Estimating annual flows of migration amongst ASEAN countries: Overcoming high levels of missing and inconsistent flow data[1]

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Abstract
International migration is increasing and thriving in the Asia-Pacific region yet annual movements and pathways remain largely unknown because data are unavailable for cross-national comparison. This problem has resulted in relatively little research on international migration in the Asia-Pacific, which is surprising considering the region contains over three-fifths of the world's population. This paper addresses a fundamental gap in our knowledge about population movements in the Asia-Pacific region by developing a strategy for harmonising and estimating annual flows by origin and destination. To develop this strategy, we focus on the ten countries comprising the Association of Southeast Asian National (ASEAN). The estimates will ultimately form an invaluable basis for understanding the dynamics and complexity of migration for countries in the Asia-Pacific region.

Introduction
International migration is increasing and thriving in the Asia-Pacific region yet annual movements and pathways remain largely unknown because data are unavailable for cross-national comparison (Iredale et al. 2003; Hugo 2005; Charles-Edwards et al. 2016). This problem has resulted in relatively little research on international migration in the Asia-Pacific, which is surprising considering the region contains over three-fifths of the world's population. While data are now starting to be gathered (e.g., Park et al. 2015), there are further limitations deriving from inconsistencies in definitions and measurement.

The current paper addresses a fundamental gap in our knowledge about population movements in the Asia-Pacific region by developing a model framework to estimate and validate annual flows by origin and destination. The estimates form an invaluable basis for understanding the dynamics and complexity of migration in the Asia-Pacific region. This is particularly relevant due to the expansion of regional labour and irregular migration, as well as temporary migration in the region.

The overall aim of this research is to provide a better understanding of migration patterns in the Asia-Pacific region. To do this, we make a distinction between generation and distribution of migration (Willekens and Baydar 1986; Rogers et al. 2002). In order to provide a fuller picture of these population movements, we augment the available data that are inconsistent, inadequate or missing with statistical estimation and population change information. This project will produce analyses of the estimated migration flow patterns, which will then form the basis of evidence-driven recommendations for future policies and practices related to international migration within the region.

The research has the following four objectives:

1. To collect and organise the available data and metadata on regular and irregular movements in the ASEAN region.
2. To develop models for estimating migration flows from each country (generation) and to each destination contingent on the origin (distribution). The models incorporate auxiliary

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information on the propensities to emigrate and the likelihood to migrate to particular destinations.

3. To validate the estimated flows based on other country reports and population change amongst the countries in the ASEAN region.
4. To develop a theoretical understanding of the differences between the patterns of regular and irregular migration amongst countries in the Asia-Pacific region.

Background

Migration data

People undertake international migration for many reasons. Those who have a choice move for employment, family reunion or amenity reasons. Those lacking choices move to escape persecution or harm. Reported statistics on these flows, meanwhile, are relatively confusing or non-existent. There are two main reasons. First, no consensus exists on what exactly is a 'migrant', so comparative analyses suffer from differing national definitions. This is particularly the case for a large proportion of migrants in Asia where permanent migration pathways are restricted and temporary flows are the most dominant form of migration. Temporary migrants moving across Asia are often caught between having regular and irregular migration statuses due to a sudden loss of employment and financial difficulties in returning to their country of origin (Pietsch 2015a). Second, the event of migration is rarely measured directly. Often it is inferred from a comparison of places of residence at two points in time or from a change in residence recorded by a population or migration registration system. The challenge is compounded because countries use different methods of data collection (Bilsborrow et al. 1997; De Beer et al. 2010). Migration statistics may come from a variety of administrative data sources (e.g., population registers, registers of foreigners, border statistics, pension or tax registers), population censuses or surveys.

In order to estimate the migration flows effectively, some understanding of the different types of migration are needed. For example, consider regular and irregular migrants. Regular migrants are those who come for employment, family reunion or other reasons with full knowledge and approval of immigration and border protection agencies. Irregular migrants enter countries in other ways or extend their stays beyond their permitted allocations; this also includes those who enter to claim asylum. Migrants in many parts of Asia can easily move from temporary migration status to one defined by irregularity such as those who suddenly become unemployed or awaiting the outcome of a regularisation process. These temporary regular and irregular migration flows have increased rapidly throughout Asia since the 1990s. The most obvious examples include the rapid increase of irregular migration between Indonesia and Malaysia and between Burma (Myanmar) and Thailand where state capacity to control long and porous borders is limited (Pietsch 2015a). In some countries throughout Asia irregular migrants are welcomed by different sectors of the local community because of their contribution to the local economy in the form of cheap and unregulated labour. The estimation of irregular migrants will be much harder with scarcely available data.

International migration statistics suffer from unreliability, caused by the collection method or the non-participation of the migrants themselves. Statistics on irregular migration and emigration by their very nature are particularly problematic. Not all countries have population or migration registers. Surveys require very large sample sizes to adequately capture the details needed for analysing migration. Furthermore, flows for certain countries may be missing for particular years or entirely. Censuses occur only periodically and are unable to count emigrants. Finally, migration data may be available only for the total population, not for more detailed demographic, socioeconomic or spatial characteristics required for a particular study.

