Accounting for income convergence by developing Asian economies: The role of jobs and earnings from fabrication and knowledge activities in global value chains[1]

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Abstract

This paper examines income convergence using a global value chain perspective. We study jobs and income in developing Asia from participation in the global factory of manufactured products. A new dataset with occupational tasks is combined with multi-regional input-output tables to measure the GVC involvement of fifteen developing Asian economies from 2000 to 2018. Developing Asian economies have been catching up much faster in fabrication compared to knowledge activities. In 2018, on average, GVC income levels from fabrication stood at 57% of levels observed in the OECD, with several countries such as the PRC having closed the gap in fabrication income. For knowledge-intensive activities, it stood on average at 24% by the end of 2018. Our findings suggest convergence in income from fabrication proceeded at a faster pace compared to knowledge activities. We observe convergence in income from knowledge activities, but from low levels such that a major gap still exists by 2018.

Keywords: Global value chains; knowledge activities; fabrication activities; innovation, convergence; Asia

JEL codes: F14, F60, O19

1. Introduction

The second half of the 20th century has witnessed a momentous shift in the center of gravity for the production and export of manufactured products from advanced economies to East Asia, beginning with Japan in the 1950s and the People's Republic of China (PRC) most recently. The key to the lasting success of current high-income economies has been the ability to transition from assembly to higher value-added exports by taking advantage of knowledge flows and technology transfer within global production networks (Gereffi 1999). In a recent book, Baldwin (2016) argues that this process has resulted in rapid industrialization and income convergence, which he refers to as the 'Great Convergence'.[2] However, by 2018, gaps in income per capita are still considerable: GDP per capita in the PRC and other developing Asian economies is about one third of the level in OECD countries. Why is income per capita convergence incomplete?

In this paper, we use a global value chain (GVC) income accounting framework to examine the role of scale and productivity effects in driving income per capita convergence in developing Asian economies to levels observed in Organisation for Economic Co-operation and Development (OECD) member countries. Scale refers to the share of workers from developing Asian countries involved in GVCs of manufactured products. Productivity refers to the productivity level of carrying out tasks in the GVC. Using the approach introduced by Buckley et al. (2020), we combine two datasets for a sample of 15 developing Asian economies representing over 90% of total employment in the region and 29 OECD member countries between 2000 and 2018. First, a new dataset on labor income and number of workers by year, industry, and occupation, which was expanded for the purpose of this study to cover eleven additional developing Asian economies, namely Bangladesh, Cambodia, Fiji, Kyrgyz Republic, Mongolia, Nepal, Pakistan, the Philippines, Sri Lanka, Thailand, and Viet Nam. Second, the Asian Development Bank (ADB)'s Multi-Regional Input-Output Tables (MRIOTs), a set of national input-output tables connected by means of bilateral international trade flows.

We measure where, what, and how much income is earned from GVC participation. Note that the perspective in this paper is not on manufacturing industries in developing Asia, but rather the set of activities carried out in the region for final manufactured products produced anywhere in the world (Timmer et al. 2013). For example, an Asian firm might be involved in business processing, such as data entry, accounting, or call centers, for a final manufacturing product from a firm in the United States. Indeed, activities in GVCs of manufactured products can be performed by firms classified in the manufacturing sector, but also firms in agriculture and in particular the services sector. This requires explicitly accounting for interdependence between firms using input-output linkages.

A wide range of tasks are undertaken in a value chain, such as design, various production activities, and supporting activities such as branding, marketing, and logistics. To keep the

[2] Although the focus in Baldwin's (2016) analysis is mostly on Asian countries and includes the People's Republic of China, the Republic of Korea, India, Indonesia, and Thailand, the sample of industrializing emerging economies in Baldwin (2016) also includes Poland, at times extended with Brazil and Mexico.

analysis tractable and parsimonious, we collapse the full set of activities to just two, namely jobs and income from fabrication and knowledge-intensive activities. This is sufficient for documenting our main findings. Fabrication activities are defined as the tasks carried out by workers with occupations involved in the physical transformation process. Knowledge-intensive activities are the activities that are carried out by workers with occupations that relate to pre-fabrication activities (such as R&D and design) as well as post-fabrication activities (such as branding and marketing).[3]

In the framework introduced by Buckley et al. (2020), income convergence may originate in three ways. First, through increasing the scale of either fabrication or knowledge-intensive activities, i.e. the number of workers involved in activities carried out for final manufactured products relative to the OECD. Second, through the reallocation of workers from low- to high-value added activities within GVCs, which would increase the overall skill content of the activities. This shift towards higher value-added activities within GVCs is referred to as 'functional upgrading.' A stylized functional upgrading pattern would involve the shift from assembly to own-equipment manufacturing to ultimately own-brand manufacturing (Gereffi, 1999). In our framework, functional upgrading is defined as an increase in the share of workers in knowledge-intensive activities relative to fabrication activities. Finally, productivity convergence in one (or both) activities will lead to income convergence and implies process upgrading, for example through better organization of the production process or the use of improved technology, or product upgrading, for example by improving quality or design, or adding new features.

We apply this framework and find that productivity in fabrication and knowledge tasks for developing Asia converges to levels observed in the OECD, but from low initial starting points. We observe a rapid (slow) expansion in the scale of fabrication (knowledge) activities. The findings suggest the expansion in the scale of fabrication activities has been driving income convergence.

Section 2 explores the evidence from the existing literature and clarifies our contribution to the literature. Section 3 describes the methodology to measure activities in GVCs, whereas Section 4 discusses the data. Section 5 outlines the convergence framework and Section 6 presents the results. Concluding remarks are in Section 7.

2. Growth and income convergence in GVCs: a review of related literature

There are several possible approaches to study how the types of activities carried out along value chains drive growth and income convergence in an economy. Brancati et al. (2015) conduct a longitudinal study to assess the impact of GVC participation on firm's innovative activity and performance. The study is based on four waves—2008, 2009, 2011, and 2013—

[3] The mapping of occupations to tasks is provided in section 4.

of a nationally representative survey of Italian firms with a sample size of roughly 25,000 firms per wave. The richness of the dataset, which includes even firms with less than 10 employees, allows them to define value chains and their forms of governance (i.e. modes of participation) based on type and destination markets of goods, type and origin markets of inputs purchased, existence and length of inter-firm relationships, and firms' degree of involvement in the conception of the final product. The dataset also provides information on firm structural characteristics, choices, and strategies, allowing the authors to explore several dimensions of upgrading. They find that firms involved in GVCs display a significantly higher upgrading propensity than 'standalone' companies or enterprises in national value chains, but there are two moderating factors: first, the type of GVC governance; and second, the capability of firms to handle the existing stock of knowledge and access and exploit new inflows from external sources.

Large, nationally representative firm-level surveys such as the one used by Brancati et al. (2015) allow researchers to analyze upgrading patterns in granular detail, but they do not allow to trace activities along value chains across economies; in fact, such surveys are hardly ever harmonized across economies, which makes this type of study difficult to replicate. It is also worth noting that the cost of conducting such detailed firm-level surveys may be prohibitive for developing economies.

The analysis in Belderbos et al. (2016) is based on a dataset of about 5,000 cross-border greenfield investments in R&D and innovation between 2002 and 2011. Therefore, their data can trace activities along value chains across economies but is limited to one specific type of linkage along value chains. The authors set out to investigate the 'pull' and 'push' factors of global investments in R&D and innovation focusing on the attractiveness of global cities. Most of these investments concern activities such as development, design, and testing, which often benefit from proximity to the lead firm's major markets. The data show that, until 2008, a substantial share of such investments went to Asian global cities such as Shanghai, Beijing, Bangalore, and Singapore. After the Global Financial Crisis, however, this trend slowed down and countries like the US, Germany, and the UK attracted a growing number of R&D investments. Emerging Asian economies like India and the PRC have also increased their R&D investments abroad.

Belderbos et al. (2016) find no evidence that prior investment in production activities abroad 'push' firms to follow up with R&D investments abroad; rather, alternative foreign locations where firms have already set up production activities 'pull' further investment in R&D. This is particularly evident for engineering industries, in which technology development is characterized by short product life cycles and continuous innovation processes. In addition, the evidence suggests that outward investments in R&D and innovation increase the lead firms' innovation activities in their home city; in other words, innovation activities at home and abroad are likely to be complementary.

Pahl and Timmer (2020) investigate the relationship between GVC participation and long-term growth of employment and labor productivity at the level of individual manufacturing value chains, which they identify by the exporting country-industry. The analysis is based on

an unbalanced panel of 58 developed and developing economies and 13 industries—making it a total of 754 country-industries—over the period 1970 to 2008. The data is divided into three 10-year periods going backwards from 2008, and one 8-year period 1970 to 1978. They find two meaningful results: first, a strong positive association of GVC participation with labor productivity growth in the export chain, which becomes larger the further a country is from the productivity frontier; and second, no significant association of GVC participation with employment growth, except for countries close to the productivity frontier, where the association is negative. These results lend support to the so-called 'mixed-blessing hypothesis,' according to which firms that participate in GVCs might be successful at absorbing advanced technologies, but less so in employing labor.

For their study, Pahl and Timmer (2020) combine national input-output tables with a dataset of formal manufacturing employment and value added derived from national industrial surveys and censuses. This approach is basically a macroeconomic analysis of GVCs. Because it is built on the national account series of gross output, value added, and employment, it can include a large number of developed and developing economies. However, the informal workforce, which makes up a large share of manufacturing employment in developing economies, may not be counted in national industrial surveys and censuses.

Alternative research designs to econometric analysis involve, for example, comparative case analysis. Awate et al. (2012) study the knowledge strategy and the process through which Suzlon Energy Inc., an emerging multinational enterprise from India, reached the technology frontier of the wind turbine industry within 12 years from its entry. The technology frontier was represented by Vestas Wind Systems A/S, a multinational enterprise from Denmark. The authors used qualitative analysis based on archival sources and interviews with company executives and wind industry experts to show that Suzlon's strategic quest in the initial years was focused on the production of output on a technology standard and design framework established by Vestas. As a result, Suzlon developed a comparable product portfolio to Vestas. Next, they analyzed the two firms' patents and patent citations from 2000 to 2010, and found that Vestas' knowledge base was deep and composed of a broad network of different technology sources and their well-defined groupings, which are important indicators of firm's innovation capability. Suzlon's knowledge base, in contrast, was shallower and narrower, indicating that it was lagging in terms of innovation capabilities. In other words, while Suzlon had caught up in terms of output, it was yet to catch-up in terms of innovation capabilities.

The findings in Awate et al. (2012) exemplify the fact that for an emerging economy multinational enterprise, in the initial years, investing in output capabilities is far more attractive than investing in innovation capabilities because of the certainty and speed of returns. Yet, to be a leader in the industry, these firms cannot simply buy knowledge; they need to generate innovations that will push forward the industry's technology frontier.

Xing and Huang (2020) perform a teardown analysis of three popular smartphones sold in the PRC—Apple iPhone X, Xiaomi MIX 2, and OPPO R11s—using both production cost and retail price as the baselines. The objective of the analysis is to understand the distribution of value added along different segments of the GVC for smartphones in the PRC, and in particular

how much of this value added (and from which segment) is captured by the Chinese economy. The confidential industry data at the basis of this analysis not only contains rich information about the sources and prices of major components in the production stage, but it also reveals clues on the value-added captured by the lead firms in the pre- and post-production stages, as shown by their gross profits. Using production costs as the baseline, the teardown analysis shows that Chinese firms are still not able to fulfill more advanced manufacturing tasks, although they are showing some signs of catching up. Using retail price as the baseline, the authors find that Chinese manufacturers have found an alternative path to moving up the value chain: instead of developing advanced technological capabilities, they have done it by building a strong brand name.

Xing and Huang (2020)'s methodology is built on the assumption that value-added contributed by pre- and post- production stages accrues to the national economy where the brand vendor's headquarter is located. However, a proportion of high value-added activities may be conducted by foreign subsidiaries. In other words, there may be a home-country bias of value capture estimation in the pre- and post- production stages. Furthermore, although the findings provide a novel insight into functional specialization along the smartphone GVC in the PRC, they are still based on product-level case-based analysis, and there is no guarantee that the cases under examination are genuinely representative of the broader roles of the relevant countries in the GVC.

In sum, existing evidence shows a positive association between GVC participation and labor productivity in developing economies. However, catching up with industry leaders in terms of product portfolio is one thing; catching up in terms of innovation capabilities is another, and emerging economy multinational enterprises still have a way to go. Finally, the case study of the three smartphones from the PRC shows that a firm can move up the value chain by building a strong brand name, while the returns from innovation capabilities are more uncertain and may be realized in the long run.

Evidence from advanced economies also suggests that GVC participation increases a firm's probability of functional upgrading, although that depends on a firm's mode of participation and capability. While there are co-location effects between production and innovative activities that may pull R&D investment to offshore production bases, innovative activities conducted at home and abroad are likely to be complementary.

