Skills Mobility and Postsecondary Education in the ASEAN Economic Community

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Abstract

This paper aims to clarify the nature of high-skill migration and its relationship with postsecondary education in the Association of Southeast Asian Nations (ASEAN) countries empirically using the latest available dataset from 1990 and 2000. The results show that intra-ASEAN migration was responsible for the lowest proportion of high-skill migration and the second highest concentration of bilateral corridors among four regional communities. Postsecondary-educated human capital stock in the origin, but not in the destination countries explains high-skill intra-ASEAN migration. However, bilateral high-skill intra-ASEAN mobility explains postsecondary-educated human capital stock in both origin and destination countries; therefore, high-skill mobility of ASEAN could have positive relationship with increase in investment of postsecondary education in origin countries. These results indicate the necessity to encourage high-skill intra-ASEAN migration because of its effect on postsecondary education.

Keywords: ASEAN economic community, skill migration, human capital, postsecondary education

JEL classification codes: F22, O15

I. Introduction

In 2007, the Association of Southeast Asian Nations (ASEAN) agreed to create the ASEAN economic community (AEC) by 2015 to pursue economic integration. The AEC envisages the creation of better economic opportunities by allowing a "free flow of skilled migration" in the region (ASEAN 2008), which could solve the large labor deficit and surplus among ASEAN member countries caused by different levels of economic development, population growth and aging, and a lack of regional distribution

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mechanisms (Chia 2013). Actually, intra-ASEAN migration including both high-skill and low-skill workers has increased recently. In 2013, 70% of 9.5 million migrants in ASEAN countries were from other ASEAN member states, which is a considerable increase compared with 40% in 1990 (Papademetriou et al. 2016). Recently, ASEAN countries have focused more on high-skill mobility to follow AEC aims and realize the full potential of human capital in the region (Asian Development Bank Institute 2014).

Defining "high-skill" migration is complex. For instance, Papademetriou et al. (2016) defines high-skill workers as individuals with a university education or equivalent professional workers. ASEAN member states target high-skill migrants in eight professional sectors: engineering, nursing, architecture, medicine, dentistry, tourism, surveying, and accounting. Considering the currently ambiguous definition and viewed from a macro perspective, this paper defines high-skill migrants as those with postsecondary education and low-skill individuals as generally less educated. The definition of migration follows the one in dataset provided by Artuc et al. (2015), where migration is measured on the country of birth as opposed to citizenship due to its consistency over time.

To facilitate and optimize high-skill intraregional mobility in ASEAN countries, it is necessary to understand its features, causes, and impacts. However, the intra-ASEAN migrant profile is incomplete because of the absence of appropriate data (Papademetriou et al. 2016). Despite these obstacles to detailed data collection, two intra-ASEAN migration characteristics were identified: low-skill workers are the majority and the concentration of migration flows into a few bilateral corridors. However, little evidence is available regarding whether these characteristics are ASEAN-specific or shared with other regional communities. Therefore, the current study tries to clarify the regional migration characteristics in ASEAN countries through comparison with these characteristics in other economic communities.

The analysis above could be made possible based on a high-skill migration dataset including non-Organization for Economic Cooperation and Development (non-OECD) countries as destinations. Several comprehensive datasets of origin–destination migrations are available (Özden et al. 2011; Docquier and Marfouk 2004, 2006). However, only the latest dataset provided by Artuc et al. (2015), which includes non-OECD destinations and educational levels, is sufficient for the analysis of the

current paper even though it includes only two time points (1990 and 2000). Artuc et al. (2015) found that non-OECD destinations account for one-third of high-skill migration worldwide, and a higher proportion of postsecondary-educated men and women immigrated to OECD countries. While some Asian countries were included in the analysis, such as India and China, the ASEAN situation is not clear in this influential paper and it is worthwhile to investigate.

After exploring the basic features of ASEAN migration, the current study investigates the relationships between high-skill migration and postsecondary-educated human capital considering the commonalities between mobility and human capital development; the role of human capital stock as determinants of migration; and the impact of migration on postsecondary-educated human capital stock. International migration and education share common factors because both invest in human agents whose decisions are intertwined in many dimensions (Dustmann and Glitz 2011). For instance, wage differences are the main drivers of both migration and education. From the perspective of capabilities proposed by Sen (1999), de Haas (2009) pointed out the general mechanism by which migration and human development are interrelated, the necessity of human development for migration, and the potential of migration for well-being and enhancing freedom. In that sense, it is appropriate to discuss the cause and impact of high-skill migration together with postsecondary education.

Previous studies have already investigated the above relationship empirically as described in detail in the literature review, but there is room for improvement. Few studies have analyzed the ASEAN situation, especially focusing on intraregional mobility. The estimation model could also be improved considering the scope of effect and heterogeneity of countries and regions. Regarding the effect, although the discussion of the migration effect usually focused on origin countries, the current paper extends the discussion to both destination and origin countries. It is because migrants generate a significant impact even on the native populations of destination countries by participating in the local capital and labor markets as shown by Borjas (1994). Both origin and destination countries could have positive and negative impacts on various aspects such as human capital, labor market, and science and technology (Cervantes and Guellec 2002), while several empirical studies showed inconclusive results for these impacts (Dustmann and Glitz 2011).

The remainder of this paper is organized as follows. Section 2 describes the related literature and introduces the research questions. Section 3 explains the model and data and section 4 summarizes the results. Section 5 concludes.

II. Literature Review and Research Questions

High-skill migration, but not migration itself, has increased rapidly worldwide. In 2010, the 214 million international migrants represented only 3% of the world population and only increased by a modest amount compared with the accelerating growth of the world population (King 2012). The increase in migration is also small, with a 0.4% point increase from 1960 to 2005 compared with trade, which increased threefold in the same period. However, high-skill migration shows a different picture. High-skill migrants to OECD countries increased at the same rate as trade (Docquier and Rapoport 2012). Following these trends, Clemens, Özden, and Rapoport (2014) have shown that research about migration and development has grown sharply in volume and has emerged as a proper subfield. Most past studies focused on single destinations in the wealthiest nations (Kim and Cohen 2010); however, the improved dataset made possible studies targeting multiple destinations, including non-OECD countries.

