structural bonus). Indian and Filipino data are concorded to our usual five sectors classification. Thai value added data did not permit this consistency, so six sectors are use for the Thai decompositions.

India saw tremendous labor productivity growth, mostly due to services, as well as a modest structural bonus arising from a shift of workers into services. Thailand suffered from lackluster productivity growth within sectors, as productivity in services fell hard in the wake of the Asian Crisis. However, Thailand did accrue a substantial structural bonus due to an increase

in manufacturing employment. The Philippines experienced little structural bonus but saw some productivity growth in agriculture and manufacturing. However, services stagnated because declining productivity and rising employment in low-skill services offset modest productivity gains in high-skill services. This resonates well with our findings that Filipino services have become compositionally less education intensive, that they account for much of the decline in returns for all secondary graduates and young college graduates, and that they disproportionately absorb LS- and college-educated workers. The Philippines' limited structural bonus reflects the funneling of labor departing agriculture into low-skill services, rather than manufacturing: labor productivity is roughly 3.5 times as high in manufacturing as in low-skill services (not shown). Thus, while productivity rose rapidly in India, and Thai policy maker would seek to restore productivity growth in services, Filipino policy makers must worry about job creation in the manufacturing sector.

A particularly intriguing aspect of these decompositions is that sectors roles in shifting labor productivity align perfectly with their roles in shifting in the returns to college education for young workers: for young Indians, college returns and productivity were driven up by rising contributions from services, particularly high-skilled services; for young Thais, whose college-returns were held down by falling contributions of high-skill services, labor productivity fell in services, especially high-skill services; and the college returns of young Filipinos declined as a result of crashing returns in low-skill services, while labor productivity in that sector declined and it absorbed more new college graduates. These observations stop far short of a theory, not least because there are intergenerational dynamics left unexplained. However, to the extent that labor productivity increases result from innovation, the results are consistent with the widely accepted finding that education pays when there are new technological innovations to adopt (Foster and Rosenzweig, 1996; Rosenzweig, 1995).

8. Discussion

Our findings revolve around three themes: (i) Employment in lower-skill service jobs is becoming more common, especially amongst graduates of secondary school; (ii) The returns to college are determined mainly by services, particularly high-skill services, which have increased their demand for college graduates but are growing slowly; and (iii) Rising educational attainment, patterns of industrialization and productivity growth have effects on the wage distribution that are deeply country specific. However, (i) and (ii) together account for the fact that college returns rose relative to returns to secondary education in all three countries. This increased convexity of the log-wage-education profile and its contribution to rising inequality has

been well documented, but the search for its cause continues. Our contribution is to show that to explain the trend, one has to explain (i) and (ii) first, and this means looking at services.

We believe this will prove an important finding. Counter to Heckscher-Ohlin logic, many unskilled-labor abundant developing countries have seen inequality and returns to college education rise following trade liberalization (Goldberg & Pavcnik, 2007). Skills-biased technical change (SBTC), typically trade-induced, is a common explanation for this. Good studies of SBTC seek confirmation from firm- or plant-level data that units that increased the use and relative pay of educated workers also underwent some technological shift that would merit the term SBTC (Pavcnik, 2003). All such studies that we have found use data from manufacturing plants. In fact, our data show that most high-skill services workers do not produce tradables, but that the sector determines the returns to college. Services sectors, and the withdrawal of constraints on their operation, therefore need to be brought under the microscope to make sense of emerging trends in income inequality.

Our results also bear on the vigorous, but generally inconclusive debate over why the measured relationship between education attainment and growth is noisy. Some authors cite measurement error (Krueger and Lindahl, 2001), while other authors have shown that the macro-returns to education differ across countries (Becchetti and Trovato, 2007). However there has been insufficient work explaining *why* returns might differ across countries. Work documenting cross-country variation in education quality has certainly been convincing (Hanushek and Woessmann, 2007), but this is not the only possibility. Pritchett (2001) and Easterly (2001) argue that the institutions determining the environment in which education is utilized will influence the macro-return to schooling, and that the supply of educated workers may rise faster than demand. Both writers clearly suspect that the returns to education, and the value of education for growth, will be specific to the types of work available. Our results confirm the relevance of the critique.

Our findings resonate with the work of several authors who have taken a nuanced view of the role of education in promoting productivity growth. Nelson et al. (1966) argue, theoretically, that it is the education of those in a position to innovate that matters for growth. Rozenzweig (1995) and Foster and Rosenzweig (1996) confirm this, showing that returns to education rise when there are new technologies to be adopted – a circumstance that has arisen less frequently in developing country agriculture in recent years, and seems irrelevant to construction and most low-skilled services in developing economies. A manufacturing sector that is stagnant (as in the Philippines), or shifting in employment terms into less sophisticated areas (India), would similarly have limited need for the educated, while a manufacturing sector that upgrades rapidly (Thailand) would benefit from education. Our decompositions confirm these expectations also.

Other studies encourage even greater skepticism. Lewis (2004), after conducting detailed microeconomic studies on the causes of low labor productivity in several sectors of thirteen countries, concludes that inadequate formal education is an immediate constraint on productivity growth in none of them. A separate, but obviously related literature from the United States and Europe (Autor and Dorn, 2009; Goos and Manning, 2007) shows that routinizable jobs in the middle of the skill distribution are disappearing, and are being replaced with low- and high-skill jobs. This "hollowing out" echoes the view of Braverman (1974) that the modernization of production processes through mechanization and the division of labor leads to a polarization in skill requirements. The fact that trends in returns to education in our countries can be linked to the growing importance of education in some small sectors relative to all the others means that we must, to an extent, side with the skeptics.

This is not to discourage investments in education. Rather, we argue that when economies do not develop in the specific ways that require more educated workers for productivity, the other very real benefits that education confers – improvements in health, political empowerment, social cohesion, gender equity and the like – become the primary motivations for educational expansion. The empirical evidence on these benefits remains overwhelming.

