The impact of ASEAN economic integration on occupational outlooks and skills demand

Souleima El Achkar Hilal
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Regional Office for Asia and the Pacific
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Preface

By 2015, the ASEAN Economic Community (AEC), envisioned as a single common market and production base, will become a reality. This will lead to the freer flow of goods, services, investment capital and skilled labour in the region. Tariffs and non-tariff barriers will be reduced, which will have implications for intraregional trade and investment. New opportunities for growth and prosperity are likely to emerge, but the challenge is to ensure that growth is inclusive and prosperity is shared.

Ultimately, the success of ASEAN regional integration will depend on how it affects the labour market and therefore how it improves the quality of life of women and men in the region. To prepare for the impact and find the opportunities to seize, the International Labour Organization initiated with the Asian Development Bank a joint study to examine the impact of the AEC on labour. Findings from the series of studies that were initiated are collected in the 2014 publication *ASEAN Community 2015: Managing integration for better jobs and shared prosperity*. That report highlights the challenges and opportunities that will accompany the AEC, including managing labour migration, boosting productivity and wages and improving job quality. The report offers policy recommendations for creating better jobs and ensuring that the benefits of the AEC are equitably shared among different countries and sectors.

The background papers to the joint publication are available as part of the ILO Asia–Pacific Working Paper Series, which is intended to enhance the body of knowledge, stimulate discussion and encourage knowledge sharing and further research for the promotion of decent work in Asia and the Pacific. This paper by Souleima El Achkar Hilal examines projected shifts in occupational demand and in occupational structure of the economy to determine potential skills mismatches that may ensue from ASEAN integration.

The ILO is devoted to advancing opportunities for women and men to obtain decent and productive work. It aims to promote rights at work, encourage decent employment opportunities, enhance social protection and strengthen dialogue in handling work-related issues. As countries in the Asia and the Pacific region continue to recover from the global economic crisis, the ILO’s Decent Work Agenda and the Global Jobs Pact provide critical policy frameworks to strengthen the foundations for a more inclusive and sustainable future.

Yoshiteru Uramoto
Assistant Director General and
Regional Director for Asia and the Pacific
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This paper benefited from very helpful comments and inputs provided by ILO colleagues, including Kee Beom Kim, Specialist on Employment, ILO Decent Work Technical Support Team for East and South-East Asia and Phu Huynh, Labour Economist, ILO Regional Office for Asia and the Pacific. Any errors are the sole responsibility of the author.
Executive summary

This paper examines the potential impact of the Association of Southeast Asian Nations (ASEAN) Economic Community (AEC) on the labour markets of six countries (Cambodia, Indonesia, the Lao People’s Democratic Republic, the Philippines, Thailand and Viet Nam) and on occupational employment and outlooks in particular. These outcomes are, to an important extent, linked to the projected asymmetric effects on sector employment. The analysis presented in this paper builds on the work of Petri, Plummer and Zhai (2013) who developed a computable general equilibrium (CGE) model to assess the impact of various regional integration initiatives on ASEAN labour markets.

The CGE model results showed that under the current trajectory (baseline scenario), employment growth in the six countries would be greatest in services, and particularly in trade and transport, in all countries, and in agriculture in some countries, which implies that a large share of employment growth may be in “vulnerable employment” in the informal sectors. Under the baseline scenario, growth in industry employment is also projected for all countries; but less than half of this growth would be in manufacturing, except in the Lao People’s Democratic Republic.

The AEC would have a significant impact on overall employment growth in all six countries, but the results presented in this paper also suggest that it would lead to increases in both the demand for and supply of workers in occupations that are linked to informal sector employment (such as some semi-skilled sales and service occupations and some elementary occupations). Employment growth in some of these occupations would also have implications for female employment.

The results presented below therefore imply that ASEAN governments need to place particular emphasis on ensuring that the growth path they are pursuing is inclusive and on protecting the most vulnerable segments of their population.

Under the AEC, industry employment, including manufacturing employment, would further increase in all countries relative to the baseline scenario. However, only in Thailand and Viet Nam would the manufacturing share of growth in industry employment be higher than under the baseline scenario. The AEC would generally have mixed effects on employment in manufacturing subsectors and on agriculture and primary resource subsectors linked to regional supply chains. The distributive effects of integration on manufacturing employment would be reflected in the changes in demand for semi-skilled occupations and, to a lesser extent, on labour market imbalances in those occupations. These effects also have different implications for female employment across the six countries. For instance, although apparel manufacturing occupations have larger shares of female workers in all six countries, some occupations along the food supply chain have larger shares of females in some countries and lower shares in others. The projected distributive effects of integration have important policy implications. For instance, if government support to the industries that would be negatively affected is inefficient, perhaps programmes may be in place to retrain workers from the affected industries such that they can be employed (transferable skills) in the industries that are expected to benefit.
In the semi-skilled occupational groups, large proportions of underqualified workers (except for clerical occupations for which there are more overqualified workers) reflect the relatively limited share of semi-skilled workers in supply, relative to the demand for these workers. This implies a shortage of semi-skilled workers, despite a large number of semi-skilled occupations identified as facing excess supply. The current focus on secondary-level and technical and vocational education and training (TVET) in many countries is thus consistent with the objective of reducing skills mismatch and labour market inefficiencies. This is because the most significant growth in occupational demand (in terms of growth rates and numbers of workers) is generally projected in semi-skilled and unskilled occupations. As the workforce in these countries becomes increasingly skilled, governments face the challenge of expanding decent work opportunities to absorb larger contingents of semi-skilled and skilled workers, which can be done, for instance, by attracting investment and supporting industries with high employment, creating potential for higher-skilled occupations.

All countries, with the exception of Viet Nam, are projected to see both actual and potential mismatch decline over the forecast period; in all cases, the decrease in potential mismatch would be greater than the decrease in actual mismatch because shifts in demographic and skills structure (increasing educational attainment) in these countries are occurring faster than changes in the underlying institutional factors that cause actual mismatch. In Viet Nam, although actual mismatch is expected to decrease over the forecast period, potential mismatch, initially very low, would increase as the country continues its transition to a market economy (as the share of the population striving for higher educational attainment exceeds the new opportunities being created for semi-skilled and skilled occupations). The AEC would have marginal impact on skills mismatch because the changes in mismatch are primarily driven by structural changes occurring gradually over time.

The results of the occupational projections support the message from Petri, Plummer and Zhai regarding the importance of structural adjustment as a driving force in determining the efficiency gains from integration and the role of governments in limiting adjustment costs in the short term.

**About the author**

Souleima El Achkar Hilal is an economist and labour market information specialist, working as a consultant for the ILO.

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## Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AEC</td>
<td>ASEAN Economic Community</td>
</tr>
<tr>
<td>ASEAN</td>
<td>Association of Southeast Asian Nations</td>
</tr>
<tr>
<td>CGE</td>
<td>computable general equilibrium</td>
</tr>
<tr>
<td>FDI</td>
<td>foreign direct investment</td>
</tr>
<tr>
<td>GDP</td>
<td>gross domestic product</td>
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<tr>
<td>LFS</td>
<td>Labour Force Survey</td>
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</table>
1. Introduction

In recent years, economic integration and cooperation has become an increasingly important policy priority for the economies of the Association of Southeast Asian Nations (ASEAN). Important steps have been made towards both deeper intraregional integration and further integration with the region’s neighbours, including the ASEAN Free Trade Area already in place, the ASEAN Economic Community (AEC) and the Regional Comprehensive Economic Partnership, a recently launched initiative.

The AEC, which was launched in 2007 and is to be implemented in 2015, is a significant initiative and involves the following components, or pillars: i) a single market and production base (removing or bringing down barriers to trade in goods and services, facilitating the flows of investment, capital and skilled labour, cooperating in priority integration sectors); ii) enhanced competitiveness through competition policy, consumer protection, intellectual property rights protection, infrastructure development, e-commerce and avoidance of double-taxation; iii) equitable economic development (narrowing development gaps within the region); and iv) improved integration into the global supply chains. The AEC falls just short of being a common market because it lacks certain requirements for a true common market – specifically, a customs union and the free flow of all categories of labour and capital (Petri, Plummer and Zhai, 2013).

Although major progress has been made in the implementation of measures to meet the AEC objectives, much work remains to be done. Specifically, although tariff rates have come down enormously and are “on track to be eliminated by 2015 […] non-tariff barriers continue to constitute serious impediments to intraregional trade” (Petri, Plummer and Zhai, 2013). There are additional implementation problems in terms of trade facilitation, technical barriers, trade logistics and services liberalization; and some measures aimed at facilitating foreign direct investment (FDI) inflows in priority sectors are posing domestic policy challenges in many countries (Petri, Plummer and Zhai, 2013). These challenges have been recognized, and the need for a post-2015 programme to deepen cooperation was discussed during the most recent ASEAN Summit.

The AEC, like any other regional integration initiative, is expected to have positive and negative welfare impacts on ASEAN countries, including dynamic effects, such as economies of scale, technology transfer and incentives to increase competition through policy reforms as well as distributive, or asymmetric, effects on factors of production within and across industries. Increased regional competition could generate a more efficient division of labour and reduce inefficient domestic production. On the other hand, regional integration could increase domestic production despite inefficiencies and market imperfections simply by allowing countries preferential access to markets. In sum, the potential welfare and distributive impacts of regional integration on participating economies depend on a variety of factors and initial conditions, including production structures, factor endowments and market failures (Petri, Plummer and Zhai, 2013).

As part of a series of thematic studies on the potential labour market impact of ASEAN integration commissioned by the International Labour Organization’s Regional Office for Asia and the Pacific, a state-of-the-art computable general equilibrium (CGE) model was used to estimate to 2025 the impacts of four ASEAN-based initiatives on total employment, the sector distribution of employment and factor returns for
The work presented in this paper, which is also part of the same series of thematic studies, builds upon that CGE model’s projections; presented here is the analysis of the potential occupational and skills implications of integration, focusing on the AEC scenario. Specifically, the Petri, Plummer and Zhai (2013) CGE model sector employment projections as well as trends in terms of occupational structures of industries and skills distribution of the labour force in each country are used to assess the impact of integration on occupational employment and outlooks. This paper examines the projected shifts in occupational demand and in the occupational structure of the economy to determine potential skills mismatches that may ensue; it therefore provides useful insights for policy-making towards reducing labour market adjustment costs.

The paper is structured as follows: The next section briefly presents the methodology used; the third section provides an overview of the economies and labour markets of the six countries studied; the fourth section presents the projection results in terms of occupational demand and imbalances; the fifth section discusses the important issue of skills mismatch; and the sixth section considers the potential gender impacts of the AEC. The last section concludes with a summary and a brief discussion of policy implications.

2. A brief description of the methodology

The methodology used in this paper follows the widely used manpower requirements approach to project occupational imbalances, which involves three stages: 1) projecting occupational demand; 2) projecting occupational supply; and 3) comparing demand and supply to identify potential imbalances. The detailed steps of each of the three stages are described in Annex B.

There are two components to occupational demand: expansion demand, which is attributable to growth in sector output and employment and/or shifts in the occupational structures of industries, and replacement demand, which is attributable to such factors as death, retirement and inter-occupational and geographical labour mobility.

To project expansion demand by occupation, trends in the occupational distribution of industries over time, obtained from the Labour Force Survey (LFS) microdata, are assumed to continue into the future. Specifically, the industry-occupation coefficients are allowed to change over time, using two approaches (a linear and a log-linear regression). The result of the two approaches as well as the coefficients of the last year of the available Labour Force Surveys are applied to the CGE model’s sector employment projections to obtain a range of projected expansion demand (“stock measure”) by occupation in 2025. A range is preferable to a point estimate, given the absence of margins of error for the estimates, because there are a number of factors that can affect the accuracy of results. In particular, trends are based on a limited number of observations, and the average trends for other countries are used for the countries with only one data point.

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1 The model incorporates heterogeneous firms trade theory and detailed specifications and decompositions of the labour market in the six countries; please refer to Petri, Plummer and Zhai (2013) for the detailed description of the model and assumptions.
2 In both cases, time is used as a proxy for technological change; please refer to Annex B for more details.
3 A range is preferable to a point estimate, given the absence of margins of error for the estimates, because there are a number of factors that can affect the accuracy of results. In particular, trends are based on a limited number of observations, and the average trends for other countries are used for the countries with only one data point.
between the projected stock measure in 2025 and the corresponding occupational employment in 2010 is calculated to obtain the projected “flow measure” of expansion demand over the forecast period.

Replacement demand, the second component of occupational demand, is not always included in occupational projections because of difficulties in assembling the required data (labour market outflows and transitions, including retirement figures, inter-occupational flows, etc.) There are methods with less restrictive data requirements, which, for instance, use age cohorts to estimate retirements by occupation and exclude transitions from one occupation to another (Cedefop, 2012). For the purpose of this paper, a simplistic version of these methods was used, which involved using the share of workers aged 65 years and older for each occupation as an estimate of replacement demand for that occupation. Total occupation demand was then obtained as a sum of the two components.

On the supply side, trends in educational attainment of the labour force for each demographic group were applied to the estimated labour force figures for 2025 and to the education-to-occupation matrix coefficients (occupational share of workers for each level of education attained), which were also allowed to change over time using a similar approach as with the industry-occupation coefficients. This provided a range for the projected occupational supply (stock measure) in 2025. The difference between the stock measure of the occupational supply in 2025 and the estimated occupational supply stock in 2010 was obtained as a measure of the flow of occupational supply.

The range of projected occupational demand and supply flow measures were then compared to identify occupations with projected labour market imbalances (excess labour demand or supply) for each country. Note that compared with the baseline scenario, the projected occupational demand under the AEC differs due to a change in expansion demand (replacement demand is assumed to stay constant), and the labour supply changes only because of the change in labour force size (participation rates). Two measures of skills mismatch, discussed in section 5, are presented to provide complementary information regarding labour imbalances.

3. Economic and labour market structure of the six countries – An overview

The potential impacts of economic integration depend to a large extent on initial conditions; for the six ASEAN countries studied here, it is useful to first consider their economic and labour market structures, particularly in terms of sector distribution.