Following the AEC aims, several reports and papers discuss high-skill migration in ASEAN countries. Most were published recently and attempt to provide policy implications. Despite the obstacles to detailed data collection, previous studies identified two intra-ASEAN migration characteristics. The first characteristic is that low-skill workers are the majority. In 2007, low-skill workers comprised 87% of intra-ASEAN migrants and 73% of global migrants (Orbeta 2013). The second is the concentration of migration flows in a few bilateral corridors. Based on United Nations data from 2013, the top five corridors from the 57 corridors used by intra-ASEAN migrants represent around 88% of the total (Sugiyarto and Mendoza 2014). These features reasonably describe intra-regional migration in ASEAN countries, but there seems to be room for improvement using the latest released comprehensive dataset.

A clarification through comparison with other economic communities could lead to a better understanding of ASEAN in, out, and intra-migration. Jurje and Lavenex (2015) compared mobility commitments in trade agreements to explore the labor

mobility model in ASEAN countries with those of the Mercado Común del Sur, the 'Common Market of the South' (MERCOSUR), North American Free Trade Agreement (NAFTA), and European Union (EU). Because their study is based on interview and documentary survey data, additional empirical analysis is worthwhile to clarify high-skill migration characteristics in ASEAN countries. Simple data comparison is inappropriate considering the various historical, cultural, and socioeconomic backgrounds of the regional communities. Mobility policies or commitments, especially in destination countries, also influence the decision to migrate. However, the current study expects that the findings from previous studies could be characterized clearly through the comparison with other regional communities.

Research Question 1: Are there high-skill intra-ASEAN migration characteristics (fewer high-skill migrants than low-skill migrants and concentrated in a few migration corridors) shared by other regional communities?

After clarifying the intra-ASEAN migration characteristics, the current paper investigates their determinants. Although no single theory captures the complexity of migration, several theories explaining the determinants of migration have been developed over the last fifty years (King 2012). One of these theories is the push-and-pull theory, where push factors describe migration from an origin country or region because of poverty, political repression, or income level. However, migration is primarily driven by pull factors, such as better income or job opportunities at the destination, but not by push factors (Piore 1979). The push-and-pull theory was followed by a neoclassical theory based on utility maximization and then by network theory, which moved beyond previous impersonal theories and connected individual and sociocultural reasons for migrating (Faist 1997). However, pull factors, such as the wage difference between regions is still indicated as a crucial factor for migration (Mayda 2010, Clark, Hatton, and Williamson 2007, Grogger and Hanson 2011).

High-skill workers tend to migrate to OECD countries. In 2000, 72.6% of 28.8 million high-skill workers migrated to OECD countries while 46.1% of 83.1 million low-skill workers migrated to the same countries (Artuc et al. 2015). Migrants from Asian countries also followed this tendency (Asian Development Bank Institute 2014).

OECD countries are attractive probably because of the accumulation of human capital. In theory, the neoclassical growth model predicts a human capital flow from abundant to scare regions; however, in practice, a reverse flow known as the brain drain from scarce to abundant regions is more evident (Lucas 1988).

Using United States data, Moretti (2013) confirmed empirically that postsecondary-educated workers move to regions with a greater accumulation of human capital. This could be partially related to the possibility of movement because postsecondary-educated people are more mobile as they seek distant educational or market opportunities (Wozniak 2010). These empirical results were based on domestic migration in the United States, but the argument may be extended to international migration. Therefore, the current study sets up the following research question:

Research Question 2: Does high-skill intra-ASEAN migration positively relate to the postsecondary-educated human capital in both the origin and destination countries?

The impact of migration, especially on origin countries, has been the main theme for a large amount of related literature. However, the impact of international migration on human capital investment is still inconclusive.[1] Regarding the "beneficial brain drain" (Mountford 1997), some studies have pointed out the remittance effect (Rapoport and Docquier 2006, Yang 2008) and incentives for the prospect of better job opportunities abroad (Stark, Helmenstein, and Prskawetz 1997) as causes of investment in further education. It is during the revival of the optimistic perspective, which has gained popularity recently. These arguments were confirmed by a series of macro empirical studies by Beine, Docquier, and Rapoport (2001, 2008) and Beine, Docquier, Rapoport, and Özden (2010). The positive impact for the country-level case was also confirmed empirically in Cape Verde (Batista, Lacuesta, and Vicente 2012), Tonga and Papua New Guinea (Gibson and McKenzie 2011), and the African continent (Easterly and Nyarko 2009), although the first two studies targeted small populated island states with a heavy migration impact. However, several works in the literature question the

[1] These perspectives could be understandable as a policy and research debate on migration and development that has swung back and forth like a pendulum (de Haas 2012).

effect of brain gain through brain drain. For instance, based on the partial and general equilibrium, Schiff (2005) concluded that the size of brain gain was smaller than suggested and resulted in smaller human capital gain and a negative impact on human capital stock. This view is supported by the results of empirical analyses conducted by Lucas (2007) and Checchi, De Simone, and Faini (2007).

Considering the inclusiveness of the effect of migration on human capital development, heterogeneity is assumed to be related. Through reviewing the migration and development literature comprehensively from a theoretical perspective, de Haas (2010) concluded that related empirical findings yield a nuanced picture. In some cases, migration has a positive effect, but in others, there is no effect or even a negative effect. Bhagwati (2009) described the diversity of impacts on the origin countries based on their magnitude of human capital. Considering these contradictory empirical results, neither the pessimistic nor the optimistic perspectives were correct because the heterogeneity of migration impacts is a more realistic approach. Migration rarely has a uniform impact; e.g., the brain drain was truly massive only in generally small or very poor countries (de Haas 2010).

Another impact of migration on human capital development is related to heterogeneous determinants for enrollment in postsecondary education. In addition to individual incentives, there are several other determinants for enrolling in postsecondary education. For example, in Japan, these determinants include intertwined micro, mezzo, and macro factors; students' socioeconomic factors, such as household income, parents' jobs and educational careers, university capacity in the students' hometown and its costs, job availability after graduation, and regional cultural and historical factors (Kato 2016). At the micro level, according to Eccles' (1994, 2005) expectancy–value theory, major career choices are directly influenced by the deeply intertwined factors of psychological ability, competence, and subjective task value. With these various factors discussed in advance, the decision for postsecondary education enrollment could depend on complex conditions where the extent to which incentives give effect could be partial. Therefore, the current study tries to analyze the impact of migration on postsecondary enrollment in the ASEAN countries through a comparison considering the country or regional heterogeneity.