Finally, our work highlights two directions for future research. First, far more effort is required to understand the nature of low-skill service jobs, and the implications of their expansion for inequality, upward mobility, labor productivity growth and labor market regulation. Second, such efforts will be aided by the development of proper structural models of developing country labor markets that make allowances for labor market segmentation and/or unobservable worker heterogeneity. Arriving at a tractable but realistic set of assumptions upon which to build these models will require the collection of longitudinal datasets that not only provide more refined measures of human capital in order to minimize endogeneity problems, but are suitable for measuring employment structures as well.

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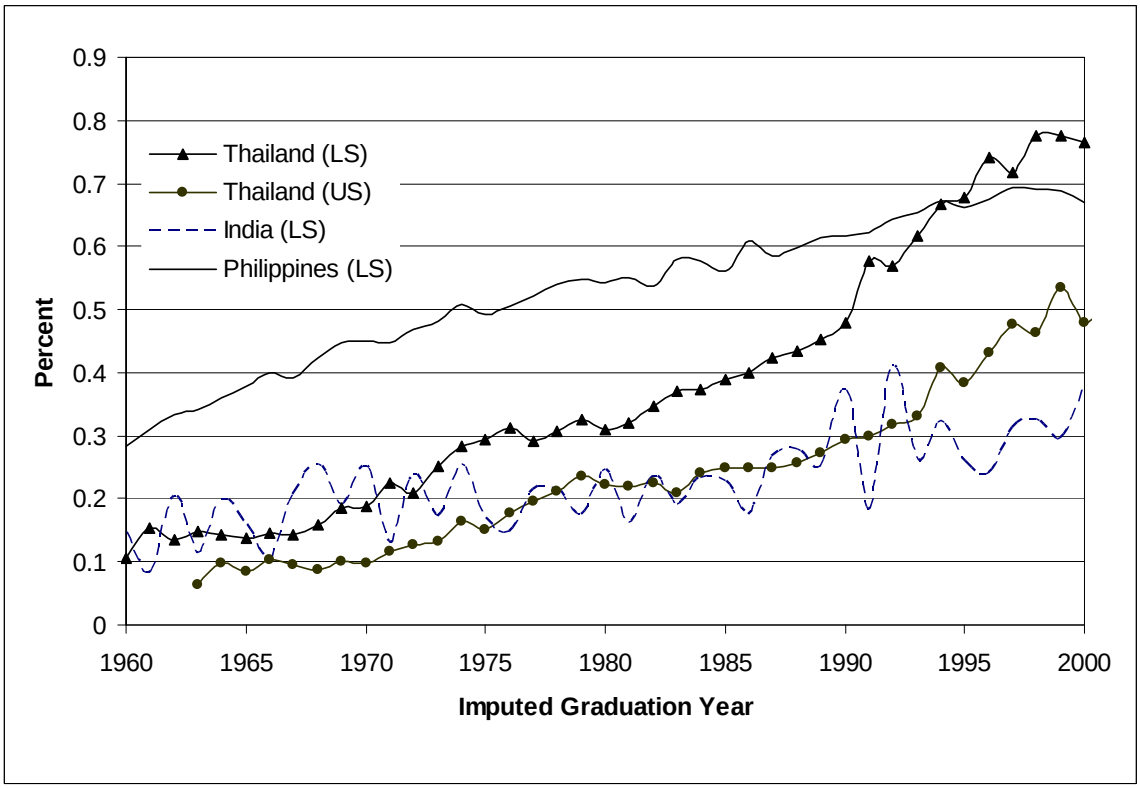
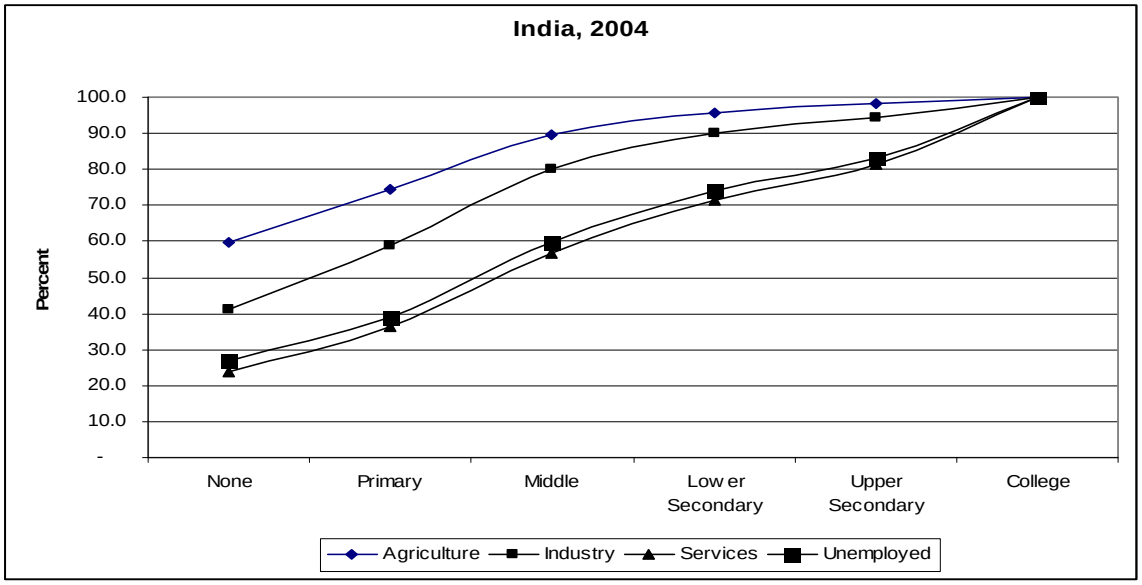
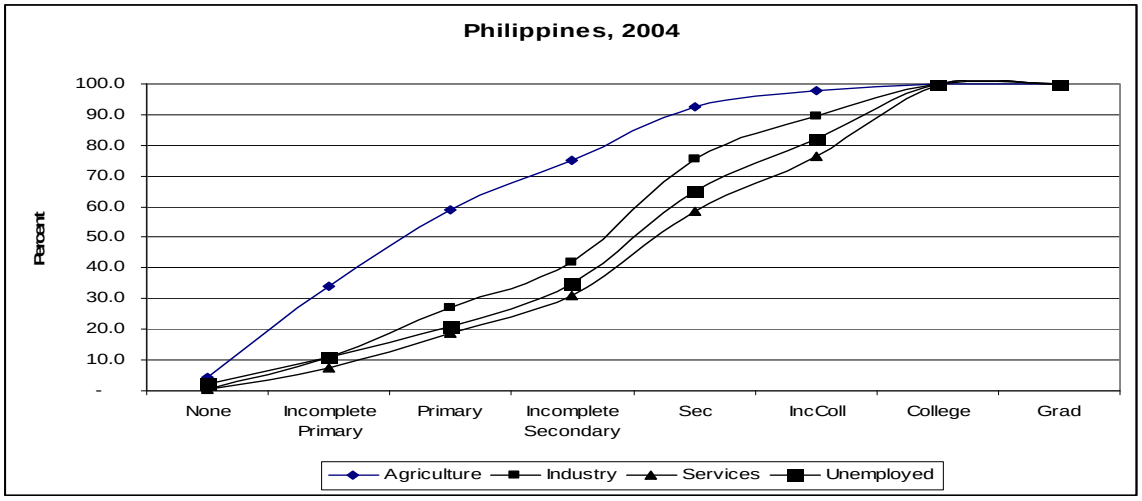
Figure 1: Secondary graduation rates by country and cohort, imputed from the latest LFS.



