Legacy of Khmer Rouge on Skill Formation in Cambodia

Hyeok Jeong

This paper explores the effects of the demographic shocks related to the genocide of Khmer Rouge regime and their implications on skill formation in Cambodia. We found that the mass and targeted massacre created a deep hole in the middle-aged and the educated. After the end of the regime and the subsequent transition periods, baby boom followed. This baby-boom generation youth had difficulty in finding qualified teachers at schools and experienced mentors at workplaces and this led to the breaks of the intergenerational link of human capital transfer in Cambodia. Unfortunately, the current curriculum design of the TVET and general education in Cambodia is biased against the skill needs of the Cambodian labor market. Fixing these problems is an urgent issue for the sustainable development in Cambodia.

Keywords: skill shortage, skill mismatch, demography, TVET System, educational reform, Cambodian labor market

1. INTRODUCTION

Cambodia once was a glorious nation in history having built one of the World Heritages. In the process of modern state building, Cambodia went through a dark age, the so-called Khmer Rouge regime. Around the period of the regime in the 1970s, the Cambodian economy went through a deep and long recession. According to the Penn World Table version 8 data which compiles real GDP with purchasing power parity (PPP) adjusted population data for 167 countries, the average real income per person of Cambodia in 1970 was $1,299 in 2005 constant PPP-adjusted dollar value, which became halved down to $663 by the end of the Khmer Rouge regime. This corresponds to the negative income growth of -6.5% per year. Unfortunately, the recession continued during the transition period in the 1980s. Even after Norodom Sihanouk was restored as the King of Cambodia in 1993, political stability was not established and the growth performance was unstable in Cambodia. It was only after 1997 that Cambodia gained its growth momentum. The average real income of Cambodia grew from $878 in 1997 to $2,348 in 2011. That is, Cambodian real income grew 7.3% each year on average. In the World Bank Report, Giumbert (2010) suggests that Cambodia belongs to top 3% high-growth performing countries in the world in terms of income growth for the 1998~2008 period.

The major engine of the rapid growth of Cambodia for the 1997~2011 period was the expansion of investment mainly driven by the foreign direct investment from abroad. Recently this kind of FDI-driven growth is also observed in other ASEAN economies. Thus, whether this kind of growth would be sustained or not is an important question among the policymakers not only in this region but also in the international community of development cooperation. Many policy-reports argue that the skill shortage and skill mismatch are the central problem for this sustainable development issue for these economies. Martinez-Fernandez and Powell (2009) explore the general issues of employment and skills among ASEAN countries. Chalamwong et al. (2012) discuss the skill mismatch issues for the

Southeast Asian countries such as Thailand, Cambodia, and Vietnam, and World Bank (2012) focuses on Cambodia.

In fact, the skill shortage is a typical problem for most developing countries that go through the structural transformation from agriculture to manufacturing and services. In this sense, the recent attention to the ASEAN economies regarding the skill shortage and mismatch is not new in its qualitative nature. Due to the faster inflows of the FDI toward this region than to other regions, the ASEAN economies are facing these problems more severely in terms of adjustment speed. The speed of introducing new technologies or industries by the foreign investors used to be much faster than the speed of expanding the needed skills for them because building the skills and the required human capital takes time. This "time-to-build" issue is the fundamental cause of the skill shortage and skill mismatch problems for any developing countries. Thus, the skill shortage and mismatch problems are typically an adjustment problem for most developing countries. However, in Cambodia, skill shortage and mismatch problems is much more than the labor market adjustment problem.

The genocide under the Khmer Rouge regime was not only one of the unparalleled ones but also a targeted one, targeting the educated adults or the so-called intelligentsia, rather than over the random population. This is not simply about reducing the labor force. This created a vacuum in the middle-aged group in labor force and particularly the educated group. As we will argue below, it severs the link of human capital transfer between generations. Furthermore, the baby boom shock exacerbated the situation. Therefore, in case of Cambodia, the skill shortage and mismatch problems can be a fundamental hurdle to the sustainable development later as well as the labor market adjustment problem.

This paper analyzes the above issues of skill shortage and mismatch in the Cambodian labor market and diagnose the current problems that contributes worsening the problems. The paper is organized as follows. In Section 2, we explain the two demographic shocks that are due to the Khmer Rouge regime, and discuss their implications on skill shortage and human capital formation in Cambodia. In Section 3, we perform the labor demand forecast analysis using the nationally representative household surveys in Cambodia. This analysis will provide us with what kinds of skills Cambodia will need in near future. In Section 4, we diagnose the current problems of skill mismatch in Cambodian education and vocational training system. Section 5 provides concluding remarks.

2. DOUBLE DEMOGRAPHIC SHOCKS AND THEIR IMPLICATIONS ON SKILL SHORTAG AND HUMAN CAPITAL FORMATION

2.1. Legacy of Khmer Rouge Regime on Cambodian Demographic Structure

One of the most striking features of Cambodian labor market is the stark dominance of the youth group in the Cambodian labor force. According to the 2008 Population Census, about 60% of the entire Cambodian population is younger than 25 years old. This skewed age-group composition of population is due to the two demographic shocks of the baby boom during the 1980s and the vanished middle-aged population in the latter half of 1970s. Both demographic shocks in fact are related to the Khmer Rouge regime for the 1975-1979 periods. The massive genocide committed by the Khmer Rouge, often known as the Killing Fields, killed about two million people, about a quarter of the total population at that

time.[1] The death toll itself is tremendous, but more important feature of this genocide is that it was a targeted one. The targeted groups of this atrocity were sometimes the ethnic minorities, but mostly the main targets were the educated adults, the so-called intelligentsia.

After the end of the Khmer Rouge regime and the related civil wars during the Vietnamese occupation and transition periods, Cambodia experienced the typical post-war baby boom. The annual increases of new births were about 401,000 in the 1980-1985 period and 417,000 in the 1990-1995 period. Due to this baby boom period, the total population increased from 6.5 million in 1980 to 14.1 million in 2010. Among them, the size of the working age population (WAP), i.e., the age group of 15-year old or older, increased from 4 million in 1980 to 9.6 million in 2010. Furthermore, the size of the training age population (TAP), i.e., the 6 to 24-year old age group, increased from 3 million in 1980 to 6.3 million in 2005, more than doubling.