Research Question 3: Does intra-ASEAN high-skill migration influence postsecondary education enrollment in origin and destination countries?

III. Model and Data

Model

For bilateral skill migration, the current study utilizes the gravity model, which has become widely used by recent international migration studies because of increased access to improved bilateral data (Ramos 2016). Previous empirical studies using the gravity model includes those that explored the determinants of international mobility (Kim and Cohen 2010, Beine, Noël, and Ragot 2014) and bilateral knowledge networks (Maggioni and Uberti 2009).

The gravity model views migration as directly proportional to a country's population size or income and inversely proportional to the physical distance between bilateral countries. This model is used with some amendments, including language, culture, and shared history such as former colonial links (Mayda 2010). Beine, Noël, and Ragot (2014) also identified a significant network effect and destination attractiveness, such as quality of universities in the destination countries for international students. The current study refers to the model proposed by Beine, Noël, and Ragot (2014) because of the closeness of the study targets.

The model for bilateral skill migration is defined as follows:

$$\text{Skill}migration_{(i,j,t)} = \alpha_0 + \alpha_1 \text{Relationship}_{(i,j,t)} + \alpha_2 \text{ODspecific}_{(i,j,t)} + \alpha_3 \text{Regiondum}_{(i,j,t)} + \nu_{(i,j)} + \varepsilon_{(i,j,t)} \ldots \quad \text{(a)}$$

where $\text{Skill}migration_{(i,j,t)}$ denotes the number of migrants from origin *i* to destination *j* ($i \neq j$) in time *t*, $\nu_{(i,j)}$ shows the unobserved bilateral factors, $\varepsilon_{(i,j,t)} \sim IN(0, \partial^2)$ as an error term, and α_0 as a constant. The relationships of bilateral countries are captured as $\text{Relationship}_{(i,j,t)}$, origin- and destination-specific as $\text{ODspecific}_{(i,j,t)}$, and regional dummy as $\text{Regiondum}_{(i,j)}$.

These relationships include the distance and networks between two countries.

Although the analysis for developing countries shows that high-skill migration is less sensitive to geographic distance (Docquier and Rapoport 2012), probably because of the development of transportation and communication technologies, it is worthwhile to investigate the impact of distance at the regional level. Beine, Noël, and Ragot (2014) described the network as the total migration stock from the origin country *i* to destination country *j*, but in this paper, the network was substituted for trade due to data limitations.

Regarding the specific factors in either destination or origin countries, Beine, Noël, and Ragot (2014) included only destination-specific variables such as skill prices. However, the current model includes both origin and destination countries such as the impact of their economic levels. Regarding the origin-specific factors, data from 1990 to 2000 confirm that middle-income countries have the highest average rates of high-skill migration to OECD countries because people in these high-income countries have less incentive to emigrate and people in low-income countries have liquidity constraints (Beine, Docquier, and Rapoport 2007). Martin (1996) confirmed an inverted U-shaped relationship or hump hypothesis between high-skill migration and income. Based on this discussion, $\text{Relationship}_{(i,j,t)}$, $\text{ODspecific}_{(i,j,t)}$, and $\text{Regiondum}_{(i,j,t)}$ in Model (a) are replaced as follows:

$\text{Relationship}_{(i,j,t)}$:

where $Dist_{(i,j)}$ denotes physical distance, $Trade_{(i,j,t)}$ shows trade flows between two countries. The language is captured as $Lang_{(i,j)}$ and former colonial ties as $\text{Col}_{(i,j)}$. Bilateral differences is denoted as $\max\{Income_{(j,t)} - Income_{(i,t)}, 0\}$ for income differences and $\max\{Hcapital_{(j,t)} - Hcapital_{(i,t)}, 0\}$ for human capital differences, which are modified to either take the greater value of the surplus of destinations or zero because the migration decision depends on the relative conditions of the paired countries.

$\text{ODspecific}_{(i,j,t)}$:

where $Income_{(i,t)}, Income_{(j,t)}$ denotes income level and $Hcapital_{(i,t)}, Hcapital_{(j,t)}$ denotes human capital level.

$\text{Regiondum}_{(i,j,t)}$:

where it takes either one of followings. First, $\text{Regioncom}_{(i,j,t)}$ shows the regional dummy, whether the migration is intraregional of the four regional communities (1) or not (0). Second, $\text{ASEANHumanCap}_{(i,j,t)}$ denotes the cross term for human capital level in the inter-ASEAN migration.

The implied equation which deals with Research Question 2, becomes:

$$\begin{aligned}
&\ln\text{Skill}migration_{(i,j,t)} \\
&= \beta_0 + \beta_1 \ln Dist_{(i,j)} + \beta_2 \ln Trade_{(i,j)} + \beta_3 Lang_{(i,j)} + \beta_4 \text{Col}_{(i,j)} \\
&+ \beta_5 \ln\max\{Income_{(j,t)} - Income_{(i,t)}, 0\} \\
&+ \beta_6 \ln\max\{Hcapital_{(j,t)} - Hcapital_{(i,t)}, 0\} + \beta_7 \ln Income_{(j,t)} + \beta_8 \ln Income_{(i,t)} \\
&+ \beta_9 \ln Hcapital_{(j,t)} + \beta_{10} \ln Hcapital_{(j,t)} + \beta_{11} \text{Regiondum}_{(i,j)} + \nu_{(i,j)} \\
&+ \varepsilon_{(i,j,t)} \ldots \quad (1)
\end{aligned}$$

The coefficients of the independent variables in Model (1) are expected to be positive, and the geographical distance between two countries is expected to be negative.

The model to explain the impact of high-skill migration on enrollment for postsecondary education, which deals with Research Question 3, is assumed as a simple production function. Considering the two-way causal relationship between human capital stock and economic development (Kato and Ando 2007), the current study adds income level as an independent variable with a relationship to postsecondary-educated human capital stock. Because this study assumes the effect of high-skill migration on the origin and destination countries, the variables describing the postsecondary-educated human capital stock, income level, and skill migration are treated as a product of those variables in origin and destination countries.

$$\ln(\Delta Hcapital_{(i)} * \Delta Hcapital_{(j)}) = \beta_0 + \beta_1 \ln(\Delta \text{Skillmigration}_{(i)} * \Delta \text{Skillmigration}_{(j)}) + \beta_2 \ln(\Delta Income_{(i)} * \Delta Income_{(j)}) + \nu_{(i,j)} + \varepsilon_{(i,j)} \quad \dots \quad (2)$$

The coefficients of the independent variables in Model (2) are expected to be positive.