Note: Graduation rates are imputed from the latest round of the labor force survey for each country as the percentage of persons who should have graduated in a given year who report having completed the education level

Figure 2: Cumulative distribution of education, by sector.





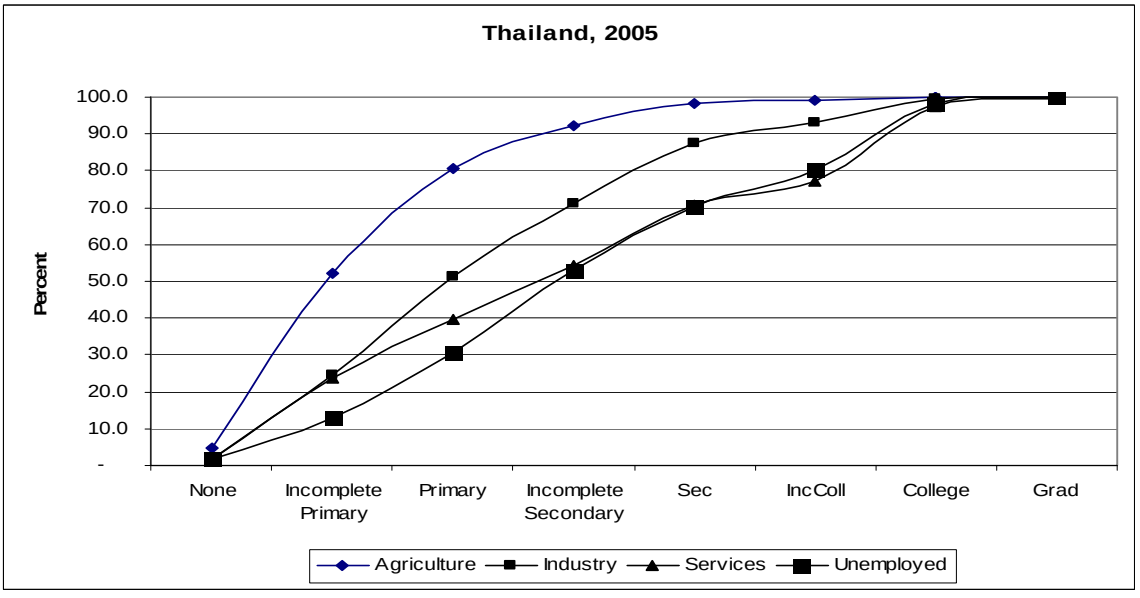


Table 1. Cumulative Distributions of Education Attainment Amongst Workers by Country, Year

Philippines		Workers Age 25-60		Workers Age 25-30		Thailand		Workers Age 25-60		Workers Age 25-30		India		Workers Age 25-60		Workers Age 25-30	
Education Level	Grade	1991	2004	1991	2004	Education Level	Grade	1995	2005	1995	2005	Education Level	Grade	1993	2004	1993	2004
None		3.4	2.1	1.4	1.5	None		4.2	3.2	1.8	1.6	None		61.3	49.2	55.0	39.7
Incomplete Elementary		23.5	16.9	13.1	11.3	Incomplete Elementary		66.9	41.1	34.9	4.6	Elementary	5	72.4	62.4	67.0	53.3
Elementary	6	47.2	33.7	31.1	22.8	Elementary	6	78.6	64.0	68.2	39.4	Middle School	8	82.9	77.5	79.6	72.8
Incomplete L. Secondary		58.3	45.5	43.5	34.8	Lower Secondary	9	85.6	74.9	79.0	57.7	Lower Secondary	10	90.3	86.6	88.1	84.1
Lower Secondary	10	76.2	69.4	66.7	61.8	Upper Secondary	12	91.5	85.2	90.2	76.1	Upper Secondary	12	94.2	91.6	93.2	90.6
Incomplete College		86.1	83.6	80.6	79.0	Diploma*	14	94.1	88.9	93.8	83.5	College/Grad.School	15	100.0	100.0	100.0	100.0
College/Grad. School	14	100.0	100.0	100.0	100.0	College/Grad. School	16	100.0	100.0	100.0	100.0						
Millions of workers		17.80	26.22	4.16	6.24	Millions of workers		23.77	28.96	5.99	5.86	Millions of workers		212.9	267.4	59.6	70.4
Barro and Lee's Average Years of Schooling (Age 25+)		1990	1995	2000		Barro and Lee's Average Years of Schooling (Age 25+)		1990	1995	2000		Barro and Lee's Average Years of Schooling (Age 25+)		1990	1995	2000	
		7.06	7.33	7.62				5.35	5.73	6.10				3.68	4.16	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: Simple Returns to Education by Work Experience