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4 The methodology for projecting occupational supply focuses on the national labour force growth trends and does not account for the free flow of labour under any of the scenarios. The results therefore point to (rather than take into account) potential inflows of labour for occupations with excess demand and outflows for occupations with excess supply as well as upward and downward pressures on wages. Such adjustments would be expected to correct for the labour market imbalances that would arise, although there are likely to be delays and important adjustment costs (additional challenges to labour mobility, such as skills qualification equivalences or language barriers).
Agriculture is a major sector in all six countries, employing a third of all workers in the Philippines and in Cambodia, around 40 per cent in Indonesia and Thailand, nearly half of all workers in Viet Nam, and more than 70 per cent of workers in the Lao People’s Democratic Republic (Table 1).

The agriculture sector’s share in total value-added for Cambodia has increased over the past decade at the expense of both industry and services (Figure 1). In 2012, although more than a quarter of the country’s workers were employed in industry, including 17 per cent in manufacturing (the highest employment share in manufacturing among the six countries), the industry share in gross domestic product (GDP) was less than 25 per cent (Table 1). This implies that the manufacturing sector in Cambodia has relatively low productivity, and largely based on lower value-added products. Indeed, 55 per cent of the country’s manufacturing employment was in the apparel subsector in 2012 (Figure 2). A large share of the country’s labour force (57 per cent) was unskilled in 2012 (Annex A, Table A1).

Indonesia’s industrial sector value-added share has increased over the past decade and is the largest among the six countries, with 47 per cent of GDP in 2012 (Table 1). Manufacturing, however, accounted for only half of the industrial value-added share. The industry and manufacturing sectors employed 19 per cent and 13 per cent, respectively, of the country’s workers in 2010. In terms of subsectors, food processing was the largest employer in Indonesia, with 26 per cent of manufacturing employment in 2011, followed by wood products and apparel, at approximately 15 per cent each (Figure 2). Nearly half of Indonesia’s workforce was unskilled in 2010, and another 46 per cent consisted of semi-skilled workers, with skilled workers representing only 5 per cent of the labour force (Annex A, Table A1).

Table 1. Sector value added and employment shares, 2010–12 (latest LFS)

<table>
<thead>
<tr>
<th></th>
<th>Value-added share (% of GDP) in 2012</th>
<th>Share of total employment (%) – last year LFS*</th>
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<tbody>
<tr>
<td></td>
<td>Agriculture</td>
<td>Industry</td>
</tr>
<tr>
<td></td>
<td>Total, including manuf.</td>
<td>Manuf. only</td>
</tr>
<tr>
<td>Cambodia</td>
<td>35.6</td>
<td>24.3</td>
</tr>
<tr>
<td>Indonesia</td>
<td>14.4</td>
<td>46.9</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>28.0</td>
<td>36.2</td>
</tr>
<tr>
<td>Thailand</td>
<td>11.8</td>
<td>31.1</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>12.3</td>
<td>43.6</td>
</tr>
</tbody>
</table>


Sources: Value-added shares from WDI, 2013; employment shares from LFS (latest year available).

In the Lao People’s Democratic Republic, the agriculture sector’s share in value added has declined, from 43 per cent in 2002 to 28 per cent in 2012, while its industrial sector value added increased, from 20 per cent to 36 per cent over the same period (Figure 1). Nevertheless, only 8 per cent of the country’s workers were employed in industry in 2010, with 5 per cent in manufacturing, while the agriculture sector still employed more than 70 per cent of workers (Table 1). The manufacturing subsector with the largest employment potential in the Lao People’s Democratic Republic is food processing, which employed approximately one third of manufacturing workers in 2010 (Figure 2). The service sector in the Lao People’s Democratic Republic is less important than in the other countries in terms of value added and also in terms of employment, accounting for only 20 per cent of the country’s workers in 2010 (Table 1). In terms of skills distribution, the Lao People’s Democratic Republic has the least skilled workforce among the six countries. In 2010, more than 60 per cent of the labour force was unskilled, 35 per cent semi-skilled and less than 5 per cent was skilled (Annex A, Table A1).
The Philippines has the largest service sector among the six countries. The service sector share in GDP grew from 52 per cent in 2002 to 57 per cent in 2012 (Figure 1). More than half of the country's workers were employed in services in 2012 and approximately one third were employed in agriculture, while only 15 per cent were employed in the industrial sector, including 8 per cent in manufacturing (Table 1). A decline in industrial sector value added between 2002 and 2012 reflects the country's difficulties in attracting foreign direct investment. The limited share of employment in industry, and in manufacturing in particular, is a cause for concern for the Philippines because these sectors generally have higher productivity and better working conditions than the agriculture and services sectors. The Philippines has the highest skilled workforce among the six countries, with nearly 30 per cent of the labour force having completed higher education (university or post-graduate degrees) and another 40 per cent of the labour force considered as semi-skilled (Annex A, Table A1).

Thailand's important service sector has seen its value-added share decline, from 48 per cent in 2002 to 44 per cent in 2012. In 2010, around 41 per cent of Thailand's workers were employed in services, another 41 per cent in agriculture and 18 per cent in industry. Only 13 per cent of the country’s workers were employed in manufacturing, despite the relatively high value-added share of the sector (34 per cent of GDP in 2012), reflecting higher productivity relative to other countries in the region. Thailand’s manufacturing sector is also relatively diverse (Figure 2). However, the country does not have a highly skilled workforce, with 54 per cent of the labour force having completed primary school as their highest level of educational attainment in 2010 (Annex A, Table A1).
**Figure 2. Manufacturing subsector employment shares, 2010–12 (latest LFS) (%)**

Viet Nam’s industrial sector share in value added has been growing in recent years at the expense of both the agriculture and service sectors (Figure 1). In 2012, industry accounted for 39 per cent of Viet Nam’s GDP and 21 per cent of employment. Manufacturing, however, represented only 17 per cent of value added and 14 per cent of employment. In particular, the apparel industry accounted for 31 per cent of manufacturing employment, while the employment shares of industries higher up the value-added chain were smaller (Figure 2). The agriculture sector, which remains the largest employer in Viet Nam, with 47 per cent of workers, accounted for approximately 20 per cent of the country’s GDP in 2012. Nearly half of Viet Nam’s labour force consisted of semi-skilled workers and 43 per cent were unskilled in 2012 (Annex A, Table A1).

### 4. Employment and occupational projection results

The occupational-demand projections discussed in this paper rely primarily on the sector employment results of the CGE model (Petri, Plummer and Zhai, 2013), which, when combined with projected industry-occupation coefficients for each country provide estimates of expansion demand – one of the two components of occupational demand. The second component, replacement demand, is also discussed (section 4.2). Expansion demand is expected to be more directly impacted by the AEC than replacement demand, because the AEC design thus far does not allow for the free movement of all labour, only skilled labour. But even then, there are remaining barriers to the mobility of skilled labour (such as lack of a harmonized qualifications system). Thus replacement demand and increases in the labour supply attributable to labour movements are expected to be minimal.
4.1 Sector employment projections and expansion demand

The CGE model results show that under the current trajectory (baseline scenario), employment growth in the six countries would be greatest in services, except for the Lao People’s Democratic Republic, where employment growth would be higher in agriculture. Employment in agriculture is also projected to be important in Cambodia and, to a lesser extent, in the Philippines; while Indonesia, Thailand and Viet Nam would have a decline in agriculture employment. The manufacturing share of the growth in industry employment would be largest in the Lao People’s Democratic Republic (at 73 per cent), followed by Thailand (at 45 per cent) (Tables 2 and 3).

The AEC would have a positive impact on employment growth at the aggregate levels: overall on the three broad sectors (agriculture, service and industry) and on manufacturing in the six countries. Manufacturing employment would increase more as a share of industry employment under the AEC in Thailand and Viet Nam. The AEC would generally have asymmetric effects on manufacturing subsectors and on agriculture subsectors linked to regional supply chains in all countries.

More specifically, under both the baseline and AEC scenarios, the results of the CGE model reveal that the highest net growth in sector employment over the forecast period is projected in the trade and transport sector for all countries, with the exception of the Lao People’s Democratic Republic, where the sector comes second behind paddy rice (Tables 2 and 3). The construction sector comes in second place for all countries, except the Philippines, where private services rank higher, and in the Lao People’s Democratic Republic, where several subsectors rank higher, namely natural resources, other crops, livestock, private and public services, and wood products manufacturing.

In the Lao People’s Democratic Republic, the AEC is projected to have a positive effect on employment in the largest agriculture subsector, paddy rice, as well as in the other grains and natural resources subsectors. But it will have a negative effect on employment in the other crops and livestock subsectors. The AEC is also projected to have a negative impact on employment in the food processing manufacturing subsector, which is linked with the livestock and other agriculture subsectors. However, other manufacturing subsectors are projected to benefit from the AEC, particularly electrical equipment, metals and wood products.

In Cambodia, high net employment growth is also projected under the baseline scenario in the other crops agriculture subsector, in livestock and natural resources; but a decline in employment is projected in the other grain subsector. High net employment growth is also projected in public and private services. As for manufacturing, the subsectors with the highest employment generation potential would be apparel, followed by chemicals and textiles. Under the AEC scenario, net employment growth in Cambodia would be relatively higher than the baseline scenario for all sectors except livestock and food processing. In particular, a positive net employment growth of 13,000 workers in the food processing industries would be replaced by a decline in employment of 26,000 workers under the AEC scenario. On the other hand, the projected decline of 17,000 workers in the other grains agriculture subsector would be replaced by a limited net employment growth of 8,000 workers.
Table 2. Sector employment changes in Cambodia, Indonesia and the Lao People’s Democratic Republic, baseline and AEC, 2010–25 (‘000 workers)

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<td>BASE</td>
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<td>BASE-AEC</td>
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<tr>
<td>Agriculture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paddy rice</td>
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<td>Livestock</td>
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<td>Metals</td>
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Note: BASE=baseline scenario; AEC=ASEAN Economic Community scenario.
Source: Petri, Plummer and Zhai, 2013.

In **Indonesia**, a decline in agriculture employment is projected in all of the agriculture subsectors with the exception of livestock, under both the baseline and AEC scenarios. However, the projected increase in livestock employment is higher, and the projected decline in the other agriculture subsectors is less significant under the AEC scenario. Employment growth in the sectors with the highest employment generation potential (trade and transport, construction, and public and private services) is projected to be higher under the AEC scenario. The AEC would have a mixed impact on manufacturing in Indonesia; compared with the baseline scenario; employment growth would be higher in chemicals, metals, machinery and in the “other manufacturing” subsectors, but considerably lower in the food processing industries. The decline in employment in the electrical equipment subsector projected under the baseline scenario would be even greater under the AEC scenario. Employment growth in mining would be nearly twice as high under the AEC, compared with the baseline.
In the Philippines, the largest net employment growth is projected in trade and transport, followed by private services, construction and public services under the baseline scenario; growth in these subsectors is projected to be even higher under the AEC scenario. The AEC would also increase employment in agriculture. In particular, net employment growth in the other crops and livestock subsectors would be more than double the baseline, net employment growth in natural resources would increase by 45 per cent, compared with the baseline, and employment in the other grains subsector would grow by 130,000 workers, instead of decreasing by 7,000 workers, as forecasted in the baseline scenario. The AEC would have no effect on employment in the paddy rice subsector. Net employment growth in mining would be lower under the AEC scenario. The AEC would have a positive impact on manufacturing employment overall, and particularly on food processing, electrical equipment, vehicles and apparel. It would have a negative impact on employment growth in other manufacturing subsectors, such as textiles, chemicals, and machinery.

Under the baseline scenario, Thailand is projected to have negative employment growth in agriculture over the forecast period. Under the AEC scenario, employment growth in the livestock subsector would be positive, and the decline in employment in the other agriculture subsectors would be less severe. The AEC would increase the projected employment growth in construction and lessen the projected decline in the utilities sector. The manufacturing subsectors with the largest projected net employment growth under the baseline scenario (food processing, vehicles, electrical equipment and machinery) are projected to have even higher growth under the AEC scenario. The projected decline in the apparel, wood products and “other manufacturing” subsectors would be even more severe under the AEC. On the other hand, the AEC would have little impact on the projected decline in textiles, lessen the projected decline in metals and reverse the

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Table 3. Sector employment changes in the Philippines, Thailand and Viet Nam, baseline and AEC, 2010–25 ('000 workers)

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<tr>
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<td>1 668</td>
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<td>1 389</td>
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<td>1 407</td>
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<td>Manuf. &amp; industry (%)</td>
<td>43</td>
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Note: BASE—baseline scenario; AEC—ASEAN Economic Community scenario.
Source: Petri, Plummer and Zhai, 2013.
projected decline in chemicals. In services, employment in trade and transport, projected to expand under the baseline scenario, would expand even more under the AEC, while private and public services employment, projected to decline under the baseline scenario, would decline even further under the AEC scenario.

In Viet Nam, with the exception of the livestock subsector, employment in agriculture is projected to decrease in the baseline scenario and, to a lesser extent, in the AEC scenario as well. The projected decline in employment in mining and utilities under the baseline scenario is also expected to be smaller under the AEC, but significant nonetheless. Projected employment growth in the construction sector would be even higher under the AEC, compared with the baseline. All manufacturing subsectors would benefit from the AEC in terms of employment growth, with the exception of wood products. In particular, the most important impact of the AEC would be in the machinery, textiles and vehicles subsectors, in terms of percentage change in employment compared with the baseline and in apparel and food processing in terms of numbers of additional workers. In the services sector, the projected net employment growth would be even higher under the AEC scenario in the trade and transport subsector but lower for private and public services.