Data and estimation method

1. Data

The data are described in Table 1. All sources are public domain and downloaded from the Internet. The table is unbalanced because it merges four datasets with a variety of countries and a lack of data. The high-skill migration dataset from Artuc et al. (2015) initially included 195 countries, which was reduced to 186.

Table 1. Data Description and Variable Sources

Variable name	Description	Source
skill$migration$	The number of postsecondary educated bilateral migrants stock with direction	Comprehensive migration matrices by education level and by gender (1990-2000) Database - Version 2 (Apr 2013), which is analyzed by Artuc et al. (2015).
$Income$	Gross National Income (GNI) per capita based on Purchasing Power Parity (PPP) shown by united states dollar.	World Development Indicators
$Hcapital$	The number of postsecondary educated poeple among population aged 15 and over in 2010	Barro and Lee (2013)
$Dist$	Distance between two countries based on bilateral distances between the biggest cities of those two countries, those inter-city distances being weighted by the share of the city in the overall	CEPII data: dist-cepii
$Trade$	Annual export and import of goods between two countries shown by united states dollar. 1990 data is not available at country level, so data of 1990 is substitute by that of 1995.	UN Comtrade Database

2. Method

The current paper compares the migration of four regional communities in response to Research Question 1 using the latest available dataset. Considering

Research Question 2, one of the challenges in using the gravity model is how to deal with the potential presence of zero or negative values in the case of net or no change in migrant flows. While alternative count data models may be used, such as Poisson, negative binominal, and zero-inflated models (Ramos 2016), the current paper tries to use a count data model with some identification tests to determine which distribution pattern will be used.

The dependent variable in Model (1) used panel data; therefore, a panel estimation method can be applied, which assumes either fixed or random effects. The fixed effect is appropriate when the existence of a country- or corridor-specific effect is assumed. Alternatively, Hausman test results should be used to decide whether the fixed or random effect is appropriate. However, due to one-time point influential dummy such as distance, the current study uses the random-effect model because the fixed-effect model loses the one-time point data. One of the advantages of using panel data is that it is less likely to have multicollinearity problems, which could easily happen for Model (1) because of independent variables such as income and postsecondary-educated human capital stock. However, models using different combinations of independent variables were estimated to check the robustness. The ordinary least squares (OLS) method was used in Model (2), which is based on the production function and where data time points are one.

IV. Results

High-skill intra-ASEAN migration characteristics (Research Question 1)

1. High-skill migration in regional communities

Table 2 shows an overview of four regional communities including ASEAN, MERCOSUR, NAFTA, and EU. ASEAN has the largest population and the smallest total economic size among these four regional communities, which may relate to the impact of migration because its small population and lower economic level countries has a greater impact than for bigger and rich countries. In 2010, the average proportion of the ASEAN postsecondary-educated population was the second smallest following MERCOSUR, with the smallest enrollment ratio for postsecondary education. This could be related to the proportion of skilled migrants to the entire migration.

Table 2. Regional Community Overview

Name of regional community	ASEAN	NAFTA	MERCOSUL	EU
Number of country	10	3	6	28
Name of member countries	Indonesia, Cambodia, Singapore, Thailand, Philippines, Brunei, Vietnam, Malaysia, Myanmar, Laos	Canada, Mexico, United States	Argentina, Bolivia, Brazil, Paraguay, Uruguay, Venezuela	Belgium, Bulgaria, Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden, United Kingdom
Population (Million)	597.91	460.87	276.63	495.26
Total GDP in the region (Trillion united states dollar)	2.135	17.985	3.31	17.552
GDP per capita (united states dollar)	3,571	39,025	11,964	35,440
Amount of trade (export and import) (Trillion united states dollar)	2.493	5.38	0.847	11.813
Proportion of tertiary education complete population among population aged 15 and over in 2010	7.5	19.7	4.5	13.5
Gross enrollment ratio of tertiary education in 2010	25.15	60.02	50.85	65.88

Source: Population figures, GDP, and trade information was obtained from the 2015 report by the Ministry of Foreign Affairs, Japan (The figure related to the EU was estimated with 27 countries, excluding Estonia). Postsecondary-educated human capital was calculated by Barro and Lee (2013), and gross enrollment ratio was calculated from World Development Indicators from the World Bank.
Note: Data on gross enrollment of postsecondary education were not available for some countries in 2010 and these figures are replaced by that from different years in Myanmar (2011), Bolivia (2007), Venezuela (2009), and Germany (2013). The figure for Singapore was based on Japanese Embassy material from 2012. Canada was not included in the calculation for NAFTA. The figure for Brazil is the net enrollment ratio in 2010 from MEXT Japan.

Table 3 shows the high-skill migration of four regional communities in 1990 and 2000. The current paper uses the Herfindahl–Hirschman Index (HHI) to show the concentration of bilateral migration corridors, which is usually used to show the degree of oligopoly in the market share.[2] As Table 3 shows, ASEAN has some differences and commonalities with other countries. For instance, the number of intra-ASEAN high-skill migrants is less than that for out-migrants in 2000. The proportion of intraregional to out-migrants is 0.97 (ASEAN), 3.88 (MERCOSUR), 190.10 (NAFTA) and 2.32 (EU). The situation in NAFTA and EU countries could be understandable because they include major OECD destination countries, such as the United States in the NAFTA countries and United Kingdom and Germany in the EU, but MERCOSUR

[2] The HHI is calculated as HHI = s1^2 + s2^2 + s3^2 + ... + sn^2 (where sn is the market share of the i^{th} firm). If the firm has 100% market share, the HHI equals 10,000 (100^2), which indicates a monopoly.

has more intraregional high-skill migrants than out-migrants. However, all regional communities have a higher proportion of high-skill out-migration than for intraregional mobility. The difference of the proportion between intra- and out-migrant mobility is the biggest in the ASEAN countries; the proportion of intra- (10.41%) versus out-migrant mobility (44.53%) is 4.28, and among other regions, the highest proportion is 2.68 in NAFTA and the lowest is 1.45 in MERCOSUR.