Education level	7 years of experience				20 years of experience			
India	1993	2004	Change		1993	2004	Change	
Sub-sample size	*8851*	*5801*			*12249*	*4816*		
Middle School	6.6%	8.4%	1.8%		9.9%	7.1%	-2.8%	*
Lower Secondary	11.9%	4.9%	-7.1%	**	19.7%	20.6%	0.9%	
Upper Secondary	14.5%	8.3%	-6.2%	*	16.2%	15.4%	-0.8%	
College	17.0%	24.3%	7.3%	**	11.9%	19.0%	7.1%	**
Philippines	1991	2004	Change		1991	2004	Change	
Sub-sample size	*3922*	*5548*			*2263*	*3695*		
Lower Secondary	17.3%	10.1%	-7.2%	**	12.6%	7.3%	-5.3%	**
College	19.5%	17.9%	-1.6%	*	15.8%	16.3%	0.5%	
Thailand	1995	2005	Change		1995	2005	Change	
Sub-sample size	*3843*	*4884*			*2868*	*4817*		
Lower Secondary	9.0%	5.8%	-3.2%	*	9.3%	7.1%	-2.2%	
Upper Secondary	11.7%	4.1%	-7.5%	**	10.5%	10.1%	-0.4%	
College	19.9%	19.7%	-0.2%		22.3%	26.5%	4.2%	*

** change in annualized returns is statistically significant at 1% level, * change statistically significant at 5% level

Table 3: Changes in returns, decomposed per identity (5)

	8 Sector Classification							
	Total contribution to change							
	Young Workers 7 Years of Experience				Mid-career workers 20 Years of experience			
India	Middle	LS	US	College	Middle	LS	US	College
Structurally expected change	0.008	-0.007	0.006	-0.005	0.013	0.001	0.010	0.002
Residual change	0.010	-0.064	-0.068	0.078	-0.041	0.008	-0.018	0.069
Total Change in Return	*0.018*	*-0.071*	*-0.062*	*0.073*	*-0.028*	*0.009*	*-0.008*	*0.071*
Thailand	LS	US	College		LS	US	College	
Structurally expected change	-0.002	0.009	0.031		0.011	0.009	0.061	
Residual change	-0.029	-0.084	-0.033		-0.013	-0.013	-0.019	
Total Change in Return	-0.032	-0.075	-0.002		-0.002	-0.004	0.042	
The Philippines	LS	College			LS	College		
Structurally expected change	0.011	0.032			-0.006	0.025		
Residual change	-0.083	-0.048			-0.047	-0.019		
Total Change in Return	*-0.072*	*-0.016*			*-0.053*	*0.005*		

Table 4: Share of the returns to education accounted for by allocative effects

		Young Workers				Mid-career Workers			
India		Middle	LS	US	College	Middle	LS	US	College
	1993	19.1%	8.2%	**30.2%**	14.5%	33.3%	**40.7%**	20.3%	6.1%
	2004	12.2%	33.9%	**38.7%**	12.3%	26.4%	24.9%	**41.8%**	9.7%
Thailand		LS	US	College		LS	US	College	
	1995	**16.6%**	0.6%	6.5%		**15.6%**	9.9%	7.2%	
	2005	**20.9%**	11.4%	13.8%		**22.7%**	10.0%	2.9%	
Philippines		LS	College			LS	College		
	1991	**28.6%**	23.1%			**15.5%**	12.3%		
	2004	7.1%	**19.4%**			**39.8%**	11.1%		

Numbers in **bold** highlight the education level in each cohort for whom allocative effects, defined in Identity (2) account for the largest share of returns.

Table 5: Sectoral contributions to tertiary returns and changes in tertiary returns

		India		Thailand		The Philippines	
Years of experience		7	20	7	20	7	20
Contribution to returns in the subsequent year from Identity (3)							
(1) Agriculture		0.020	0.015	0.003	0.003	0.009	0.012
(2) Low-Skill Manufacturing		0.021	0.008	0.036	0.033	0.002	0.012
(3) High Skill Manufacturing		0.016	0.013	0.022	0.019	0.008	0.009
(4) Mining		0.001	0.003	0.000	0.001	0.000	0.001
(5) Utilities		0.003	0.005	0.001	0.007	0.002	0.008
(6) Construction		0.005	0.007	0.009	0.011	0.000	0.000
(7) Low-Skill Services		0.019	0.008	0.052	0.062	0.071	0.057
(8) High-Skill Services		**0.160**	**0.131**	**0.074**	**0.129**	**0.086**	**0.065**
(9) *Aggregate*		*0.243*	*0.190*	*0.197*	*0.265*	*0.179*	*0.163*
Percent of college graduates employed in high-skill services	Initial year	68.5%	75.5%	34.0%	53.1%	39.8%	42.2%
	Subsequent year	63.4%	69.1%	37.2%	45.0%	41.1%	36.7%
Contribution to change in tertiary returns							
(1) Agriculture		0.003	0.007	0.001	0.001	-0.002	0.001
(2) Low-Skill Manufacturing		0.007	-0.001	0.016	**-0.019**	-0.001	0.006
(3) High Skill Manufacturing		0.007	0.014	**-0.033**	0.013	0.002	0.005
(4) Mining		-0.001	0.005	-0.001	0.001	-0.001	0.000
(5) Utilities		0.001	0.005	0.001	0.006	0.001	0.000
(6) Construction		0.003	0.007	0.003	0.009	**-0.011**	-0.006
(7) Low-Skill Services		0.003	-0.001	0.006	0.016	**-0.010**	0.005
(8) High-Skill Services		**0.050**	**0.034**	0.004	0.014	0.006	-0.007
(9) *Aggregate*		*0.073*	*0.071*	*-0.003*	*0.041*	*-0.016*	*0.005*

The sector with the greatest contribution is indicated in **bold**.