Figure 2.9 shows the time-series of the entry, exit, and the implied balance of Cambodian working age population for the 1950-2010 period, and the forecasts of such population flows for the 2010-2060 period. The balance was peaked for the 1995-2000 period, and then just started the demographic transition of declining fertility since the year 2000. However, the impacts of the large youth group in the labor force would be likely to persist at least for a generation. Hence, there still are serious challenges for Cambodia to train this group of young workers to enter into the labor force with appropriate skills to build the sustainable and robust growth strategies for the Cambodian economy.

Another interesting feature of Cambodian demography is that the net entry (balance) into the labor force is forecast to decline rapidly for the 2010-2060 period. After the year 2045, the working age population is expected to decrease in absolute number. That is, Cambodia is predicted to experience a fast demographic transition of declining population after thirty years later from now. This makes the problem of training the young workers into skilled workforce even more challenging.

Figure 1. Entry, Exit, and Balance of Cambodian Working Age Population (in Thousands)
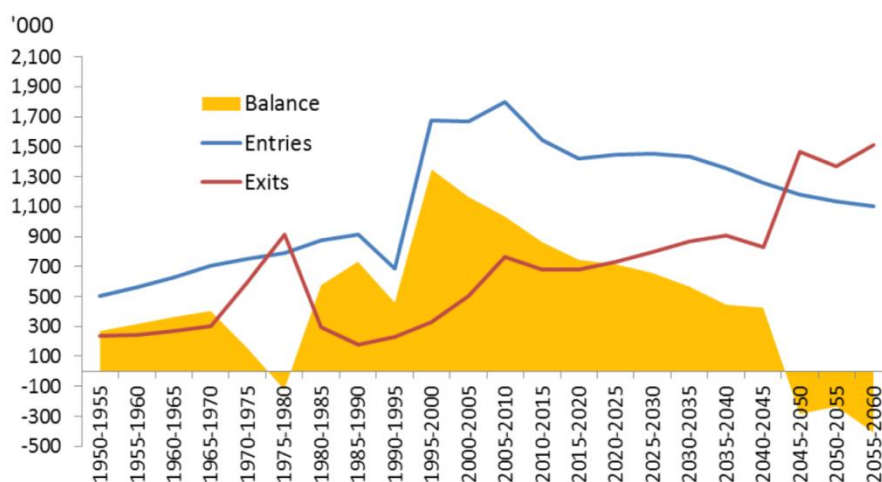
Source: United Nation Population Division 2010.

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[1] Estimates of the killed people vary from one to three million, but the most commonly accepted estimate is two million.

2.2. Implications of the Two Shocks on Skill Formation in Cambodia

The two demographic shocks discussed in the previous subsection have critical implications on the skill formation for Cambodia. During the era of the Killing Fields, most of the educated and skilled adults either were killed or escaped from Cambodia to the neighboring countries. This yielded two unrecoverable outcomes in the Cambodian labor market. First, it created a vacuum in the middle-aged group in the workforce. Second, it reduced the group of the educated and professional workers and hence downgraded the level of skill of the nation. In particular, the disappearance of teachers at all levels of schools during this period has been the root cause of the lack of the qualified teachers in Cambodian schools today. All these devastated outcomes resulted in massive destruction of human capital during the era. This of course lowered the national level of human capital at that time. However, the true problem is not about this transitory negative shock in human capital level itself, but is rather about the *severance of the link of the generational transfer of human capital*, which can have long-run effects on growth.

The missing middle-aged workers implies that there are little mentors for the young workers at the workplaces who can teach their work experience and tacit knowledge embodied in them which is an important component of human capital. In fact, Lucas (1993) emphasized the importance of this kind of job-specific skills and on-the-job formation of such skills in making miraculous growth in East Asia. From this perspective, Cambodia seemed to miss an important channel of human capital accumulation, the effects of which would persist over generations unless there would be active policy intervention to fix this problem.

The disappearance of qualified teachers in all levels of schooling resulted in missing another channel of human capital accumulation. In fact, this is a more fundamental channel of human capital accumulation that has been lost since then in the following sense. Broadly speaking, there are two kinds of human capital: (i) "general human capital" that can be universally applied to any kinds of activities, (ii) "specific human capital" that are useful to some particular set of activities. The first kind of human capital or skill is acquired at schools with various degree of sophistication from elementary to college education. The second kind of human capital or skill is acquired through the vocational training or learning by doing at workplaces. Without being equipped with the first kind of human capital, the second set of skills may contribute to production with low productivity. Hence, typical curriculum of schooling system is designed so that general schooling precedes the vocational training and education. For example, the technical and vocational education and training (TVET) system starts after finishing some critical level of general education. The critical threshold is usually middle school graduation. In Cambodia, this is also the case. The Cambodian TVET starts after finishing the 9th grade, which corresponds to the graduation of middle school. Given this curriculum design, if students do not or cannot finish formal schooling up to the 9the grade, the vocational education and training system can have only weak effects. There are some public institutions that provide some forms of vocational training for the uneducated workforce, but the effective formation of useful skills through these public institutions is limited. Thus, without solid establishment of the formal schooling and attainment, the formation of the second set of skills is difficult to achieve.

In case of Cambodia, due to the lack of qualified teachers at schools from the genocide during the Khmer Rouge regime, the speed of expansion of the educational attainment has

been low since then, compared to the speed of industrialization. According to the Barro-Lee (2013) dataset on educational attainment, the average years of schooling of the working-age population is only 4.8 years, only 6.2% completed the secondary level schooling, and 1.5% of them completed college or higher education in the year 2010. Another important aspect of Cambodian education is that the drop-out rate is too high, particularly at the primary level schooling. For example, in 2010, 59.6% of the working-age population was enrolled in the primary level schools, but only 38% of the working-age population graduated from the primary level schools. That is, about 40% of the elementary school enrollees dropped out from the formal schooling system. Then, 12.5% of the working-age population enrolled in the secondary level schools and 6.2% graduated. This is a serious problem because most of the Cambodian youths are losing their opportunities to acquire the skills not only from general schools but also from the vocational training system.

Furthermore, the baby boom followed by the Khmer Rouge regime and Vietnamese occupation and transition periods, rapidly enlarged the youth group. This resulted in the ballooning of the training-age population (TAP) as was explained in the previous subsection. Thus, without having the qualified teachers at both schools and workplaces, this sudden increase in youth group exacerbated the skill shortage problems. These consequences from the two demographic shocks that is the legacy of the Khmer Rouge regime are the fundamental and peculiar reasons behind the skill shortage of the current Cambodian labor force.