Our paper relates to these studies in various ways. The review suggests that moving from imitation to innovation is not an automatic process and requires active learning by doing. Therefore, we follow the distinction between production and innovation tasks in GVCs (Awate et al. 2012; Belderbos et al. 2016). Furthermore, Timmer and Pahl (2020) demonstrate the relevance of distinguishing between productivity and employment effects from participation in GVCs. This motivates us to apply the framework by Buckley et al. (2020) which distinguishes between the role of scale (employment generation) and productivity in driving income convergence. The framework is discussed in section 5. First, we present the methodology to measure jobs and income in GVCs followed by a presentation of the data used to implement the methodology.

3. Measuring activities in GVCs: methodology

We study the production fragmentation of final manufactured products. Final products are not used as intermediate inputs but consumed or for investment. The GVC of a final manufactured product is defined as the value-added of all (knowledge and fabrication) activities that are directly and indirectly needed to produce the final product (Timmer et al. 2013).

Our methodology involves two steps. First, we derive GVC income and jobs as in Timmer et al. (2013). The second step involves disaggregating income and employment by type of activity (fabrication and knowledge) involved in the GVCs of final manufactured products.

To start, let **f** be a vector of final demand (of dimension *cs × 1*) with *c* the number of countries and *s* the number of goods or sectors in the economy (goods and sectors are used interchangeably in input-output analysis). Let **A** be the *cs × cs* intermediate input coefficients matrix, with typical element a_{st} the amount of good *s* from country *c* used in production of one unit of good *t* from country *c*.

Let vector **v** (*cs × 1*) be the amount of value added a country adds to final demand **f**. This can be derived using:

$$\mathbf{v} = \mathbf{R}(\mathbf{I}-\mathbf{A})^{-1}\mathbf{f}, \qquad (1)$$

where **R** is the matrix (*cs × cs*) with diagonal elements the value added to gross output ratio for sector *s* in country *c* and zeroes otherwise. $(\mathbf{I}-\mathbf{A})^{-1}$ is the Leontief inverse matrix that ensures direct and indirect output related to final demand is taken into account (see Miller and Blair (2009) for an accessible introduction).

A couple of issues are worth mentioning. First, we only consider the final demand for manufactured goods in the vector of final demand **f**. Other goods, such as agricultural products and services in **f** are set to zero.[4] Second, this method is appropriate for any form the production network may take, as long as it is described in production stages linked through trade and therefore measured in input-output tables.

Next, consider a matrix **B** with dimension *k × cs*, where *k* is the number of different activities—in our approach fabrication and knowledge activities. The typical element b_{kcs} denotes the labor income from workers performing activity *k* in sector *s* of country *c*, expressed as a share of value added in *s*.

[4] Indeed, if we would consider all goods and services, we are back to a country's GDP.

GVC income, the value added from activity *k* (fabrication or knowledge) in final demand, can then be expressed as:

$$\mathbf{y} = \mathbf{Bv} = \mathbf{BR}(\mathbf{I}-\mathbf{A})^{-1}\mathbf{f}, \quad (2)$$

where **y** is the vector of GVC income (dimension *k × 1*) for fabrication or knowledge activities in final demand. Since we consider final manufactured products in **f**, we obtain value added from fabrication and knowledge in final manufacturing products.[5]

We use equation 2 to measure income from participating in the global value chains of manufactured products. This is called GVC income (Timmer et al. 2013), which is the value added generated on the domestic territory for the worldwide production of manufactured goods. Since manufactured goods are highly internationally contestable, GVC income can be viewed as an indication of competitiveness as argued by Timmer et al. (2013). Moreover, being involved in activities related to manufacturing products appears to result in unconditional convergence (Rodrik, 2013). Hence, GVC income from manufactured products appears a relevant set of the economy to examine in order to understand the realized and potential for catching up by developing Asia.

In an analogous fashion to GVC income, consider a matrix **E** with dimension *k × cs*, where *k* is the number of different activities—in our approach fabrication and knowledge activities. The typical element e_{kcs} denotes the number of workers performing activity *k* in sector *s* of country *c*, divided by value added in *s*.

GVC jobs, the number of workers from activity *k* (fabrication or knowledge) in final demand, can then be expressed as:

$$\mathbf{z} = \mathbf{Ev} = \mathbf{BR}(\mathbf{I}-\mathbf{A})^{-1}\mathbf{f}, \quad (3)$$

where **z** is the vector of GVC jobs (dimension *k × 1*) for fabrication or knowledge activities in final demand. Since we consider final manufactured products in **f**, we obtain GVC jobs from fabrication and knowledge in final manufacturing products.

Equations (2) and (3) are our key equations to measure GVC income and GVC jobs from fabrication and knowledge activities in the global value chains of final manufactured products.

[5] It measures the labor income of workers that carry out the activity. Value added is the sum of labor and capital income, but capital income is not considered. This is partly because capital is difficult to allocate to a particular activity, but also because the ownership of capital income is difficult to assess. Capital income in a country might well end up abroad due to foreign ownership. Labor income typically accrues to the country as workers reside and work in the same country and is therefore considered the appropriate unit of analysis.

4. Data

We aim to measure jobs and income earned by developing Asian economies in the global value chains of final manufactured products. This requires combining two datasets. This section describes both datasets, relegating details on construction to a Data Appendix.

The first dataset we use is the Occupations Database (OD), introduced in Reijnders and de Vries (2018), and extended for this paper by a new set of developing Asian economies. The database provides information on wages and the number of workers by occupation-country-sector-year. That is, for each of the occupation-country-sector-year cells we measure the employment and the labor income share. We describe below the sectors distinguished, the countries covered, time coverage, and sources used to measure the occupations of workers.

A common set of 35 (ISIC revision 3.1) sectors covering the overall economy are distinguished for each country. These include agriculture, mining, construction, utilities, 14 manufacturing industries, telecom, finance, business services, personal services, 8 trade and transport services industries and 3 public services industries. Sectors are chosen such that they coincide with the sectors distinguished in the ADB Multi-Regional Input-Output Tables.

The original occupation dataset by Reijnders and de Vries (2018) includes 40 economies, including the PRC, India, Indonesia, and Taipei,China (see Appendix Table A1). For the analysis in this paper, the data for the Asian economies in the original dataset has been revised and the set has been extended with an additional eleven developing Asian economies, namely Bangladesh, Cambodia, Fiji, Kyrgyz Republic, Mongolia, Nepal, Pakistan, the Philippines, Sri Lanka, Thailand, and Viet Nam. These countries were selected based on data available to us. It will be relevant to extend coverage to other developing economies in future work.

For each of the 35 industries in the 15 developing Asian economies, we have developed time series information on occupations and their wages for the period from 2000 to 2018. Table 1 provides an overview of the sources and survey years. Constructing this dataset entails processing detailed labor force surveys. Sampling weights are used to measure occupational employment by 56 two-digit occupations in each of the 35 sectors. The two-digit occupations follow the 2008 International Standard Classification of Occupations (ISCO 08). Hence, for each year for which a labor force survey is available, we constructed an employment matrix that has dimensions 35 sectors by 56 occupations.[6] We assume wages are equalized across sectors conditional on occupation, and tabulate the median wage by each of the 56 occupations for each of the survey years. We then combine the employment share with the relative wage of the occupation to calculate the labor income share. This results in a labor income matrix with 35 sectors by 56 occupations.

Clearly, such detailed information is novel and not readily available from public sources. Yet, more aggregate information on employment by broad sectors or employment by broad

[6] The number of 2-digit occupations is lower than 56 if an occupation is not observed in a particular sector.

occupations is available from the ILO labor statistics database. Data available at the ILO database was used to cross-check the accuracy at which our dataset has been constructed.

For most countries, we either have a time series or data for a year close to the starting year (2000) and ending year (2018) of the analysis, see Table 1, with notable exceptions of Bangladesh, the Kyrgyz Republic, and Viet Nam. If we do not have information for a given year, then we use interpolation or extrapolation while making sure that the employment shares always sum to one. These shares are subsequently multiplied with the number of persons employed by country-industry-year. This approach closely follows Reijnders and de Vries (2018).

Table 1. Source of occupational data for fifteen developing Asian economies

	Country	Survey Name	Years
1	Bangladesh	Labor Force Survey (LFS)	2006, 2010, 2013, 2016
2	Cambodia	Cambodia Socio-Economic Survey (CSES)	2003/2004, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017
3	Fiji	Employment and Unemployment Survey (EUS)	2004, 2005, 2010, 2011, 2015, 2016
4	India	National Sample Survey – Employment Unemployment Survey (NSS-EUS)	1999/2000, 2004/2005, 2011/2012
5	Indonesia	National Labor Force Survey (SAKERNAS)	2000, 2003, 2005, 2008, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017
6	Kyrgyz Republic	Kyrgyzstan Integrated Household Survey (KIHS)	2012, 2013, 2014, 2015, 2016, 2017, 2018
7	Mongolia	Labor Force Survey (LFS)	2002, 2003, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018
8	Nepal	Nepal Labor Force Survey (NLFS)	1999, 2008, 2017/2018
9	Pakistan	Labor Force Survey (LFS)	2001/02, 2003/04, 2005/06, 2006/07, 2008/09, 2009/10, 2010/11, 2012/13, 2013/14, 2014/15, 2017/18

10	Philippines	Labor Force Survey (LFS)	quarterly releases for: 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2010, 2011, 2012, 2013, 2014, 2015, 2017
11	PRC	Population census	2000, 2010, 2015
12	Sri Lanka	Labor Force Survey (LFS)	2002, 2003, 2004, 2005, 2006, 2007, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017
13	Taipei,China	Manpower Utilization Survey (MUS)	2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018
14	Thailand	Labor Force Survey (LFS)	2000, 2005, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018
15	Viet Nam	Labor Force Survey (LFS)	2007, 2009, 2010, 2012, 2013, 2014, 2016

Notes: We drop the LFS in Indonesia before 2003 because of anomalies in the data. For China, 2015 is an interim population census, based on a more limited sample compared to a full census.

The new occupation dataset for developing Asian economies is based on an in-depth investigation of sources and methods on a country-by-country basis, described in detail in Appendix B. Yet, the dataset is not without concerns. In particular, the accuracy is subject to data limitations in several Asian economies. Measurement error will be larger for those countries with more limited statistical capacity, especially if statistical offices have a small budget and limited experience in administering labor force surveys to cover an adequate and nationally representative portion of the workforce.[7] Note that below we describe aggregation of employment and labor income shares to two types of activities. Hence, the final country-year matrices we work with have dimensions 35 sectors by 2 occupational groupings. More aggregated data reduces measurement error.

In a final step, we follow Timmer et al. (2019) and Buckley et al. (2020) and distinguish between knowledge and fabrication activities based on the occupations of workers. [8]

[7] See the World Banks documentation of statistical capacity of countries here: https://datatopics.worldbank.org/statisticalcapacity/SCIdashboard.aspx.

[8] Various mappings of labor income by activity from occupation are possible. Reijnders and de Vries (2018) map occupations in routine and non-routine occupations. Timmer et al. (2019) map occupations into R&D, fabrication, marketing, and management. In this paper we follow Buckley et al. (2020) and distinguish fabrication and knowledge activities.

Fabrication activities are defined as those activities carried out by workers with occupations involved in the physical transformation process. Example occupations are machine operators and assemblers. Knowledge activities are defined as activities that are carried out by workers involved in a wide range of pre-fabrication activities (conceptualization, R&D, design, engineering, and specification development) as well as post-fabrication activities (marketing, branding, and distribution). The allocation of workers into knowledge and fabrication activities is exclusive (each worker features only in one set) and exhaustive (each worker is allocated to a set), see Table 2. The resulting labor income shares and employment of knowledge and fabrication activities by country-industry-year are used for matrix **B** in equation (2) and matrix **E** in equation (3) respectively.

Table 2. Mapping of Occupations to Activities

Type of activity:	Example tasks:	Example occupations (ISCO08):	ISCO08 codes included
Knowledge-intensive activities	R&D, design, commercialization, engineering, marketing, advertising and brand management, specialized logistics, and after-sales services.	Professionals; Technicians and associate professionals; Clerks; Senior officials and managers.	11-14, 17-18, 21-26, 29, 31-35, 40-44, 51-54, 56-59, 91, 94-95
Fabrication activities	Assembly, parts and components manufacturing, standardized services.	Plant and machine operators and assemblers; Craft and related trades workers; Service workers and shop and market sales workers; Elementary occupations.	1-3, 61-63, 69, 71-75, 79, 81-83, 85-86, 92-93, 96, 99

Notes: Occupation descriptions based on the International Standard Classification of Occupations 2008 (ISCO 08).