International migration models

All these problems mean that only a very limited amount of work has been carried out to estimate the dynamics of regular and irregular migration. Most has focused on indirect methods for particular countries, independent of others (e.g., Hugo 2014). However, we can draw from some recent exceptions that examine European migration. Poulain (1993) demonstrated the weaknesses of reported

migration data and provided a simple mathematical method for adjusting the flows and making them more consistent across countries. Raymer (2008) showed how spatial interaction models could be applied to model international migration flows in a hierarchical manner. Abel (2013) demonstrated how migrant stocks could be used to infer migrant transitions. Raymer et al. (2013) and Wiśniowski et al. (2013, 2014) demonstrated the usefulness and flexibility of incorporating various forms of prior information, including expert judgements, and the importance of probabilities associated with the predicted values.

The Integrated Modelling of European Migration (IMEM) approach (Raymer et al. 2013; Wiśniowski et al. 2016) focuses on the measurement aspects of the reported statistics, providing measures of uncertainty for all flows and parameters in the model. The interest is in estimating a set of unobserved true flows of migration based on four pieces of information: flows reported by the sending country, flows reported by the receiving country, covariate information and expert judgements. The reported data are harmonised via measurement models, which distort the true flows by taking into account duration definitions used in various countries, relative accuracy of the data-collection mechanisms and overall undercount of migration and coverage.

Association of Southeast Asian Nations (ASEAN)

The Association of Southeast Asian Nations (ASEAN) is a regional intergovernmental organization founded in 1967 by Indonesia, Malaysia, Philippines, Singapore and Thailand, with Brunei, Viet Nam, Laos, Myanmar, and Cambodia joining between 1984 and 1999.[2] Figure 1 presents a map of ASEAN countries and their neighbouring Asia−Pacific countries. The ten member-states share common interests and collective aims in economic growth, social progress, cultural development, technical and scientific advancement, and regional stability and integration. Being a prominent and influential organisation, ASEAN sets a model of corporation between diversity and differences and engages other Asia-Pacific states as well as other organizations regularly. For instance, the International Labour Migration Statistics Database in ASEAN (ILMS), being the first of its kind in the region with comprehensive official statistics on migrant workers' stock and flows, was developed through extensive collaboration between ASEAN member states, ASEAN Secretariat, and the International Labour Organization's (ILO).[3]

---FIGURE 1 ABOUT HERE---

International migration among ASEAN countries is an important component for global international migration and the Asia-Pacific region exchange. The 2017 World Bank statistics shows that migration stock from and to ASEAN countries accounts for 10% of total global international migration stock and 63% of total Asia-Pacific international migration stock (Table 1).

---TABLE 1 ABOUT HERE---

Data Situation

Available flow data

Migration flow statistics for ASEAN countries come from four sources, including the ILMS, the Organisation for Economic Co-operation and Development (OECD), the Population Division at Department of Economics and Social Affairs of the United Nations (UNPD), and individual countries. Among them, ILMS has the most comprehensive origin-destination-specific international migration flows for ASEAN countries covers yearly statistics between 1980 and 2016. However, data remain limited even for this comprehensive effort. For instance, only Indonesia, Philippines, Thailand and Malaysia reported inflows and Cambodia, Indonesia, Myanmar, Philippines, Thailand, Vietnam and Laos reported outflows for 2010. Reports of bilateral migration flow are mostly missing. Definitions of

[2] http://asean.org/

[3] http://www.ilo.org/asia/WCMS_416366/lang--en/index.htm

migrant and types of flow are inconsistent, and sometimes categorized incorrectly. For instance, Indonesia reports inflow of migrants by sex and country of origin, however the data are inflows of labour migrants (and does not include any other type of migrants) sourced from Administrative records of the Directorate of Controlling of Foreign Employment (ILO 2015 and 2016). We augmented ILMS with emigrant statistics from the Philippines. Filipino employed overseas and permanent emigrants are documented by Commission of Filipino Overseas and Philippines Overseas Employment Administration, respectively. These emigration statistics are destination-specific and are available annually between 1981 and 2015.

Further, we augmented the missing flows using the UNPD and OECD datasets. Although no ASEAN country reported data directly to these two sources, limited flows from and to some ASEAN countries could be gleaned from reports of non-ASEAN countries in UNPD and OECD data. From the UNPD's *International Migration Flows to and from Selected Counties Database (IMFSCD)*, we picked up some yearly bilateral flows in the 1980-2013 period from reported flows related to Australia, New Zealand, Canada,[4] and the United States. From the OECD database, we captured flows related to ASEAN and Asia-Pacific countries from yearly statistics reported by Japan, South Korea, Australia, New Zealand, Canada,[5] and the United States in the 2000-2015 period.