From the above consideration, it is not surprising to find that the current employers in Cambodia commonly complain that the "experience" and "work attitude" are the most needed but hard-to-find character skills among their workers for all types of unskilled, special, and professional workers.[2] Specifically, The Cambodian Federation of Employers and Business Associations (CAMFEBA) conducted a survey among the Cambodian establishments, which provides a detailed study about the types of skills of shortage. Figures 2 to 4 list the ranking of various characteristics or attributes of skills that employers require but are hard to find for each of the three types of workers, unskilled, specialized and professional, respectively.

Among the unskilled workers, top three such skill characteristics (required but hard-to-find) are work attitude (52%), foreign language (37%), and experience (32%). Among the specialized workers, top three such skill characteristics are decision-making (45%), experience (42%), and analytical (40%). Among the professional workers, top three such skill characteristics are analytical (64%), decision-making (55%), and experience (37%). An interesting observation is that "experience" is the common skill characteristic that is hard to find among all types of workers. In contrast, "education" and "computer" related skills are lowly ranked among the skill characteristics that employers complained about. This seems to show that the characteristics of skills that employers of Cambodian establishments expect from their employees are actual work-specific skills such as work experience rather than the general skills that can be learned from schools. This may be either due to the features of labor demand at the current development stage of Cambodia, or due to the features of labor

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[2] The "unskilled" workers are group of common laborers, or non-technical workers whose work is mostly manual and repetitive. The "specialized" workers are a group of workers whose work is mostly repetitive but requires a level of skill or understanding that is slightly more sophisticated than manual work. The "professional" workers are a group of workers whose work consists of independently performing a variety of tasks and requires a high level of skill or understanding.

supply, i.e., Cambodian schools may not provide right kinds of skills to the students, hence forming low expectation of the employers about the schooling of their workers.

Another observation is that "foreign language" is highly ranked only for the unskilled workers, neither for the specialized nor for the professional workers. This may reflect the fact that tourism is an important business in Cambodian service sector and the "unskilled" workers are the main body of such service workers.

It is also interesting to notice that the "work attitude" is named as one of the skills in serious shortage. Among the unskilled workers, it is the most frequently cited issue of complaints from employers. It is a middle-ranked problem among the specialized and

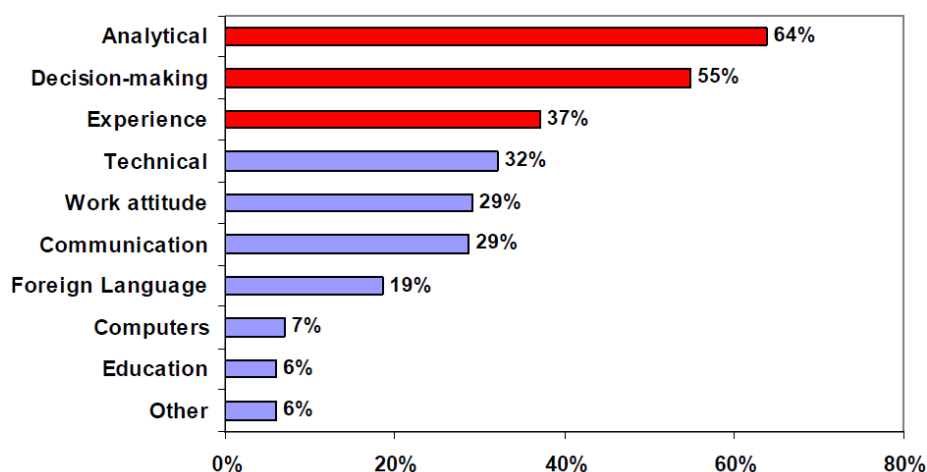**Figure 2.** Required but Hard-to-find Skill Characteristics among Unskilled Workers
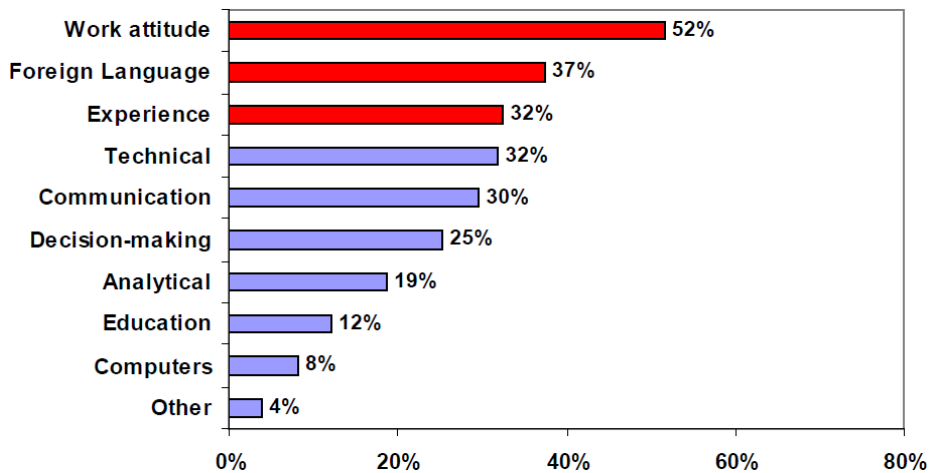
Source: CAMFEBA (2008).

Figure 3. Required but Hard-to-find Skill Characteristics among Specialized Workers
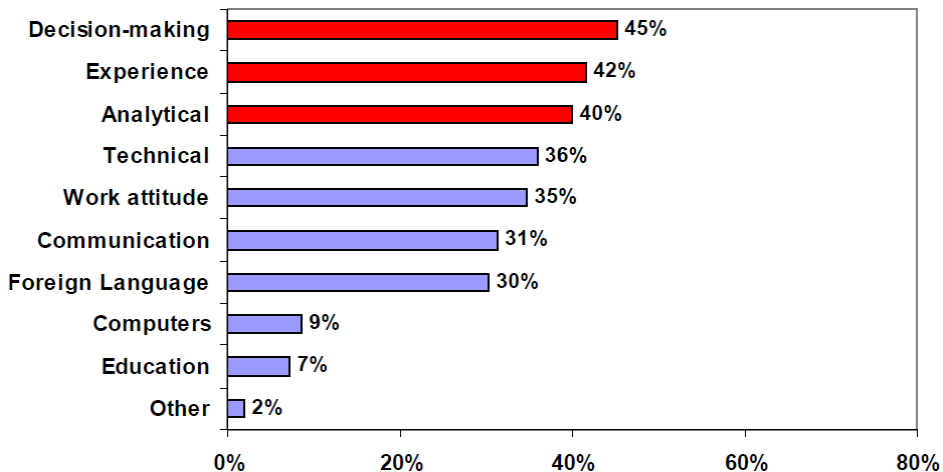
Source: CAMFEBA (2008).