Table 4. AEC sector impact summary

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<thead>
<tr>
<th>Industry</th>
<th>Cambodia</th>
<th>Indonesia</th>
<th>Lao PDR</th>
<th>Philippines</th>
<th>Thailand</th>
<th>Viet Nam</th>
</tr>
</thead>
<tbody>
<tr>
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<td>+</td>
<td>+</td>
<td>+</td>
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</tr>
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</tr>
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<td>Other crops</td>
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<td>+</td>
</tr>
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<td>Livestock</td>
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</tr>
<tr>
<td>Mining</td>
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</tr>
<tr>
<td>Trade and transport</td>
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<td>+</td>
<td>+</td>
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<td>+</td>
</tr>
</tbody>
</table>

Source: Petri, Plummer and Zhai, 2013.

In sum, as expected, the AEC is projected to have distributive impacts on sector employment in participating countries (Table 4). For instance, it is projected to have a negative impact on industries along the food supply chain (livestock sector and food processing manufacturing) in Cambodia and the Lao People’s Democratic Republic and on food processing manufacturing in Indonesia, while leading to considerable employment growth in these sectors in the Philippines, Thailand and Viet Nam.

As Petri, Plummer and Zhai (2013) emphasize, the skills distribution of the labour force differs across countries, not only at the aggregate level but within the same sector. For instance, the share of unskilled workers in textile manufacturing ranges from 67 per cent in Thailand to 34 per cent in Viet Nam (Annex
A, Table A1). Thailand, which has the largest share of unskilled workers in the apparel industry, is the only country where employment growth in this industry would be negatively impacted by the AEC, whereas Viet Nam’s apparel industries would benefit tremendously. If the share of unskilled labour in sector employment can be used as a proxy for the factor composition – and therefore for the productivity – of industries, then these results would support the view that increased regional competition would benefit countries with more efficient production structures. In some cases, however, a larger share of unskilled workers could also mean lower labour and production costs (and therefore higher production efficiency). The skills structure of the workforce and factor composition of industries are among several factors that determine efficiency. Other factors, such as existing economies of scale and supply chain linkages, are also certainly at play in determining which sectors gain and which sectors lose in each country under the AEC.

4.2 Replacement demand

The results of the approach used here to project replacement demand represent conservative estimates. Because the approach relies entirely on the occupational age structure (and excludes other components, such as mobility across occupations and geographic areas), the highest replacement demand is often for occupations that are becoming less common as lifestyles change over time, including traditional and complementary medicine professionals and associate professionals (in Cambodia, Indonesia, the Philippines and Viet Nam), legal, social and religious associate professionals (in Cambodia and the Philippines), handicrafts workers in most countries, subsistence agriculture workers in Viet Nam and Indonesia, and most other skilled agricultural occupations in all countries except Cambodia. (Annex A, Table A3).

Replacement demand was also relatively high for some skilled worker occupations in Cambodia, including legislators and senior officials, business services and administration managers, and hotel and restaurant managers, life science technicians and related associate professionals, and nursing and midwifery associate professionals. In the Lao People’s Democratic Republic, it was relatively high for certain semi-skilled occupations, such as printing trades workers, and metal processing and finishing plant operators.

4.3 Occupational demand projections

Under the baseline scenario, the occupations with the highest projected growth rates over the forecast period in Cambodia include mixed crop and animal producers, due to the projected growth in the livestock and “other crops” agriculture subsectors, as well as retail and wholesale trade managers, business service agents, numerical clerks, and street and related service workers (tables 2 and 5). In terms of the numbers of workers (occupational demand), the highest growth is projected in unskilled or semi-skilled occupations: agricultural, forestry and fishery labourers, street and market salespersons and mining and construction labourers (Table 6).

The AEC is projected to have a positive impact on employment in all manufacturing subsectors in Cambodia, with the exception of food processing. This is reflected in major increases in the growth rates of some semi-skilled occupations, such as wood treaters, cabinetmakers and related trades workers; electrical equipment installers and repairers; assemblers; and blacksmiths, toolmakers and related trades workers. But it would have an important decrease in the growth rate of food processing and related trades

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5 Average annual growth rates are calculated using the change in occupational employment (stock measure of demand) between 2010 and 2025. They are calculated using the midpoint of the range of projected demand in 2025. These rates therefore represent expansion demand or growth in demand attributable to economic growth in a sector rather than to replacement demand.
workers (Table 8). Other occupations that would be negatively affected by the AEC in Cambodia are life science professionals and animal producers (Table 10). The occupational projections results suggest that informal employment would further increase under the AEC because the largest growth in occupational demand relative to the baseline scenario would be for street and market salespersons, market gardeners and crop growers as well as agricultural, forestry and fishery labourers, and mining and construction labourers (Table 9).

In Indonesia, many of the occupations with the fastest projected employment growth rates under the baseline scenario are linked to the substantial projected growth in trade, which includes the retail and wholesale trade, restaurants and hotels (subsectors linked to tourism and to private consumption). These are hotel and restaurant managers, waiters and bartenders, shop salespersons and cashier and ticket clerks (Table 5). In terms of the numbers of workers, the largest increases are projected for some sales and service occupations (shop salespersons and other sales workers, waiters and bartenders) but also for mixed crop and animal producers as well as building frame and related trade workers, and food processing and related trade workers (Table 6).

The AEC is expected to have a negative impact on employment in the food processing industries and, to a lesser extent, on the electrical equipment manufacturing subsectors in Indonesia while having a positive impact on other manufacturing subsectors, particularly on employment in chemicals, metals, textiles and “other manufacturing” (Table 4). This mixed impact is reflected in an important decrease in the growth rate of food processing and related workers (Table 8) and an increase in the growth rates of metal processing and finishing plant operators; blacksmiths, toolmakers and related trades workers; textile, fur and leather products machine operators; other stationary plant and machine operators; and rubber, plastic and paper products machine operators (Table 7). Despite the projected decline in the growth of the demand for food processing and related workers, compared with the baseline, the demand for these workers would remain high under the AEC scenario.
<table>
<thead>
<tr>
<th></th>
<th>Cambodia (%)</th>
<th>Indonesia (%)</th>
<th>Lao PDR (%)</th>
<th>Philippines (%)</th>
<th>Thailand (%)</th>
<th>Viet Nam (%)</th>
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<td>and curators</td>
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Note: Growth rates in this table refer to changes in stock and therefore reflect expansion demand only. They are calculated as average annual rates, using the midpoint of projected demand in 2025, compared with occupational employment in 2010.

Source: ASEAN occupational projections, 2014.
Table 6. Growth in occupational demand between 2010 and 2015 – top-ten occupations for each country, ('000 workers)

<table>
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<tr>
<th>Managers</th>
<th>Cambodia ('000s)</th>
<th>Indonesia ('000s)</th>
<th>Lao PDR ('000s)</th>
<th>Philippines ('000s)</th>
<th>Thailand ('000s)</th>
<th>Viet Nam ('000s)</th>
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Note: Figures in this table refer to total occupational changes and therefore include both expansion and replacement demand. They represent the midpoint of the projected range of total occupational demand flows between 2010 and 2025.
Source: ASEAN occupational projections, 2014.
In the **Lao People’s Democratic Republic**, the fastest occupational employment growth rates under the baseline scenario are for semi-skilled occupations linked to the projected growth in manufacturing, particularly in the wood products subsector and also in the food processing industries. Specifically, these are wood treaters, cabinetmakers and related trades workers; rubber, plastic and paper products machine operators; and other stationary plant and machine operators (Table 5). In terms of numbers, however, the highest employment growth is projected for unskilled and semi-skilled occupations linked to agriculture, particularly with rice and natural resources and specifically market gardeners and crop growers, and agriculture, forestry and fishery labourers as well as semi-skilled occupations in trade, specifically street, market and shop salespersons (Table 6).

As with **Cambodia**, the AEC is projected to have a negative impact on the Lao People’s Democratic Republic’s employment in the food processing industries and in the livestock agriculture subsector, which is reflected in a decline in the growth rates of food and related products machine operators as well as animal producers, who are lower down the food supply chain (Table 8). On the other hand, the AEC would expand employment in the electrical equipment, metals and wood products subsectors, as reflected in a projected increase in the growth rates of electronics and telecommunications installers and repairers; electrical equipment installers and repairers; blacksmiths, toolmakers and related trades workers; rubber, plastic and paper products machine operators; and assemblers (Table 7). The AEC is also projected to lead to a slowdown in public services employment growth in the Lao People’s Democratic Republic, leading to lower growth for some highly skilled occupations, including medical doctors (Table 8).

In the **Philippines**, the occupation with the highest projected growth rate is ships’ deck crews and related workers, a semi-skilled occupation that pertains to the country’s important maritime and shipbuilding industry (Table 5). Other occupations with the fastest projected growth rates are high-skilled occupations, including managing directors and chief executives; sports and fitness workers; and database and network professionals. In terms of numbers of workers, significant growth in occupational demand is projected for unskilled occupations (mainly agricultural, forestry and fishery labourers, and mining and construction labourers) as well as semi-skilled occupations (primarily for service and sales workers) and some skilled occupations, specifically for managers rather than for professionals or technicians and associate professionals (Table 6). The relative importance of projected employment growth in services sector occupations in the Philippines reflects the large role of private consumption in the current economic growth path of the country.

Also in the Philippines, the AEC would have a negative impact on employment for a limited number of occupations, namely mining and mineral processing plant operators linked to lower growth in mining employment (compared with the baseline), handicraft workers linked to lower growth in textiles, and chemical and photographic products plant and machine operators linked to lower growth in chemicals manufacturing (Table 8). It would have a positive impact on all other occupations, with the largest increases in growth rates for occupations across all skill levels in agriculture and food processing, such as assemblers; production managers in agriculture, forestry and fisheries; animal producers; and food processing and related trades workers (Table 7).

In **Thailand**, the occupations with the fastest projected growth rates under the baseline scenario relate to the tourism and hospitality industries, specifically hotel and restaurant managers, waiters and bartenders, and cooks (Table 5). Other occupations with high projected growth rates include mixed crop and animal
producers as well as ICT service managers. In terms of the numbers of workers, the largest increases are projected for semi-skilled services and sales workers, which is linked to high growth in the trade and transport sector, and for unskilled workers (agricultural, forestry and fishery labourers, and mining and construction labourers), many of whom would be employed in the informal sector (such as street and market salespersons) (Table 6).

Also in Thailand, the AEC is projected to have a positive impact on employment in occupations linked to the livestock and food processing sectors, specifically on animal producers; food and related products machine operators; assemblers; and food processing and related trades workers (Table 7). But it would have negative impact on occupations in textiles and apparel manufacturing, such as garment and related trades workers: textile, fur and leather products machine operators; and handicraft workers (Table 10). The AEC would also have a negative impact on private services occupations, such as hairdressers, beauticians and related workers; sports and fitness workers; and vehicle, window, laundry and other hand cleaning workers (Table 8). Employment in public services, which is projected to decline under the baseline scenario, would decline further under the AEC, resulting in a negative impact on a number of highly skilled and semi-skilled occupations in government and education, including legislators and senior officials; and primary school and early childhood teachers, child care workers and teachers’ aides (Table 10).

In Viet Nam, the highest projected growth rates under the baseline scenario are in a variety of occupations related to the trade and transport and construction sectors, including other craft and related workers; heavy trucks and bus drivers; business service agents; cooks; and other elementary workers (Table 5). In terms of the numbers of workers, the largest increases are projected in occupations that often involve informal employment, specifically street and market salespersons; agricultural, forestry and fishery labourers; and mining and construction labourers (Table 6). Other occupations with large projected increases in the number of workers are heavy truck and bus drivers linked to the projected growth in trade and transport and construction; and textile, fur and leather products machine operators, largely due to rapid growth in the apparel manufacturing industries.

Under the AEC scenario, employment growth would be higher for all economic sectors in Viet Nam, except for wood products manufacturing and private and public services (Table 5). In terms of growth rates, the most significant increases relative to the baseline would be, for the most part, occupations in trade and transport, such as heavy truck and bus drivers; street and market salespersons; food preparation assistants; and waiters and bartenders (Table 7). In terms of the numbers of workers, the largest increases would be for agricultural, forestry and fishery labourers; and street and market salespersons, which suggests that informal employment would increase under the AEC (Table 9). The most substantial negative impacts of the AEC on occupational employment are projected (similar to Thailand) in various high-skilled and semi-skilled occupations in government and education, including legislators and senior officials; primary school and early childhood teachers; secondary education teachers; and child care workers and teachers’ aides as well as private service occupations like hairdressers, beauticians and related workers (Table 10).
Table 7. Changes in occupational employment growth rates (2010–25) between the AEC and baseline scenarios – top-five increases in growth rate for each country (percentage points)