A major barrier to integrating migration flow data for ASEAN countries (and also for Asia-Pacific countries) is that the definition of migrant varies between difference sources. Three main definitions are used in UNPD, OECD and ILMS datasets to define international migrants: birthplace, nationality, and residence. ILMS, in particular, sourced data from various state level agents, thus the definition of migrants jumps between foreign-born, foreign worker, foreigner, nationals employed abroad, overseas nationals, and residence longer than one year. The IMFSCD defines migrants by country of birth (used by the United States), country of citizenship (used by Canada and New Zealand), and country of residence (used by Australia and New Zealand). In the OECD database, definitions include country of birth (used by Australia, New Zealand, Canada, and the United States), country of former nationality (used by Japan, South Korea, Australia, New Zealand, Canada, and the United States), and country of nationality (used by Japan, South Korea, Australia, New Zealand, Canada, and the United States).

We combined data from all four sources and displayed available flow data for the year 2011 in Table 2. Even after combining all possible definitions, most flows are missing. In the sole instance when data are reported by two sources, i.e., both origin and destination countries, as in the case of migration from the Philippines (PHL) to other Asia-Pacific countries (AP) and to the rest of the world (RW), the reported flows are far from consistent. This problem is due mainly to the lack of reporting from receiving countries, as only prominent immigrant receiving countries like the United States, Canada, Australia, New Zealand, Japan and Korea are reporting incoming flows from the Philippines in the IMFSCD and OECD database.

---TABLE 2 ABOUT HERE---

Labour migrants and asylum seekers are important components of international migration for ASEAN countries. Labour migrant flow data for ASEAN countries are available in the ILMS database. ILMS sourced on outflows of nationals for employment from origin countries' administrative statistics on nationals registered to work abroad. Cambodia, Indonesia, Laos, Myanmar, Philippines, Thailand, and Viet Nam provide outflow statistics to an incomplete set of destination countries. Labour migration inflows are only reported by the Philippines, Thailand and Indonesia in ILMS, all of which have been miscategorized to total migrant inflows. Using ILMS data, Table 3 displays a matrix of bilateral labour migration flows for ASEAN countries in 2011.[6] 2011 labour migrant flow data for ASEAN countries are presented in Table 3.

[4] Canada and the United States do not provide outflow statistics.
[5] Canada and the United States did not provide outflow statistics.
[6] The same migration flow statistics are also reported in the ILOSTAT database, maintained by the International Labour Organization (ILO), at https://www.ilo.org/ilostat

---TABLE 3 ABOUT HERE---

Compared to overall flows (which we displayed in Table 2), there are less missing flows in the labour migration flow matrix. As labour migration is an important component of migration in the ASEAN regions, these flows provide some basis for understanding the migration connectivity between ASEAN countries, relative to other Asia-Pacific countries and the rest of the world. The consistency of this data, however, is also questionable, as reports by origin and destination countries tend to be quite different. For instance, Thailand reported sending 1,289 migrants to Indonesia, yet the number reported by Indonesia is over three times larger. Further, as Thailand reports outflows defined by previous residence (which include both Thai nationals and foreigners residing in Thailand), this figure should be larger than the inflows of Thai nationals reported by Indonesia.

In Table 4, we display data on asylum seeker flows in 2011, which we obtained from the United Nations High Commissioner for Refugees (UNHCR) and the OECD database. The OECD provides data for 2010-2015, and its data are compiled by UNHCR from the vantage point of destination countries.[7] Despite the similar source, the reported numbers are not the same. As shown in Table 4, where the shaded rows reflecting data from the OECD differ remarkably from the non-shaded rows showing data from UNHCR. We suspect that this is due to different definitions of "origin" in the data source, such that the OECD reports inflows of asylum seeker based on nationality only.[8] It is unclear which definitions were used by UNHCR. The UNHCR database includes a wider range of destination countries (both industrialized and non-industrialized nations), covers a longer period (1951-2014), and disaggregate into seven specific populations: refugees (including refugee-like situations), asylum seekers, internally displaced persons (IDP), returned IDPs, returnees, stateless persons, and others of concern. The number in Table 4 only reflects flows of asylum-seekers, who have applied for asylum or refugee status, but who have not yet received a final decision on their application.[9] The statistics include those who have submitted an individual request during a certain period and those whose individual asylum request has not yet been decided at a certain date.

---TABLE 4 ABOUT HERE---

From the data, it is clear that most asylum seekers from the ASEAN region hail from Myanmar (MMR), which is consistent with the pattern of conflicts in the region. As the data are only reported from the destinations' vantage point (although with different level of interventions by the UNHCR and definitions used between UNHCR and OECD), comparisons and adjustments are not viable.

Available bilateral migration stock data

We also located three main data sources with information relevant to bilateral ASEAN migrant stock, which could be used to glean the relative distribution of emigrants across different destination countries. Two of the sources are databases maintained by international governance bodies: the United Nations and World Bank. The third source is country-specific statistical offices across various ASEAN and Asia-Pacific countries.

First, UNPD publishes and regularly updates the International Migration Stock Database (IMSD), with estimates and projected origin-destination-specific international migrant numbers. The most recent revision of this database is in 2017. Earlier estimates are available for 1990, 1995, 2000, 2005, 2010, and 2015 for all countries and areas in the world. The estimates are based on official statistic of the foreign-born or the foreign population (United Nations 2017).