Figure 4. Required but Hard-to-find Skill Characteristics among Professional Workers

Source: CAMFEBA (2008).

professional workers as well. The survey conducted by the National Employment Agency (NEA) of Cambodian government also confirms the work attitude problem. Specifically, in the NEA survey, 89% of employers state that they have difficulties working with young workers, particularly the drop-outs, because of their behavioral issues.

3. CAMBODIAN LABOR AND SKILL DEMANDS FORECASTS ANALYSIS

3.1. Methods of Labor and Skill Demand Forecast

In order to discuss the skill mismatch issues, we first assess the labor and skill demands in Cambodia. Using the nationally representative household survey called the Cambodia Socio-Economic Survey (CSES) and the sector level GDP data from the Ministry of Economy and Finance (MEF) of Cambodia, we forecast the needed amount of labor and skill types of Cambodia in the near future.

The Cambodia Socio-Economic Survey (CSES) is a nationally representative repeated cross-section household survey that are collected in ten rounds between 1993 and 2011 (1993/1994, 1996, 1997, 1999, 2003/2004, 2007, 2008, 2009, 2010 and 2011) by the National Institute of Statistics (NIS) of Cambodia. The sampling method of CSES is the stratified two-stage random sampling. That is, the entire kingdom is stratified into 48 strata by geographic provinces and rural-urban areas, then villages are randomly sampled in the first stage, and then the households are randomly selected within the chosen villages in the second stage. In each random sampling, different sampling probabilities are applied to depending on stratum, hence sampling weights play a crucial role in uncovering the nationally representative statistics.

The methodology we use is basically the BLS method. Briefly summing up, the procedure is as follows. First, we partition the Cambodian economy into 19 sectors and form the forecasted paths of sectoral GDP of each of the 19 sectors using the sectoral GDP growth

rate data. Second, using the CSES data, we construct the employment coefficients data series for each sector and forecast the within-sector employment coefficients. This will consist of the labor demand forecasts by sector. Third, combining the forecasts of within-sector GDP and within-sector employment coefficients, we construct the forecasts of the within-sector employment. Fourth, again using the CSES data, we estimate the job-sector matrix, where the jobs are classified into ten categories according to the skill types. Using this estimated job-sector matrix, the employment demand forecasts that are obtained as above are converted into the skill demands forecasts. Detailed estimation methods and econometric models are described in Appendix.

The actual contents of the forecasts depend on how we partition the sectors and the jobs. The sectors are categorized into the 19 sectors such that: (i) four agricultural sectors (crops, livestock and poultry, fisheries, and forestry/logging); (ii) eight industrial sectors (mining, food/beverages/tobacco, textile/garment/footwear, wood/paper/publishing/furniture, rubber/ plastic/chemical, other manufacturing, electricity/gas/water, construction), and (iii) seven service sectors (trade, hotels/restaurants, transport/communication, finance, public administration, real estate/business, other services). We will re-label some multi-subcategory sectors for short for the purpose of convenience of displaying the results such that: "livestock" for livestock and poultry, "forestry" for forestry and logging, "food processing" for food/ beverages/tobacco, "garment" for textile/garment/footwear, "wood" for wood/ paper/publishing/ furniture, "rubber" for rubber/plastic/chemical, "utilities" for electricity/ gas/water, "tourism" for hotels/restaurants, "transport" for transport/communication, "real estate" for real estate/ business.

Regarding the job or skill groups, we divide the workforce into ten categories: managers (legislators, senior officials and business managers), professionals, technicians, clerk, service workers, farmers (skilled agricultural workers), craftsmen (and related trade workers), mechanics (plant and machine operators and assemblers), unskilled (elementary occupations), and armed forces.

3.2. Trends of Structural Transformation

Using the econometric methods that are described in Appendix, we forecast the employment changes of the 19 sectors for the 2012-2015 periods. In terms of the employment size, the demand for labor will increase in each sector as well for the overall economy. However, there are relative differences in the speed of expansion. The annual average growth rates of employment were 1.7%, 5%, and 10.7% for the agriculture, service, and industry sectors, respectively. That is, industry sectors have been expanding the fastest. We find that these trends will continue in near future in Cambodia. Figure 5 shows the actual and the forecasted employment share data of these broad-category sectors. We find that the employment share of agricultural sectors will continue to decrease and those of industry and service sectors will continue to increase. The agricultural employment share declined from 72% in 1993 to 56% in 2011, which will continue to fall to 48% by the year 2015. The industry employment share was 5% in 1993, which is forecasted to rise to 20% by 2015. The service sector employment share was 22% in 1993, which is forecasted to rise to 32% by 2015. Thus, it is predicted that Cambodian economy will continue its structural transformation from agriculture to industry and service sectors. Due to the presence of the relative income gap across the three broad sectors, the structural transformation in terms of GDP share is reinforced compared to the employment shares, as shown in Figure 6. The

Figure 5. Actual and Forecasted Employment Shares by One-digit Sector
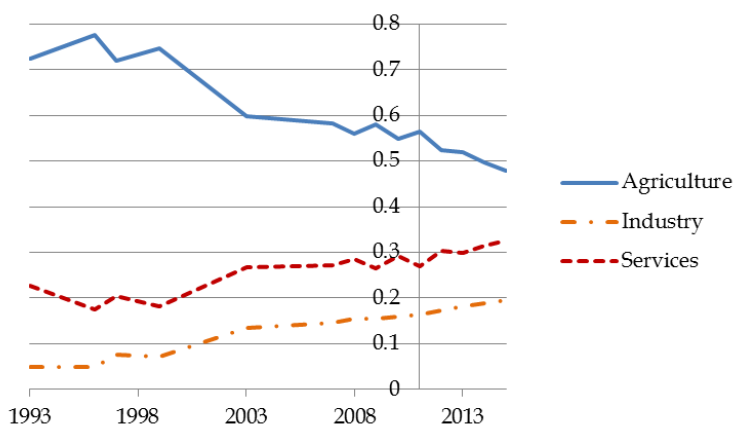
Source: Authors' calculation using the CSES.