Table 6.-Sectoral contributions per job to the returns to education, major sectors only

	India (2004)			The Philippines (2004)		Thailand (2005)		
	LS	US	College	LS	College	LS	US	College
Agriculture	0.042	0.069	0.069	0.032	0.057	**0.093**	0.041	0.041
L. Manufacturing	0.054	0.003	0.135	**0.137**	0.023	0.046	0.030	0.127
H. Manufacturing	**0.198**	**0.216**	**0.331**	**0.263**	0.095	0.040	**0.059**	0.167
L. Services	**0.083**	0.087	0.087	0.107	**0.152**	**0.067**	0.055	**0.173**
H. Services	0.039	**0.227**	**1.121**	0.047	**0.660**	0.019	**0.058**	**0.587**
Actual Retun	*0.049*	*0.083*	*0.243*	*0.101*	*0.179*	*0.058*	*0.041*	*0.197*

Sectoral contributions per job to the returns to education in the subsequent year for workers with 7 years' experience, decomposed per identity (3). Figures in **bold** indicate sectors with the highest rate of contribution .

Table 7: India. Shift-Share Analysis (Identity 1)

Lower-Secondary Shift-Share Analysis	Employment Share			Intensity			Decomposition		Sectoral Contribution to Absorption	
	1993	2004	Change	1993	2004	Change	Across sectors	Within sectors	Total Sector Absorp-tion	% of net influx absorbed
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Agriculture	0.587	0.502	**-0.085**	0.071	0.105	0.035	-0.006	0.017	0.011	**0.224**
L Manufacturing	0.093	0.104	**0.011**	**0.167**	**0.201**	**0.034**	0.002	0.004	0.006	0.122
H Manufacturing	0.012	0.015	0.003	0.516	0.475	-0.040	0.002	-0.001	0.001	0.020
Mining	0.008	0.009	0.001	0.146	0.152	0.006	0.000	0.000	0.000	0.000
Utilities	0.004	0.003	-0.001	0.475	0.509	0.035	0.000	0.000	0.000	0.000
Construction	**0.036**	**0.063**	**0.027**	0.105	0.122	0.017	0.003	0.001	0.004	0.082
L Services	0.151	0.175	**0.024**	0.236	0.288	0.053	0.006	0.009	0.015	**0.304**
H Services	0.070	**0.076**	**0.006**	0.716	0.767	0.052	0.004	0.004	0.008	0.163
Unemployment	0.038	0.052	**0.014**	0.423	0.405	-0.019	0.006	-0.001	0.005	0.102
Aggregate	*1.000*	*1.000*	*0.000*	*0.172*	***0.222***	***0.049***	***0.016***	***0.034***	***0.049***	*1.000*

Percent of influx absorbed in Each Sector

	Middle	LS	US	College
	(1)	(2)	(3)	(4)
Agriculture	0.29	0.23	**0.18**	**0.14**
L Manufacturing	0.14	0.11	0.08	0.08
H Manufacturing	0.02	0.02	0.04	0.04
Mining	0.01	0.00	0.00	0.00
Utilities	0.00	-0.01	0.00	0.00
Construction	0.11	0.08	0.05	0.03
L Services	0.26	0.30	**0.27**	**0.22**
H Services	0.09	0.17	**0.28**	**0.36**
Unemployment	0.09	0.10	0.10	0.13
Aggregate	*1.00*	*1.00*	*1.00*	*1.00*

Shift-share with different degrees of disaggregation

	Middle	LS	US	College
	(5)	(6)	(7)	(8)
Change in education prevalence	0.105	0.049	0.035	0.025
% of influx absrobed by across sector movements				
3+1 sectors	0.231	0.388	0.342	0.303
5+1 sectors	0.206	0.334	0.288	0.251
8+1 sectors	0.198	**0.327**	0.275	0.240
25+1 sectors	0.236	0.410	0.396	0.378
68 sectors	0.183	0.312	0.282	0.271
92 occupations	0.243	0.377	0.314	0.291

Underlined sectors absorbed most e-educated. Numbers in **bold** are referred to in the text.

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Table 8: India - Select Decompositions of the shift in returns to education (Identity 5)