<table>
<thead>
<tr>
<th></th>
<th>Cambodia</th>
<th>Indonesia</th>
<th>Lao PDR</th>
<th>Philippines</th>
<th>Thailand</th>
<th>Viet Nam</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent. points</td>
<td>Rank</td>
<td>Percent. points</td>
<td>Rank</td>
<td>Percent. points</td>
<td>Rank</td>
</tr>
<tr>
<td><strong>Managers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production managers in agriculture, forestry and fisheries</td>
<td>0.4</td>
<td>62</td>
<td>0.1</td>
<td>54</td>
<td>0.1</td>
<td>55</td>
</tr>
<tr>
<td><strong>Technicians and associate professionals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information and communications technology operations and user support technicians</td>
<td>2.9</td>
<td>1</td>
<td>0.1</td>
<td>39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telecommunications and broadcasting technicians</td>
<td>0.2</td>
<td>78</td>
<td>0.1</td>
<td>79</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Service and sales workers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waiters and bartenders</td>
<td>1.1</td>
<td>24</td>
<td>0.1</td>
<td>73</td>
<td>0.7</td>
<td>17</td>
</tr>
<tr>
<td>Street and market salespersons</td>
<td>1.0</td>
<td>28</td>
<td>0.1</td>
<td>89</td>
<td>-0.4</td>
<td>91</td>
</tr>
<tr>
<td><strong>Skilled agricultural, forestry and fishery workers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animal producers</td>
<td>0.0</td>
<td>122</td>
<td>0.0</td>
<td>97</td>
<td>-0.9</td>
<td>93</td>
</tr>
<tr>
<td><strong>Craft and related trades workers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blacksmiths, toolmakers and related trades workers</td>
<td>1.7</td>
<td>5</td>
<td>0.3</td>
<td>2</td>
<td>2.9</td>
<td>2</td>
</tr>
<tr>
<td>Electrical equipment installers and repairers</td>
<td>2.3</td>
<td>3</td>
<td>0.2</td>
<td>12</td>
<td>2.3</td>
<td>3</td>
</tr>
<tr>
<td>Electronics and telecommunications installers and repairers</td>
<td>0.3</td>
<td>65</td>
<td>0.2</td>
<td>10</td>
<td>7.7</td>
<td>1</td>
</tr>
<tr>
<td>Food processing and related trades workers</td>
<td>-2.3</td>
<td>126</td>
<td>-0.4</td>
<td>128</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood treaters, cabinetmakers and related trades workers</td>
<td>2.5</td>
<td>2</td>
<td>0.2</td>
<td>14</td>
<td>1.1</td>
<td>11</td>
</tr>
<tr>
<td><strong>Plant and machine operators, and assemblers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal processing and finishing plant operators</td>
<td>1.2</td>
<td>18</td>
<td>0.4</td>
<td>1</td>
<td>1.1</td>
<td>10</td>
</tr>
<tr>
<td>Rubber, plastic and paper products machine operators</td>
<td>1.5</td>
<td>9</td>
<td>0.3</td>
<td>5</td>
<td>1.5</td>
<td>4</td>
</tr>
<tr>
<td>Textile, fur and leather products machine operators</td>
<td>0.5</td>
<td>58</td>
<td>0.3</td>
<td>3</td>
<td>1.1</td>
<td>9</td>
</tr>
<tr>
<td>Food and related products machine operators</td>
<td>0.2</td>
<td>87</td>
<td>-0.1</td>
<td>127</td>
<td>-0.8</td>
<td>92</td>
</tr>
<tr>
<td>Other stationary plant and machine operators</td>
<td>1.0</td>
<td>29</td>
<td>0.3</td>
<td>4</td>
<td>1.4</td>
<td>7</td>
</tr>
<tr>
<td>Assemblers</td>
<td>2.2</td>
<td>4</td>
<td>0.2</td>
<td>18</td>
<td>1.5</td>
<td>5</td>
</tr>
<tr>
<td>Heavy truck and bus drivers</td>
<td>1.0</td>
<td>26</td>
<td>0.1</td>
<td>41</td>
<td>0.6</td>
<td>25</td>
</tr>
<tr>
<td><strong>Elementary occupations</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing labourers</td>
<td>0.5</td>
<td>53</td>
<td>0.0</td>
<td>105</td>
<td>1.3</td>
<td>8</td>
</tr>
<tr>
<td>Food preparation assistants</td>
<td>0.8</td>
<td>42</td>
<td>0.0</td>
<td>107</td>
<td>123</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Note: The percentage point changes presented in this table represent the difference between the average annual growth rates (2010–25) projected under the AEC scenario and the average annual growth rates projected under the baseline scenario during the same period. Source: ASEAN occupational projections, 2014.
<table>
<thead>
<tr>
<th>Professionals</th>
<th>Cambodia Percent. points</th>
<th>Indonesia Percent. points</th>
<th>Lao PDR Percent. points</th>
<th>Philippines Percent. points</th>
<th>Thailand Percent. points</th>
<th>Viet Nam Percent. points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical &amp; earth science professionals</td>
<td>0.0</td>
<td>0.1</td>
<td>-0.1</td>
<td>0.1</td>
<td>29</td>
<td>-0.4</td>
</tr>
<tr>
<td>Life science professionals</td>
<td>-0.7</td>
<td>2</td>
<td>0.0</td>
<td>0.6</td>
<td>72</td>
<td>0.1</td>
</tr>
<tr>
<td>Architects, planners, surveyors &amp; designers</td>
<td>0.0</td>
<td>8</td>
<td>0.1</td>
<td>101</td>
<td>-0.2</td>
<td>0.3</td>
</tr>
<tr>
<td>Medical doctors</td>
<td>0.0</td>
<td>20</td>
<td>0.0</td>
<td>27</td>
<td>-0.3</td>
<td>5</td>
</tr>
<tr>
<td>Paramedical practitioners</td>
<td>0.0</td>
<td>7</td>
<td>0.1</td>
<td>105</td>
<td>0.1</td>
<td>23</td>
</tr>
<tr>
<td>Legal professionals</td>
<td>0.2</td>
<td>51</td>
<td>0.0</td>
<td>16</td>
<td>0.2</td>
<td>33</td>
</tr>
<tr>
<td>Authors, journalists &amp; linguists</td>
<td>0.2</td>
<td>39</td>
<td>0.1</td>
<td>34</td>
<td>0.2</td>
<td>42</td>
</tr>
<tr>
<td><strong>Total professionals</strong></td>
<td><strong>0.0</strong></td>
<td><strong>0.1</strong></td>
<td><strong>-0.1</strong></td>
<td><strong>0.1</strong></td>
<td><strong>29</strong></td>
<td><strong>-0.4</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technicians and associate professionals</th>
<th>Cambodia Percent. points</th>
<th>Indonesia Percent. points</th>
<th>Lao PDR Percent. points</th>
<th>Philippines Percent. points</th>
<th>Thailand Percent. points</th>
<th>Viet Nam Percent. points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life science technicians &amp; related associate</td>
<td>0.3</td>
<td>58</td>
<td>0.0</td>
<td>5</td>
<td>2</td>
<td>36</td>
</tr>
<tr>
<td>professionals</td>
<td>0.0</td>
<td>6</td>
<td>0.2</td>
<td>48</td>
<td>0.3</td>
<td>71</td>
</tr>
<tr>
<td>Sports &amp; fitness workers</td>
<td>0.9</td>
<td>87</td>
<td>0.0</td>
<td>4</td>
<td>29</td>
<td>0.3</td>
</tr>
<tr>
<td>Artistic, cultural &amp; culinary associate professionals</td>
<td>0.9</td>
<td>87</td>
<td>0.0</td>
<td>4</td>
<td>29</td>
<td>0.3</td>
</tr>
</tbody>
</table>

| **Total Technicians and associate professionals**  | **0.0**                   | **0.1**                   | **-0.1**                | **0.1**                     | **29**                   | **-0.4**                 | **5**                    | **0.0**                   | **26**                    | **0.0**                   | **29**                    |

<table>
<thead>
<tr>
<th>Service and sales workers</th>
<th>Cambodia Percent. points</th>
<th>Indonesia Percent. points</th>
<th>Lao PDR Percent. points</th>
<th>Philippines Percent. points</th>
<th>Thailand Percent. points</th>
<th>Viet Nam Percent. points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooks</td>
<td>0.9</td>
<td>93</td>
<td>-0.1</td>
<td>3</td>
<td>0.4</td>
<td>60</td>
</tr>
<tr>
<td>Hairdressers, beauticians &amp; related workers</td>
<td>0.2</td>
<td>48</td>
<td>0.1</td>
<td>94</td>
<td>0.5</td>
<td>62</td>
</tr>
<tr>
<td>Street &amp; market workers</td>
<td>1.0</td>
<td>99</td>
<td>0.1</td>
<td>40</td>
<td>-0.4</td>
<td>4</td>
</tr>
<tr>
<td>Child care workers &amp; teachers' aides</td>
<td>0.1</td>
<td>28</td>
<td>0.1</td>
<td>97</td>
<td>0.3</td>
<td>78</td>
</tr>
</tbody>
</table>

| **Total Skilled workers**                         | **0.0**                   | **0.1**                   | **-0.1**                | **0.1**                     | **29**                   | **-0.4**                 | **5**                    | **0.0**                   | **26**                    | **0.0**                   | **29**                    |

<table>
<thead>
<tr>
<th>Craft and related trades workers</th>
<th>Cambodia Percent. points</th>
<th>Indonesia Percent. points</th>
<th>Lao PDR Percent. points</th>
<th>Philippines Percent. points</th>
<th>Thailand Percent. points</th>
<th>Viet Nam Percent. points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handicraft workers</td>
<td>1.6</td>
<td>120</td>
<td>0.3</td>
<td>120</td>
<td>-0.1</td>
<td>2</td>
</tr>
<tr>
<td>Food processing &amp; related trades workers</td>
<td>-2.3</td>
<td>1</td>
<td>-0.4</td>
<td>1</td>
<td>0.7</td>
<td>121</td>
</tr>
<tr>
<td>Wood treaters, cabinetmakers &amp; related trades</td>
<td>2.5</td>
<td>125</td>
<td>0.2</td>
<td>115</td>
<td>1.1</td>
<td>84</td>
</tr>
</tbody>
</table>

| **Total Craft and related trades workers**         | **0.0**                   | **0.1**                   | **-0.1**                | **0.1**                     | **29**                   | **-0.4**                 | **5**                    | **0.0**                   | **26**                    | **0.0**                   | **29**                    |

<table>
<thead>
<tr>
<th>Plant and machine operators &amp; assemblers</th>
<th>Cambodia Percent. points</th>
<th>Indonesia Percent. points</th>
<th>Lao PDR Percent. points</th>
<th>Philippines Percent. points</th>
<th>Thailand Percent. points</th>
<th>Viet Nam Percent. points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining and mineral processing plant operators</td>
<td>1.3</td>
<td>112</td>
<td>0.2</td>
<td>118</td>
<td>0.4</td>
<td>61</td>
</tr>
<tr>
<td>Chemical &amp; photographic products plant &amp; machine</td>
<td>1.5</td>
<td>119</td>
<td>0.3</td>
<td>121</td>
<td>-2.5</td>
<td>1</td>
</tr>
<tr>
<td>operators</td>
<td>1.5</td>
<td>118</td>
<td>0.3</td>
<td>124</td>
<td>1.5</td>
<td>91</td>
</tr>
<tr>
<td>Rubber, plastic &amp; paper products machine operators</td>
<td>0.2</td>
<td>40</td>
<td>-0.1</td>
<td>2</td>
<td>-0.8</td>
<td>3</td>
</tr>
</tbody>
</table>

| **Total Plant and machine operators**             | **0.0**                   | **0.1**                   | **-0.1**                | **0.1**                     | **11**                   | **-1.1**                 | **3**                    | **6**                     | **100**                   |

<table>
<thead>
<tr>
<th>Elementary occupations</th>
<th>Cambodia Percent. points</th>
<th>Indonesia Percent. points</th>
<th>Lao PDR Percent. points</th>
<th>Philippines Percent. points</th>
<th>Thailand Percent. points</th>
<th>Viet Nam Percent. points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle, window, laundry &amp; other handcleaning</td>
<td>0.3</td>
<td>63</td>
<td>0.1</td>
<td>89</td>
<td>0.7</td>
<td>75</td>
</tr>
</tbody>
</table>

**Note:** The percentage point changes presented in this table represent the difference between the average annual growth rates (2010–25) projected under the AEC scenario and the average annual growth rates projected under the baseline scenario during the same period.
### Table 9. Top-five increases in projected occupational employment growth (2010–25) between the AEC and baseline scenarios for each country ('000 workers)

<table>
<thead>
<tr>
<th></th>
<th>Cambodia ('000s)</th>
<th>Rank</th>
<th>Indonesia ('000s)</th>
<th>Rank</th>
<th>Lao PDR ('000s)</th>
<th>Rank</th>
<th>Philippines ('000s)</th>
<th>Rank</th>
<th>Thailand ('000s)</th>
<th>Rank</th>
<th>Viet Nam ('000s)</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technicians and associate professionals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mining, manufacturing and construction supervisors</td>
<td>12</td>
<td>16</td>
<td>60</td>
<td>7</td>
<td>4</td>
<td>13</td>
<td>30</td>
<td>22</td>
<td>80</td>
<td>5</td>
<td>2</td>
<td>68</td>
</tr>
<tr>
<td><strong>Service and sales workers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Street and market salespersons</td>
<td>175</td>
<td>1</td>
<td>104</td>
<td>4</td>
<td>-15</td>
<td>129</td>
<td>45</td>
<td>16</td>
<td>53</td>
<td>13</td>
<td>1245</td>
<td>2</td>
</tr>
<tr>
<td>Shop salespersons</td>
<td>19</td>
<td>10</td>
<td>31</td>
<td>16</td>
<td>8</td>
<td>4</td>
<td>150</td>
<td>5</td>
<td>40</td>
<td>15</td>
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<td>Other sales workers</td>
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<td>15</td>
<td>193</td>
<td>1</td>
<td>2</td>
<td>22</td>
<td>121</td>
<td>6</td>
<td>134</td>
<td>3</td>
<td>35</td>
<td>19</td>
</tr>
<tr>
<td><strong>Skilled agricultural, forestry and fishery workers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market gardeners and crop growers</td>
<td>157</td>
<td>2</td>
<td>38</td>
<td>10</td>
<td>72</td>
<td>1</td>
<td>195</td>
<td>3</td>
<td>457</td>
<td>1</td>
<td>113</td>
<td>9</td>
</tr>
<tr>
<td>Animal producers</td>
<td>-5</td>
<td>129</td>
<td>9</td>
<td>40</td>
<td>-20</td>
<td>130</td>
<td>225</td>
<td>2</td>
<td>136</td>
<td>2</td>
<td>46</td>
<td>15</td>
</tr>
<tr>
<td>Mixed crop and animal producers</td>
<td>0</td>
<td>126</td>
<td>113</td>
<td>3</td>
<td>4</td>
<td>11</td>
<td>6</td>
<td>58</td>
<td>19</td>
<td>25</td>
<td>1</td>
<td>73</td>
</tr>
<tr>
<td><strong>Craft and related trades workers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building frame and related trades workers</td>
<td>31</td>
<td>7</td>
<td>171</td>
<td>2</td>
<td>0</td>
<td>40</td>
<td>71</td>
<td>10</td>
<td>58</td>
<td>12</td>
<td>201</td>
<td>4</td>
</tr>
<tr>
<td>Building finishers and related trades workers</td>
<td>19</td>
<td>9</td>
<td>15</td>
<td>34</td>
<td>10</td>
<td>3</td>
<td>7</td>
<td>56</td>
<td>21</td>
<td>22</td>
<td>5</td>
<td>58</td>
</tr>
<tr>
<td>Handicraft workers</td>
<td>41</td>
<td>5</td>
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<tr>
<td>Electronics and telecommunications installers and repairers</td>
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<td>59</td>
<td>16</td>
<td>30</td>
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<td>53</td>
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<td><strong>Elementary occupations</strong></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Agricultural, forestry and fishery labourers</td>
<td>141</td>
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<td>62</td>
<td>6</td>
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<td>1</td>
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</table>

Note: Figures in this table refer to the difference between total occupational changes (expansion plus replacement demand, 2010–2025) projected under the AEC scenario and those projected under the baseline scenario.