Figure 6. Actual and Forecasted GDP Shares by One-digit Sector
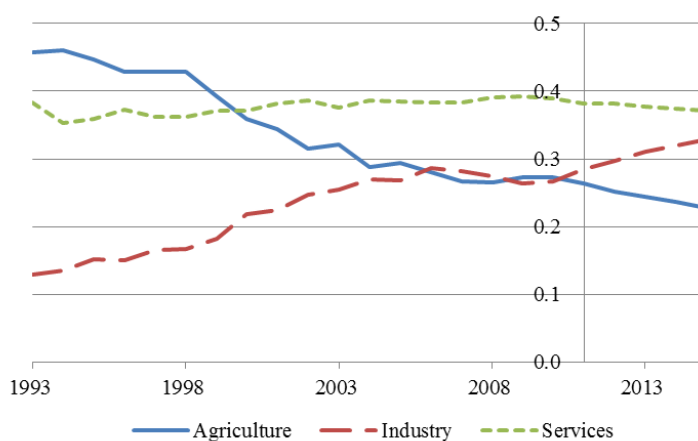
Source: Authors' calculation, Ministry of Economy and Finance of Cambodia.

agricultural GDP share is predicted to fall to 20% by 2018, while the industry GDP share will increase to 36%, which was just 13% in 1993. The GDP share of the service sector turn out to be more or less constant around 36% throughout.

3.3. Forecasted Employment Changes and Skill Demands

Understanding the big picture of the trends of structural transformation in Cambodia, this subsection decomposes the forecasted employment changes into the nineteen sectors. Then, following the procedure described in the Appendix, we convert these sectoral employment forecasts into skill demands forecasts.

We perform the forecasts for the 2012-2015 period for each sector, and Table 1 illustrates the forecasted annual average changes in employment of each of the 19 sectors.[3] It shows that crops sector and other service sector are forecast to decrease in employment by absolute amounts. Employment in all other 17 sectors is expected to increase in different magnitudes. Major increases in employment (more than 50,000 new jobs) are likely to happen in livestock (410,507), real estate (260,923), forestry (101,140), tourism (98,763), garment (98,695), and utilities (94,815) sectors. It is interesting to observe that the livestock and forestry sectors, which are the agricultural ones, are the two out of the major six job-creating sectors. This tells us that there will be employment compositional changes shifting from crops to non-crop sectors even within agriculture and such changes are in fact the major ones for the entire Cambodian economy. In service sector, real estate and tourism will be the main job-creating sectors. In industry sectors, major job-creating sectors will be garment and utilities (i.e., electricity, gas, and water).

Table 2 shows the forecasted average employment changes by skill groups. Major expanding skill groups are unskilled (564,568), service workers (244,885), and craftsmen (174,431), and clerks (98,163). Surprisingly, the far dominant skill group, the demand for which will expand the most, is the group of *unskilled workers* (elementary occupations in the CSES data). Among the industrial skill groups, it is the craftsmen group that is predicted to expand the most rather than the technicians or mechanics. Among the service skill groups, the service workers and clerks are expected to expand the most rather than professionals.

Table 1. Forecasted Changes of Employment by Sectors

| Sector	Employment Changes
Crops	-124,358
Livestock	410,507
Fisheries	19,567
Forestry	101,140
Mining	3,896
Food Processing	16,990
Garment	98,695
Wood	36,569
Rubber	847
Other Manufacturing	11,861
Utilities	94,815
Construction	20,976
Trade	37,175
Tourism	98,763
Transport	30,292
Finance	4,292
Public Administration	28,941
Real Estate	260,923
Other Services	-25,927

Source: Authors' calculation using the CSES.

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[3] The forecast results in this subsection are from Jeong (2013). See Jeong (2013) for more detailed forecast results.

Table 2. Forecasted Changes of Employment by Skill Groups

Skill Group	Employment Changes
Managers	5,918
Professionals	33,610
Technicians	19,131
Clerks	98,163
Service workers	244,885
Farmers	-36,692
Craftsmen	174,431
Mechanic	21,033
Unskilled	564,568
Army	917

Source: Authors' calculation using the CSES.

Figure 7. Patterns of Skill Upgrading in Cambodia
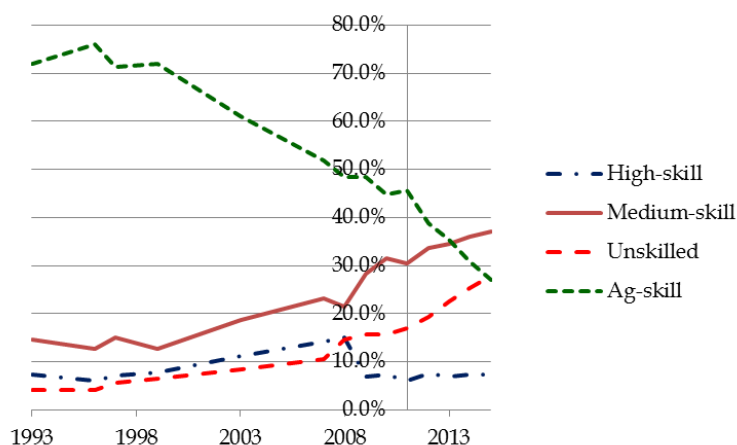
Source: Authors' calculation, CSES.

Despite the rapid structural transformation in terms of employment shifts across sectors, the fastest increasing demands are for the groups of unskilled or medium-skilled workers in either industry or service sectors, not the high-level skill groups.