[7] UNHCR offers a varying range of help to destination countries for the registration of refugees and asylum seekers. For industrialized destination countries, the help is minimal. For non-industrialized destination countries, UNHCR provides more comprehensive supports, including that UNHCR would manage the entire registration process in countries with limited means. See http://www.unhcr.org/statistics/STATISTICS/45c06c662.html

[8] https://stats.oecd.org/

[9] http://www.unhcr.org/statistics/STATISTICS/45c06c662.html

Second, World Bank manages Global Bilateral Migration Database (GBMD) for 1960, 1970, 1980, 1990 and 2000 (World Bank et al. 2011), and Bilateral Migration Matrix (BMM) 2010, 2013 and 2017 (World Bank 2018a and 2018b) with origin-destination-specific migration stock breakdowns. The data are sourced from census and population register records across the region for both datasets, with UNPD being the most comprehensive source of information (World Bank 2018a). The two World Bank datasets are, however, not comparable, as GBMD uses estimations to fill the gaps for the cells while BMM extends UNPD statistics using data from new censuses and country sources.

Third, migrant stock data can also be gleaned from censuses, surveys, and administrative statistics reported by the national statistical offices across ASEAN and Asia-Pacific countries. Most countries only have data on immigrant stock, whereas some countries also collect data on emigrant stock. Definition of emigrant however, varies from citizens residing overseas, citizens employed overseas, to ethnic diaspora community. Of the ten ASEAN countries, Philippines regularly reports statistics of its overseas citizens. The ILMS compiled some of these country-specific reports of migrant stock, but the database is not comprehensive.

In summary, the migration data situation for ASEAN countries is not very good. It is certainly different from Europe. First, there are hardly any information available on migration flows. Second, there is no clear benchmark from which estimated flows can be compared. In Europe, Sweden was often used as the 'gold standard' due its excellent population registration system and consistency with the United Nations (1998) recommendations on the measurement of international migration. Third, there is no regional agency overseeing statistics in the way that Eurostat, the statistical agency for the European Union, operates. Furthermore, there are no multi-/bilateral exchange on migration statistics as there are amongst the Nordic countries. Finally, the ASEAN region contains very large heterogeneous countries whose economies and societies are rapidly changing (e.g., Indonesia and the Philippines).

Modelling Strategy

Given the incomplete and inconsistent nature of migration flow data among ASEAN countries, we start to fill the gaps with indirect estimations from the generation and distribution method developed by Willekens and Baydar (1986) and use available ASEAN data, which we have collected, for validation and adjustment. One major advantage of the generation and distribution method is that it separates the estimation process into two multiplicative components, which allows us to simplify the assumptions and validation checks, while at the same time improving the quality of the estimates.

Following Willekens and Baydar (1986) and Rogers et al. (2002), a table of international migration flow data may be expressed in a two-way contingency table or matrix. These flows may then be decomposed into two components: (1) a generation component, $m_{i+}^{t,t+1}$, and (2) a distribution component, $p_{j|i}^{t,t+1}$, as follow:

$$m_{ij}^{t,t+1} = (m_{i+}^{t,t+1})(p_{j|i}^{t,t+1})$$

where $m_{ij}^{t,t+1}$ is a count of persons migrating from country *i* to country *j* between year *t* and year *t+1*, $m_{i+}^{t,t+1}$is total number of persons migrating from country *i*, and $p_{j|i}^{t,t+1}$is the probability that a migrant from country *i* will move to country *j*.

The Generation Component

We start by estimating the generation component that pertains to emigration. We use two different methods to generate this estimate. First, we use regression models to predict the (log) annual count of emigration for ASEAN countries with missing data. Following Raymer et al. (2011, see also Jennissen 2004; Raymer 2008; Abel 2010), we use ordinary least squares (OLS) regression model to predict the generation component, or the probability of emigration from country *i*, with the following covariates:

(1) Population size (log),
(2) Percentage of the population aged 65 and over (log),
(3) Life expectancy of females (log),

(4) GDP per capita adjusted for PPP (log),
(5) Percentage urban (log), and
(6) Indicator variables for the calendar years to adjust for common time shock.

The strength of this method is that it focuses on the emigration process, where it is possible to identify a population at risk of emigrating (i.e. the population of country *i* at time *t*). Prior research based on internal migration patterns suggests that the probability of out-migration from a specific origin tends to be stable over time (Willekens and Baydar 1986; Rogers et al. 2002). The weakness, however, is that reported emigration data are typically less accurate than immigration data, as countries around the world tend to keep better records of incoming immigrants (Raymer et al. 2011: p188). As such, poor input data might result in incorrect models and imprecise emigration estimates.

An alternative approach is to estimate the generation component using predicted immigration counts and the demographic accounting equation (Raymer 2008). Annual immigration into country *i*, denoted as $m_{+i}^{t,t+1}$, can be predicted with OLS regression models including the same set of predictor variables outlined by Raymer et al. (2011), which we described earlier. We then use the demographic accounting equation to estimate emigration flows:

$$m_{i+}^{t,t+1} = P_i^{t+1} - P_i^t - B_i^{t,t+1} + D_i^{t,t+1} - m_{+i}^{t,t+1}$$

where $m_{i+}^{t,t+1}$ is the total number of persons emigrating from country *i* between year *t* and *t+1*, P_i^{t+1} is the population of country *i* in year *t+1*, P_i^t is the population of country *i* in year *t*, $B_i^{t,t+1}$ and $D_i^{t,t+1}$ are the number of births and deaths in country *i* between year *t* and year *t+1*, and $m_{+i}^{t,t+1}$ is the total number of immigrants coming into country *i* between the two years.