Concerning the change in high-skill migration over a decade between 1990 and 2000, intra-ASEAN mobility had the highest increase (2.13 times), which was higher than for out-migrant mobility (1.80 times). When this change is compared between intraregional and out-migrant mobility, EU and NAFTA had bigger increases in intraregional migration than out-migration. When this change is compared between high- and low-skill migration, these increases are higher than that for low-skill migration in ASEAN and EU countries. High-skill mobility in intraregional migration increased more than that for high-skill out-migrant mobility except in NAFTA countries.

Concerning the concentration of bilateral intraregional migration corridors, the HHI is high in ASEAN (2876.39) and NAFTA (4449.86), both of which are categorized as having high oligopoly. HHI is the lowest in EU (166.76) and MERCOSUR (786.79), both of which are categorized as having low oligopoly with competitive situations.

Table 3. Migration in 1990 and 2000: ASEAN, MERCOSUR, NAFTA, EU

Region / Variables	ASEAN		MERCOSUR		NAFTA		EU	
	intra	out	intra	out	intra	out	intra	out
Number of high-skill migrants in 2000	1,278	1,314	1,349	417	171,451	902	2,468	1,063
Proporttion of high-skill migrants in 2000	10.41%	44.53%	9.47%	42.66%	21.05%	56.48%	21.55%	39.36%
Increase in number of high-skill migrantsn between 2000 and 1990	2.13	1.80	1.99	1.98	1.79	1.61	1.89	1.23
Increase in number of low-skill migrantsn between 2000 and 1990	1.36	1.53	2.40	2.04	2.07	1.13	1.07	0.93
Number of observation	100	1,750	36	1,074	9	546	784	4396
Herfindahl-Hirschman Index, HHI	2876.39	-	836.90	-	4449.86	-	166.76	-

Note: Values show the average of bilateral corridors. ‘Intra’ means migration within the region, and ‘out’ means migration from a region to another region, excluding intraregional mobility.

2. Corridors of high-skill migration in ASEAN countries

Table 4 shows the top 10 corridors of intra-ASEAN migration in 1990 and 2000. Total migration more than doubled (2.18 times). In both 1990 and 2000, the top 10 corridors represented more than 85% of the total intraregional high-skill migration. The

top corridor from Malaysia to Singapore more than tripled in 2000 compared with 1990, and in 2000, just over half of the total migration (51.99%) was in this corridor, which became more dominant with an almost 20% increase from that in 1990. In 2000, the only top corridor was ranked the same as in 1990 and four of the top 10 corridors were new, such as from Vietnam to Cambodia, which was ranked fifth, and from Indonesia to the Philippines, which was ranked seventh.

Table 5 shows the top 10 corridors for ASEAN out-migration in 1990 and 2000. Total out-migration increased 1.78 times in 2000. The top 10 corridors represented around 75% of out-migration, in both 1990 and 2000. The first seven corridors have the same corridor and rank between 1990 and 2000. The United States is the most popular destination within the top 10 ranks, and other countries may have various backgrounds, such as their historical connections (e.g., Indonesia–The Netherlands), geographical closeness (Australia as a destination), and connection with low-skill migration (Philippines–Saudi Arabia).

Table 6 shows the top 10 corridors of in-migration into ASEAN in 1990 and 2000. Total in-migration increased 1.07 times over the decade, which is less than both intraregional and out-migration of high-skill migrants, as stated earlier. On one hand, the decrease in in-migration was because of the decreased use of the corridor with the Philippines as a destination. On the other hand, the corridor with Singapore as a destination increased drastically in the same period. Countries as origin and destination became less concentrated in the same period. For instance, China as an origin country appeared six times in 1990 and twice in 2000, and Philippines as a destination country appears five times in 1990 and three times in 2000.

Table 4. Top 10 Corridors of ASEAN High-Skill Intra-migration

Rank	2000				1990			
	origin	destination	Skill migration stock	%	origin	destination	Skill migration stock	%
1	Malaysia	Singapore	66,452	51.99%	Malaysia	Singapore	19,005	31.61%
2	Singapore	Malaysia	8,400	6.57%	Philippines	Malaysia	9,273	15.42%
3	Indonesia	Singapore	6,952	5.44%	Indonesia	Malaysia	8,736	14.53%
4	Malaysia	Brunei	6,135	4.80%	Myanmar	Thailand	5,298	8.81%
5	Vietnam	Cambodia	6,018	4.71%	Malaysia	Brunei	3,729	6.20%
6	Indonesia	Malaysia	5,650	4.42%	Indonesia	Singapore	1,820	3.03%
7	Indonesia	Philippines	3,689	2.89%	Thailand	Malaysia	1,688	2.81%
8	Philippines	Malaysia	3,650	2.86%	Singapore	Malaysia	1,242	2.07%
9	Thailand	Cambodia	3,269	2.56%	Philippines	Brunei	725	1.21%
10	Malaysia	Philippines	2,974	2.33%	Thailand	Brunei	489	0.81%
Subtotal			113,189	88.55%			52,005	86.50%

Table 5. Top 10 Corridors of ASEAN High-Skill Out-migration

Rank	2000				1990			
	origin	destination	Skill migration stock	%	origin	destination	Skill migration stock	%
1	Philippines	United States	833,958	36.27%	Philippines	United States	496,276	38.87%
2	Vietnam	United States	347,127	15.10%	Vietnam	United States	132,697	10.39%
3	Philippines	Canada	154,960	6.74%	Philippines	Canada	74,335	5.82%
4	Indonesia	Netherlands	78,548	3.42%	Indonesia	Netherlands	53,207	4.17%
5	Vietnam	Australia	57,970	2.52%	Vietnam	Australia	43,860	3.43%
6	Thailand	United States	57,375	2.50%	Thailand	United States	37,705	2.95%
7	Philippines	Australia	51,487	2.24%	Philippines	Australia	37,036	2.90%
8	Vietnam	Canada	49,790	2.17%	Malaysia	Australia	35,366	2.77%
9	Philippines	Saudi Arabia	41,654	1.81%	Philippines	Saudi Arabia	28,688	2.25%
10	Laos	United States	41,440	1.80%	Indonesia	United States	26,385	2.07%
Subtotal			1,714,309	74.56%			965,555	75.62%