Source: ASEAN occupational projections, 2014.
### Table 10. Top-five decreases in projected occupational employment growth (2010–25) between the AEC and baseline scenarios for each country ('000 workers)

<table>
<thead>
<tr>
<th></th>
<th>Cambodia ('000s)</th>
<th>Indonesia ('000s)</th>
<th>Lao PDR ('000s)</th>
<th>Philippines ('000s)</th>
<th>Thailand ('000s)</th>
<th>Viet Nam ('000s)</th>
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<tbody>
<tr>
<td><strong>Managers</strong></td>
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<tr>
<td>associates' aides</td>
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<td><strong>Service and sales workers</strong></td>
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<td>fishery workers</td>
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<td><strong>Craft and related trades workers</strong></td>
<td></td>
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<td>Wood treaters, cabinetmakers and</td>
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<td>Garment and related trades workers</td>
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<td>Chemical and photographic</td>
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<td><strong>Elementary occupations</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle, window, laundry and other</td>
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<td>86</td>
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<tr>
<td>hand cleaning workers</td>
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</table>

Note: Figures in this table refer to the difference between total occupational changes (expansion plus replacement demand, 2010-2025) projected under the AEC scenario and those projected under the baseline scenario.

Source: ASEAN occupational projections, 2014.
4.4 Occupational outlooks by occupation

Occupational demand projections alone are not sufficient to determine employment outlooks for occupations – the supply side needs to be considered as well. The occupational supply discussed here is a function of the trends in educational attainment of the labour force as well as changes in the occupational and skills structures. It is important to emphasize that under the AEC scenario, the size of the labour force is projected to increase when compared with the baseline for all countries, but the skills distribution of the labour force in each country is assumed to remain unchanged. The underlying assumption is that the increase in the labour force under the AEC scenario is largely attributable to an increase in labour force size (participation rate) rather than shifts in skill structure linked to labour flows. Rather than account for the potential free flow of labour that could ensue from the AEC, the results presented here may provide insights on the directions of these flows if there were actually no barriers to labour movements within the region.

Another issue to keep in mind is that the occupational supply is “actual supply” obtained from projected changes in the education-to-occupation matrix (coefficients) over time. It thus takes into account the trends in skills mismatch rather than assuming a “no mismatch situation” in which the supply of workers with a certain skill level would be employed in occupations that correspond to their skill level. In this context, excess demand does not mean labour shortage but a shortage of workers with the adequate qualifications; similarly, excess supply does not necessarily mean high unemployment but that workers are likely to be employed in occupations that do not correspond to their skill level. For this reason, the discussion of skills mismatch (section 5) complements this section.

The Philippines is the only country among the six that is projected to have potential excess demand for many skilled occupations under both the baseline and AEC scenarios. Specifically, these are life science professionals; electrotechnology engineers; architects, planners, surveyors and designers; sales, marketing and public relations professionals; legal professionals; process control technicians; financial and mathematical associate professionals; and administrative and specialized secretaries (Table 11). These occupations are not necessarily the ones with the largest projected employment growth but the ones for which growth in demand exceeds growth in supply.

In Cambodia, potential excess demand for life science technicians and related associate professionals is projected under both scenarios, although this is mainly attributable to high replacement demand rather than to expansion demand. Additionally, potential excess demand for university and higher education teachers is projected in Cambodia under the baseline scenario and in Thailand under both scenarios (Table 11). In Thailand, a potential excess demand for legal professionals under the baseline scenario would be less likely under the AEC scenario.

Excess demand for clerical support workers is projected for a limited number of occupations in each country, under both the baseline and AEC scenarios. In particular, these would be keyboard operators and

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6 The approach used to estimate the increase in labour force corresponding to the employment growth under the baseline and AEC scenario is described in Annex B.

7 Two measures of imbalances are calculated from the total flow measures of demand and supply over the 2010–25 period, for each scenario: 1. “Definite” excess demand or supply (when the low end of the projected range of demand is higher than the high end of projected supply – or vice versa – such that there is no overlap between the projected ranges of supply and demand). 2. A broader measure (excess demand: when the midpoint of the projected supply is lower than the high end of projected demand and excess supply: when the midpoint of the projected supply is higher than the high end of projected demand).
material-recording and transport clerks in the Philippines and client information workers in Thailand (Table 12).

Excess demand is projected for a number of service and sales occupations, including waiters and bartenders in Thailand and Viet Nam, building and housekeeping supervisors in the Lao People’s Democratic Republic, other personal services workers in Cambodia and Indonesia and shop salespersons in Viet Nam (Table 12). There would be excess demand for other sales workers in Indonesia and Thailand under both scenarios. There also would be excess demand for street and market salespersons under the baseline scenario in the latter two countries and in Indonesia only under the AEC scenario. Although no excess demand for these workers exists in Thailand under the AEC scenario, the number of these workers would be larger than for the baseline (Table 10). This means that the increase in the supply of these workers attributable to the AEC would exceed the increase in demand.

Potential excess demand for most skilled agriculture occupations is projected in Indonesia and in Thailand under both the baseline and AEC scenarios and for many of these occupations in Cambodia as well. In Thailand, however, there could be an excess supply of forestry and related workers and of fishery workers, hunters and trappers (Table 12). In the Lao People’s Democratic Republic, there would be an excess demand for animal producers and forestry and related workers under both scenarios and for mixed crop and animal producers under the AEC scenario only. In the Philippines, there potentially would be excess demand for market gardeners and crop growers but excess supply of animal producers and mixed crop and animal producers as well as fishery workers, hunters and trappers under both scenarios. In Viet Nam, there would be excess supply of forestry and related workers and subsistence livestock farmers and subsistence crop farmers, but there would be potential excess demand for mixed crop and animal producers under both scenarios and potential excess demand for subsistence crop farmers under the baseline scenario only.

Under both the baseline and AEC scenarios, potential excess demand for building frame and related trades workers is projected in all countries except the Lao People’s Democratic Republic and for painters, building structure cleaners and related trades workers in all countries except the Lao People’s Democratic Republic and the Philippines (Table 12). Other occupations with potential excess demand under both scenarios include building finishers and related trades workers in Cambodia and Viet Nam, sheet and structural metal workers, moulders and welders and related workers, and machinery mechanics and repairers in the Philippines, and food processing and related trades workers and garment and related trades workers in Viet Nam.

An excess supply of workers is projected for most of the other crafts and related trades occupations under both scenarios in all countries, except in the Lao People’s Democratic Republic, where the AEC has a substantial impact on imbalances in these occupations. By expanding employment growth in several manufacturing subsectors (mainly in electrical equipment, metals and wood products) in the Lao People’s Democratic Republic, the AEC would reduce the likelihood of excess labour supply of building finishers and related trades workers; painters, building structure cleaners and related trades workers; sheet and structural metal workers, moulders and welders and related workers; and electrical equipment installers and repairers. And it would increase the probability of having excess demand for blacksmiths, toolmakers and related trades workers; and wood treaters, cabinetmakers and related trades workers. In the case of electronics and telecommunications installers and repairers, an excess supply under the baseline scenario could be replaced by excess demand under the AEC scenario.
In the Philippines, an excess supply of plant and machine operators and assemblers is projected for most occupations in that occupational group under both scenarios, but there could be excess demand for chemical and photographic products plant and machine operators and for locomotive engine drivers and related workers. In Indonesia as well, excess supply is projected for most occupations in the plant and machine operators and assemblers occupational group under both scenarios, although there could be excess demand for some transport-related occupations, such as locomotive engine drivers and related workers; car, van and motorcycle drivers; heavy truck and bus drivers; and ships' deck crews and related workers. An excess demand in most of these transport-related occupations and for chemical and photographic products plant and machine operators is also projected in Thailand under both scenarios. In Thailand as well, the AEC would increase the likelihood of excess demand for rubber, plastic and paper products machine operators and for food and related products machine operators, but would reduce the likelihood of excess supply of metal processing and finishing plant operators and assemblers.

In Cambodia, excess demand for rubber, plastic and paper products machine operators and for ships' deck crews and related workers is likely under both scenarios. Under the AEC scenario, excess demand for mining and mineral processing plant operators, for chemical and photographic products plant and machine operators and for assemblers are also projected. A risk of excess supply of heavy truck and bus drivers would subside.

In the Lao People’s Democratic Republic, excess demand for any of the plant and machine operators and for assemblers occupations is unlikely under the baseline scenario but could occur for metal processing and finishing plant operators and for other stationary plant and machine operators under the AEC scenario. In Viet Nam, an excess demand for rubber, plastic and paper products machine operators and for ships' deck crews and related workers is projected under both scenarios. However, excess demand for food and related products machine operators becomes less likely under the AEC.

The AEC has limited impact on occupational imbalances for elementary occupations. Under both scenarios, excess demand for agricultural, forestry and fishery labourers is projected in Cambodia, the Lao People’s Democratic Republic, Thailand and Viet Nam and for transport and storage labourers in Indonesia, Thailand and Viet Nam. Excess demand for refuse workers is also projected under both scenarios in Indonesia, the Lao People’s Democratic Republic and Thailand and under the baseline scenario in Viet Nam. Other unskilled occupations with potential excess demand under both scenarios are mining and construction labourers in Indonesia and Viet Nam, other elementary occupations in Indonesia and Thailand, domestic, hotel and office cleaners and helpers and manufacturing labourers in Thailand and street and related service workers and street vendors (excluding food) in Viet Nam.
Table 11. Projected imbalances for skilled occupations, baseline and AEC scenarios

<table>
<thead>
<tr>
<th>Managers</th>
<th>Cambodia</th>
<th>Indonesia</th>
<th>Lao PDR</th>
<th>Philippines</th>
<th>Thailand</th>
<th>Viet Nam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legislators and senior officials</td>
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<tr>
<td>Managing directors and chief executives</td>
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<td></td>
</tr>
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<td>Base, AEC</td>
<td>Base, AEC</td>
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<td>Base, AEC</td>
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<tr>
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<tr>
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<td>Base, AEC</td>
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<tr>
<td>Manufacturing, mining, construction, and distribution managers</td>
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<td>Retail and wholesale trade managers</td>
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<td>Thailand</td>
<td>Viet Nam</td>
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<td>Physicall and earth science professionals</td>
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</table>

**Legend**

- **Definite excess demand** (no overlap between supply and demand)
- **Likely excess demand despite some overlap in the projected ranges of supply and demand**
- **Definite excess supply** (no overlap between supply and demand)
- **Likely excess supply despite some overlap in the projected ranges of supply and demand**

Source: ASEAN occupational projections, 2014.
### Table 12. Projected imbalances for semi-skilled and unskilled occupations, baseline and AEC scenarios

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Cambodia</th>
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5. Skills mismatch

In the analysis presented in this paper, two concepts are used to describe skills mismatch: the first, “actual mismatch”, refers to the share of workers who are either underqualified or overqualified for their occupation. The second, “potential mismatch”, refers to the skills distribution of the workforce (labour supply by skill level\(^8\)), compared with the distribution that would be implied by the occupational structure of the economy (labour demand by skill level).\(^9\) A skills mismatch index is also used, which is based on the relative shares of supply and demand for each skill level and is essentially a summary measure of potential mismatch. The detailed methodology used to project mismatch is provided in Annex B.

---

\(^8\) Skills were divided into three levels, based on the ISCO-ISCED classifications and concordances: i) unskilled, which is primary education or less (corresponding to elementary occupations); ii) semi-skilled, which includes lower secondary to post-secondary, pre-university and which is sometimes lumped together with high school in the Labour Force Survey (corresponding to the clerical support workers, sales and service workers, skilled agricultural, forestry and fishery workers, craft and related trades workers and plant and machinery operators and assemblers); and iii) skilled, which is university or postgraduate educational attainment (corresponding to the managers, professionals and technicians and associate professionals categories).

\(^9\) These measures, which rely solely on skill levels, are a “narrow definition” and underestimate the “true” mismatch that would result if the field of specialization was also taken into account, or even the quality of training. Using this narrow definition implies perfect substitution of workers with a certain skill level across all occupations requiring that level. The narrow definition must be used, however, due to the lack of data on qualifications or field of training in the Labour Force Survey.
Although both measures of mismatch are affected by the change in the occupational structures of the economy over time, potential mismatch is also affected by changes in the skills distribution of the population, while actual mismatch is attributable to the actual skills distribution of occupations. Potential mismatch can be reduced through workforce planning (training and education decisions); actual mismatch is often attributable to various institutional factors and labour market barriers and inefficiencies (such as any form of discrimination or inadequate hiring practices that are not based on merit or qualifications).

In all six countries in the last year for which Labour Force Survey data were available, actual mismatch exceeded potential mismatch. This implies that existing mismatches between occupational requirements and worker qualifications are attributable, to a greater extent, to the misallocation of labour rather than to large discrepancies between the skills distribution of the workforce and the skills requirements of the economy.