The second dataset we use are the Multi-Regional Input-Output Tables (MRIOT) developed at the Asian Development Bank for the years from 2000 to 2018.[9] The MRIOT provides global

[9] The tables are constructed using the World Input-Output Tables (www.wiod.org) and using detailed data for Asian economies to distinguish these from the RoW in the original World Input-Output Tables, see https://kidb.adb.org/kidb/downloads/gvc.

input-output tables. In essence, these are national input-output tables connected by means of bilateral international trade flows. The tables provide the transactions between industries and final users of goods and services across countries for a given year. The tables contain data on intermediate products that are used in the production of goods and services. These intermediates are traded within as well as across countries and form matrix **A**. The MRIOTs also provide estimates of deliveries to final demand, vector **f**, as well as value added and gross output by country-industry to create matrix **R**.

The MRIOTs, in combination with the extended OD, allow us to examine the global production network of final manufactured products and measure the GVC income and GVC jobs by activity using equations (2) and (3).

The data provided in the MRIOTs is in current US dollars based on exchange rate conversion of data in national currencies. It is well known that exchange rates do not fully reflect the cross-country differences in consumption prices, since consumption involves a large share of non-tradable services. To compare real GVC income across countries, we adjust GVC income by activity for each country such that it is at US dollar PPPs (Purchaser Power Parities) in constant 2011 prices. We use the price levels of output-side real GDP relative to the USA from the Penn World Tables, version 9.0 (Feenstra et al. 2015).

5. GVC Income Convergence Framework

Let *Y* be the income from participation in GVCs of final manufactured products of country *c*, i.e. 'GVC income;' *L* the number of workers involved in the GVCs of final manufactured products of country *c,* i.e. GVC jobs; and *P* the population of country *c*. Then *L/P* reflects the participation of country *c* in manufactures' GVCs.[10] We can express the income *Y* from participation in GVCs of final manufactured products per head of the population *P* of country *c* as follows:

$$\frac{Y_c}{P_c} = \frac{L_c}{P_c} \times \frac{Y_c}{L_c} \qquad (4)$$

Equation 4 simply states that country *c* can increase GVC income per head of population by either increasing the scale of GVC participation, or productivity, or both.

To analyze the patterns of convergence, we express the level of an Asian economy (or a group of Asian economies) relative to the 'frontier' set by the average for the OECD countries included in the analysis. We prefer an average of OECD countries rather than a specific frontier country. Since our focus is on GVC income per capita it is not straightforward to decide which country defines the 'frontier' and we rather examine the performance of

[10] In our approach, *L* does not refer to the total labor force of a country, but only that part engaged in the global value chains of final manufactured goods.

developing Asia to the average OECD country. Asian economies that are also OECD members (i.e. Japan and the Republic of Korea) are allocated to the group of OECD countries (see Appendix Table A1 for the full list of economies). Specifically, we have the following relative measures:

$$\left(\frac{Y_c}{P_c}\right)\Big/\left(\frac{Y_{OECD}}{P_{OECD}}\right)$$ *Income ratio* (GVC income per head of population for country *c* relative to the OECD average) (5a)

$$\left(\frac{L_c}{P_c}\right)\Big/\left(\frac{L_{OECD}}{P_{OECD}}\right)$$ *Scale ratio* (GVC workers per head of population for country *c* relative to the OECD average) (5b)

$$\left(\frac{Y_c}{L_c}\right)\Big/\left(\frac{Y_{OECD}}{L_{OECD}}\right)$$ *Productivity ratio* (GVC income per GVC worker for country *c* relative to the OECD average) (5c)

Workers in global value chains can be engaged in knowledge-intensive activities, indicated by superscript *K*, or fabrication activities, indicated by superscript *F*. Hence, we have that $L_c = L_c^K + L_c^F$, and L_c^K/L_c reflects the specialization of a country in knowledge-intensive activities as opposed to fabrication activities.

Workers generate income and the total GVC income from involvement in manufactures' global value chains is given by $Y_c = Y_c^K + Y_c^F$. [11] Labor productivity from knowledge-intensive activities is denoted by Y_c^K/L_c^K, whereas for fabrication activities it is Y_c^F/L_c^F.

Following Buckley et al. (2020), we can then further decompose GVC income per head of the population *P* of a country *c* as follows:

$$\frac{Y_c}{P_c} = \frac{L_c}{P_c} \times \left[\frac{L_c^K}{L_c} \times \frac{Y_c^K}{L_c^K} + \frac{L_c^F}{L_c} \times \frac{Y_c^F}{L_c^F}\right] \quad (6)$$

Hence, global value chain income per capita (Y_c/P_c) is related to participation in global value chains (L_c/P_c), labor productivity of workers in knowledge activities (Y_c^K/L_c^K) and fabrication activities (Y_c^F/L_c^F), and the specialization in global value chains (L_c^K/L_c and $L_c^F/L_c = 1 - (L_c^K/L_c)$).

In order to analyze the drivers of convergence of Asian economies to the OECD average by type of activity, we derive additional relative measures as follows:

$$\left(\frac{Y_c^K}{P_c}\right)\Big/\left(\frac{Y_{OECD}^K}{P_{OECD}}\right)$$ *GVC knowledge income ratio* (GVC income from knowledge-intensive activities per head of population for country *c* relative to the OECD average) (7a)

[11] Income does not refer to the total income (GDP) of a country, but only that part of labor income from engagement in the global value chains of manufactured goods, which we denote GVC labor income (see also Section 3). The same reasoning applies to workers, which we denote GVC jobs.

$\left(\frac{L_c^K}{L_c}\right)/\left(\frac{L_{OECD}^K}{L_{OECD}}\right)$ *GVC knowledge worker ratio* (GVC workers in knowledge-intensive activities per total GVC workers in country *c* relative to the OECD average) (7b)

$\left(\frac{Y_c^K}{L_c^K}\right)/\left(\frac{Y_{OECD}^K}{L_{OECD}^K}\right)$ *Productivity knowledge activities ratio* (GVC income from knowledge-intensive activities per GVC worker in knowledge-intensive activities in country *c* relative to the OECD average) (7c)

The same relative measures in equations 7a - 7c are derived for fabrication activities.

Identification of drivers of convergence in this framework does not imply that causal relations have been established or that these drivers are exogenous. These drivers may be the result of more fundamental underlying causes. Also, the various drivers are not independent of each other and ideally one establishes the degree of independence from each other and their responsiveness to policy instruments. This is beyond the scope of this paper. We consider measurement of the drivers as first approximations and indicative of relative orders of magnitude.

6. What is driving income convergence? Results

This section examines what accounts for income convergence in fifteen developing Asian economies. It provides a development accounting exercise of differences in income per capita attributable to observable components using a GVC perspective. Section 6.A examines aggregate convergence patterns, distinguishing the role of GVC participation and productivity. Section 6.B splits GVC participation and productivity effects into the contribution from fabrication and knowledge activities. We present results for the aggregate of developing Asia and by Asian economy. The discussion on data quality in section 4 highlighted that a word of caution: findings for smaller economies are likely subject to larger measurement error.

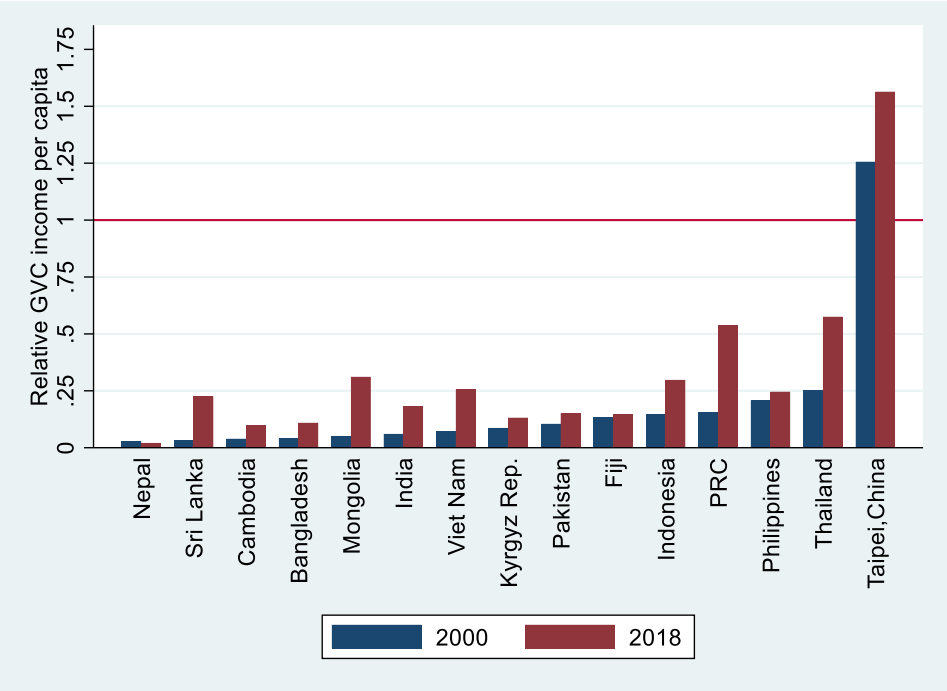
A. Aggregate patterns

Figure 1 shows GVC income divided by population in each of the 15 Asian economies in 2000 and 2018. GVC income per capita is expressed relative to the average for the OECD. Economies are sorted based on the income ratio in 2000. In 2000, with the exception of Taipei,China, all Asian economies have per capita GVC incomes that are below 25% of the OECD level, sometimes much below.

Over time, it is apparent that developing Asian economies increased their competitive position in manufactures GVCs. This is consistent with the increase in GVC participation observed by Pahl and Timmer (2020). We find GVC income in developing Asia increased more rapidly compared to the OECD average. All economies therefore managed to close part of the

GVC income gap, except for Nepal. For several of the large developing Asian economies, a rapid increase in GVC income is observed. In the PRC, Viet Nam and Thailand the GVC income ratio increased from 0.15 to 0.54, from 0.07 to 0.26, and from 0.25 to 0.58, respectively.

Figure 1: GVC income per capita relative to the OECD average

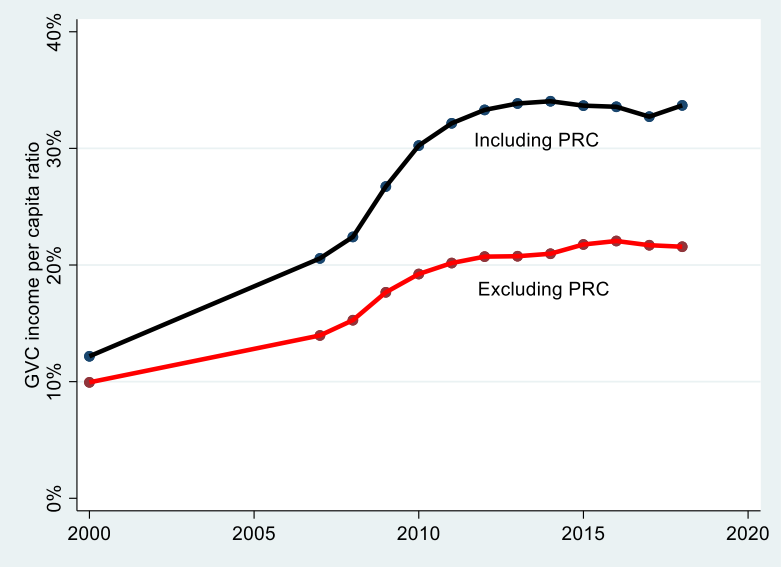


Notes: GVC income per capita calculated as real GVC income in final manufacturing products, expressed per head and at 2011 constant PPPs. The GVC income ratio is calculated using (5a), and is relative to the (unweighted) average for the OECD.
Source: Authors' calculations based on ADB MRIOTs.

Figure 2 shows the GVC income gap for the aggregate of the fifteen Asian economies over time. The dots in the figure refer to years for which ADB MRIOTs are available. The convergence process appears more rapid before 2010, but it has continued during the 10s. Levels are affected by excluding the PRC, but trends are qualitatively similar. The weighted average income ratio for the 15 Asian economies rose from 12% in 2000 to 34% by 2018.[12] Although impressive, it is still about one third the OECD average, thus a sizable gap remains.

Figure 2: GVC income per capita in developing Asia relative to OECD

[12] Excluding the PRC it rose from 10% in 2000 to 22% by 2018.



Notes: GVC income per capita calculated as real GVC income in final manufacturing products, expressed per head and at 2011 constant PPPs. Aggregate GVC income per capita of the 15 developing Asian economies (with and without PRC) relative to (unweighted) OECD average.
Source: Authors' calculations based on ADB MRIOTs.

What is accounting for income convergence? We use the framework introduced in section 5 to examine the role of scale and productivity. Scale refers to the number of workers that participate in the global value chains of manufactured products. Following Timmer et al. (2013), these are called GVC jobs, which are the jobs generated on the domestic territory for the worldwide production of manufactured goods measured using equation (3). Productivity refers to income per worker, which is defined as real GVC income divided by GVC jobs.