	$\Delta\beta_{e,s}$	$\Delta P(s\mid e)$	$\Delta\overline{\varpi}_{e-1,s}$	$\Delta\gamma_{e,s}$	$P(s\mid e)\Delta\beta_{e,s}$	$\beta_{e,s}\Delta P(s\mid e)$	$\gamma_{e,s}\Delta\overline{\varpi}_{e-1,s}$	$\overline{\varpi}_{e-1,s}\Delta\gamma_{e,s}$	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					Lower Secondary, 7 Years Experience				
Agriculture	-0.032	0.011	-0.123	0.034	-0.007	0.001	0.003	-0.007	-0.010
L Manufacturing	-0.083	**-0.045**	0.085	-0.027	**-0.015**	**-0.006**	0.000	0.000	**-0.021**
H Manufacturing	-0.009	-0.002	0.091	-0.002	-0.001	0.000	0.001	0.000	0.000
Mining	0.006	0.000	-0.100	-0.006	0.000	0.000	0.001	0.000	0.000
Utilities	-0.260	-0.005	-0.062	-0.002	-0.002	-0.002	0.000	0.000	-0.004
Construction	-0.041	**0.033**	-0.077	-0.005	-0.004	0.001	0.002	-0.002	-0.003
L Services	0.007	**0.067**	-0.053	0.032	0.002	0.003	-0.001	0.003	0.007
H Services	-0.273	**-0.060**	0.279	-0.022	**-0.034**	**-0.013**	0.009	-0.002	**-0.040**
Aggregate	.	0.000	.	0.000	**-0.062**	**-0.016**	0.015	-0.009	**-0.071**
					Upper Secondary, 7 Years Experience				
Agriculture	0.004	0.016	-0.046	0.003	0.000	0.000	0.002	-0.001	0.002
L Manufacturing	-0.157	**-0.040**	0.061	0.003	**-0.020**	-0.007	-0.002	0.000	**-0.029**
H Manufacturing	-0.128	0.021	0.214	0.011	-0.012	0.004	0.003	0.001	-0.004
Mining	0.007	0.006	0.054	0.003	0.000	0.000	0.000	0.001	0.002
Utilities	-0.305	-0.010	-0.439	-0.003	0.000	0.000	0.002	-0.001	0.000
Construction	-0.114	**0.058**	-0.017	0.012	-0.011	0.008	0.000	0.002	-0.001
L Services	-0.067	**0.065**	0.103	-0.001	**-0.018**	0.009	-0.001	0.000	-0.010
H Services	0.012	**-0.117**	-0.125	-0.028	0.003	-0.007	-0.010	-0.008	**-0.022**
Aggregate	.	0.000	.	0.000	**-0.057**	0.007	-0.005	-0.007	**-0.062**
					College, 7 Years Experience				
Agriculture	0.013	-0.014	0.086	-0.010	0.000	-0.001	-0.003	0.006	0.003
L Manufacturing	**0.037**	0.003	-0.130	0.014	**0.003**	0.000	0.002	0.001	**0.007**
H Manufacturing	**0.085**	0.011	0.083	-0.003	**0.006**	0.002	-0.001	-0.001	**0.007**
Mining	0.102	-0.001	0.191	-0.002	0.000	0.000	0.000	0.000	-0.001
Utilities	0.353	-0.003	-0.925	0.002	0.003	-0.001	-0.002	0.001	0.001
Construction	-0.002	0.015	-0.120	-0.014	0.000	0.002	0.003	-0.002	0.003
L Services	0.009	0.042	0.093	-0.008	0.001	0.005	-0.004	0.001	0.003
H Services	**0.083**	**-0.051**	0.022	0.022	**0.053**	**-0.007**	0.003	0.002	**0.050**
Aggregate	.	0.000	.	0.000	**0.067**	0.001	-0.003	0.009	**0.073**
					Upper Secondary 20 Years Experience				
Agriculture	**-0.068**	0.024	0.204	0.001	**-0.007**	0.002	-0.016	0.000	**-0.022**
L Manufacturing	**-0.022**	-0.028	-0.118	-0.029	**-0.003**	-0.003	0.003	-0.005	**-0.008**
H Manufacturing	**-0.165**	-0.032	0.049	-0.017	**-0.008**	-0.006	0.000	-0.006	**-0.020**
Mining	0.344	-0.001	-0.331	0.001	0.005	0.000	0.001	0.000	0.006
Utilities	0.014	-0.014	0.191	-0.004	0.000	-0.003	0.000	-0.001	-0.003
Construction	-0.031	0.044	-0.025	-0.002	-0.003	0.001	0.001	0.000	-0.001
L Services	**0.049**	0.102	0.022	0.062	**0.013**	0.010	0.001	0.004	**0.029**
H Services	**0.148**	-0.096	-0.063	-0.013	**0.050**	-0.012	-0.007	-0.004	**0.028**
Aggregate	.	0.000	.	0.000	**0.047**	-0.010	-0.017	-0.012	**0.009**

Figures in **bold** are referred to in the text.

Table 9: Thailand Shift-Share Analysis and Returns Decompositions

Lower Secondary Shift-Share (Identity 1)

	Employment Share			Contribution of sectors to absorbing an:		
	1995	2005	Δ	**18** pt. rise in the share of LS graduates	**12.7** pt. rise in the share of US graduates	**5.5** pt. rise in the share of college graduates
	(1)	(2)	(3)	(4)	(5)	(6)
Agriculture	0.503	0.406	**-0.097**	0.232	0.170	0.050
L Manufacturing	0.106	0.131	**0.024**	**0.203**	**0.183**	**0.101**
H Manufacturiing	0.029	0.035	**0.006**	0.052	**0.061**	0.042
Mining	0.001	0.001	0.000	0.000	0.001	0.001
Utilities	0.005	0.003	-0.002	-0.007	-0.005	0.006
Construction	0.058	0.053	-0.005	0.027	0.018	0.009
L Services	0.199	0.243	**0.045**	**0.301**	**0.303**	**0.282**
H Services	0.087	0.114	**0.026**	**0.159**	**0.235**	**0.468**
Unemployment	0.011	0.014	0.003	0.035	0.034	0.040
Aggregate	*1.000*	*1.000*	*0.000*	*1.000*	*1.000*	*1.000*

Decompositions of the Shifts in Returns (Identity 5)