The Distribution Component

In the absence of reliable data, the probability that a migrant from country *i* will move to country *j*, $p_{j|i}^{t,t+1}$, can be predicted with regression models that include covariates reflecting the characteristics of the destination country *j* and covariates reflecting the relationship between specific origin-destination *i-j* pair. The intuition is that some destinations are more attractive to emigrants from country *i* than others (e.g., see Fotheringham et al. 2000). Covariates that could predict the relative attractiveness of a destination country include: population size, percentage of the population aged 65 and over, life expectancy of females, GDP per capita adjusted for PPP, and percentage urban. Additionally, origin-destination associations such as contiguity, geographic distance, language similarity, bilateral migrant stock, and bilateral trade flows have been shown to be good predictors of the distribution component (Raymer et al. 2011, see also Cohen et al. 2008).

Once the generation and distribution components are estimated, we multiply them to estimate the quantity of interest, m_{ij}, which is the annual migration flow from country *i* to country *j*.

Estimations

Input data for predictive models

We rely on migration flow data that are relatively consistent and accurate to build our estimation models. As shown in Table 5, the majority of our data come from 31 European countries where emigration, immigration, and harmonized bilateral flow data, defined by previous residence, are made available through the IMEM project (Raymer et al. 2013; Wiśniowski et al. 2016). From country-specific sources, we also found emigration data defined by previous residence for South Korea, Australia, New Zealand, and Canada. Emigration flow data defined by citizenship or nationality are reported by ILOSTAT, and data are available for Armenia, Fiji, Georgia, India, Jordan, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, and Samoa. From the OECD database, we obtained immigration data defined by citizenship for Japan, Mexico, Chile, and Israel. Annual emigration and immigration data will be used to estimate the generation component.

---TABLE 5 ABOUT HERE---

Bilateral flow data will be used to estimate the distribution component. They are hardly available outside European countries and prominent immigrant-receiving countries such as the United States, Canada, and Australia. Furthermore, the matrix of bilateral flows does not cover all possible sending countries (Cohen et al. 2008). Thus, if the model does not have good fit, we will develop alternative strategies, such as using change in migration stock data.

Finally, we will be using data from ASEAN countries, where available, to validate our estimates for emigration, immigration, and for the distribution component. We will use the incomplete data from Philippines, Indonesia, Cambodia, Thailand, and Vietnam to evaluate our resultant estimates and adjust our models accordingly.

Validation Strategy

As we have discussed earlier, very little is known about migration patterns in ASEAN countries and in the broader Asia-Pacific region. It is possible that existing modelling strategies -- which are based primarily on European countries (Raymer et al. 2011, Willekens and Baydar 1986) and prominent immigrant-receiving countries such as the U.S.A, Canada, and Australia (Cohen et al. 2008) -- are not a good match for migration patterns in ASEAN and the broader Asia-Pacific region. We thus will validate our modelling strategies in three steps:

(1) Estimated emigration flows (using two methods) with reported emigration flows;
(2) Estimated immigration flows (using two methods) with reported immigration flows; and
(3) Estimated bilateral migration flows (using two methods) with reported bilateral migration flows.

Beyond evaluating the usefulness of existing modelling strategies, our three-step validation strategy will also help understanding the accuracy of prediction models for each component of bilateral flows. This step is crucial for taking stocks of available tools and, hopefully, adapting existing models to fit the migration reality in ASEAN countries and the broader Asia-Pacific region.

Discussions and Next Steps

The project brings together expertise in migration measurement, statistical modelling, elicitation, population movements with a focus on the countries in the ASEAN region. Two important aspects of the methodology are (i) the inclusion of the origins and destinations and (ii) the techniques to incorporate auxiliary information.

Currently, we have finished gathering all relevant data for our proposed estimation strategy. In the coming months, we will generate estimates for the ASEAN region and evaluate our estimates using reported data, where available. This work will ultimately increase understanding of the mechanisms underlying population movements in the Asia-Pacific. The estimates of international migration flows will provide governments with the means to improve migration policies directed at attracting particular types of migrants or persons with specific occupational skills. This is important because migration is increasingly the major factor contributing to population change and is also a significant factor in social change. Without a full understanding of migration, the ability to plan, develop improved policies or appreciate the nature of existing movements is limited.