Table 6. Top 10 Corridors of ASEAN High-Skill In-migration

Rank	2000				1990			
	origin	destination	Skill migration	%	origin	destination	Skill migration stock	%
1	China	Singapore	30,567	18.96%	China	Philippines	23,725	17.71%
2	India	Singapore	17,593	10.91%	United States	Philippines	18,263	13.63%
3	China	Philippines	11,376	7.06%	China	Thailand	12,625	9.42%
4	United States	Philippines	10,678	6.62%	China	Indonesia	11,276	8.42%
5	United Kingdom	Philippines	7,226	4.48%	United Kingdom	Philippines	7,679	5.73%
6	Japan	Thailand	6,317	3.92%	China	Malaysia	5,615	4.19%
7	India	Malaysia	5,600	3.47%	China	Singapore	4,991	3.73%
8	Bahrain	Philippines	4,794	2.97%	Japan	Philippines	4,760	3.55%
9	Japan	Malaysia	3,950	2.45%	China	Myanmar	2,807	2.10%
10	China, Hong Kong SAR	Thailand	3,028	1.88%	India	Philippines	2,354	1.76%
Subtotal			101,129	62.73%			94,095	70.24%

Relationships between high-skill migration and postsecondary-educated human capital (Research Questions 2 and 3)

For Model (1), deviance and Pearson goodness-of-fit tests were conducted to decide the count data model distribution (deviance: goodness-of-fit = 9199.468, $p > \chi^2$ (7823) = 0.0000; Pearson: goodness-of-fit = 7672.638, $p > \chi^2$ (7823) = 0.8858). Although the results of these two tests are inconsistent, the Pearson test supports the use of Poisson distribution. The Vuong test was then conducted; the results supported the use of the zero-inflated model (z = 32.36, $p > z = 0.0000$). Therefore, the zero-inflated Poisson regression is considered appropriate for Model (1) as well as panel data estimation with random effect. The results are shown in Table 7. As Table 7 shows, R^2 is higher in the panel data estimation shown from (1) to (8) than that of the zero-inflated Poisson estimation shown from (9) to (16). Although the significance and sign of coefficients are similar between the two estimation types with some exceptions, the current study pays closer attention to the results estimated by panel data.

From the estimation results targeting the entire data shown as World in (1), the coefficient of four regional dummy variables does not show a significant result. However, the cross term of human capital stock in ASEAN countries shows significant results, which indicates that the human capital stock either in ASEAN origin or destination countries has a different relationship with high-skill migration to other regions.

Regarding the relationship between bilateral countries, the similarity and differences between ASEAN countries and other regions are shown. First, the coefficient of distance variable for intra-ASEAN mobility shown in (3) is negative and that of out-ASEAN migration in (4) is insignificant, which is the same tendency to that for the EU. The coefficient of trade is significant and positive besides intra-ASEAN mobility in (3). Trade seems to have little relationship with skill migration within ASEAN countries. The common official language is also positive and significant for both intra- and out-ASEAN migration as for the EU. Income and human capital stock differences between origin and destination countries do not show any significant results except for world estimation; therefore, these differences have little influence on intraregional migration. Regarding origin and destination country-specific characteristics, the coefficient of income in destination variable shows positive and

significant results for all regional communities and the world as expected. That of income in origin is positive and significant in intra-ASEAN and out-NAFTA migration, but negative and significant in both intra- and out-EU migrations in (7) and (8). In summary, during intra-ASEAN migration, high-skill workers from relatively high-income countries move to closer countries with relatively higher income and a common official language. The migration flow does not accompany the flow of trade in ASEAN countries, which differs from other regional communities.

The estimation results for different combinations of independent variables in Model (1) are shown from (17) to (22), targeting high-skill intra-ASEAN migration, and from (23) to (28), targeting high-skill intra-EU migration. The average of R^2 is 0.457 in the ASEAN countries and 0.702 in the EU countries, which indicates that the current education and economy-focused model had a better fit for the EU, although the number of observations differs between the two targeted datasets as 72 and 694 on average, respectively. Here, the results of distance and official language have the same sign and significance tendency as all of the results. The coefficient of the income difference variable does not show any significant result, but that of the human capital difference shows a significant result for the model without origin- and destination-specific variables. That of human capital in the destination variable shows an insignificant result besides (23) and that of destination shows positive and significant results at the 1% level besides (21). These results indicate that high-skill migration has a positive relationship with human capital in the origin country, but not the destination country within the ASEAN regional community and that of the EU. The coefficient of income level in either origin or destination countries is also significant.

Model (2) was then estimated by OLS. The results are shown in Table 8 where the adjusted R^2 is low, which suggests the necessity of including additional independent variables or modifying the model structure. The results show that the coefficients of high-skill migration variables are positive and significant at 1% in all results. The coefficient of the income change variable is positive only for World, and that of out-ASEAN and intra-EU migration is negative, which was unexpected. One interpretation of this finding is that it is a result of economic stagnation and the increase in postsecondary education enrollment in destination countries such as Japan recently, but further analysis is needed to confirm this interpretation.

Table 7. Estimation Results for Model (1)