	Lower Secondary - 7 years of experience					Upper Secondary - 7 years experience				
	$P(S\|e)\Delta\beta$	$\beta\Delta P(S\|e)$	$\gamma\Delta\overline{\omega}$	$\overline{\omega}\Delta\gamma$	Total	$P(S\|e)\Delta\beta$	$\beta\Delta P(S\|e)$	$\gamma\Delta\overline{\omega}$	$\overline{\omega}\Delta\gamma$	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Agriculture	0.004	0.000	-0.004	0.004	0.003	-0.003	0.003	-0.006	0.004	-0.002
L Manufacturing	**-0.013**	**-0.002**	-0.001	0.004	**-0.012**	**-0.023**	**0.011**	0.000	0.001	**-0.010**
H Manufacturiing	-0.002	**-0.001**	0.000	-0.006	**-0.009**	**-0.015**	**0.001**	0.000	0.002	**-0.012**
Mining	0.001	0.000	0.000	0.000	0.001	-0.001	0.000	0.000	0.000	0.000
Utilities	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Construction	-0.003	0.002	0.001	0.000	0.001	-0.005	-0.001	0.001	-0.002	-0.007
L Services	**-0.022**	**0.006**	0.001	-0.001	**-0.016**	**-0.020**	**-0.013**	0.000	0.001	**-0.033**
H Services	0.002	-0.001	0.000	-0.001	0.000	**-0.006**	**-0.008**	0.002	0.001	**-0.011**
Aggregate	***-0.034***	*0.005*	*-0.004*	*0.001*	***-0.032***	***-0.073***	***-0.007***	*-0.001*	***0.006***	***-0.075***

	College - 7 years experience					College - 20 years experience				
	$P(S\|e)\Delta\beta$	$\beta\Delta P(S\|e)$	$\gamma\Delta\overline{\omega}$	$\overline{\omega}\Delta\gamma$	Total	$P(S\|e)\Delta\beta$	$\beta\Delta P(S\|e)$	$\gamma\Delta\overline{\omega}$	$\overline{\omega}\Delta\gamma$	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Agriculture	-0.002	0.001	-0.003	0.004	0.001	0.000	0.000	-0.001	0.002	0.001
L Manufacturing	-0.004	**0.019**	0.001	0.000	**0.016**	-0.005	**-0.014**	-0.003	0.002	**-0.019**
H Manufacturiing	-0.003	**-0.029**	0.000	-0.002	**-0.033**	-0.004	**0.016**	0.004	-0.003	**0.013**
Mining	0.000	-0.001	0.000	0.000	-0.001	0.001	0.000	0.000	0.000	0.001
Utilities	0.000	0.000	0.000	0.000	0.001	0.006	0.000	0.000	0.000	0.006
Construction	0.000	0.002	0.001	0.000	0.003	0.006	0.000	0.004	-0.001	0.009
L Services	0.007	0.000	0.000	0.000	0.006	0.011	0.008	-0.001	-0.002	0.016
Non-FIRE	**-0.011**	**0.015**	**0.008**	0.003	**0.015**	0.005	**-0.048**	-0.001	0.001	**-0.043**
FIRE	**-0.004**	**-0.007**	**0.003**	-0.002	**-0.010**	**0.019**	**0.019**	-0.005	**0.024**	**0.057**
Aggregate	***-0.017***	*0.000*	***0.010***	***0.004***	***-0.003***	***0.040***	***-0.020***	*-0.003*	***0.024***	***0.041***

Numbers in **bold** are referred to in the text.

Table 10: Philippines: Shift-Share Analysis and returns decompositions

Lower Secondary Shift-Share (Identity 1)

	Employment Share			Contribution of sectors to absorbing a:	
	1993 (1)	2004 (2)	Δ (3)	**12.2** pt. rise in the share of LS graduates (4)	**2.7** pt. rise in the share of college graduates (5)
Agriculture	0.399	0.315	**-0.084**	0.056	0.025
L Manufacturing	0.078	0.060	**-0.018**	**-0.024**	**-0.048**
H Manufacturiing	0.020	0.027	0.007	**0.060**	**0.077**
Mining	0.006	0.003	-0.004	-0.008	-0.003
Utilities	0.043	0.048	0.005	0.050	0.002
Construction	0.004	0.004	-0.001	0.002	0.004
L Services	0.259	0.319	**0.059**	**0.596**	**0.526**
H Services	0.100	0.113	**0.013**	**0.111**	**0.228**
Unemployment	0.090	0.112	**0.022**	**0.157**	**0.188**
Aggregate	*1.000*	*1.000*	*0.000*	*1.000*	*1.000*

Returns Decompositions (Identity 5)

	Lower Secondary - 7 years of experience					Lower Secondary - 20 years experience				
	$P(S\|e)\Delta\beta$ (1)	$\beta\Delta P(S\|e)$ (2)	$\gamma\Delta\overline{\omega}$ (3)	$\overline{\omega}\Delta\gamma$ (4)	Total (5)	$P(S\|e)\Delta\beta$ (6)	$\beta\Delta P(S\|e)$ (7)	$\gamma\Delta\overline{\omega}$ (8)	$\overline{\omega}\Delta\gamma$ (9)	Total (10)
Agriculture	-0.001	0.000	0.015	-0.004	0.009	-0.005	0.000	0.002	-0.001	-0.004
L Manufacturing	-0.005	**-0.008**	-0.004	-0.006	**-0.023**	**-0.021**	**-0.009**	0.001	0.000	**-0.029**
H Manufacturiing	0.013	0.000	-0.021	0.000	-0.008	-0.008	0.000	0.000	0.005	-0.003
Mining	0.000	0.000	0.000	0.001	0.001	-0.001	-0.001	0.000	-0.001	-0.003
Utilities	-0.001	0.001	0.001	0.000	0.000	0.000	0.001	-0.001	0.002	0.001
Construction	0.000	-0.001	-0.001	-0.010	-0.012	0.000	0.002	0.001	-0.003	0.001
L Services	**-0.047**	**0.020**	0.008	**-0.016**	**-0.035**	**-0.016**	-0.003	0.000	0.001	**-0.018**
H Services	*0.001*	0.000	-0.004	0.000	-0.003	-0.005	0.004	0.002	0.001	0.003
Aggregate	**-0.041**	**0.011**	-0.007	**-0.035**	**-0.072**	**-0.057**	**-0.006**	0.005	0.004	**-0.053**