Among the six countries, the Lao People’s Democratic Republic has the most significant skills mismatch in terms of both potential and actual measures, followed by Thailand and Cambodia (Table 14). In the last year for which the Labour Force Survey data are available, the demand for semi-skilled occupations in these three countries constituted between 72 per cent and 88 per cent of total labour demand, whereas the supply of semi-skilled workers represented 34 to 36 per cent of the labour force (Table 13). Unskilled workers accounted for the largest share (between 54 and 61 per cent) of the labour force in these three countries. In Indonesia, 74 per cent of demand was for semi-skilled labour in 2010, but semi-skilled workers constituted a larger share of the workforce (46 per cent) than in Cambodia, the Lao People’s Democratic Republic and Thailand.

In the Philippines, the gap between the share of semi-skilled occupations in employment demand (50 per cent) and the share of semi-skilled workers in labour supply (40 per cent) was relatively narrower (Table 13). The Philippines has the largest share of skilled workers in terms of both demand and supply and the second lowest potential mismatch, which is considerably lower than the other countries, except Viet Nam (Table 14).

Among the six countries, actual mismatch and potential mismatch are the lowest in Viet Nam. The skills distribution of the labour force in Viet Nam was almost identical to the skills requirements structure of the economy in 2012, with semi-skilled workers accounting for approximately half of all employment and of the labour force, unskilled workers for approximately 41 per cent, and skilled workers for approximately 10 per cent (Table 13).

Under both the baseline and AEC scenarios, there is a projected excess supply for most skilled occupations in all countries except the Philippines, which would normally suggest that an increasingly educated labour force in these countries would not be met with sufficient employment opportunities that correspond to their skill levels. However, a closer look at the skills mismatch by occupational group reveals additional interesting insights. In Cambodia, Indonesia and the Lao People’s Democratic Republic, large shares of workers in high-skilled occupations are underqualified (Figure 3). This is also the case for Thailand and Viet Nam with respect to technicians and associate professionals. An excess supply of skilled workers, despite the large share of underqualified workers in skilled occupations, is due to the fact that occupational supply refers to “actual supply”, which may include people who do not necessarily have adequate qualifications. Therefore, as educational attainment increases, an excess supply of skilled workers would not necessarily increase, but the share of underqualified workers in skilled occupations could decrease.
In the Philippines, however, less than 5 per cent of professionals are underqualified for their occupations, and the share of overqualified semi-skilled workers is relatively large across all occupational groups, which suggests limited employment opportunities for skilled workers relative to the supply of these workers.

In particular, the limited employment opportunities for skilled workers in the Philippines are reflected in a large share of overqualified clerical support workers (nearly 80 per cent). The share of overqualified clerical support workers is 45 per cent in the Lao People’s Democratic Republic, 44 per cent in Thailand and 40 per cent in Cambodia. In many countries, the latter occupational group tends to absorb high-skilled workers who are unable to find employment in occupations that correspond to their skill level.

In the other semi-skilled occupational groups, a large proportion of underqualified workers reflects the relatively limited share of semi-skilled workers in supply, relative to the demand for those workers. For instance, the share of underqualified workers in the skilled agriculture, forestry and fishery workers group is 61 per cent in the Philippines and Viet Nam and between 72 and 76 per cent in the other four countries (Figure 3). The large share of underqualified workers implies a shortage of semi-skilled workers, despite the large number of excess supply of semi-skilled occupations cited in section 4.4. Therefore, because the semi-skilled share of the workforce increases over time, skills mismatch should, and is indeed projected to, decrease over time.

In pursuit of the Millennium Development Goals targets, countries have made substantial efforts towards achieving universal primary education by 2015, and many countries are now focusing on the secondary level and, in particular, on technical and vocational education and training to prepare their workforce for an increase in employment in semi-skilled occupations. The supply of semi-skilled workers (with educational attainment levels ranging from lower secondary to post-secondary and pre-university) is projected to increase from 46 per cent in 2010 to 65 per cent in 2025 in Indonesia and from 34 to 42 per cent in the Lao People’s Democratic Republic and in Thailand (Figure 4). In Viet Nam, the most significant change would be within the semi-skilled category because the share of workers with post-secondary and pre-university level of educational attainment is projected to increase from less than 1 per cent to 10 per cent of the labour force over the same period. The change in skills distribution projected here is a function of both the trends in educational attainment by age and sex groups and the changing age structure of the population of each country.10

<table>
<thead>
<tr>
<th>Table 13. Skills distribution of supply and demand by country, 2010–12 (latest LFS)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cambodia</strong></td>
</tr>
<tr>
<td>Unskilled</td>
</tr>
<tr>
<td>Semi-skilled</td>
</tr>
<tr>
<td>Skilled</td>
</tr>
</tbody>
</table>

Note: S = supply; D = demand.

10 Trends in educational attainment by demographic group are calculated from the Labour Force Survey microdata sets for each country when more than a single data point is available (as is the case for Indonesia, the Philippines and Viet Nam), while the average trend for these three countries is used for the remaining countries (Cambodia, Lao People’s Democratic Republic and Thailand).
Table 14. Skills mismatch summary measures

<table>
<thead>
<tr>
<th></th>
<th>Mismatch – latest LFS</th>
<th></th>
<th>Mismatch baseline 2025</th>
<th></th>
<th>Mismatch AEC 2025</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Actual</td>
<td>Potential</td>
<td>Index</td>
<td>Actual</td>
<td>Potential</td>
<td>Index</td>
</tr>
<tr>
<td>Cambodia</td>
<td>57.0</td>
<td>41.5</td>
<td>0.394</td>
<td>55.0</td>
<td>32.0</td>
<td>0.295</td>
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<tr>
<td>Indonesia</td>
<td>55.9</td>
<td>37.8</td>
<td>0.339</td>
<td>42.0</td>
<td>12.4</td>
<td>0.091</td>
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<td>Lao PDR</td>
<td>67.2</td>
<td>59.1</td>
<td>0.573</td>
<td>60.0</td>
<td>44.2</td>
<td>0.423</td>
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<tr>
<td>Philippines</td>
<td>53.6</td>
<td>14.8</td>
<td>0.100</td>
<td>52.4</td>
<td>10.2</td>
<td>0.043</td>
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<td>Thailand</td>
<td>59.5</td>
<td>45.4</td>
<td>0.449</td>
<td>53.3</td>
<td>31.2</td>
<td>0.307</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>44.1</td>
<td>3.4</td>
<td>0.022</td>
<td>43.3</td>
<td>6.0</td>
<td>0.054</td>
</tr>
</tbody>
</table>

Source: ASEAN occupational projections, 2014.

Figure 3. Actual skills mismatch by occupational group, 2010–12 (latest LFS)

Source: ASEAN occupational projections, 2014.
Following current trends, skills mismatch is projected to decrease most pointedly over the forecast period in Indonesia, followed by the Lao People’s Democratic Republic and Thailand, in terms of both skills mismatch measures. Under both the baseline and AEC scenarios, potential mismatch is projected to decrease by approximately 25 percentage points in Indonesia, approximately 15 percentage points in the Lao People’s Democratic Republic and around 14 percentage points in Thailand. In all three countries, the percentage point decrease in actual mismatch is projected to be approximately half of the decrease in potential mismatch. A faster decrease in potential mismatch compared with actual mismatch is to be expected because shifts in demographic and skills structure (increasing educational attainment) in these countries are occurring faster than changes in the underlying institutional and other factors that cause actual mismatches. Potential mismatch is also projected to decrease by approximately 10 percentage points in Cambodia and 5 percentage points in the Philippines, while the corresponding actual mismatch decreases would be by approximately 2 and 1 percentage points, respectively (Table 14).

Only in Viet Nam is the potential mismatch projected to increase over the forecast period. This is not surprising because the initial level was exceptionally low, at 3.4 per cent, due to a higher demand for unskilled workers relative to other countries and the legacy of central planning of the workforce. As the country continues its transition to a market economy, potential mismatch would increase over time because the share of the population striving for higher educational attainment exceeds the new opportunities being created for semi-skilled and skilled occupations. Indeed, potential mismatch in Viet Nam is projected to increase to 6 per cent under the baseline scenario and to 6.7 per cent under the AEC scenario (Table 14). The skills mismatch index would also increase, from 0.022 in 2012 to 0.054 in 2025 under the baseline scenario and to 0.063 under the AEC scenario.

The AEC would have marginal impacts on actual mismatch in Viet Nam and on both mismatch measures for the other five countries. This is partly because of the assumptions used in this analysis: Neither the occupational distribution of industries (skills demand structure within industries) or the skills distribution of the labour force are assumed to be affected by the AEC. In other words, relative to the baseline, changes
in the skills demand structure are driven only by changes in the sector distribution of employment, while
skills supply increases are driven by the overall labour force growth rather than by changes in labour force
composition.

6. Gender impact

At the aggregate level, females represented nearly 40 per cent of the labour force in Indonesia and the
Philippines and between 46 and 50 per cent of the labour force in the other four countries (Annex A, Table
A2). There are general patterns in terms of gender breakdown by occupational group, which are common
to most countries; however, at a more disaggregated level, ASEAN Member States differ in the sex
composition of occupations.

In general, males dominate management positions in most countries, with the notable exception of the
Philippines, where the share of females is larger than or approximately equal to that of males for several
occupations (Annex A, Table A2). The Philippines and Thailand are the two countries in which the share
of females is larger than that of males for many occupations in the professional and technicians and
associate professionals occupational groups. In the Philippines, Thailand and Viet Nam, the female share
is also greater in most of the clerical support workers occupations. The service and sales workers is the only
occupational group in which females constitute the largest share of workers in most occupations for all six
countries.

Skilled agriculture workers are dominated by males in all countries, with the exception of animal producers
and subsistence agriculture workers in Cambodia and Viet Nam. Craft and related trades workers
occupations are also dominated by males in all countries, with the exception of handicraft workers and
garment and related trades workers, which employ a larger share of females in all countries and food
processing and related trades workers, which employ a larger share of females in Indonesia, Thailand and
Viet Nam. Again reflecting the larger share of females in the textiles and garments industries, textile, fur
and leather products machine operators is the only occupation within the plant and machine operators and
assemblers occupational group that is dominated by women in all six countries. Interestingly, however,
females account for the larger share of employment as assemblers as well in the Philippines, Thailand and
Viet Nam.

Males represent a larger share of most elementary occupations in Indonesia, the Lao People’s Democratic
Republic and the Philippines, whereas the opposite is true for Viet Nam. However, there are occupations,
such as domestic, hotel and office cleaners and helpers that are largely dominated by females in all
countries, while others, such as mining and construction labourers; transport and storage labourers; and
other elementary workers are largely dominated by males in all six countries.

Assuming the sex breakdown of occupations remains relatively constant over time, what potential gender
impact would the AEC have, based on the occupational projections discussed in the previous sections?

In Viet Nam, the AEC would have a negative impact on a small number of skilled occupations that are
dominated by women, such as paramedical practitioners, secondary education teachers and primary school
and early childhood teachers. In the other countries, the most significant changes in the demand for skilled workers generally would be in occupations dominated by men.

The AEC’s impact on service and sales workers would have considerable implications for female employment in most countries. For instance, an increase in demand for street and market salespersons, shop salespersons and other sales workers in all countries (with the exception of the Lao People’s Democratic Republic) would lead to growth in female employment. Although these are semi-skilled, they can involve large shares of vulnerable employment. Females also would be disproportionately impacted by important declines in the demand for hairdressers, beauticians and related workers and in child care workers and teachers’ aides in Thailand and Viet Nam.

The asymmetric impact that the AEC would have on the food supply chain occupations would also have implications for female employment across the six countries. In particular, the AEC would have a negative impact on the demand for animal producers in Cambodia and the Lao People’s Democratic Republic but a positive impact in all the other countries. In Cambodia, this projected decline would affect females more than males, whereas the opposite is true for the Lao People’s Democratic Republic. A decline in the demand for food processing and related trades workers under the AEC relative to the baseline would have a higher impact on female employment than on male employment in Indonesia and to a lesser extent in Cambodia. Similarly, higher demand for this occupation would have a relatively greater impact on females in Thailand and Viet Nam and a greater impact on males in the Philippines.

The impact of the AEC on employment in the apparel manufacturing subsector (positive in all countries except for Thailand) would affect female employment because the garment and related trades workers and the textile, fur and leather products machine operators occupations are dominated by females in all the countries. The decline in demand for handicraft workers under the AEC relative to the baseline in Thailand and Philippines (due to relatively lower employment growth in textiles) would also have a more significant effect on female employment in these two countries.

7. Summary and policy implications

7.1 Country summaries

The current trajectory in Cambodia would result in growth in demand for semi-skilled and unskilled workers, linked to projected growth in the agriculture, trade and construction sectors. Thus, vulnerable employment is projected to account for a considerable share of employment growth. Under the AEC, employment in occupations linked to the informal sector would increase, particularly in trade and agriculture. The AEC would have a positive effect on all manufacturing subsectors, except food processing, and a corresponding effect on semi-skilled occupations linked to this sector. Under both scenarios, excess demand is projected for skilled agriculture workers. Changes in the skills structure of the workforce are occurring at a slower pace than in other countries with similar skills structures, such as the Lao People’s Democratic Republic and Thailand, and as a result, skills mismatch is projected to remain high in Cambodia.
Under the baseline scenario in Indonesia, high employment growth is projected in occupations linked to retail trade and hotels and restaurants and also in the food processing industries. The AEC would have a negative impact on manufacturing employment in food processing and, to a lesser extent, on electrical equipment while having a positive effect on employment in the other manufacturing subsectors, with corresponding changes in demand for semi-skilled occupations linked to these subsectors.

Despite the projected decline in agriculture employment in Indonesia under both the baseline and AEC scenarios, excess demand is projected for most skilled agriculture occupations. This is due to the relatively high replacement demand as well as a projected decline in the supply of skilled agricultural workers. Excess demand is also projected for a number of service and sales occupations in Indonesia due to significant expansion demand, which exceeds the projected supply for those occupations. Because the largest projected increases in employment demand are for semi-skilled occupations and that the share of the labour force with the corresponding skill levels is projected to grow substantially (from 47 per cent to 65 per cent), mismatch in Indonesia would decrease in terms of potential mismatch but also in terms of actual mismatch.