Methods	Panel with random effect								Poisson							
Model (1)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Target Indepent variabls	World	World	intra ASEAN	out ASEAN	out MERCOSUL	out NAFTA	intra EU	out EU	World	World	intra ASEAN	out ASEAN	out MERCOSUL	out NAFTA	intra EU	out EU
distance	-0.6091***	-0.6068***	-1.7348***	0.08	-1.3343***	-0.8794***	-0.6194***	0.01	-0.1739***	-0.1754***	-0.2539**	-0.06	-0.3460***	-0.2790***	-0.1690***	-0.0797***
	(-18.67)	(-20.67)	(-3.15)	(0.35)	(-5.26)	(-4.22)	(-5.82)	(0.08)	(-23.63)	(-28.04)	(-2.05)	(-1.33)	(-5.06)	(-5.63)	(-5.79)	(-4.38)
income difference	0.0626***	0.0629***	-0.28	0.05	0.01	0.11	-0.03	0.1765***	0.0160***	0.0166***	-0.08	-0.03	0.01	0.02	0.00	0.0544***
	(3.16)	(3.18)	(-1.21)	(0.69)	(0.15)	(0.67)	(-0.47)	(3.32)	(2.86)	(2.97)	(-1.42)	(-1.48)	(0.66)	(0.37)	(0.07)	(3.90)
hcapital difference	-0.0586***	-0.0600***	0.10	-0.1099*	-0.07	-0.07	0.03	-0.05	-0.0194***	-0.0204***	0.09	-0.0321*	-0.0454*	-0.0619*	0.01	-0.0277**
	(-3.16)	(-3.23)	(0.39)	(-1.75)	(-0.93)	(-0.65)	(0.56)	(-0.96)	(-3.56)	(-3.75)	(1.26)	(-1.75)	(-1.89)	(-1.67)	(0.36)	(-2.05)
trade	0.2099***	0.2098***	0.13	0.2167***	0.1537***	0.3539***	0.3371***	0.2585***								
	(20.42)	(20.50)	(1.06)	(5.47)	(3.00)	(6.57)	(7.35)	(7.72)								
hcaptal in destination	0.03	0.03	-0.15	-0.11	0.05	0.00	0.15	0.01	0.01	0.01	-0.08	-0.0554*	0.06	0.00	0.05	-0.01
	(1.16)	(1.32)	(-0.68)	(-1.04)	(0.51)	(-0.02)	(1.37)	(0.22)	(1.29)	(1.55)	(-1.48)	(-1.82)	(1.60)	(-0.13)	(1.23)	(-0.33)
hcaptal in origin	0.3739***	0.3719***	0.01	0.3025***	0.09	-2.4315***	0.7794***	0.7552***	0.0959***	0.0948***	(0.06)	0.1066***	0.02	-0.6799***	0.1278***	0.1331***
	(13.53)	(13.48)	(0.04)	(2.96)	(0.43)	(-3.26)	(6.89)	(6.12)	(12.66)	(12.61)	(-0.69)	(3.58)	(0.33)	(-3.26)	(3.16)	(3.74)
income in destination	0.6103***	0.6080***	0.5800*	0.9201***	0.8454***	0.4177***	0.4838***	0.5027***	0.1858***	0.1850***	0.1704**	0.3214***	0.2084***	0.1634***	0.1271***	0.1924***
	(20.52)	(20.45)	(1.80)	(7.31)	(6.56)	(3.63)	(4.32)	(7.36)	(23.28)	(23.27)	(2.13)	(9.73)	(4.83)	(5.34)	(3.59)	(11.10)
income in origin	-0.0889***	-0.0872***	1.1256***	-0.16	0.14	2.9479***	-0.2935**	-0.5022***	0.0146*	0.0157**	0.2707**	-0.04	0.08	0.8872***	0.01	-0.03
	(-2.80)	(-2.75)	(2.65)	(-1.07)	(0.73)	(3.84)	(-2.45)	(-3.98)	(1.86)	(2.02)	(2.11)	(-0.84)	(1.53)	(4.06)	(0.21)	(-0.87)
four regional community dummy	0.01								0.01							
	(0.21)								(1.01)							
official common language	1.4160***	1.4169***	2.0323**	1.3229***	0.19	0.8304***	1.2426***	1.0800***	0.3325***	0.3311***	0.3471**	0.2881***	0.02	0.2188***	0.1779**	0.2814***
	(21.84)	(22.22)	(2.53)	(3.82)	(0.47)	(3.94)	(4.23)	(4.38)	(22.18)	(22.44)	(2.34)	(4.16)	(0.12)	(4.18)	(2.31)	(5.42)
colony relation	1.6647***	1.6680***	0.00	3.2622***	2.4924***	1.4437**	1.3805***	1.4724***	0.2455***	0.2469***	0.00	0.4072***	0.4851**	0.06	0.2823***	0.2632***
	(12.19)	(12.22)	(.)	(4.06)	(3.07)	(2.30)	(4.42)	(5.08)	(9.96)	(10.01)	(.)	(3.73)	(2.57)	(0.52)	(3.56)	(4.81)
hcaptal in ASEAN destination		-0.1730*							-0.0636***							
		(-1.72)							(-2.72)							
hcaptal in ASEAN origin		0.1902**							0.0711***							
		(2.05)							(3.28)							
constant	-14.1655***	-14.1863***	-21.0553**	-22.8026***	-13.1476***	-50.9020***	-14.1131***	-15.1309***	-3.8844***	-3.8929***	-5.1222*	-4.9504***	-4.0102***	-13.5749***	-3.1427***	-4.9545***
	(-20.74)	(-20.85)	(-2.56)	(-6.19)	(-3.13)	(-5.26)	(-5.90)	(-7.28)	(-22.38)	(-22.43)	(-1.96)	(-4.75)	(-3.09)	(-4.82)	(-4.39)	(-9.93)
inflate lntradettl									-0.2703***	-0.2701***	-2339.85	-0.3361***	-0.3046**	-0.4644***	-0.94	-0.2896***
									(-16.34)	(-16.32)	(-0.00)	(-5.54)	(-2.13)	(-3.29)	(-0.77)	(-7.21)
inflate _cons									1.4638***	1.4593***	34054.16	3.0938***	1.49	5.1696**	8.79	2.3658***
									(5.81)	(5.79)	0.00	(3.29)	(0.74)	(2.14)	(0.46)	(3.58)
Adj R-squared	0.53	0.53	0.52	0.53	0.61	0.60	0.73	0.44	0.156	0.157	0.035	0.172	0.163	0.115	0.149	0.143
N	7,835	7,835	64	572	304	419	648	1,501	7,835	7,835	64	572	304	419	648	1,501