Figure 3 shows decomposition results by economy. Panel A shows the scale of GVC participation in each of the fifteen developing Asian economies in 2000 and 2018. A value above one indicates that a larger share of the workforce is employed in GVCs relative to the OECD average.

In 2000, 9 out of 15 economies had a scale ratio above one. This increased to 12 out of 15 by 2018. In fact, in India, Indonesia, the PRC, Taipei,China, and Thailand the ratio is above 2, which highlights the active involvement of Asian workers in manufactures GVCs. The scale ratio for the aggregate of developing Asian economies is 1.34 in 2000 rising to 2.10 by 2018. This suggests the GVC income gap between developing Asia and the OECD is not due to the overall scale of their involvement in GVCs.[13]

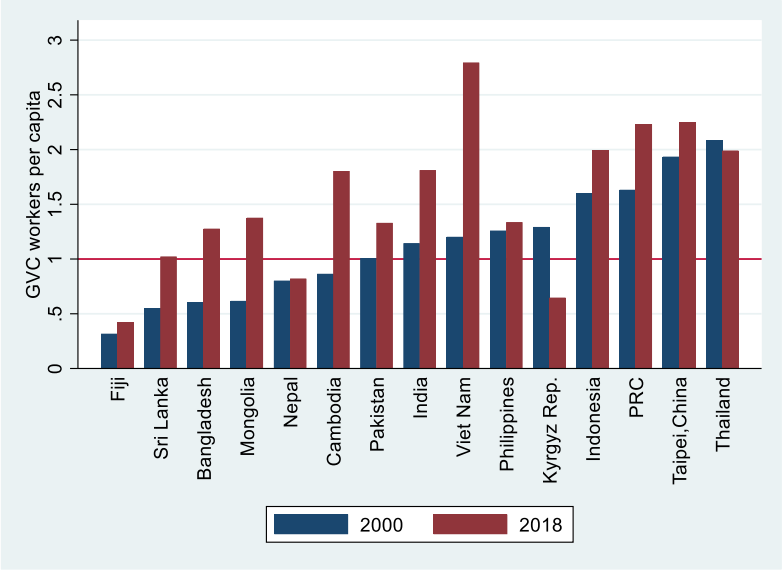
Panel B shows the income gap is due to differences in productivity. On average, the productivity ratio is about 9% the average level for the OECD in 2000. While productivity rapidly increased, it started from low levels such that it is still at only 16% the OECD level by 2018.

[13] Structural transformation in OECD economies has been such that the output and employment share of services activities not related to manufactured products increased. This affects the observed changes in the ratios.

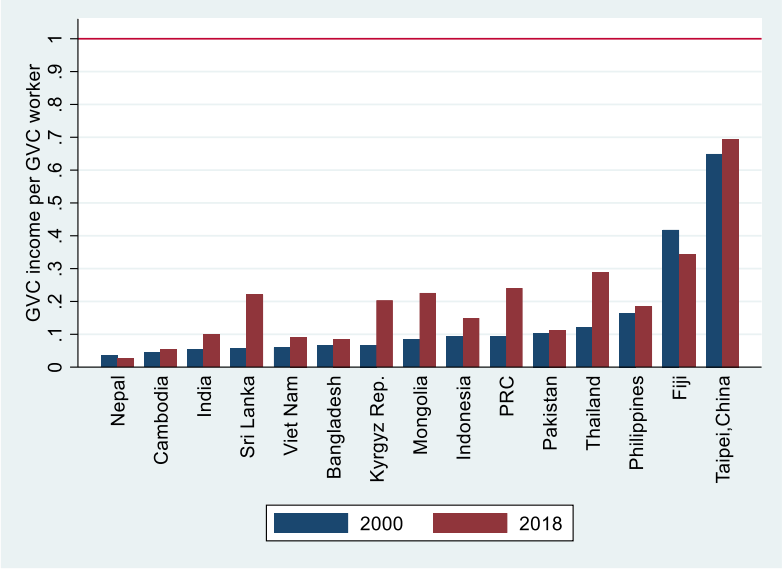
This accounting exercise suggests that the gap in scale from being involved in manufactures GVCs has been closed by most developing Asian economies. Yet there remains a considerable gap in productivity per worker such that on average developing Asia is at about one third the GVC income level of the OECD. The next subsection goes one step further by exploring the role of fabrication and/or knowledge activities for scale and productivity effects in accounting for the income gap.

Figure 3: Accounting for the gap in GVC income per capita

Panel A. Scale effect: GVC workers per head of population relative to the OECD average



Panel B. Productivity effect: GVC income per GVC worker relative to the OECD average



Notes: In panel (a): GVC workers per capita calculated as GVC jobs in final manufacturing products divided by population, relative to that ratio for the average of OECD economies. In panel (b): GVC income calculated as real

GVC income in final manufacturing products, expressed at 2011 constant PPPs and divided by GVC workers calculated as GVC jobs in final manufacturing products, again relative to that ratio for the average of OECD economies.
Source: Authors' calculations based on ADB MRIOTs and employment by economy-industry-year.

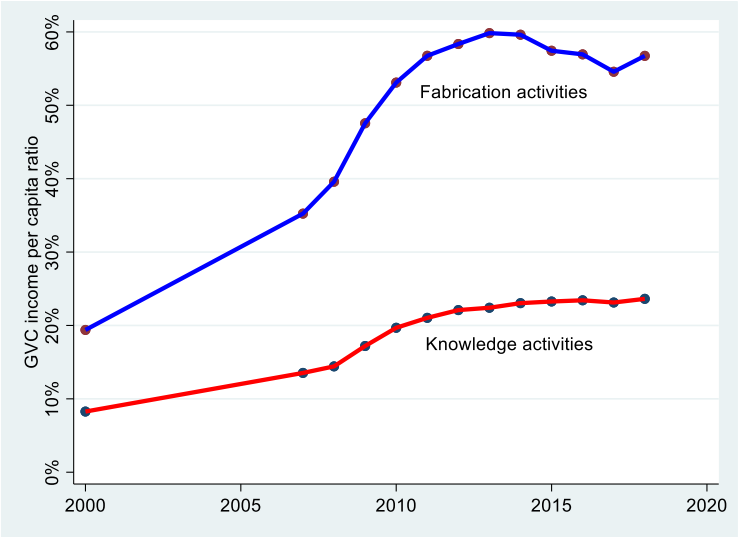
B. Distinguishing fabrication and knowledge activities

This subsection uses the new occupation dataset for fifteen Asian economies to explore the type of activities undertaken by domestic workers involved in manufactures GVCs. we use labor income shares by economy *x* industry *x* occupation *x* year to split GVC income into fabrication and knowledge-intensive activities. Similarly, we use employment shares by economy *x* industry *x* occupation *x* year to split GVC jobs into jobs related to fabrication and knowledge-intensive activities. This permits an application of the decomposition framework that explores the role of activities in accounting for income convergence.

Figure 4 shows convergence in GVC income by activity for developing Asia. It shows the GVC income ratio for the aggregate of developing Asian economies relative to the average ratio for the OECD. This Figures suggests that the aggregate convergence trend shown in Figure 2 masks a clear difference in convergence rates between fabrication and knowledge activities.

Developing Asia has been catching up much faster in fabrication compared to knowledge activities. In 2018, GVC income levels from fabrication stood at 57% of levels observed in the OECD. For knowledge-intensive activities, it stood at 24% by the end of 2018. These findings suggest income convergence from fabrication has proceeded at a faster pace compared to knowledge activities. To be sure, there has also been convergence in income from knowledge-intensive activities, but from low levels such that a major gap still exists by 2018. This is consistent with the literature that has argued rapid catch up in production activities, which should be followed by a second phase of catching up in innovation activities before income convergence is complete (see e.g. Awate et al. 2012; Buckley et al. 2020).

Figure 4. Convergence in GVC income by activity (Developing Asia relative to OECD)



Notes: GVC income per capita calculated as real GVC income by activity in final manufacturing products, expressed per head and at 2011 constant PPPs. Aggregate for 15 developing Asian economies relative to OECD average.
Source: authors' calculations based on ADB MRIOTs and occupations dataset for developing Asia.

Figure 5 shows decomposition results by activity and economy. It consists of three panels. Panel A shows the GVC income ratio, panel B the scale effect, and panel C the productivity ratio in 2000 and 2018. Columns (1) and (4) show aggregate ratios, which were discussed in subsection 6.A. Subsequent columns in Table 3 show the ratios for fabrication and knowledge activities. Since the framework is multiplicative, income ratios can be obtained by multiplying the scale and productivity ratios. E.g. the GVC fabrication income ratio of 1.06 for the PRC in 2018 can be calculated by multiplying the respective GVC fabrication worker ratio (3.18) by the productivity ratio (0.33).

Because the GVC fabrication income ratio for the PRC in 2018 is 1.06 and thus above one, it suggests that the PRC has closed part of the income gap. Namely, it closed the part of the gap that pertains to production-related activities. The PRC did not close the GVC income knowledge ratio, which is 0.31 in 2018 such that the overall GVC income ratio is 0.54 or 54 percent of the average OECD level. Indonesia, Viet Nam, and Thailand are also near to closing the income gap from fabrication activities in manufactures GVCs with respective ratios of 0.54, 0.52, and 0.70, but not from knowledge activities in 2018.

Panels B and C suggest that convergence was mainly driven by an expansion of jobs involved in GVCs. Indeed, the ratio of GVC workers is above one for several of the major Asian economies, both in fabrication and knowledge jobs, but especially fabrication jobs. Five Asian economies have a ratio for fabrication jobs that is more than two times compared to the OECD average, namely India, Thailand, Pakistan, Bangladesh, and Cambodia. Two other Asian economies have a GVC jobs ratio for fabrication workers that is over three times compared to the OECD average, namely the PRC and Indonesia. And Viet Nam appears to have over five times as many fabrication workers involved in manufactures GVCs compared to the OECD

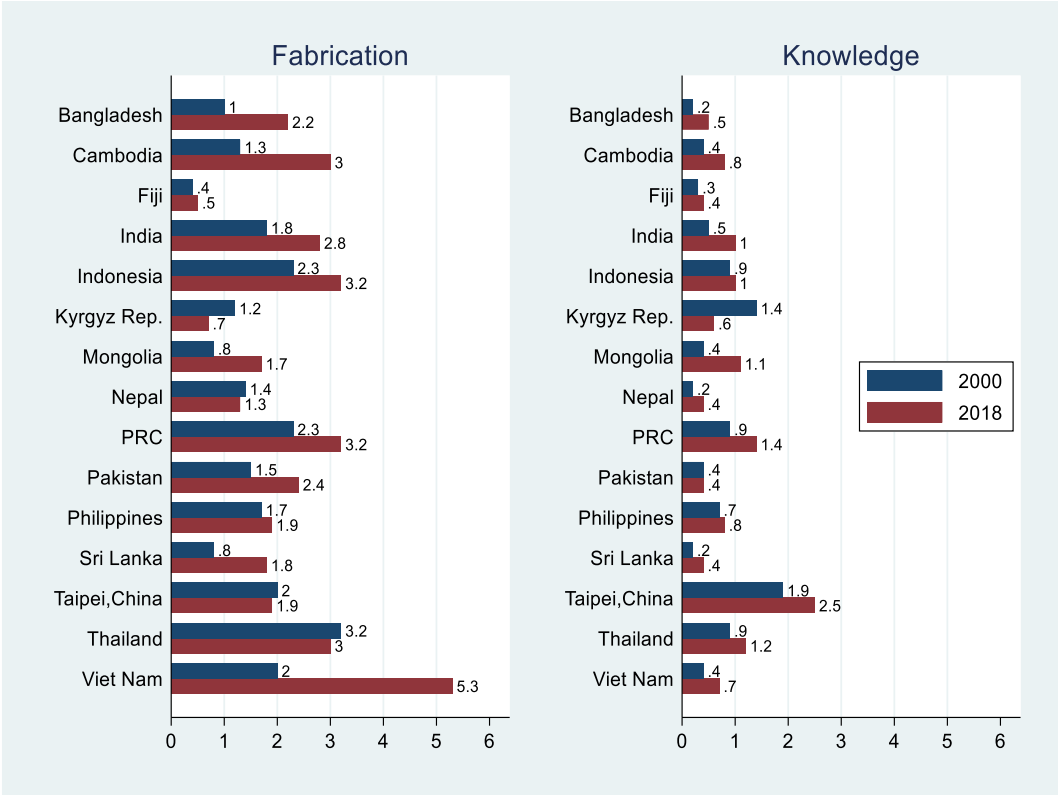
average. These findings indicate a strong performance of developing Asian countries in GVCs, especially as it pertains to fabrication activities.