	College - 7 years experience					College - 20 years experience				
	$P(S\|e)\Delta\beta$ (1)	$\beta\Delta P(S\|e)$ (2)	$\gamma\Delta\overline{\omega}$ (3)	$\overline{\omega}\Delta\gamma$ (4)	Total (5)	$P(S\|e)\Delta\beta$ (6)	$\beta\Delta P(S\|e)$ (7)	$\gamma\Delta\overline{\omega}$ (8)	$\overline{\omega}\Delta\gamma$ (9)	Total (10)
Agriculture	-0.001	0.001	-0.001	-0.001	-0.002	0.000	0.000	0.001	0.000	0.001
L Manufacturing	0.000	**-0.006**	0.004	0.001	-0.001	0.006	**-0.003**	0.003	0.001	0.006
H Manufacturiing	-0.001	0.002	0.000	0.001	0.002	0.003	0.001	0.001	0.000	0.005
Mining	0.000	0.000	0.000	0.000	-0.001	0.000	-0.001	0.000	0.001	0.000
Utilities	0.000	0.000	0.000	0.000	0.001	0.002	0.001	-0.003	0.000	0.000
Construction	-0.002	**-0.009**	0.001	-0.001	**-0.011**	-0.003	0.001	-0.002	-0.001	-0.006
L Services	**-0.020**	**0.017**	**-0.010**	0.003	**-0.010**	-0.003	**0.013**	0.000	-0.005	0.005
H Services	**0.011**	0.001	**-0.009**	0.002	0.006	-0.002	**-0.008**	0.006	-0.003	-0.007
Aggregate	**-0.012**	**0.006**	**-0.015**	**0.005**	**-0.016**	0.003	**0.004**	0.005	-0.006	**0.005**

Rates of Contribution to Lower Secondary returns (Identity 4)

	7 years experience		20 years experience	
	1991	2004	1991	2004
L Manufacturing	0.266	0.230	0.137	0.072
H Manufacturing	0.468	0.252	0.263	0.190
L Services	0.205	0.122	0.107	0.063
H Services	0.098	0.098	0.047	0.101

Note: Numbers in **bold** are referred to in the text.

Table 11. Labor Productivity and Structural Change

Labor Productivity Growth (annualized)

	India	*The Philippines*	*Thailand*
Agriculture	2.27%	1.27%	3.22%
Manufacturing	2.29%	1.07%	1.16%
Non-Man	0.91%	0.31%	0.07%
SU Services	4.45%	-0.49%	-2.30%
SI Services	5.64%	0.81%	-2.90%
Trans, Stor, Comm			3.76%
Aggregate	4.37%	0.77%	1.48%

Chenery's Decomposition

Productivity effects	3.31%	0.61%	0.12%
Structural bonus	1.04%	0.18%	1.36%
Total	4.35%	0.79%	1.48%

Labor productivity decomposition defined by identity (6).

Appendix: Eight-Sector Classification

	India	Philippines	Thailand
Agriculture (including Fishing, Hunting and Forestry)			
Mining & Quarrying			
Utilities = Electricity, Gas, Water Supply			
Construction			
Low-Skill Manufacturing	• Food Products • Beverages, tobacco & related • Textiles • Textile products • Wood & wood products • Leather & leather products • Basic chemicals and chemical products • Non-metallic mineral products • Base metals and alloys • Metal products & parts, except machinery & transport equipment • Other manufacturing industries	• Food, beverages & tobacco • Non-metallic mineral products • Textiles, apparel & leather • Wood & wood products, including furniture & fixtures. • Other manufacturing industries	• Food products • Tobacco • Textiles • Footwear • Apparel • Non-wearing textile products • Wood & cork products • Furniture & Fixtures • Leather & fur products not for wearing • Rubber products • Petroleum products • Other non-metallic mineral products • Metal products, excluding machines • Transport equipment • Miscellaneous
High-Skill Manufacturing	• Paper, paper products, printing, publishing • Rubber, plastics, petroleum and coal products • Machinery, machine tools and parts • Electrical and electronic apparatus, machinery, appliances etc. • Transport equipment & parts	• Paper, paper products, printing, publishing • Chemicals & chemical products, petroleum, coal, rubber & plastic • Basic metals • Fabricated metal products, machinery & equipment	• Paper & paper products, printing, publishing • Chemicals & chemical products • Basic metals • Machinery • Electrical machinery • Medical & scientific equipment • Photographic/optical products • Watches & Clocks.
Low-Skill Services	• Retail • Transportation • Household and Personal Services • Hotels & Restaurants • Social Work & Other Community Services • Wholesale Trade • Recreational & Cultural Services	• Wholesale Trade • Retail Trade • Transportation • Recreational & Cultural Services • Personal and HH Services • Hotel & Restaurants • Sanitary & Similar Services	• Retail Trade • Transportation • Personal and HH Services • Hotels and Restaurants • Wholesale Trade • Recreational and Cultural and Cultural Services • Warehousing • Sanitary and Similar Activities
High-Skill Services	• Warehousing • Sanitary & Similar Services • Repair • Public Administration & Defense • Education, Scientific & Research • Health & Medical • Communications • Financial Intermediation • Real Estate • Business Services • Insurance • Extra-territorial Org & Bodies	• Communications • Banking • Non-bank Financial Intermediation • Insurance • Real Estate • Business Services • Public Administration & Defense • Education • Health, Social & Community services • Extraterritorial Organizations	• Public Administration and Defense • Education, Scientific and Research • Health and Medical Services • Social Work, and other Social and Community services • Communication • Financial intermediation • Real Estate • Business Activities incl renting • Insurance