In the Lao People’s Democratic Republic, rapid employment growth rates are projected in wood products and food processing manufacturing; but in terms of the numbers of workers, the most significant increases would be for unskilled and semi-skilled agriculture workers, particularly in the rice and natural resources subsectors. The AEC would have a negative impact on livestock and on food processing but a positive impact on other subsectors, including wood, electrical equipment and metals. It would therefore have a corresponding impact on semi-skilled occupations linked to those industries. Despite the lower employment growth in the livestock and other crops subsectors, under the AEC compared with the baseline scenario, there could be excess demand for certain related semi-skilled occupations, like animal producers and forestry and related workers under both scenarios. Excess demand is also projected under the AEC scenario in some semi-skilled plant and machine operator occupations and is attributable to expansion demand for all manufacturing subsectors except food processing. In the Lao People’s Democratic Republic, the skills distribution of the labour force is shifting faster than in Cambodia and, as a result, skills mismatch is decreasing faster over time. Nevertheless, the Lao People’s Democratic Republic would remain the country with the most extensive skills mismatch in 2025.

In the Philippines, high occupational growth is projected for skilled and semi-skilled occupations linked to services rather than to industry as well as for unskilled workers in agriculture, mining and construction. The AEC would not have substantial impact on the fast-growing occupations in services but more so on semi-skilled manufacturing workers (positive for occupations linked to food processing, negative for handicraft workers and other occupations linked to textiles). The Philippines is the only country among the six that is projected to have potential excess demand for many skilled occupations, under both the baseline and AEC scenarios. It is the country with the largest share of skilled workers in terms of both demand and supply and the second-lowest potential mismatch, which is significantly lower than the other countries, with the exception of Viet Nam.

In Thailand, the fastest growth in occupational demand would be for semi-skilled occupations linked to growth in tourism and hospitality and trade. The CGE modelling results suggest that the growth in sales and services workers would involve growth in vulnerable and informal employment. The AEC would have a mixed effect on semi-skilled manufacturing occupations (increase in food-related occupations, decrease in apparel-related, for example), a negative effect on a number of private services occupations across all skill levels and a negative effect as well on public services employment, which includes a number of high-
skilled occupations. Excess demand is projected for a number of service and sales occupations and for most skilled agriculture occupations under both the baseline and AEC scenarios.

In Viet Nam, under the baseline scenario, the fastest employment growth is projected in semi-skilled and unskilled occupations linked to trade and transport and construction. Rapid growth is also projected in occupations linked to apparel manufacturing. The AEC would increase employment in trade and transport, agriculture and all industry sectors except wood products manufacturing. It would have a negative effect on employment in private and public services. Excess demand is projected under both scenarios for a number of semi-skilled service and sales occupations and crafts and related trades workers. Increased occupational demand for several unskilled and semi-skilled occupations in trade, agriculture and construction suggests that further increases in informal employment would also take place under the AEC. Among the six countries, Viet Nam would have the lowest skills mismatch measures.

7.2 Overall summary and conclusions

This paper examined the potential impacts of the AEC on the labour markets of six countries (Cambodia, Indonesia, the Lao People’s Democratic Republic, the Philippines, Thailand and Viet Nam) and on occupational employment and outlooks in particular. These outcomes are, to an important extent, linked to the projected asymmetric effects on sector employment. The analysis presented in this paper builds upon the work of Petri, Plummer and Zhai (2013), who developed a CGE model to assess the impact of various regional integration initiatives on ASEAN labour markets.

The CGE modelling results showed that under the current trajectory (baseline scenario), employment growth would be greatest in services, and particularly in trade and transport, in all countries except the Lao People’s Democratic Republic, where employment growth would be greater in agriculture than in services. Employment in agriculture is also projected to be important in Cambodia and, to a lesser extent, in the Philippines, while Indonesia, Thailand and Viet Nam would experience a decline in agricultural employment. The substantial projected employment growth in the trade and transport sectors in all countries and agriculture in some countries imply that a large share of this employment growth may be vulnerable employment, which is typically linked to the informal sectors.

The AEC would have tremendous impact on overall employment growth in all six countries, but the CGE results suggest that the AEC would lead to an increase in both the demand for and supply of workers in occupations that are linked to informal sector employment. For instance, under the baseline scenario, excess demand for street and market salespersons is projected in Indonesia and Thailand. Although this excess demand persists under the AEC scenario in Indonesia, it is not the case in Thailand where the increase in supply of these workers, attributable to the AEC, would exceed the increase in demand. The increase in worker supply (higher labour force participation) under the AEC implies that there may be lower barriers to labour market entry or that the perception of increased opportunities draws previously economically inactive people to the labour force.

Under the baseline scenario, growth in industry employment is also projected for all countries, but less than half of this growth would be in manufacturing, except in the Lao People’s Democratic Republic. Under the AEC, industry employment, including manufacturing employment, would further increase in all countries.
However, only in Thailand and Viet Nam would the manufacturing share of growth in industry employment be larger than under the baseline scenario.

The AEC would generally have mixed effects on employment in manufacturing subsectors and on agriculture and primary resource subsectors linked to regional supply chains. For instance, the AEC is projected to have a negative impact on industries along the food supply chain in Cambodia, the Lao People’s Democratic Republic (livestock sector and food processing manufacturing) and Indonesia (food processing manufacturing only) but leading to significant employment growth in these sectors in the Philippines, Thailand and Viet Nam. Thailand’s apparel industry would be negatively affected while Viet Nam’s apparel industry would benefit considerably. These results are not surprising because any regional integration initiative can be expected to have asymmetric effects on factors of production within and across industries, which depend on a variety of factors, including the skills structure of the workforce, factor composition of industries, economies of scale and supply chain linkages.

The AEC would generally have mixed effects on employment in manufacturing subsectors and on agriculture and primary resource subsectors linked to regional supply chains. For instance, the AEC is projected to have a negative impact on industries along the food supply chain in Cambodia, the Lao People’s Democratic Republic (livestock sector and food processing manufacturing) and Indonesia (food processing manufacturing only) but leading to significant employment growth in these sectors in the Philippines, Thailand and Viet Nam. Thailand’s apparel industry would be negatively affected while Viet Nam’s apparel industry would benefit considerably. These results are not surprising because any regional integration initiative can be expected to have asymmetric effects on factors of production within and across industries, which depend on a variety of factors, including the skills structure of the workforce, factor composition of industries, economies of scale and supply chain linkages.

The distributive effects of the AEC on manufacturing employment are reflected in the changes in demand for semi-skilled occupations and, to a lesser extent, on labour market imbalances in these occupations. For instance, an excess supply of crafts and related trades workers is projected for all countries except Viet Nam under the baseline scenario. Despite a general increase in demand for these workers under the AEC, there would still be excess supply for those occupations, except in Viet Nam and the Lao People’s Democratic Republic. In the Lao People’s Democratic Republic, the expansion in demand for manufacturing employment under the AEC would reduce the likelihood of excess labour supply and increase the chance of having excess demand for several semi-skilled occupations.

Under both scenarios, excess demand for agricultural, forestry and fishery labourers is projected in Cambodia, the Lao People’s Democratic Republic, Thailand and Viet Nam and for transport and storage labourers in Indonesia, Thailand and Viet Nam. The AEC would have limited impact on occupational imbalances for elementary occupations, partly because it would lead to an almost equivalent increase in demand and supply of these occupations.

Among the six countries, the Lao People’s Democratic Republic has the most significant skills mismatch, followed by Thailand and Cambodia. In these countries, semi-skilled occupations account for the largest of total labour demand, but unskilled workers account for the largest share of the labour force. In Indonesia as well, the largest share of demand would be for semi-skilled workers, which constitute a relatively larger share of the workforce than in the other three countries.

Among the six countries, the Lao People’s Democratic Republic has the most significant skills mismatch, followed by Thailand and Cambodia. In these countries, semi-skilled occupations account for the largest of total labour demand, but unskilled workers account for the largest share of the labour force. In Indonesia as well, the largest share of demand would be for semi-skilled workers, which constitute a relatively larger share of the workforce than in the other three countries.

In the semi-skilled occupational groups, a large proportion of underqualified workers (except for clerical occupations, where there are more overqualified workers) reflects the limited share of semi-skilled workers in supply, relative to the demand for these workers. This implies a shortage of semi-skilled workers, despite a large number of semi-skilled occupations identified as facing excess supply. Therefore, as the semi-skilled share of the workforce increases over time, skills mismatch should decrease over time.

Indeed, all countries, with the exception of Viet Nam, are projected to see both actual and potential mismatch decline over the forecast period. In all cases, the decrease in potential mismatch would be greater than the decrease in actual mismatch because shifts in demographic factors and skills structure (increasing educational attainment) in these countries are occurring faster than changes in the underlying institutional
and other factors that cause actual mismatches. In Viet Nam, although actual mismatch is expected to decrease over the forecast period, potential mismatch is projected to increase. This is because the initial level of potential mismatch was exceptionally low and can be expected to increase as the country continues its transition to a market economy, while the share of the population striving for higher educational attainment exceeds the new opportunities being created for semi-skilled and skilled occupations. The AEC would have marginal impacts on skills mismatch because the changes in mismatch are primarily driven by structural changes occurring gradually over time.

There are general patterns in terms of gender breakdown by occupational group, which are common to most countries; however, at a more disaggregated level, ASEAN Member States differ in the sex composition of occupations. The AEC’s impact on service and sales workers would have significant implications for female employment in most countries. For instance, an increase in demand for street and market salespersons, shop salespersons and other sales workers in all countries, with the exception of the Lao People’s Democratic Republic, would lead to growth in female employment. Although these are semi-skilled, they can involve large shares of vulnerable employment. The distributive effect of integration on the food supply chain occupations and on apparel manufacturing would also have implications for female employment across the six countries.

7.3 Policy implications

The results of this analysis suggest that ASEAN governments need to place particular emphasis on ensuring that the growth path they are pursuing is inclusive. Under the current trajectories, a large share of the employment growth in these countries is projected in vulnerable employment, which is typically linked to the informal sectors. Under the AEC, overall employment growth is projected to be greater in all countries, but the results suggest that the incidence of vulnerable and informal employment is also likely to increase. Governments thus need to ensure that social safety nets are in place to protect the most vulnerable segments of their population.

The current focus on secondary education and TVET in many countries is consistent with the objective of reducing skills mismatch and labour market inefficiencies. This is because the most significant growth in occupational demand (in terms of growth rates and numbers of workers) is generally projected in semi-skilled and unskilled occupations. As the workforce in these countries becomes increasingly skilled, governments face the challenge of expanding decent work opportunities to absorb larger contingents of semi-skilled and skilled workers, which can be done, for instance, by attracting investment and supporting industries with high employment-creating potential for higher-skilled occupations.

Integration will inevitably have an asymmetric impact on various industry subsectors. If government support to the industries that will be negatively affected is inefficient, then perhaps programmes will need to be in place to retrain workers from the affected industries, such that they can be employed (transferable skills) in the industries that are expected to benefit. For instance, in the Lao People’s Democratic Republic, food processing workers may be retrained to work in wood products, while wood products manufacturing workers in Viet Nam could be retrained to work in the apparel manufacturing industries. Such measures could help ensure that potential benefits from further economic integration are more equally distributed.
The results of the occupational projections support the message from Petri, Plummer and Zhai (2013) regarding the importance of structural adjustment as a driving force in determining the efficiency gains from integration and the role of governments in limiting adjustment costs in the short term.
References


## Table A1. Skills distribution by industry (%)

<table>
<thead>
<tr>
<th>Industry</th>
<th>Cambodia Unskilled</th>
<th>Cambodia Skilled</th>
<th>Indonesia Unskilled</th>
<th>Indonesia Skilled</th>
<th>Lao PDR Unskilled</th>
<th>Lao PDR Skilled</th>
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</thead>
<tbody>
<tr>
<td>Paddy rice</td>
<td>67.6</td>
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<td>77.0</td>
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<td>Grain, other</td>
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<td>79.9</td>
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<td>Crops, other</td>
<td>75.7</td>
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<td>73.3</td>
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<td>46.6</td>
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### Table A2. Female share of occupations (%)

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### Professionals

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### Elementary occupations

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**LEGEND**

- Female share > 51 %
- Female share < 49 %
- Female share (49-51 %)

Table A3. Replacement demand estimate – share of workers aged 65 or older, by occupation (%)

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</tr>
<tr>
<td>Manufacturing labourers</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Transport and storage labourers</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Food preparation assistants</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Street and related service workers</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td>9</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Street vendors (excluding food)</td>
<td>4</td>
<td>3</td>
<td>8</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Refuse workers</td>
<td>12</td>
<td>6</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Other elementary workers</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

Annex B – Occupational projections methodology

The methodology used in this paper follows the widely used manpower requirements approach to project occupational imbalances, which involves three stages: 1. Projecting occupational demand; 2. Projecting occupational supply; and 3. Reconciling (comparing) demand and supply to identify potential imbalances. The following describes each step of each of the three stages.

Stage 1. Projecting occupational demand

There are two components to occupational demand: i) “expansion demand”, which is attributable to growth in sector output and employment and/or shifts in the occupational structures of industries; and ii) “replacement demand”, which is attributable to such factors as death, retirement and interoccupational and geographical labour mobility.

A. Expansion demand

In projecting expansion demand for each of the six countries included in the study, eight steps were followed:

D1. Industry-occupation matrices were constructed from the available Labour Force Survey microdata sets for the six countries (Table B1). Specifically, industries were aggregated into the groupings for which the CGE model results were available,\(^{11}\) while occupations were disaggregated to the extent allowed by the data, following the 2008 International Standard Classification of Occupations (ISCO) structure.

<table>
<thead>
<tr>
<th>Country</th>
<th>LFS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>2012</td>
</tr>
<tr>
<td>Indonesia</td>
<td>2009 (Aug), 2010 (Aug)</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>2010</td>
</tr>
<tr>
<td>Philippines</td>
<td>2010 (July), 2011 (July)</td>
</tr>
<tr>
<td>Thailand</td>
<td>2010 (Q3)</td>
</tr>
</tbody>
</table>

Note: Although additional data sets were available and Viet Nam (2007 and 2009), they were not used because the data was not available at a sufficiently disaggregated level (Indonesia 2011 and 2012, Viet Nam 2007) or there were some issues with the consistency of time series (Viet Nam 2009).