Model (1)	Panel with random effect											
Target	intra ASEAN						intra EU					
Indepent variabls	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
distance	-1.0283**	-1.7555***	-1.8545***	-0.8789	-1.4647***	-1.1463*	-0.6543***	-0.6509***	-0.9198***	-0.3717***	-0.3764***	-0.4664***
	(-1.97)	(-3.34)	(-4.11)	(-1.57)	(-2.74)	(-1.90)	(-6.26)	(-5.86)	(-9.31)	(-3.17)	(-3.30)	(-4.17)
income difference		-0.26		0.33	-0.21	0.26		-0.01		0.06	0.1089*	0.01
		(-1.17)		-1.59	(-0.87)	-1.2		(-0.18)		-0.85	-1.72	-0.17
hcapital difference	0.0123			0.2501	0.0948	0.2154	0.0138			0.2129***	0.1269**	0.1760***
	(0.05)			(0.96)	(0.37)	(0.85)	(0.31)			(3.46)	(2.11)	(2.99)
trade	0.2389**	0.133		0.3765***	0.2998***	0.1982	0.3862***	0.2592***		0.6506***	0.6800***	0.5151***
	(2.47)	(1.08)		(3.60)	(3.02)	(1.41)	(10.24)	(5.62)		(19.92)	(19.22)	(14.77)
hcaptal in destination	0.1712		0.1325			-0.2773	0.6055***		0.1417			0.1371
	(1.37)		(0.79)			(-1.16)	(11.30)		(1.57)			(1.17)
hcaptal in origin	0.5409***		0.4604***		0.0132		0.3949***		0.4486***		0.9245***	
	(3.31)		(2.76)		(0.05)		(7.24)		(4.93)		(7.57)	
income in destination		0.4104**	0.4076*			0.7564**		0.6983***	0.7575***			0.2734**
		(2.15)	(1.81)			(2.10)		(12.17)	(8.83)			(2.44)
income in origin		1.1872***	0.3954*		1.1553***			0.4687***	0.2762***		-0.8243***	
		(4.49)	(1.85)		(2.66)			(8.02)	(3.26)		(-6.97)	
official common language	2.3677***	2.0629***	2.6598***	1.7160**	1.8809**	1.8210**	1.1811***	1.1901***	1.6001***	0.6630**	0.7901**	0.8648***
	(2.83)	(2.61)	(3.88)	(1.97)	(2.33)	(2.00)	(3.88)	(3.88)	(5.70)	(2.02)	(2.48)	(2.76)
colony relation	0	0	0	0	0	0	1.3303***	1.5396***	1.4027***	1.1351***	1.0273***	1.2205***
	(.)	(.)	(.)	(.)	(.)	(.)	-4.14	-4.72	-4.62	-3.24	-3.02	-3.66
_cons	-2.1277	-19.2525***	-9.9657*	-7.8524	-16.4990**	-15.4098**	-11.3998***	-24.9716***	-22.6377***	-9.3892***	-1.437	-13.1956***
	(-0.49)	(-3.19)	(-1.73)	(-1.22)	(-2.19)	(-2.07)	(-11.04)	(-14.39)	(-12.22)	(-6.86)	(-0.80)	(-7.32)
R-squared	0.4197	0.5032	0.5343	0.3975	0.4963	0.3897	0.7108	0.7044	0.7018	0.6826	0.707	0.7074
N	78	64	99	64	64	64	696	648	875	648	648	648

* p<0.10, ** p<0.05, *** p<0.01, intra-MERCOSUR and intra-NAFTA were omitted because of the small number of observations.

Table 8. Estimation Results for Model (2)

Methods	OLS						
Model (2)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Target / Indepent variabls	World	intra ASEAN	out ASEAN	out MERCOSUL	out NAFTA	intra EU	out EU
Skillmigration	0.2858***	0.2625***	0.2801***	0.3310***	0.2748***	0.3794***	0.3236***
	(28.33)	(3.43)	(7.61)	(5.35)	(7.82)	(22.31)	(16.49)
Income	0.1422***	-0.39	-0.3312***	-0.32	0.09	-0.1367**	-0.06
	(5.66)	(-1.51)	(-3.32)	(-1.50)	(0.88)	(-2.09)	(-1.00)
Regional community	-0.2787***						
	(-8.06)						
constant	20.6136***	28.1446***	29.2921***	27.5341***	22.7289***	23.3611***	23.6247***
	(53.85)	(6.96)	(18.36)	(8.16)	(14.26)	(20.65)	(24.86)
Adj R-squared	0.28	0.27	0.31	0.23	0.32	0.62	0.34
N	2,738	28	130	89	169	314	571

* p<0.10, ** p<0.05, *** p<0.01, intra-MERCOSUR and intra-NAFTA were omitted because of the small number of observations.

V. Conclusion

This paper has two main contributions regarding high-skill migration in ASEAN countries. It clarifies the nature of high-skill migration and the relationship between high-skill migration and postsecondary education in the region.

Using the latest available dataset from 1990 and 2000 provided by Artuc et al. (2015), this study found that intra-ASEAN migration was responsible for the lowest proportion of high-skill migration and the second highest concentration of bilateral corridors among four regional communities. The findings clarify the characteristics of migration in ASEAN countries that were indicated by previous studies. In both 1990 and 2000, the concentration of migrants in the top 10 bilateral corridors represented more than 85% of the total intraregional high-skill migration. In 2000, the top corridor from Malaysia to Singapore became more dominant with just over half of the total migration. The flow of in-migration into ASEAN countries is another notable finding. There was a modest increase of immigrants into ASEAN countries, although the volume of high-skill migration has increased to almost double both from and within ASEAN countries in the same period.

On the one hand, postsecondary-educated human capital stock in the origin, but not in the destination countries explains high-skill intra-ASEAN migration possibly. However, bilateral high-skill intra-ASEAN mobility explains postsecondary-educated human capital stock in in both origin and destination countries; therefore, high-skill mobility of ASEAN could have positive relationship with increase in investment of postsecondary education in origin countries.

The findings show that there are several policy implications. First, the results indicate the necessity for encouragement of high-skill ASEAN intra-migration for two reasons: its effect on increases in postsecondary education enrollment in origin countries and the low level of current intra-ASEAN high-skill mobility compared with three other regional communities. The obstacles to increasing high-skill migration have been pointed out by Papademetriou et al. (2016), but this could be a subject for future research. Therefore, I recommend that migration and postsecondary education policies should be discussed together. Second, high-skill in-migration into ASEAN countries should be investigated further because the findings show its modest increase compared with that of both from and within ASEAN regional migration. High-skill in-migration relates directly to the competitiveness of regions; therefore, background and more recent trends should be clarified as well as interregional migration.

This paper has several aspects that should be improved in future. First, more recent data could be used for analysis. Longer time series data would make analysis available for the causality relationship between regional high-skill migration and postsecondary educated human capital accumulation. Second, the target should be extended to include the impacts of studying abroad. There are two major reasons for extending the target of research: international students are an important aspect of high-skill migration and their increase in numbers in Asian countries is a main driver of high-skill migration (Asian Development Bank Institute 2014).

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