Figure 1. Map of ASEAN and Asia-Pacific countries

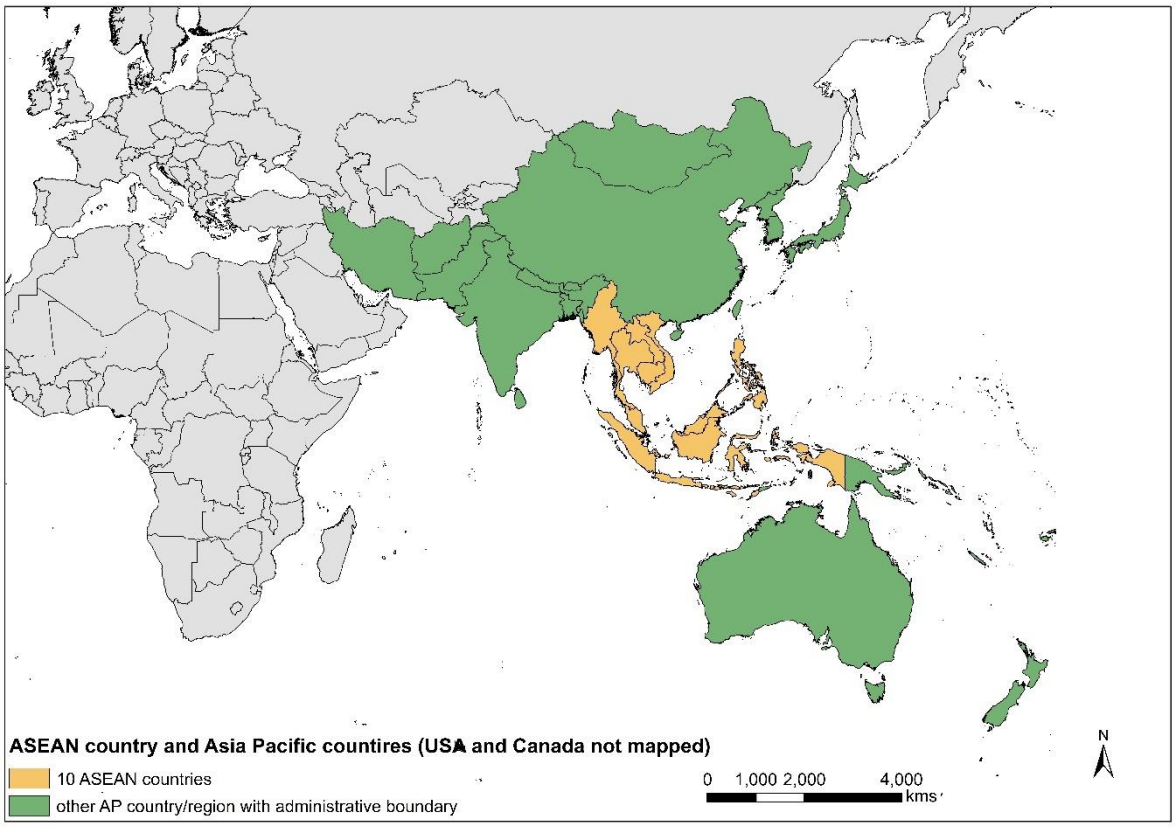

Table 1. Size and share of international migrants from, to, and within ASEAN countries, 2017

Origin	Destination	Bilateral international migration stock	% of world bilateral stock	% of Asia-Pacific bilateral stock
world	world	266,143,792	100%	
world	Asia-Pacific	81,986,535	31%	
world	ASEAN	21,537,460	8%	
Asia-Pacific	World	94,857,062	36%	
Asia-Pacific	Asia-Pacific	47,492,260	18%	100%
Asia-Pacific	ASEAN	15,735,457	6%	33%
ASEAN	World	11,484,963	4%	
ASEAN	Asia-Pacific	21,644,369	8%	46%
ASEAN	ASEAN	7,321,653	3%	15%

Source: 2017 World Bank Bilateral Migration Matrix

Table 2. Available origin-destination-specific migration flows amongst ASEAN countries, 2011

Origin	Reported by	Destination												
		BRN	KHM	IDN	LAO	MYS	MMR	PHL[##]	SGP	THA[**]	VNM	AP[*]	RW[#]	total
BRN	O													
BRN	D											103[N]	80[N]	
KHM	O													
KHM	D											11,525[N]	785[N]	
IDN	O													
IDN	D											22,926[N]	5,851[N]	
LAO	O													
LAO	D											2,305[N]	221[N]	
MYS	O													
MYS	D											11,728[N]	5,970[N]	
MMR	O													
MMR	D											22,448[N]	1,167[N]	
PHL[##]	O	15,406[R]	1,768[R]	4,793[R]	992[R]	16,798[R]	334[R]		146,613[R]	6,445[R]	4,349[R]	326,478[R]	841,365[R]	1,402,137[R]
PHL[##]	D											130,009[N]	31,321[N]	
SGP	O													
SGP	D											3,522[N]	5,292[N]	
THA[**]	O													
THA[**]	D											37,495[N]	16,109[N]	
VNM	O													
VNM	D											82,987[N]	11,848[N]	
AP[*]	O	70[N]	2,088[N]	14,415[N]	897[N]	17,947[NA]	1,689[N]	21,433[N]	1,396[N]	19,655[N]	25,089[N]		608,508[NA]	683,128[NA]
AP[*]	D												564,756[N]	
RW[#]	O	148[N]	93[N]	2,941[N]	55[N]	5,303[N]	324[N]	10,504[N]	1,984[N]	5,301[N]	4,266[N]	224,147[N]		
RW[#]	D											912,124[N]		
total	O													
total	D			494,266[R]		93,700[N]				35,000[R]		1,062,040[B]		

Source: UNPD, OECD, ILMS, and the Philippines

[*] non-ASEAN countries in our Asia-Pacific country list. Note that the counts are summed across only some of the non-ASEAN Asia-Pacific countries.