The relative number of knowledge workers is much lower compared to fabrication workers, reflecting a global division of labor whereby relatively more knowledge workers are involved from advanced economies and relatively more fabrication workers from developing Asia. Yet over time, there has also been a relative increase in knowledge workers such that by 2018 various developing Asian economies were close or exceeded the average ratio observed in the OECD.

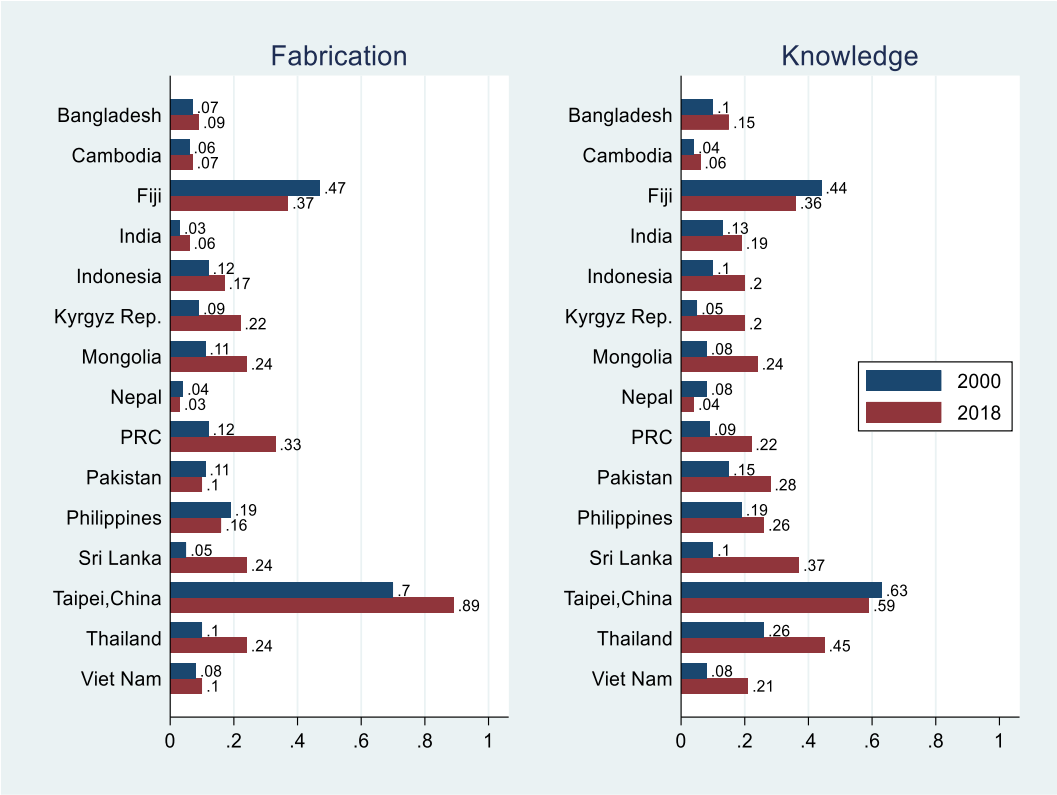
In a nutshell, these findings suggest that income convergence has been driven by the increased involvement of domestic workers in manufactures GVCs, in particular by workers involved in fabrication activities.

Figure 5. Decomposition results by activity and economy

Panel A. Scale ratio



Panel B. Productivity ratio



Notes: In panel (a): GVC workers per capita calculated as GVC jobs in final manufacturing products divided by population, relative to that ratio for the average of OECD economies. In panel (b): GVC income calculated as real GVC income in final manufacturing products, expressed at 2011 constant PPPs and divided by GVC workers calculated as GVC jobs in final manufacturing products, again relative to that ratio for the average of OECD economies. See Appendix Table A2 for the full decomposition results. *Source*: Authors' calculations based on ADB MRIOTs and occupations dataset.

7. Concluding remarks

This paper used a global value chain perspective to examine convergence in income per capita of developing Asia to levels observed in OECD countries. Our findings suggest that developing Asia experienced a rapid expansion in the scale of fabrication activities between 2000 and 2018. We observe a slower expansion in the scale of knowledge activities. We find convergence in productivity levels to levels observed in OECD countries, but from low initial levels.

What is causing the expansion of GVC activities in developing Asia? This goes beyond the scope and ambitions of the paper. Clearly, globalization and the resulting unbundling of production caused labor-intensive fabrication and its associated employment to expand in low-wage labor-abundant developing Asia.

Yet, we still observe a large gap in income per capita from knowledge-intensive activities between developing Asia and OECD countries. Will this gap be closed in the foreseeable future? If so, what would drive this convergence? What are the key potential barriers to

evolve from having imitation to innovation capabilities? These are important questions to consider. Decades ago, Lucas (1988) eloquently expressed the quest for growth when he stated that "the consequences for human welfare involved in questions like these are simply staggering." Scholars have suggested a sequence in which knowledge-intensive capabilities developed only after, and based on, previously developed fabrication capabilities (Buckley et al. 2020). Studying the causes of catch up will involve a variety of approaches, including case studies, literature review, and novel empirical and theoretical models. This is an important area for future research.

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Appendix A. Tables and Figures

Appendix Table A1. Developing Asia and OECD economies included in analysis

Developing Asia	OECD countries	
Bangladesh	Australia	Latvia
Cambodia	Austria	Lithuania
Fiji	Belgium	Luxembourg
India	Canada	Mexico
Indonesia	Czech Republic	Netherlands
Kyrgyz Republic	Denmark	Poland
Mongolia	Estonia	Portugal
Nepal	Finland	Republic of Korea
Pakistan	France	Slovenia
People's Republic of China	Germany	Spain
Philippines	Greece	Sweden
Sri Lanka	Hungary	Turkey
Taipei,China	Ireland	United Kingdom
Thailand	Italy	United States
Viet Nam	Japan	

Appendix Table 2. Decomposition results by activity and economy

Panel A. Income ratio

	2000			2018		
	GVC income ratio (1)	GVC fabrication income ratio (2)	GVC knowledge income ratio (3)	GVC income ratio (4)	GVC fabrication income ratio (5)	GVC knowledge income ratio (6)
Bangladesh	0.04	0.07	0.02	0.11	0.20	0.07
Cambodia	0.04	0.08	0.02	0.10	0.21	0.05
Fiji	0.13	0.18	0.11	0.15	0.19	0.13
India	0.06	0.06	0.06	0.18	0.17	0.19
Indonesia	0.15	0.26	0.09	0.30	0.54	0.19
Kyrgyz Rep.	0.09	0.11	0.08	0.13	0.15	0.12
Mongolia	0.05	0.09	0.03	0.31	0.40	0.27
Nepal	0.03	0.05	0.01	0.02	0.04	0.01
Pakistan	0.10	0.18	0.07	0.15	0.25	0.11
PRC	0.15	0.28	0.09	0.54	1.06	0.31
Philippines	0.21	0.33	0.14	0.25	0.31	0.22
Sri Lanka	0.03	0.04	0.02	0.23	0.41	0.14
Taipei,China	1.26	1.37	1.20	1.56	1.73	1.49
Thailand	0.25	0.31	0.22	0.58	0.70	0.52
Viet Nam	0.07	0.15	0.03	0.26	0.52	0.14

Panel B. Scale ratio

	2000			2018		
	GVC worker ratio (1)	GVC fabrication worker ratio (2)	GVC knowledge worker ratio (3)	GVC worker ratio (4)	GVC fabrication worker ratio (5)	GVC worker knowledge ratio (6)
Bangladesh	0.61	0.95	0.23	1.28	2.20	0.48
Cambodia	0.87	1.34	0.35	1.80	2.95	0.81
Fiji	0.32	0.38	0.25	0.42	0.51	0.35
India	1.14	1.77	0.47	1.81	2.78	0.97
Indonesia	1.60	2.28	0.87	1.99	3.19	0.96
Kyrgyz Rep.	1.29	1.15	1.44	0.65	0.68	0.62
Mongolia	0.62	0.82	0.40	1.38	1.65	1.14
Nepal	0.80	1.36	0.20	0.82	1.32	0.39
Pakistan	1.01	1.54	0.43	1.33	2.43	0.38
PRC	1.63	2.32	0.90	2.23	3.18	1.41
Philippines	1.26	1.74	0.74	1.34	1.91	0.83
Sri Lanka	0.55	0.83	0.24	1.02	1.75	0.39
Taipei,China	1.94	1.96	1.91	2.25	1.94	2.51
Thailand	2.09	3.23	0.85	1.99	2.97	1.15
Viet Nam	1.20	1.99	0.36	2.79	5.26	0.67

Panel C. Productivity ratio

	2000	2018

	Productivity ratio (1)	Productivity fabrication activities ratio (2)	Productivity knowledge activities ratio (3)	Productivity ratio (4)	Productivity fabrication activities ratio (5)	Productivity knowledge activities ratio (6)
Bangladesh	0.07	0.07	0.10	0.09	0.09	0.15
Cambodia	0.05	0.06	0.04	0.05	0.07	0.06
Fiji	0.42	0.47	0.44	0.34	0.37	0.36
India	0.05	0.03	0.13	0.10	0.06	0.19
Indonesia	0.09	0.12	0.10	0.15	0.17	0.20
Kyrgyz Rep.	0.07	0.09	0.05	0.20	0.22	0.20
Mongolia	0.08	0.11	0.08	0.23	0.24	0.24
Nepal	0.04	0.04	0.08	0.03	0.03	0.04
Pakistan	0.10	0.11	0.15	0.11	0.10	0.28
PRC	0.09	0.12	0.09	0.24	0.33	0.22
Philippines	0.16	0.19	0.19	0.18	0.16	0.26
Sri Lanka	0.06	0.05	0.10	0.22	0.24	0.37
Taipei,China	0.65	0.70	0.63	0.69	0.89	0.59
Thailand	0.12	0.10	0.26	0.29	0.24	0.45
Viet Nam	0.06	0.08	0.08	0.09	0.10	0.21

Notes: In panel (a): GVC income per capita calculated as real GVC income in final manufacturing products, expressed per head and at 2011 constant PPPs. The GVC income ratio is calculated relative to that ratio for the average of OECD economies. In panel (b): GVC workers per capita calculated as GVC jobs in final manufacturing products divided by population, relative to that ratio for the average of OECD economies. In panel (c): GVC income calculated as real GVC income in final manufacturing products, expressed at 2011 constant PPPs and divided by GVC workers calculated as GVC jobs in final manufacturing products, again relative to that ratio for the average of OECD economies. *Sources*: authors' calculations using the ADB MRIOTs and occupation dataset for Asian economies.

Appendix B: Occupations data for Developing Asian economies

GENERAL Notes on All Countries

1. Employment levels are based on all workers while wage levels are based on wage workers only.
2. Wages are annualized by multiplying the monthly wage rate by 12.

I. BANGLADESH Notes

1. Wage levels and distribution by industry and occupation are consistent with the numbers published in ILOSTAT.

Notes on LFS 2006:

1. Industry codes in the raw data follow the Bangladesh Standard Industrial Classification (BSIC, Rev-3) [Source: ILO Microdata Repository]. BSIC Rev-3 is consistent with ISIC Rev 3.
2. Occupation codes in the raw data follow the International Standard Classification of Occupation (ISCO-88) [Source: ILO Microdata Repository].
3. Earnings of salaried workers received during the last week are treated as monthly income because the distribution of salaried workers across monthly income brackets is consistent with the distribution reported in Table 4.18 "Salaried workers by monthly income" of the LFS Report.
4. Earnings of day labourers earned during the last week are treated as weekly income because the distribution of day labourers across weekly income brackets is consistent with the distribution reported in Table 4.17 "Day labourers by weekly income" of the LFS Report. To estimate the monthly income of day labourers, their weekly income is multiplied by 4 weeks.

Notes on LFS 2010:

1. Industry codes in the raw data follow the Bangladesh Standard Industrial Classification (BSIC, Rev-4), which is comparable to the International Standard Industrial Classification (ISIC, Rev-4) [Source: ILO Microdata Repository]. Based on the corresponding industry description, the following 3-digit BSIC Rev-4 codes were recoded for consistency with ISIC 4:

BSIC 4	BSIC 4 description	ISIC 4
112	Growing of rice	011

143	Raising of camels and camelids	014
146	Raising of poultry	014
161	Support activities for crop production	016
210	Silviculture and other forestry activities	021
311	Marine fishing	031
321	Marine aquaculture	032
341	Recycling	383
520	Mining of lignite	052
620	Extraction of natural gas	062
910	support activities for petroleum and natural gas extraction	091

2. After this recoding, employment levels and distribution match the published numbers in the LFS Report and ILOSTAT, which is expressed in terms of ISIC 4. ISIC 4 industry codes are then converted into ISIC 3 using the concordances between ISIC 4 and ISIC 3.1, and between ISIC 3.1 and ISIC 3.
3. Occupation codes in the raw data follow the International Standard Classification of Occupation (ISCO-88) [Source: ILO Microdata Repository]. Occupation codes are then harmonized with ISCO-08 using the concordance between ISCO-88 and ISCO-08.