D2. For the countries for which industry-occupation matrices were available for more than one year (Indonesia, the Philippines and Viet Nam), the change in occupational share coefficients over time were obtained using two approaches to model the change in occupational structure:

a) using a linear trend: \[ C = a + b \times time \]

b) using a log-linear trend: \[ \ln(C) = a + b \times time \]

In both cases, time was considered as a proxy for technological change.

\(^{11}\) The CGE model sector employment results are available for 21 industry groupings, using the Global Trade Analysis Project classification scheme. The concordance between these sectors and ISIC Rev. 4 are presented in Annex 1.
D3. For countries with data for only one year, the average trend over the remaining countries with more than one year of data was used.

D4. A proportional adjustment method was used to ensure that the results of the change in coefficients were realistic and consistent (for instance, that the sum of the projected occupational shares for each industry did not surpass 100 per cent and that no occupational share became negative).

D5. The projected industry-occupation matrices as well as the matrix of the last year for which data were available for each country (which represents the baseline assumption of no change in occupational structure) were applied to the CGE model sector employment results in 2025 to obtain a range for the projected occupational demand (stock measure) for each country and for each of the policy scenarios.\(^{12}\)

D6. The difference between the stock measure of occupational demand in 2025 (obtained in D5) and the estimate of occupational demand stock in 2010 was obtained as a “flow measure” of expansion demand.

B. Replacement demand

D7. A simple methodology was used to obtain replacement demand: The share of older workers (65 and older) in occupational employment from the last year LFS was used as an estimate of replacement demand for each occupation in each country.\(^{13}\)

C. Occupational demand

D8. The occupational demand projections for each country obtained in D6 was adjusted to account for replacement demand from D7 (the range of expansion demand was shifted upwards, using the share of older workers in occupational employment from the last year for which the LFS is available), resulting in total occupational demand.

Stage 2. Projecting occupational supply

In projecting the occupational supply for each of the six countries, nine steps were followed:

S1. The educational attainment distribution of the labour force by demographic group (age group and sex) was obtained from the available LFS microdata sets.

\(^{12}\) A range is preferable to a point estimate, given the absence of margins of error for the estimates because there are a number of factors that can affect the accuracy of results.

\(^{13}\) Such an approach would capture, to some extent, replacement demand due to retirements and death but not that attributable to out-migration, inter-occupational shifts or shifts to other employment statuses (into unemployment or out of the labour force). It thus can be considered to provide a conservative estimate of replacement demand.
S2. The trends in educational attainment of the labour force for each demographic group were obtained, following a similar approach to the one described for industry-occupation coefficients.\textsuperscript{14}

S3. The size of the labour force by demographic group for each country was obtained from the ILO’s Economically Active Population Estimates and Projections database\textsuperscript{15} and proportionately adjusted for consistency with the labour force size “implied” by the CGE model total employment projection results. Indeed, as the CGE results represent important increases in employment compared with the baseline, the labour force size must be increasing as well (to avoid the impossible outcome of negative unemployment). To determine the growth in the labour force, a “reasonable range” unemployment rate was determined for each country, based on the available LFS data (Table B2). Based on this, an unemployment rate was assigned for each country to each of the four scenarios analysed by Petri, Plummer and Zhai (2013), with the highest end of the range being assigned to the baseline scenario (which has the lowest growth in employment for all countries), the lowest to the Regional Comprehensive Economic Partnership scenario (which has the highest employment growth for all countries) and the other scenarios falling in between the two.\textsuperscript{16} The resulting unemployment rates for the AEC scenario are presented in Table B2. The “implied” size of the labour force in 2025 was then obtained from the unemployment rate and projected employment figures for each country.

<table>
<thead>
<tr>
<th>Country</th>
<th>LFS year</th>
<th>UR</th>
<th>“Reasonable” UR range</th>
<th>AEC 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>2012</td>
<td>2.7</td>
<td>2.0–3.5</td>
<td>2.4</td>
</tr>
<tr>
<td>Indonesia</td>
<td>2009</td>
<td>7.9</td>
<td>6.5–8.5</td>
<td>8.3</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>7.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lao PDR</td>
<td>2010</td>
<td>1.9</td>
<td>1.5–2.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Philippines</td>
<td>2010</td>
<td>7.0</td>
<td>6.5–7.5</td>
<td>6.9</td>
</tr>
<tr>
<td></td>
<td>2011</td>
<td>7.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thailand</td>
<td>2010</td>
<td>0.9</td>
<td>0.5–1.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>2010</td>
<td>2.6</td>
<td>1.5–3.0</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td>2011</td>
<td>2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2012</td>
<td>1.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: UR = unemployment rate.
Source: Labour Force Surveys and ASEAN occupational projections.

\textsuperscript{14} Specifically, two trends (linear and log-linear) were generated for countries with more than one data point, the average trend was used for countries with only one data point and results were adjusted to ensure that the outcome was realistic and consistent (as in stage 1, steps 2–4).

\textsuperscript{15} The Economically Active Population Estimates and Projections Database contains estimates and projections for each country by sex and age group. The models used to generate them are not country specific but group several countries together in a panel, based on certain criteria. The database is available online at http://laborsta.ilo.org/applv8/data/EAPEP/eapep_E.html

\textsuperscript{16} Specifically, a linear trend relating the drop in unemployment rate to the rise in employment was calculated using the two data points (baseline and Regional Comprehensive Economic Partnership scenario) and to obtain the unemployment rate associated with the other scenarios, based on their corresponding change in employment from the baseline.
S4. The projected educational attainment distribution for each country (from S2) was then applied to its labour force projections by age group and sex (S3) to obtain the projected labour force by educational attainment, age group and sex for each country.

S5. The labour force by educational attainment was aggregated over the demographic groups for each country.

S6. Education-to-occupation matrices were also obtained from the microdata sets.

S7. Education-to-occupation matrix coefficients (occupational share of workers for each level of educational attainment) were also allowed to change over time, using a similar approach as for the industry-occupation coefficients.

S8. The projected education-to-occupation matrices as well as the matrix of the most recent year with available data were applied to the projected labour force by educational attainment to obtain a range for the projected occupational supply (stock measure) in 2025.

S9. The difference between the stock measure of occupational supply in 2025 (obtained in S8) and the estimate of occupational supply stock in 2010 was obtained as a “flow measure” of occupational supply.

**Stage 3. Identifying labour market imbalances and skills mismatch**

A. Labour imbalances

SD1. The range of projected occupational demand (from D8) and supply (from S9) flow measures were compared to identify occupations with projected labour market imbalances (excess labour demand/supply) for each country. Across the four policy scenarios, the projected occupational demand differs due to a change in expansion demand (replacement demand is assumed to stay constant) and labour supply changes only because of the change in labour force size (participation rate).\(^{17}\)

Two measures of imbalances were obtained: 1. “Definite” excess demand or supply (when the low end of the projected range of demand is higher than the high end of projected supply – or vice versa – such that there is no overlap between the projected ranges of supply and demand). 2. A broader measure (excess demand: when the midpoint of the projected supply is below 50 per cent of the midpoint of projected demand and excess supply: when the midpoint of the projected supply is higher than the 150 per cent the midpoint of projected demand).

\(^{17}\) Indeed, the methodology for projecting occupational supply focuses on the national labour force growth trends and does not account for the free flow of labour under any of the scenarios. The results therefore point to (rather than take into account) potential inflows of labour for occupations with excess demand and outflows for occupations with excess supply, as well as upwards/downwards pressure on wages. Such adjustments would be expected to correct for the labour market imbalances that would arise, although there are likely to be delays and important adjustment costs (such as additional challenges to labour mobility such as skills qualifications equivalences or language barriers).
B. Skills mismatch

SD2. The educational attainment distribution for each occupation was compared with the occupation’s required skills level (based on the ISCO-ISCED\textsuperscript{18} concordances) to obtain a proxy for existing actual skills mismatch by occupation (share of persons who are either under- or overqualified).\textsuperscript{19} By using education-to-occupation matrices, the underlying assumption was that the existing skills mismatch (or skills mismatch trends) would continue into the future (El Achkar Hilal, Sparreboom and Meade, 2013). For each country \( j \), actual mismatch was calculated as:

\[
Actmism_j = \sum_i (o_i + u_i) \quad \text{where } i = \{1,2, \ldots , 9\}
\]

and where \( o_i \) and \( u_i \) represent the number of workers in occupational group \( i \), who are over- and underqualified, respectively.

SD3. The results of step S5 were compared with the projected educational attainment requirements of the labour market (obtained using the ISCO-08-ISCED-97 correspondence between occupational groups and educational attainment levels and total occupational demand from step D8 to provide a measure of potential skills mismatch, or the mismatch that would ensue if workers in all occupations held the educational attainment levels requested by their occupations. For each country \( j \), the potential mismatch was calculated as:

\[
Potmism_j = \begin{cases} 
\sum_i (s_i - d_i) & \text{where } i = \{1,2,3\}, \text{ if } s_i > d_i \\
0, & \text{if } s_i < d_i
\end{cases}
\]

where \( s_i \) and \( d_i \) represent the supply and demand of workers at skills level \( i \). When demand exceeds supply for a skill level, potential mismatch is set to zero.

Furthermore, a skills mismatch index is calculated as follows:

\[
SMI = \frac{1}{2} \sum_i \text{abs} \left( \frac{s_i}{S} - \frac{m_i}{M} \right) \quad \text{where } i = \{1,2,3\}
\]

and where \( s_i \) is supply of skill level \( i \) and \( m_i \) is demand for skill level \( i \), and \( S \) and \( M \) are total supply and total demand, respectively. The skills mismatch index is based on the relative shares of supply and demand for each skill level and is therefore a summary measure of the concept of “potential mismatch”.

\textsuperscript{18} International Standard Classification of Education

\textsuperscript{19} Note that this definition of mismatch, which solely relies on skills levels, is a “narrow definition” and underestimates the mismatch that would result if the field of specialization (training or education) was also taken into account. Using this narrow definition implies perfect substitution of workers with a certain skill level across all occupations requiring that specific level. A broader definition of mismatch would require comparable data on the field of specialization, which are generally not available in the Labour Force Surveys.
### Annex C. Global Trade Analysis Project sectors and ISIC Rev. 4 concordances

<table>
<thead>
<tr>
<th>ASEAN-6</th>
<th>GTAP commodities</th>
<th>ISIC Rev. 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy rice</td>
<td>1</td>
<td>112, 1061</td>
</tr>
<tr>
<td>Other grain</td>
<td>2-3</td>
<td>111</td>
</tr>
<tr>
<td>Other crops</td>
<td>4-8</td>
<td>113-130, 150, 161 163-164</td>
</tr>
<tr>
<td>Livestock</td>
<td>9-12</td>
<td>141-149, 162</td>
</tr>
<tr>
<td>Natural resources</td>
<td>13-14</td>
<td>170-322</td>
</tr>
<tr>
<td>Mining</td>
<td>15-18</td>
<td>510-990</td>
</tr>
<tr>
<td>Food</td>
<td>19-26</td>
<td>1010-1050, 1062-1200</td>
</tr>
<tr>
<td>Textiles</td>
<td>27</td>
<td>1311-1399</td>
</tr>
<tr>
<td>Apparel</td>
<td>28-29</td>
<td>1410-1520</td>
</tr>
<tr>
<td>Wood products</td>
<td>30-31</td>
<td>1610-1820</td>
</tr>
<tr>
<td>Chemicals</td>
<td>32-34</td>
<td>1910-2220</td>
</tr>
<tr>
<td>Metals</td>
<td>35-37</td>
<td>2310-2599</td>
</tr>
<tr>
<td>Vehicles</td>
<td>38-39</td>
<td>2910-3099</td>
</tr>
<tr>
<td>Electrical equipment</td>
<td>40</td>
<td>2610-2790, 2817</td>
</tr>
<tr>
<td>Machinery</td>
<td>41</td>
<td>2811-2816, 2818-2829</td>
</tr>
<tr>
<td>Other manufactures</td>
<td>42</td>
<td>3100-3320, 3830-3900</td>
</tr>
<tr>
<td>Utilities</td>
<td>43-45</td>
<td>3510-3600</td>
</tr>
<tr>
<td>Construction</td>
<td>46</td>
<td>4100-4390</td>
</tr>
<tr>
<td>Trade and transport</td>
<td>47-51</td>
<td>4510-5299, 5510-5630</td>
</tr>
<tr>
<td>Private services</td>
<td>52-55</td>
<td>5310-5320, 5811-5299, 9000-9329, 9511-9900</td>
</tr>
<tr>
<td>Government services</td>
<td>56</td>
<td>3700-3822, 8411-8890, 9411-9499</td>
</tr>
</tbody>
</table>

Sources: Global Trade Analysis Project: [www.gtap.agecon.purdue.edu/resources/download/6208.txt](http://www.gtap.agecon.purdue.edu/resources/download/6208.txt)

Assessing the impact of ASEAN economic integration on labour markets

What is the potential impact of the ASEAN Economic Community 2015 on the occupational structure of ASEAN Member Countries? Building on the sectoral output and employment impacts of the AEC derived from a separate computable general equilibrium (CGE) model, this paper develops an innovative occupational projections model to examine the projected shifts in occupational demand and in the occupational structure of the economy to determine potential skills mismatches that may ensue. The paper identifies the occupations that are likely to have the highest demand as ASEAN economic integration progresses in six ASEAN Member Countries (Cambodia, Indonesia, Lao People’s Democratic Republic, the Philippines, Thailand and Viet Nam), with potential implications for the education, TVET and skills system in the countries. With the AEC likely to lead to an increase in both the demand for and supply of workers in occupations that are linked to the informal economy, the paper argues for the critical need to strengthen social protection systems in ASEAN Member Countries.