[#] rest of the world. Note that the counts are summed across only part of the rest countries.

[**] For Thailand, foreign workers are documented in a separate table in ILMS as to inflows of migrants (whose status are defined by residence). At this stage foreign workers are not included in Table 2 but Table 3.

[##] For Philippines, registered Filipino emigrants and out overseas Filipino workers statistics are added up. However, ILMS reported an "other countries" group for labour emigrants. This destination group is excluded and therefore the PHL origin row cells do not add up to PHL origin row total.

Notes: (1) the superscript following each count is the definition of migrant: R=residence, N=nationality, NA=not available;(2) Reported by=O – statistics reported by origin country, Reported by=D – statistics reported by destination country; (3) if more than one flow statistics are available, the maximum count and the corresponding migrant definition is shown; and (4) other Asia-Pacific countries and rest of the world groups have incomplete country lists.

Table 3. Available origin-destination-specific labour migrant flows amongst ASEAN countries, 2011

Origin	Reported by	Destination												
		BRN	KHM	IDN	LAO	MYS	MMR	PHL	SGP	THA**	VNM	AP*	RW#	total
BRN	O													
BRN	D			6[N]										
KHM	O					4,351[R]				16,837[R]		5,031[R]		26,219[R]
KHM	D			8[N]				4[N]						
IDN	O	10,804[R]	33[R]		122[R]	134,266[R]	36[R]	187[R]	47,786[R]	1,113[R]	337[R]	161,628[R]	225,039[R]	586,802[R]
IDN	D							360[N]						
LAO	O													33,588[NA]
LAO	D							3[N]						
MYS	O													
MYS	D			4,938[N]				458[N]						
MMR	O					7,222[R]			569[R]	8,294[R]		1,970[R]	225[R]	18,280[R]
MMR	D			180[N]				1[N]						
PHL	O	15,406[R]	1,768[R]	4,793[R]	992[R]	16,797[R]	334[R]		146,613[R]	6,445[R]	4,349[R]	250,881[R]	833,553[R]	1,318,727[R]
PHL	D			3,816[N]										
SGP	O													
SGP	D			2,116[N]				393[N]						
THA**	O	3,354[R]	65[R]	1,289[R]	842[R]	4,321[R]	140[R]	135[R]	11,461[R]		795[R]	79,285[R]	37,261[R]	147,623[R]
THA**	D			3,863[N]				293[N]						
VNM	O	82[R]	2,820[R]		4,277[R]	9,977[R]			61[R]			63,026[R]	7,998[R]	88,298[R]
VNM	D			116[N]				119[N]						
AP*	O					2,459[R]			1,078[R]				237,515[R]	262,961[R]
AP*	D			50,365[N]				13,721[N]						
RW#	O													
RW#	D			11,335[N]				848[N]						
total	O													
total	D			77,307[N]				17,142[N]		91,220[N]				

Source: ILMS

** non-ASEAN countries in our Asia-Pacific country list. Note that the counts are summed across only some of the non-ASEAN Asia-Pacific countries.*

 # rest of the world. Note that the counts are summed across only part of the rest countries.

*** For Thailand, foreign workers are documented in a separate table in ILMS as to inflows of migrants (whose status are defined by residence). At this stage foreign workers are not included in Table 2 but Table 3.*

Notes: (1) the superscript following each count is the definition of migrant: R=residence, N=nationality, NA=not available;(2) Reported by=O – statistics reported by origin country, Reported by=D – statistics reported by destination country; (3) if more than one flow statistics are available from ILMS, the maximum count and the corresponding migrant definition is shown; and (4) other Asia-Pacific countries and rest of the world groups have incomplete country lists in ILMS.

Table 4. Available origin-destination-specific asylum seeker flows amongst ASEAN countries, 2011

	Destination												
Origin	BRN	KHM	IDN	LAO	MYS	MMR	PHL	SGP	THA	VNM	AP*	RW#	total
BRN											1[NA]		
BRN											2[N]		
KHM					7[NA]				61[NA]		82[NA]	36[N]	
KHM											96[N]	67[N]	
IDN					11[NA]						334[NA]	36[N]	
IDN											549[N]	40[N]	
LAO									8[NA]		14[NA]	1[NA]	
LAO											36[N]	27[N]	
MYS											115[NA]	27[N]	
MYS											255[N]	78[N]	
MMR		37[NA]	112[NA]		7,348[NA]		4[NA]		12,395[NA]		3,806[NA]	410[NA]	
MMR											869[N]	590[N]	
PHL			6[N]		7[NA]				1[NA]		301[NA]	54[NA]	
PHL											469[N]	66[N]	
SGP											20[NA]	3[NA]	
SGP											26[N]	6[N]	
THA					106[NA]						57[NA]	25[NA]	
THA											66[N]	114[N]	
VNM		2[N]			5[NA]		1[NA]		258[NA]		97[NA]	938[NA]	
VNM											255[N]	1,364[N]	
AP*		9[NA]	2,500[NA]		2,648[NA]		24[NA]		420[NA]			80,308[NA]	
AP*												86,885[N]	
RW#		1[NA]	615[NA]		805[NA]		29[NA]		214[NA]		43,603[NA]		
RW#											60,243[N]		
total													
total													