Notes on LFS 2013:

1. Occupation codes are based on Bangladesh Standard Classification of Occupations (BSCO) 2012, which is in line with ISCO 2008.
2. Industry codes are based on Bangladesh Standard Industrial Classification (BSIC) 2009, which is patterned after ISIC Rev 4.
3. Code 34 (Recycling) in BSIC 2009 is recoded into 38 because Recycling is coded as 38 in ISIC 4. ISIC 4 industry codes were converted into ISIC 3 based on the concordances between ISIC 4 and ISIC 3.1, and between ISIC 3.1 and ISIC 3.
4. Monthly earnings are taken from the gross income for the month (in cash and in kind).

Notes on LFS 2016:

1. Occupation codes are based on Bangladesh Standard Classification of Occupations (BSCO) 2012, which is in line with ISCO 2008.
2. Industry codes are based on Bangladesh Standard Industrial Classification (BSIC) 2009, which is consistent with ISIC Rev 4.
3. ISIC Rev 4 industry codes were converted into ISIC 3 based on the concordances between ISIC 4 and ISIC 3.1, and between ISIC 3.1 and ISIC 3.
4. Monthly earnings in cash and in kind are summed up to get total earnings for the month.

II. CAMBODIA Notes

1. Employment levels are close to those published in the ILOSTAT.
2. Wage levels and distribution by industry and occupation are consistent with the numbers published in ILOSTAT.
3. Wages refer to the earnings of wage workers only.

Notes on CSES 2003:

1. 3-digit occupation codes truncated to 2-digit codes are consistent with ISCO 88, with some exceptions. Some 3-digit local classification codes were mapped to their 2-digit ISCO 08 counterparts in the following manner:

CAM 3-digit/ISCO 88	Description	ISCO 08
611	Field/vegetable/mixed crop growers: Operator, mainly market	61
612	Field/vegetable/mixed crop growers: Operator, mainly subsistence	61
613	Field/vegetable/mixed crop growers: Worker, experienced adult	61
614	Field/vegetable/mixed crop growers: Helper, aid, assistant	61
621	Tree and shrub crop growers: Operator, mainly market	61
622	Tree and shrub crop growers: Operator, mainly subsistence	61
623	Tree and shrub crop growers: Worker, experienced adult	61
624	Tree and shrub crop growers: Helper, aid, assistant	61
631	Gardeners, horticultural and nursery growers: Operator, mainly market	61
632	Gardeners, horticultural and nursery growers: Operator, mainly subsistence	61

CAM 3-digit/ISCO 88	Description	ISCO 08
633	Gardeners, horticultural and nursery growers: Worker, experienced adult	61
634	Gardeners, horticultural and nursery growers: Helper, aid, assistant	61
635	Market-oriented animal producers and related workers	61
641	Dairy/livestock/poultry producers: Operator, mainly market	61
642	Dairy/livestock/poultry producers: Operator, mainly subsistence	61
643	Dairy/livestock/poultry producers: Worker, experienced adult	61
644	Dairy/livestock/poultry producers: Helper, aid, assistant	61
651	Apiarists and sericulturists: Operator, mainly market	61
652	Apiarists and sericulturists: Operator, mainly subsistence	61
653	Apiarists and sericulturists: Worker, experienced adult	61
654	Apiarists and sericulturists: Helper, aid, assistant	61
661	Mixed-animal producers: Operator, mainly market	61
662	Mixed-animal producers: Operator, mainly subsistence	61
663	Mixed-animal producers: Worker, experienced adult	61
664	Mixed-animal producers: Helper, aid, assistant	61
671	Forestry/charcoal workers: Operator, mainly market	62
672	Forestry/charcoal workers: Operator, mainly subsistence	62
673	Forestry/charcoal workers: Worker, experienced adult	62
674	Forestry/charcoal workers: Helper, aid, assistant	62
681	Fishery workers: Operator, mainly market	62
682	Fishery workers: Operator, mainly subsistence	62
683	Fishery workers: Worker, experienced adult	62
684	Fishery workers: Helper, aid, assistant	62
691	Hunters and trappers: Operator, mainly market	63
692	Hunters and trappers: Operator, mainly subsistence	63
693	Hunters and trappers: Worker, experienced adult	63
694	Hunters and trappers: Helper, aid, assistant	63

The remaining 3-digit codes (i.e., those that are not in the exceptions list) were truncated to 2-digit

2. 2-digit local industry descriptions closely resemble ISIC 3.1 2-digit descriptions. The following 2-digit local classification codes were recoded.

CAM 2-digit/ISIC 3.1	Category	Recode (ISIC 3.1)
0	Growing of cereals and other crops n.e.c.	1
1	Growing of vegetables, horticultural specialties and nursery products	1
2	Growing of fruit, nuts, beverage and spice crops	1
3	Farming of cattle, sheep, goats, horses, asses, mules and hinnies; dairy farming	1
4	Other animal farming; production of animal products n.e.c.	1
5	Growing of crops combined with farming of animals (mixed farming)	1
6	Agricultural and animal husbandry service activities, except veterinary activiti	1
7	Hunting, trapping and game propagation including related service activities	1
8	Forestry, logging and related service activities	2
9	Fishing, operation of fish hatcheries and fish farms; service activities inciden…	5
96	Extra-territorial organizations and bodies	99
97	Other industry not classified elsewhere	Missing
98	Respondents don't know the industry	Missing

Notes on CSES 2007 and 2008:

1. 3-digit occupation codes truncated to 2-digit codes are consistent with ISCO 88, with some exceptions. Some 3-digit local classification codes were mapped to their 2-digit ISCO 08 counterparts in the following manner:

CAM 3-digit/ISCO 88	Description	ISCO 08
750	Pelt, leather and shoemaking trades workers	74
920	Airpump operators (inflate wheels)	91
921	Shoe cleaning and other street services elementary occupations	91
922	Domestic helpers and maids	91
923	Laundry workers	91
924	Cleaners and related workers	91

CAM 3-digit/ISCO 88	Description	ISCO 08
925	Building caretakers and window cleaners	91
926	Private security guards	91
927	Messengers, watchers and security workers	91
928	Commercial sex workers	91
929	Tins and plastic materials collectors	91
930	Rag pickers	91
931	Other garbage collectors and related labourers	91
941	Agricultural, fishery and related labourers	92
942	Firewood collectors	92
951	Mining and construction labourers	93
952	Manufacturing labourers	93
953	Loaders and unloaders	93
954	Cyclo drivers	93
955	Other transport labourers	93
998	Occupation not adequately described	missing
999	Occupation not stated	missing

2. 2-digit local industry descriptions are consistent with ISIC 4. Industry codes are then harmonized with ISIC 3 by first mapping 2-digit ISIC 4 to 2-digit ISIC 3.1 and doing the same for 2-digit ISIC 3.1 and 2-digit ISIC 3 using concordance tables.

Notes on CSES 2009 to 2017:

1. 3-digit occupation codes truncated to 2-digit codes are consistent with ISCO 08, with some exceptions. Some 3-digit local classification codes were mapped to their 2-digit ISCO 08 counterparts in the following manner:

CAM 3-digit/ISCO 08	Description	Recode (ISCO 08)
521	Child care workers and teachers' aides	53
522	Personal care workers in health services	53
531	Protective services workers	54
532	Policemen / women	54
541	Street and market salespersons	52
542	Street vegetable and fruit sellers	52
543	Street meat sellers	52

CAM 3-digit/ISCO 08	Description	Recode (ISCO 08)
544	Street fish sellers	52
545	Street food snack sellers	52
546	Street cool drink and water sellers	52
547	Street cigarette sellers and other street food salespersons	52
548	Shop salespersons	52
549	Cashiers and ticket clerks	52
550	Other sales workers	96
733	Glass makers	75
734	Palm leaf products makers, basketry weavers and related workers	75
735	Bamboo products makers	75
736	Other wood-related handicraft workers	75
737	Rope Makers	75
738	Handloom weavers, handicraft workers in textile, leather and related materials	75

2. 2-digit local industry descriptions are consistent with ISIC 4. Industry codes are then harmonized with ISIC 3 by first mapping 2-digit ISIC 4 to 2-digit ISIC 3.1 and doing the same for 2-digit ISIC 3.1 and 2-digit ISIC 3 using concordance tables.

III. FIJI Notes

1. Reference period for employment, wage, industry, and occupation is 7 days.
2. Wages were computed as follows:
    i. Since answers to the wage questions are in income ranges rather than exact amounts, responses are translated to point values by taking the midpoint of the income range or getting the lowest value in case the midpoint cannot be determined (e.g., for income range $3000+).
    ii. Weekly wage is multiplied by 4.2 to get monthly wage.
    iii. Monthly wage is annualized by multiplying it by 12.

Notes on EUS 2010-2011 and 2015-2016:

1. Industry codes follow the Fiji Standard Industrial Classification (FSIC) 2004 for EUS 2010-2011 and FSIC 2010 for EUS 2015-2016. FSIC 2004 is based on ISIC Rev. 3.1, while FSIC 2010 is based on ISIC Rev. 4.
2. ISIC Rev. 3.1 and ISIC Rev. 4 codes are converted to 2-digit ISIC Rev. 3 codes using correspondence tables for ISIC Rev. 4 and ISIC Rev. 3.1, and ISIC Rev. 3.1 and Rev. 3.

3. Occupation codes follow FSCO 2007.
4. The following FSCO 07 codes are recoded to be consistent with ISCO 88:

FSCO 07	ISCO 88
8112 (Miners and quarry workers)	7111 (Miners and quarry workers)
8113 (Shotfirers and blasters)	7112 (Shotfirers and blasters)
122 (Small business managers and managing supervisors (1-14 employees))	131 (General managers)
133 (Production and operations department managers)	122 (Production and operations department managers)
14 (Other department managers)	12 (Corporate managers)
15 (Micro-business owners)	13 (General managers)
16 (Landlords)	
33 (Other associate professionals)	34 (Other associate professionals

5. ISCO 88 codes are harmonized to ISCO 2008 codes using the concordance between ISCO-88 and ISCO-08.
6. Employment levels and distribution by industry and occupation are consistent with the EUS 2015-2016 Report.
7. Employment levels and distribution by industry in EUS 2010-2011 is consistent with ILOSTAT. Employment levels and distribution by occupation is consistent with the EUS 2010-2011 Report.
8. Average wages by occupation groups are consistent with the numbers reported in ILOSTAT. Gross weekly income for employed persons in 2015-2016 are consistent with the EUS Report.

Notes on EUS 2004-2005:

1. According to the Fiji Bureau of Statistics, industry is based on the International Standard Industrial Classification (ISIC) Revision 3. However, several codes in the microdata are not in ISIC Rev. 3. Instead, industry codes are translated to 2-digit ISIC Rev. 4 codes using a mapping constructed by the ADB Key Indicators (KI) 2015 team.
2. ISIC Rev. 4 codes are converted to 2-digit ISIC Rev. 3 codes using correspondence tables for ISIC Rev. 4 and ISIC Rev. 3.1, and ISIC Rev. 3.1 and Rev. 3.
3. ISIC Rev. 3.1 code *96* (undifferentiated goods-producing activities of private households for own use) is mapped to ISIC Rev. 3 code *95* (private households with employed persons) because in ISIC 3.1, they are both categorized within Section P

"Activities of private households as employers and undifferentiated production activities of private households."

4. Occupation is based on the Fiji Standard Classification of Occupation (FSCO) 1995. Since no documentation is available for this classification, occupation labels are assumed to be consistent with FSCO 2007 at 2-digit level.
5. FSCO 95 code *53* is mapped to FSCO 07 code *52* (information and computing and technology (ICT), motor vehicles and retail/wholesale salespersons and demonstrators).
6. Harmonization of codes to the International Standard Classification of Occupations (ISCO) 2008 is similar to EUS 2010-2011 and 2015-2016.
7. Employment levels and distribution by industry and occupation are consistent with the EUS 2004-2005 Report.
8. Wages are consistent with the numbers published in the EUS 2004-2005 Report.

IV. INDIA Notes

1. Employment is based on usual principal status.
2. Reference period on wages is the last 7 days.
3. Wages are annualized through the following steps:
    i. Wage for the week (raw wages reported in the data) divided by the number of days worked in the week to get the daily wage rate. Days worked are top coded at 5 days, i.e., workers reporting work of more than 5 days and less than or equal to 7 days were considered having worked exactly 5 days.
    ii. Daily wage rate is multiplied by 4.3 = 30 days / 7 days to get monthly wage rate.
    iii. Monthly wage rate is multiplied by 12 to get annual wage rate.