To capture a broad picture, let's define the skill groups in a coarser way by merging managers, professionals, technicians and mechanic into "high-skill" group, service workers, clerk and craftsmen into "medium-skill" group, and keeping the unskilled and farmers (labeling as "agricultural skill") separate. Then, we find interesting patterns of skill upgrading in Cambodia. Figure 7 plots the employment shares of these four broad skill groups. This figure suggests that the demand for the agricultural skill rapidly declined from 72% in 1993 to 46% in 2011, and forecasted to continue to drop to 27% by 2015. Before the global recession shock in 2008, the decrease in agriculture has been substituted by all levels of non-agricultural skills (high-skill, medium-skill and unskilled). However, the high-skill

share suddenly dropped during the crisis period, from 15% in 2008 to 7% in 2009, while the expansion of the medium-skilled and unskilled groups was expedited during the same period. Furthermore, for the period of 2012-2015, the high-skill share is forecasted to stagnate at 7 to 8% while the shares of the medium-skilled and unskilled groups are forecasted to increase. Note that during the pre-crisis period, the shares of all three non-agricultural skill groups were rising nice and smooth. This seems to suggest that the current issue of skill mismatch of Cambodia, particularly the shortage of high-level skill, is likely to be related with the adjustment of Cambodian occupational choice to the global shocks.

4. DIAGNOSIS OF SKILL MISMATCH IN TVET AND EDUCATION SYSTEM

We explored some root causes of the skill shortages and the labor and skill demands forecasts in Cambodia in the previous sections. Here, we study the aspects of skill supply by examining the contents of the vocational training system and high education.[4]

4.1. Mismatched Supply of Skills from TVET

The Ministry of Labor and Vocational Training of Cambodia classifies the technical and vocational education and training (TVET) programs into three categories: short-term training courses offered both by public and private institutions, long-term training and higher education courses offered only by public institutions. Table 3 shows the number of students enrolled in each type of TVET programs. The total number of TVET students rapidly increased from 88,367 in 2006/2007 period to 168,130 in 2008/2009 period, and then declined to 91,487 in 2010/2011 period. Among the three types of TVET, the dominant type is the short-term training. About 95% of the TVET is provided by the short-term programs as of 2010/2011 period. For the rest of 5% of TVET, 4% is provided by higher education, and the remaining only 1% by the long-term training programs. That is, Cambodian TVET skill formation is dominated by the short-term vocational training programs.

The data on composition of fields and the training duration of each field of the public short-term vocational training courses are available for the year 2008 from the Ministry of Labor and Vocational Training. According to this data, shown in Table 4, we observe a striking asymmetry in the distribution of fields of vocational training. About 75% of trainees completed the vocational training in agriculture, instead of industrial or service sector skill training, while the new skill demands are strong and growing the fastest in industry and service sectors, as we found in Section 3. Regarding the service sector skills, only 3.3% and 1.9% of the trainees received training in "technical trades" and "tourism and hospitality," respectively. Regarding the industrial skills, only 1.3% and 0.1% of trainees received training in "textile and garments" and "handicrafts and jewelry," respectively.

Recall from the demand forecasts in the previous section that agriculture will be the declining sector in terms not only of its workforce share but also of its absolute number, while the textile and garments, tourism, and crafts and related trades are the sectors where the labor demands are expected to increase very rapidly. Recall also that the opinion surveys

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[4] The Cambodian data that are used in Section 4 were provided by the government of Royal Kingdom of Cambodia during the policy consultation of the 2013 Cambodia Knowledge Sharing Program and the discussion in this section is based on Jeong (2014).

of employers suggest that the skill from "experience" rather than education is the commonly needed but hard-to-find skill from all types of workers. That is, the job-specific skills seem to be one of the core skills that the employers in the expanding industry and service sectors want to find. Thus, the current curriculum design of the Cambodian TVET system has been a source of creating a serious skill mismatch problem.

Furthermore, the average duration of such dominant agricultural training courses is extremely short, i.e., less than two weeks (0.4 month). The average duration of the training program for tourism and hospitality is even shorter, 0.3 month. The average duration periods of the other training programs are 2.9 months, 4.9 months, and 4.4 months for the technical trades, textile and garments, and handicrafts and jewelry, respectively. All are less than half year. Thus, it is very unlikely that Cambodian workers get enough vocational training from the public vocational training programs, which would form only ineffective skills. This suggests that the Cambodian TVET system is also a source of skill shortage in Cambodian labor market.

Perhaps such short-term agricultural skill training courses are designed to help the poor workers, hence to promote the poverty reduction. Of course, poverty reduction itself is an important policy goal. However, whether the provision of such short-term agricultural training programs would in fact be an effective means of poverty reduction is a different

Table 3. Distribution of TVET Enrollees by TVET Types

Categories	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011
Higher Education	3,330	4,559	4,289	5,289	3,702
Public Long-term Training	1,562	1,524	1,214	746	860
Short-term Vocational Training	83,475	107,565	163,127	114,142	86,925
Total	88,367	113,648	168,630	120,177	91,487

Source: Ministry of Labor and Vocational Training, 2012.

Table 4. Public Short-term Vocational Training Courses by Fields

Field of Training	Completed Students	Average Duration (month)
Agriculture	39,579	0.4
Technical Trades	1,757	2.9
Textile and Garments	689	4.6
Handicrafts and Jewelry	74	4.4
Hairdressing and Beautician	386	4.3
Computing	732	4.1
Tourism and Hospitality	1,008	0.3
Business and Management	32	4
Language	143	3.4
Art and Design	22	4
Miscellaneous	8,714	0.5
Total	53,136	0.7

Source: Ministry of Labor and Vocational Training, 2012.

issue. The trainees of such vocational training courses are likely to learn a kind of skills that are not only irrelevant but also ineffective, if any. Then, such vocational training programs will not help the individual workers to escape from poverty. Furthermore, they will slow down the speed of industrialization of Cambodian economy hence the overall economic growth, which can be an eventual channel of poverty reduction. Thus, making substantial changes in the TVET curriculum and extending the TVET duration long enough are likely to solve a major part of the skill shortage and mismatch problems of Cambodia.

4.2. Mismatched Supply of Skills from General Education

According to the CSES 2011, 60.2% of the population of 25 or older have no schooling or have not completed primary education, and only 7.7% among them achieved the upper secondary or higher level of education. Barro-Lee data (2013) suggests that the average years of schooling in Cambodia is 4.8 in the year 2010. The gender gap for the educational attainment seems substantial. The population share of no schooling or incomplete primary schooling is 70.8% for women, while it is 47.8% for men. The population share of receiving the diploma of upper secondary or higher level of schooling is 4.1%, while it is 11.7% for men.