Source: OECD, UNHCR

** non-ASEAN countries in our Asia-Pacific country list. Note that the counts are summed across only some of the non-ASEAN Asia-Pacific countries.*

 # rest of the world. Note that the counts are summed across only part of the rest countries.

Notes: (1) the superscript following each count is the source data. Statistics sourced from OECD are reported by destination countries. Statistics sourced from UNHCR do not have the reporting countries specified (see http://www.unhcr.org/statistics/STATISTICS/45c06c662.html).

Table 5. Input data for modelling and validation

Purpose	Country	Emigration data	Immigration data	Bilateral flow data
Modelling	31 European countries*	x	x	31 x 31 matrix
	Korea	x	x	+
	Australia	x	x	+
	New Zealand	x	x	+
	Canada	x	x	+
	Armenia^	x		
	Fiji^	x		
	Georgia^	x		
	India^	x		
	Jordan^	x		
	Kazakhstan^	x		
	Kyrgyzstan^	x		
	Tajikistan^	x		
	Uzbekistan^	x		
	Samoa^	x		
	Japan^		x	
	Mexico^		x	
	Chile^		x	
	Israel^		x	
	Denmark			+
	Germany			+
	Netherlands			+
	Sweden			+
	United States of America			+
	United Kingdom			+
	Belgium			+
	Italy			+
	Spain			+
Validation	Philippines	x	x	+
	Indonesia	x	x	+
	Cambodia**	x	x	
	Thailand**	x	x	
	Vietnam**	x	x	

Notes: x *denotes available data;*
** Harmonized data for 31 European countries are made available through the IMEM project (http://www.imem.cpc.ac.uk/About.aspx);*
^ Migrants are defined by citizenship rather than previous residence
+ Bilateral flow data available reported by destination country, with limited availability for origin countries (see Cohen et al. 2008);
*** Only labour migration flow data available.*

Appendix. Asia-Pacific country list, with ASEAN countries marked bold

Region	Code	Country/Area name
Eastern Asia	CHN	China
Eastern Asia	HKG	China, Hong Kong Special Administrative Region
Eastern Asia	MAC	China, Macao Special Administrative Region
Eastern Asia	PRK	Democratic People's Republic of Korea (North Korea)
Eastern Asia	JPN	Japan
Eastern Asia	MNG	Mongolia
Eastern Asia	KOR	Republic of Korea (South Korea)
Eastern Asia	TWN	Taiwan
South-Eastern Asia	**BRN**	**Brunei Darussalam**
South-Eastern Asia	**KHM**	**Cambodia**
South-Eastern Asia	**IDN**	**Indonesia**
South-Eastern Asia	**LAO**	**Lao People's Democratic Republic**
South-Eastern Asia	**MYS**	**Malaysia**
South-Eastern Asia	**MMR**	**Myanmar**
South-Eastern Asia	**PHL**	**Philippines**
South-Eastern Asia	**SGP**	**Singapore**
South-Eastern Asia	**THA**	**Thailand**
South-Eastern Asia	TLS	Timor-Leste
South-Eastern Asia	**VNM**	**Viet Nam**
Southern Asia	AFG	Afghanistan
Southern Asia	BGD	Bangladesh
Southern Asia	BTN	Bhutan
Southern Asia	IND	India
Southern Asia	IRN	Iran (Islamic Republic of)
Southern Asia	MDV	Maldives
Southern Asia	NPL	Nepal
Southern Asia	PAK	Pakistan
Southern Asia	LKA	Sri Lanka
Australia and New Zealand	AUS	Australia
Australia and New Zealand	NZL	New Zealand
Melanesia	FJI	Fiji
Melanesia	NCL	New Caledonia
Melanesia	PNG	Papua New Guinea
Melanesia	SLB	Solomon Islands
Melanesia	VUT	Vanuatu
Micronesia	GUM	Guam
Micronesia	KIR	Kiribati
Micronesia	MHL	Marshall Islands
Micronesia	FSM	Micronesia (Federated States of)
Micronesia	NRU	Nauru
Micronesia	MNP	Northern Mariana Islands
Micronesia	PLW	Palau
Polynesia	ASM	American Samoa
Polynesia	COK	Cook Islands
Polynesia	PYF	French Polynesia
Polynesia	NIU	Niue
Polynesia	WSM	Samoa
Polynesia	TKL	Tokelau
Polynesia	TON	Tonga
Polynesia	TUV	Tuvalu
Polynesia	WLF	Wallis and Futuna Islands
North America	CAN	Canada
North America	USA	The United States (of America)
Others	AP	Non-ASEAN Asia-Pacific countries
Others	RW	rest of the world
Others	total	total

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