Notes on NSS-EUS 1999/2000 and 2004/2005:

1. Occupation codes in 2000 and 2005 are based on the National Classification of Occupations (NCO) 1968. They were first harmonized with NCO 2004 using a crosswalk made by Pankaj Vashisht. Afterwards, these are harmonized with ISCO 08 using the crosswalk from the Key Indicators 2015 team.
2. Local industry codes are based on the National Industrial Classification (NIC) 1998. The foreword to the documentation of NIC 1998 indicate that "there exists perfect one-to-one correspondence up to 4-digit level between NIC 1998 and ISIC Rev. 3." (Source: http://mospi.nic.in/classification/national-industrial-classification/forewords).

Notes on NSS-EUS 2011/2012:

1. Industry codes are based on the National Industrial Classification (NIC) 2008. These were harmonized with ISIC Revision 4 using the crosswalk from the Key Indicators 2015 team.
2. ISIC 4 industry codes were converted into ISIC 3 based on the concordances between ISIC 4 and ISIC 3.1, and between ISIC 3.1 and ISIC 3.
3. Occupation codes are based on the National Classification of Occupations (NCO) 2004. These are harmonized with ISCO-08 using the crosswalk from the Key Indicators 2015 team.

V. INDONESIA Notes

1. Wages refer to earnings in cash and in kind.
2. Local occupation code mappings to ISCO were not used for the years 2003, 2005, 2008, 2010-2015 because checks done on results of tabulations were not consistent with occupation structures reported in ILOSTAT.

Notes on SAKERNAS 2000:

5. 3-digit industry codes are based on Klasifikasi Baku Lapangan Usaha Indonesia (KBLI) 2000, which is consistent with ISIC 3 at the 2-digit level; 3-digit occupation codes based on Klasifikasi Jabatan Indonesia (KBJI) 2000. According to the SAKERNAS 2000 documentation, "Occupation classification applied in SAKERNAS 2000 is based on the Indonesian Occupation Classification Standard (KBJI) 2000 which refers to the Australian Standard Classification of Occupations (ASCO) 1997. When there is a variable with older occupation classification in the dataset then it means the data has been converted to an older version of the classification for the purposes of comparison with the previous year's data."
6. 3-digit KBLI 2000 codes were first truncated to their 2-digit equivalents. Because KBLI 2000 is consistent with ISIC 3 at the 2-digit level, KBLI 2000 codes were taken to be equal to their respective ISIC 3 codes.
7. Similarly, 3-digit KJI 1982 codes were truncated to their 2-digit equivalents and were regarded as equal to their ISCO 68 code equivalents. A crosswalk was used to convert ISCO 68 codes to their equivalent codes in ISCO 08.

Notes on SAKERNAS 2003, 2005, 2008 and 2010-2015:

1. 3-digit industry codes are based on Klasifikasi Baku Lapangan Usaha Indonesia (KBLI 2000), which is consistent with ISIC 3 at the 2-digit level; 3-digit occupation codes based on Klasifikasi Jabatan Indonesia (KJI) 1982, which is consistent with ISCO 68 at the 2-digit level. All datasets have the KJI 1982 variable. According to the SAKERNAS documentations, "when there is a variable with older occupation classification in the

dataset then it means the data has been converted to an older version of the classification for the purposes of comparison with the previous year's data."

2. 3-digit KBLI 2000 codes were first truncated to their 2-digit equivalents. Because KBLI 2000 is consistent with ISIC 3 at the 2-digit level, KBLI 2000 codes were taken to be equal to their respective ISIC 3 codes.
3. 3-digit occupation codes based on KJI 1982 were mapped into 13 business functions using a concordance constructed by one of the authors. The 13 business functions are:
   1 Legislators
   2 Managers
   3 Engineering professionals
   4 Health professionals
   5 Teaching professionals
   6 Other professionals
   7 Clerical support workers
   8 Personal service workers
   9 Sales workers
   10 Craft workers and machine operators
   11 Agricultural workers
   12 Other, inclusing armed forces
   13 Drivers

Notes on SAKERNAS 2016 and 2017:

1. 2-digit industry codes represent 17 broad sector groupings based on Klasifikasi Baku Lapangan Usaha Indonesia (KBLI 2015). 1-digit occupation codes represent broad categories based on Klasifikasi Basu Jabatan Indonesia (KBJI) 2014 which maps to ISCO 2008.
2. These codes were taken as is because more detailed codes are not yet available for years 2016 and 2017.

VI. KYRGYZSTAN Notes

General Notes:

1. All data are based on the Kyrgyzstan Integrated Household Survey (KIHS) 2012-2018, Labor module.

2. Employment levels are based on all workers. Employment levels are consistent with labor statistics published in the website of the National Statistical Committee (NSC) of Kyrgyz Republic.
3. Wages refer to the earnings of wage workers only.
4. Wages are annualized by multiplying monthly earnings by 12 months.

Notes on year 2012-2018:

1. Survey questionnaires were translated from Russian to English to identify relevant variables and their value labels.
2. Latest national industry and occupation codes and their descriptions were downloaded from the website of the National Statistical Committee of Kyrgyz Republic and were translated from Russian to English.
3. A detailed examination of two-digit industry codes revealed that the national industry codes (NIC) correspond to the ISIC 4 classification. See table below for the list of ISIC 4 codes matched with NIC, along with their descriptions. The two-digit industry codes were then mapped to ISIC 3.

A COMPARISON OF ISIC 4 AND KGZ NIC CODE DESCRIPTIONS

Code	ISIC 4 description	KGZ NIC description (direct translation from Russian to English)
1	Crop and animal production, hunting and related service activities	Agriculture, hunting and services in these areas
2	Forestry and logging	Forestry and services in this area
3	Fishing and aquaculture	Fishing and fish farming
5	Mining of coal and lignite	Coal and brown coal (lignite) extraction
6	Extraction of crude petroleum and natural gas	Crude oil and natural gas production
7	Mining of metal ores	Mining of metal ores
8	Other mining and quarrying	Mining other minerals
9	Mining support service activities	Providing mining services
10	Manufacture of food products	Food production
11	Manufacture of beverages	Beverage production
12	Manufacture of tobacco products	Tobacco production
13	Manufacture of textiles	Textile production
14	Manufacture of wearing apparel	Clothing production
15	Manufacture of leather and related products	Production of leather, leather goods, footwear production
16	Manufacture of wood and of products of wood and cork, except furniture;	Wood processing and production of wood and cork

Code	ISIC 4 description	KGZ NIC description (direct translation from Russian to English)
	manufacture of articles of straw and plaiting materials	products (except furniture), wicker products
17	Manufacture of paper and paper products	Paper and cardboard production
18	Printing and reproduction of recorded media	Printing and replicating recorded media
19	Manufacture of coke and refined petroleum products	Coke and refined petroleum products production
20	Manufacture of chemicals and chemical products	Chemical production
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	Pharmaceutical production
22	Manufacture of rubber and plastics products	Production of rubber and plastic products
23	Manufacture of other non-metallic mineral products	Production of other non-metallic mineral products
24	Manufacture of basic metals	Production of core metals
25	Manufacture of fabricated metal products, except machinery and equipment	Production of finished metal products, except machines and equipment
26	Manufacture of computer, electronic and optical products	Manufacturing of computers, electronic and optical equipment
27	Manufacture of electrical equipment	Production of electrical equipment
28	Manufacture of machinery and equipment n.e.c.	Production of machines and equipment not included in other groups
29	Manufacture of motor vehicles, trailers and semi-trailers	Car production
30	Manufacture of other transport equipment	Production of other vehicles
31	Manufacture of furniture	Furniture production
32	Other manufacturing	Production of other products
33	Repair and installation of machinery and equipment	Repair and install machinery and equipment
35	Electricity, gas, steam and air conditioning supply	Providing (supply) with electricity, gas, steam and air conditioning
36	Water collection, treatment and supply	Water collection, processing and distribution (water supply)
37	Sewerage	Wastewater collection and treatment

Code	ISIC 4 description	KGZ NIC description (direct translation from Russian to English)
38	Waste collection, treatment and disposal activities; materials recovery	Collecting, processing and destroying waste, obtaining recycled materials
39	Remediation activities and other waste management services	Decontamination and other waste management
41	Construction of buildings	Building
42	Civil engineering	Construction of civilian facilities
43	Specialized construction activities	Special construction work
45	Wholesale and retail trade and repair of motor vehicles and motorcycles	Wholesale and retail trade in cars and motorcycles; Repairing cars and motorcycles
46	Wholesale trade, except of motor vehicles and motorcycles	Wholesale, except for the trade in cars and motorcycles
47	Retail trade, except of motor vehicles and motorcycles	Retail, except for car and motorcycle trade
49	Land transport and transport via pipelines	Ground and pipeline transport activities
50	Water transport	Water transport activities
51	Air transport	Air transport activities
52	Warehousing and support activities for transportation	Cargo storage and support transport activities
53	Postal and courier activities	Postal and courier activities
55	Accommodation	Hotel activities
56	Food and beverage service activities	Restaurant activities
58	Publishing activities	Publishing
59	Motion picture, video and television programme production, sound recording and music publishing activities	Film production, video and television programs, recording and music production
60	Programming and broadcasting activities	Broadcasting and television
61	Telecommunications	Link
62	Computer programming, consultancy and related activities	Software development, consulting and other computer science activities
63	Information service activities	Information services
64	Financial service activities, except insurance and pension funding	Financial intermediation, except for insurance and pension services
65	Insurance, reinsurance and pension funding, except compulsory social security	Insurance, reinsurance and pensions, except compulsory social security
66	Activities auxiliary to financial service and insurance activities	Support activities in financial intermediation and insurance

Code	ISIC 4 description	KGZ NIC description (direct translation from Russian to English)
68	Real estate activities	Real estate transactions
69	Legal and accounting activities	Law and accounting activities
70	Activities of head offices; management consultancy activities	Central (head) offices, management activities
71	Architectural and engineering activities; technical testing and analysis	Architecture and engineering research activities; technical tests and control
72	Scientific research and development	Research and development
73	Advertising and market research	Advertising and market research
74	Other professional, scientific and technical activities	Other professional, scientific and technical activities
75	Veterinary activities	Veterinary activities
77	Rental and leasing activities	Rent and leasing
78	Employment activities	Employment activities
79	Travel agency, tour operator, reservation service and related activities	Activities of travel agencies and tour operators, booking and other tourism activities
80	Security and investigation activities	Investigations and security
81	Services to buildings and landscape activities	Building maintenance and landscape change
82	Office administrative, office support and other business support activities	Administrative and other additional activities aimed at maintaining business
84	Public administration and defence; compulsory social security	Public administration and defence; Compulsory social security
85	Education	Education
86	Human health activities	Health
87	Residential care activities	Social services for the population with accommodation
88	Social work activities without accommodation	Social services without accommodation
90	Creative, arts and entertainment activities	Artistic and other activities in the field of art and cultural and mass entertainment events
91	Libraries, archives, museums and other cultural activities	Activities of libraries, archives, museums and other cultural institutions
92	Gambling and betting activities	Organizing and holding a lottery, selling lottery tickets
93	Sports activities and amusement and recreation activities	Sports and other activities in the organization of recreation and entertainment

Code	ISIC 4 description	KGZ NIC description (direct translation from Russian to English)
94	Activities of membership organizations	Activities of public associations (organizations)
95	Repair of computers and personal and household goods	Repair of computers, personal items and household goods
96	Other personal service activities	Other personal services
97	Activities of households as employers of domestic personnel	Private households with employees
98	Undifferentiated goods- and services-producing activities of private households for own use	Private households produce a variety of goods and services for their own consumption
99	Activities of extraterritorial organizations and bodies	Activities of extraterritorial organizations
39	Remediation activities and other waste management services	Decontamination and other waste management

4. Likewise, a detailed examination of two-digit occupation codes revealed that national occupation codes (NOC) correspond to the ISCO 08 classification (See Annex Table 1 for the list of ISIC4 codes matched with NIC, along with their descriptions).
5. Some occupation codes appear in the dataset, but are not in the NOC list. These codes, which were treated as missing values, are summarized in the table below

	Occ codes treated as missing	Total number of cases considered as 'missing'	Share in total weighted cases
2012	55, 76	807	0.04%
2013	55, 76	1423	0.06%
2014	55, 76	1472	0.06%
2015	55, 76, 84	2361	0.10%
2016	55, 64, 76	1952	0.08%
2017	55, 76, 99	32721	1.39%
2018	47, 55, 76	1579	0.07%

Notes on wage computation

1. Median wages by 2-digit occupation classification were computed based on the variable **zarplata** or monthly wage earned from primary source of employment. Observations where monthly wages are coded as zero are excluded from the computations.
2. For validation purposes, mean nominal monthly wages by industry are compared against statistics from the NSC website and ILOSTAT.
    a. Wage data from ILOSTAT are based on the Survey of Enterprises, Institutions and Organisations. These wage levels are close to those reported in the NSC website, which are based on the Integrated Sample Survey on Household Budgets and Labor Force.
    b. Wages from ILOSTAT and NSC are both higher than the wage levels computed using the KIHS microdata. Wages from NSC includes not only wages for actual time worked but also payments for unworked time (e.g. annual leave), bonuses, incentives, and imputed values of in-kind payments. On the other hand, from the KIHS microdata we consider only the basic monthly remuneration. This explains why the levels of average wages here are lower than those reported by NSC or ILOSTAT.
    c. However, the ratio of industry wages to the national average displays a pattern that is consistent across the three sources: KIHS, ILOSTAT, and NSC website.