One of the main reasons of this low attainment of education is that the exit from the general education system (either graduation or drop-out) happens too early among the training-age population. According to the Ministry of Education, Youth, and Sport of Cambodian government, the 84.2% of the exit happened at the primary or lower level of education in 2006. This exit rate decreased to 73.7% in 2010, but it still is a very large number. Despite the recent substantial increase in enrollment at the primary level of education, this high rate of exit between the primary and lower secondary levels of education is a serious problem for the skill formation in Cambodian workforce.

Among the above exits, significant portions are drop-outs. According to the Barro-Lee (2013) data, the enrollment rate at the primary school among the working age population is 59.6%, but only 38.05% completed the primary school. That is, 21.6% of the WAP are primary school drop-outs. Less than half of the primary school graduates (12.5% of the WAP) enroll the secondary level schooling. Then, about half of the secondary enrollees (6.2% of the WAP) again drop out from the secondary level schools. Among the secondary graduates, only half (3.01% of the WAP) of them enter into colleges, and then the half of the college students (1.49%) again drop out. As is described above, the drop-out is truly a serious problem in Cambodia. The drop-out students become the unskilled youth in the Cambodian labor market, about whom the 89% of the employers complain their work attitude, according to the Skill Gap survey by the National Employment Agency (NEA) of the Cambodian government.

The population share of university or graduate education among working age population is still low by absolute standard, only 2.5% in the year 2011 according to the Cambodian Socio-economic Survey (CSES). However, it has been expanding rapidly. The number of post-secondary students increased from 94,708 in 2005/2006 period to 245,329 in 2011/2012 period, growing 17% each year on average. The expansion was faster among female than among male. The annual average growth rate of post-secondary education was 21% for female students while it was 15% for male students.

Among the post-secondary education groups, Bachelor degree group is the majority and its share has been increasing from 80.2% in 2005/2006 period to 84.7% in 2011/2012 period.

Table 4. Public Short-term Vocational Training Courses by Fields

Field of Study	Male	Female	Total	Male	Female	Total
	Number of Students			Share (%)		
Economics and Business Administration	45,901	47,058	92,959	41.0	63.9	50.1
Language and Literature	14,649	8,897	23,546	13.1	12.1	12.7
Information Technology	12,965	916	13,881	11.6	1.2	7.5
Law	7,802	2,447	10,249	7.0	3.3	5.5
Agriculture	5,593	1,860	7,453	5.0	2.5	4.0
Others	4,610	2,700	7,310	4.1	3.7	3.9
Engineering	6,381	648	7,029	5.7	0.9	3.8
Medicine	3,206	2,549	5,755	2.9	3.5	3.1
Sciences	3,073	1,518	4,591	2.7	2.1	2.5
Social Sciences	1,787	1,454	3,241	1.6	2.0	1.7
Tourism	1,943	1,208	3,151	1.7	1.6	1.7
Religious School	1,958	582	2,540	1.8	0.8	1.4
Nursery School	933	1,519	2,452	0.8	2.1	1.3
Military Academic	669	38	707	0.6	0.1	0.4
Art and Handicrafts	391	258	649	0.3	0.4	0.3

Source: Ministry of Education, Youth and Sport, 2011.

The share of Master degree group has also been increasing from 2.7% in 2005/2006 period to 5.5% in 2011/2012 period. In contrast, the share of the Associate degree group, which corresponds to a two-year junior college education, has been decreasing from 16.8% in 2005/2006 period to 9.4% in 2011/2012 period. The share of Ph.D. degree group was fluctuating around 0.4% without showing any trends. Thus, the post-secondary education is governed by Bachelor degree group, and its increasing trend (with the decreasing trend for the Associate degree group) seems promising for the promotion of higher education in Cambodia.

However, we find a striking skewness in the distribution of the major fields of studies. Table 4 shows the distribution of enrolled fields of study among bachelor's degree students by gender in the year 2011. About half of the university students majored in economics and business administration. The students majoring in the top four fields of economics and business administration, language and literature, information technology, and law together account for 75.8% of the college students. This is an exceptionally skewed distribution, which can hardly be found in other countries. The bias toward economics and business administration is particularly strong among female college students (68.8% of them major in economics and business administration). In contrast, only 3.8% of the college students major in engineering and 2.5% in science. This striking bias would cause the skill mismatch in labor market in a country like Cambodia where the industrial skills are in urgent need going through the structural transformation.

5. CONCLUSION

We explored the legacy of the dark ages of Khmer Rouge regime on Cambodian labor

market and its long-term effects on skill formation for the current Cambodians and for the generations to come. The mass and targeted massacre twisted the demographic structure of Cambodia, making a deep hole in the middle-aged and educated workforce, hence the lack of qualified teachers at schools and experienced mentor workers at workplaces. We discussed how these demographic shocks affect the intergenerational link of human capital transfer and create the root causes of skill shortages not only for the current but also for the future generations. This kind of severance of intergenerational link can have huge effects on long-run growth.

Unfortunately, current Cambodian TVET and general education system do not seem to be aligned to fix the unbalanced needs for the industrial and service skills in its process of industrialization. They in fact exacerbate the skill mismatch because of the biased distribution of fields in their curriculum design. Majority of the short-term vocational training programs are about providing agricultural skills in extremely short span of training. About half of the college fields of study is concentrated in economics and business administration.

Without successful transformation of the incoming young workers into a useful workforce, Cambodia may face a problem of shortage of workforce itself, including both skilled and unskilled, which can be another serious hurdle to Cambodian development considering the recent emigration of low-skilled Cambodian workers to neighboring countries seeking the higher wages. This can be achieved by bolstering the general education system itself, for example by promoting the investment in educating teachers so that Cambodian schools can provide the appropriate and quality education to their students, particularly at the elementary and middle schools. This would increase the return to basic schooling, which will reduce the drop-out problem and mitigate the emigration problem.

Therefore, establishing a solid system of human capital formation, encompassing both general education system and TVET system is an urgent issue particularly for Cambodia. Without fixing these problems quickly and in large scale, the recent FDI-driven rapid growth in Cambodia would soon lose its momentum.

APPENDIX: LABOR MARKET FORECASTING METHODS

For the methodology of forecasting the labor and skill demands, we use the BLS methods adopted in the U.S. Here we provide a brief introduction of the methods. See Jeong (2013) for discussion that is more detailed.

The **first step** of the forecast is to form the forecasts of the growth rates by sector. For the within-sector growth forecasts, the typical procedures are as follows.

Stage 1. Considering the importance of the changes in long-run supply capacity, first form estimates for the equilibrium growth paths and potential growth rates at the aggregate level, based on the forecasted changes in fundamental production factors and productivity.

Stage 2. Using the above aggregate estimates of forecasted paths, assign the aggregate growth into sectors based on the time trend models at sector level and reflecting the differences in relative speed of growth. This form the first basis forecasts of long-run structure and growth of sectors.

Stage 3. Then, industry export groups combine the forecasts of the foreign and domestic

mega trends and the data regarding the industrial and economic environmental changes of the world economy to revise the first forecasts, and then reflecting the industrial goals and policy visions, finalize the forecasts.

From these sectoral growth forecasts, future GDP paths of each sector are projected.

The **second step** of the labor demand forecast is to construct the *employment coefficient* of each sector *i* in period *t*, which is defined as:

$$(1) \quad C_{it} = \frac{E_{it}}{Y_{it}},$$

where E_{it} denotes the total employment and Y_{it} the total GDP of sector *i* at period *t*. The employment coefficient in logarithm at time *t* is estimated such that:

$$(2) \quad \ln(\hat{C}_{it}) = F_i(t, \Omega_{it}),$$

where *t* denotes the time trend itself and Ω_{it} the information set available up to time *t*. The contents of the information set Ω_{it} as well as the specification of the estimation model F_i depend on the available data and also on the specific feature of each sector.

Combining the forecasted GDP and the employment coefficient from the equation (2), the employment $\hat{E}_{i,t+s}$ of sector *i* at date *t+s* is forecasted such that:

$$(3) \quad \hat{E}_{i,t+s} = \hat{C}_{i,t+s} \times \hat{Y}_{i,t+s}.$$

The **third step** of the forecast is to estimate the *sector-job matrix,* which consists of the joint distribution of sector and job at time *t*, where the job categories are related to the skill types. Then, the odds ratio of the population fraction p_{ijt} of the job *j* of sector *i* at time *t* in logarithm is estimated such that:

$$(4) \quad \ln\left[\frac{p_{ijt}}{1-p_{ijt}}\right] = G_{ij}(t, \Gamma_{ijt}),$$

where *t* denotes the time trend itself and Γ_{ijt} the information set available up to time *t* in predicting the log odds ratio of the job *j* of sector *i* at time *t*. The contents of the information set Γ_{ijt} and the specification of the functional form G_{ij} may differ across the sector-job cells, depending on data availability. From this estimation, the estimates of the sector-job matrix at time $t \{\hat{p}_{ijt}\}_{i=1,j=1}^{I,J}$ is constructed, where *I* indicates the total number of sectors and *J* denotes the total number of job categories.

From the above estimates, we can obtain the forecasts of $[\hat{E}_{i,t+s}]_{i=1}^{I}$ and the population fraction $[\hat{p}_{ij,t+s}]_{i=1}^{I}$ for a given job skill *j*, then the aggregate forecast of the employment of job skill, i.e., the forecasted demand for job skill *j* for the period of *t+s* is calculated such that:

$$(5) \quad \hat{E}_{j,t+s} = \sum_{i=1}^{I} \hat{p}_{ij,t+s} \times \hat{E}_{i,t+s}.$$

Using the employment coefficient series of the 19 sectors that are calculated by combining the sector level GDP from the MEF and the sector level employment from the CSES, we perform the time-series estimation for the employment coefficient sector by sector, specifying

the time-series model in equation (2) in two ways such that:

(6) Model 1: $\ln(C_{it}) = a_{0,i} + a_{1,i}t + a_{2,i}t^2 + \epsilon_{it}$,
(7) Model 2: $\ln(C_{it}) = b_{0,i} + b_{1,i}t + \rho_i C_{i,t-1} + \nu_{it}$,

where ϵ_{it} and ν_{it} denote the error terms of each model. We estimate two models instead of single model and then use the average of the forecasts to raise the precision of the forecast. The Model 1 is a simple quadratic time trend time-series model and the Model 2 is an autoregressive model of order 1, i.e., AR(1) model, controlling for the linear time trend.

To translate the employment forecasts above into skill demand forecasts, we first divide the workforce into ten skill groups: managers (legislators, senior officials and business managers), professionals, technicians, clerk, service workers, farmers (skilled agricultural workers), craftsmen (and related trade workers), mechanics (plant and machine operators and assemblers), unskilled (elementary occupations), and armed forces.

In the second step of estimating the within-sector conditional distribution of skills, we estimate the following two models for the log odds ratio and take the average population shares of the two models (as we did for the employment coefficient forecasting):

(8) Model 3: $\ln(R_{ijt}) = c_{0,ij} + c_{1,ij}t + c_{2,ij}t^2 + \eta_{ijt}$,
(9) Model 4: $\ln(R_{ijt}) = d_{0,ij} + d_{1,ij}t + \delta_{ij}R_{ij,t-1} + \xi_{ijt}$,

where $R_{ijt} = \frac{cp_{ijt}}{1-cp_{ijt}}$ is the conditional odds ratio of skill j within sector i, η_{ijt} and ξ_{ijt} denote the error terms of each model for sector i. (We omit presenting the massive set of these estimation results.) Then, the population share of the cell sector i and skill j is estimated by:

(10) $\hat{p}_{ijt} = \widehat{cp}_{ijt} \times \hat{p}_{it}$,

where $\widehat{cp}_{ijt}$ is the implied estimate for the conditional population share of skill j within sector i and $\hat{p}_{it}$ is the estimate of the population share of sector i, obtained from the estimated employment series.

Combining the estimates of the sector employment series $\{\widehat{E}_{i,t}\}$ and the population share series $\{\hat{p}_{ij,t}\}$, we can construct the demand for skill group j in period t, $\widehat{E}_{j,t}$, as in equation (5):

$$\widehat{E}_{j,t} = \sum_{i=1}^{I} \hat{p}_{ij,t} \times \widehat{E}_{i,t}.$$

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Hyeok Jeong, KDI School of Public Policy and Management, 85 Hoegiro, Dongdaemun-gu, Seoul, 130-868, Korea, Tel: +82-2-3299-1119, E-mail: hyeokj@gmail.com