VII. MONGOLIA Notes

1. Data collection period for LFS 2008-2009 is January-December 2008, so this round is treated as year 2008. Data collection period for LFS 2007-2008 is January-December 2007, so this round is treated as year 2007. Data collection period for LFS 2006-2007 is July 2006 – June 2007, so this round is treated as year 2006. Data collection period for LFS 2002-2003 is October 2002 – September 2003, so this round is treated as year 2003.
2. Reference period is *last 12 months* for employment, wages, industry, and occupation. Employment levels and distribution by industry and occupation based on this reference period are close to the figures reported in ILOSTAT, whereas, using the *last 7 days* as reference period gives too few workers in Agriculture compared to ILOSTAT. Since agriculture work is highly seasonal, it is possible that agriculture workers did not respond to the industry of work during the last 7 days.
3. Industry codes for 2007-2018 are based on ISIC Rev 4. Industry codes for 2003 and 2006 are based on ISIC Rev 3.1.
4. ISIC 3.1 industry codes were converted into ISIC 3 using the concordance between ISIC 3.1 and ISIC 3. ISIC 4 industry codes were converted into ISIC 3 based on the concordances between ISIC 4 and ISIC 3.1, and between ISIC 3.1 and ISIC 3.
5. Occupation codes for 2007-2018 are based on ISCO-08. Occupation codes for 2003 and 2006 are based on ISCO-88. The occupation codes in 2003 and 2006 were harmonized with ISCO-08 using the concordance between ISCO-88 and ISCO-08.

6. Wages refer to average monthly earnings from primary occupation in the last 12 months. We did not add earnings from secondary occupation because it will confound classification of a worker's industry and occupation of employment.
7. For robustness, wages earned in the last 7 days from primary occupation are compared with the wages in the last 12 months. These wages are very close.

VIII. NEPAL Notes

1. Employment and wage levels and distribution by industry and occupation are consistent with the numbers published in ILOSTAT and the Nepal Labour Force Survey Reports.
2. Wages refer to cash earnings only.

Notes on NLFS 1999:

1. Occupation codes are harmonized with ISCO-08 (2-digit) using the concordance made by ADB's Key Indicators (KI) 2015 team.
2. Industry codes closely match ISIC 3 2-digit codes except for NSIC code 10 ("Mining") which could map to either of the following ISIC 3 2-digit codes:

ISIC 3	Description
10	Mining of coal and lignite; extraction of peat
11	Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction excluding surveying
12	Mining of uranium and thorium ores
13	Mining of metal ores
14	Other mining and quarrying

Notes on NLFS 2008:

1. Occupation codes are harmonized with ISCO-08 (2-digit) using the concordance made by ADB's Key Indicators (KI) 2015 team.
2. Industry codes are harmonized with ISIC 4 (2-digit) using the concordance made by ADB's Key Indicators (KI) 2015 team. Industry codes are then harmonized with ISIC 3 by first mapping 2-digit ISIC 4 to 2-digit ISIC 3.1 and doing the same for 2-digit ISIC 3.1 and 2-digit ISIC 3 using concordance tables.

Notes on NLFS 2017:

1. NSCO 2017 is consistent with 3-digit ISCO 08 codes except for codes 110 ("Commissioned armed forces occupations"), 210 ("Non-commissioned armed forces occupations") and 310 ("Armed forces occupations, other ranks")
2. NSIC 2017 is consistent with ISIC 4 4-digit codes. NSIC 2017 4-digit codes are first truncated to 2-digit. 2-digit industry codes are then harmonized with ISIC 3 by first mapping 2-digit ISIC 4 to 2-digit ISIC 3.1 and doing the same for 2-digit ISIC 3.1 and 2-digit ISIC 3 using concordance tables.
3. The following rules were followed in computing for monthly wages:
    a. If the respondent is paid on a daily basis, then monthly wage = 30*daily pay
    b. If the respondent receives weekly pay, then monthly wage = (30/4)*daily pay
    c. If the respondent receives his/her remuneration at a piece rate or through other means, monthly wage is coded as missing

    The multipliers were based on experiments done on the dataset. Basically, these multipliers yield wage estimates that are closest to those that are published in the Nepal 2017 Labour Force Survey Report

IX. PAKISTAN Notes

1. Reference period for employment, wage, industry, and occupation is 7 days.
2. Wages were computed as follows:
    a. For observations with weekly wage data, weekly wage is multiplied by 4.2 to get monthly wage
    b. Monthly wage is annualized by multiplying it by 12.
    c. Yearly bonus is included

Notes on LFS 2001-02, 2003-04, and 2005-06, 2006-07, 2008-09, 2009-10, and 2010-11:

1. For LFS 2001-02 and 2003-04, industry classification used is not disclosed in the LFS reports. For LFS 2005-06 and LFS 2006-07, industry classification used is based on the International Standard Industrial Classification (ISIC) Revision 2 according to the LFS report. However, upon checking, several microdata codes are not in ISIC Rev. 2. Instead, mapping to ISIC Rev. 4 by the Asian Development Bank (ADB) team for the Key Indicators for Asia and the Pacific (KI) 2015 is used for all four LFS rounds.
2. For LFS 2008-09, 2009-10, and 2010-11, industry is based on the Pakistan Standard Industrial Classification (PSIC) 2007, which is based on ISIC Rev. 3.1.
3. Industry codes are at 2-digit level.
4. ISIC Rev. 4 codes are converted to 2-digit ISIC Rev. 3 codes using correspondence tables for ISIC Rev. 4 and ISIC Rev. 3.1, and ISIC Rev. 3.1 and Rev. 3. On the other

hand, ISIC Rev. 3.1 codes are converted to 2-digit ISIC Rev. 3 codes using the correspondence table between ISIC Rev. 3.1 and Rev. 3.

5. According to LFS reports, occupation is based on the Pakistan Standard Classification of Occupations (PSCO) 1994, which is based on the International Standard Classification of Occupations (ISCO) 1988. Occupation codes are at 2-digit level.
6. ISCO-88 codes are harmonized to ISCO 2008 codes using the concordance between ISCO-88 and ISCO-08.
7. Employment levels and distribution by industry are consistent with the results from the LFS reports.
8. Employment levels and distribution by occupation are consistent with the results from the LFS reports for all major occupational groups except ISCO 1-digit code 2 ('Professionals') due to harmonization from ISCO-88 to ISCO-08. Specifically, the difference in distribution is caused by the mapping of ISCO-88 code 33 ('Teaching associate professionals') to ISCO-08 code 23 ('Teaching professionals'), as a considerable number of observations are under ISCO-88 code 33.
9. For LFS 2001-02, 2003-04, and 2005-06, no available results for wages from LFS reports and other institutions are available for comparison with estimations from the microdata.
10. For 2006-07, 2008-09, 2009-10, and 2010-11, wages are consistent with the numbers published in the LFS reports and ILO Stat for all major occupational groups except ISCO 1-digit code 2 ('Professionals') for the same reason as that for employment levels and distribution.

Notes on LFS 2012-13, 2013-14, 2014-15, and 2017-18:

1. According to the LFS reports, industry is based on PSIC 2010, which is based on ISIC Rev. 4. Industry codes are at 2-digit level.
2. ISIC Rev. 4 codes are converted to 2-digit ISIC Rev. 3 codes using correspondence tables for ISIC Rev. 4 and ISIC Rev. 3.1, and ISIC Rev. 3.1 and Rev. 3.
3. According to LFS reports, occupation is based on PSCO 2015, which is based on ISCO-08. Occupation codes are at 2-digit level.
4. Employment levels and distribution by industry and occupation are consistent with the results from the LFS reports.
5. Wages are consistent with the numbers published in the LFS reports and ILO Stat.

X. PHILIPPINES Notes

1. 2-digit industry and occupation codes were first mapped to the international industry/occupation classification most consistent to it. For example, Philippine Standard Industrial Classification 1994 (PSIC) is closest to ISIC version 3.1. PSIC codes are first mapped to ISIC 3.1, and then mapped to ISIC 3.

2. Wages refer to cash earnings. In every year, wages are averaged over four quarters of LFS data.
3. Wage data from the microdata of PH 2001 are not used because the sum of annual wages for missing occupation codes comprises 25% of total wages. Instead, wage values for 2001 are extrapolated from other years.
4. The microdata for PH 2016 was not used because 9% of occupation codes are missing. Instead, values for 2016 are extrapolated from other years.

Notes on LFS 2001-2008, 2010-2011:

1. 2-digit industry codes are based on Philippine Standard Industrial Classification (PSIC) 1994, which is consistent with ISIC 3.1 at the 2-digit level; 2-digit occupation codes based on Philippine Standard Occupation Classification (PSOC) 1992, which is consistent with ISCO 88 at the 2-digit level.
2. 2-digit PSOC 1992 codes were first mapped to 2-digit ISCO 08 using the concordance tables prepared by the Key Indicators 2015 team. Note that the following 2-digit PSOC 1992 codes can be mapped to multiple ISCO 08 codes

PSOC 1992/ ISCO 88 Code	PSOC 1992/ ISCO 88 Description	ISCO 08 Code	ISCO 08 Final Code
1	Armed forces	Could either be 1, 2 or 3	01 (Commissioned Armed Forces officers)
14	Supervisors	Not in ISCO 08	12 (Administrative and Commercial Managers
24	Other Professionals	Could either be 24, 25 or 26	24 (Business and Administration Professionals)
33	Teaching Associate Professionals	Not in ISCO 08	33 (Business and Administration Associate Professionals)

34	Related Associate Professionals	Could either be 33, 34 or 35	33 (Business and Administration Associate Professionals)
41	Office Clerks	Could either be 41, 43 or 44	41 (General and Keyboard Clerks)
51	Personal and Protective Services Workers	Could either be 51, 53 or 54	51 (Personal Services Workers)

3. 2-digit PSIC 1994 codes were first mapped to 2-digit ISIC 3.1 codes. The codes in Table 1 below show which PSIC 1994 codes were recoded for consistency with ISIC 3.1. ISIC 3.1 codes were then mapped to their respective 2-digit ISIC 3 codes.

PSIC 1994 code	**PSIC 1994 Description**	**ISIC 3.1 Code**	**ISIC 3.1 Description**
2	Farming of animals	1	Agriculture, hunting and related service activities
3	Agricultural and Animal Husbandry Service Activities, Except Veterinary Activities	1	Agriculture, hunting and related service activities
4	Hunting, Trapping, and Game Propagation Including Related Service Activities	1	Agriculture, hunting and related service activities
5	Forestry, Logging and Related Activities	2	Forestry, logging and related service activities

6	Fishing	5	Fishing, aquaculture and service activities incidental to fishing
10	Metallic Ore Mining	13	Mining of metal ores
11	Metallic Mining and Quarrying	10	Mining of coal and lignite; extraction of peat
39	Manufacturing, n.e.c.	36	Manufacture of furniture; manufacturing n.e.c.
66	Non-bank Financial Intermediation	65	Financial intermediation, except insurance and pension funding
67	Insurance and Pension Funding except Compulsory Social Security	66	Insurance and pension funding, except compulsory social security
68	Activities Auxiliary to Financial Intermediation	67	Activities auxiliary to financial intermediation
81	Private Education Services	80	Education

Notes on LFS 2012-2013:

1. 2-digit industry codes are based on Philippine Standard Industrial Classification (PSIC) 2009, which is consistent with ISIC 4 at the 2-digit level; 2-digit occupation codes based on Philippine Standard Occupation Classification (PSOC) 1992, which is consistent with ISCO 88 at the 2-digit level.
2. 2-digit PSOC 1992 codes were first mapped to 2-digit ISCO 08 using the concordance tables prepared by the Key Indicators 2015 team. Note that the following 2-digit PSOC 1992 codes can be mapped to multiple ISCO 08 codes

PSOC 1992/ ISCO 88 Code	PSOC 1992/ ISCO 88 Description	ISCO 08 Code	ISCO 08 Final Code
1	Armed forces	Could either be 1, 2 or 3	01 (Commissioned Armed Forces officers)
14	Supervisors	Not in ISCO 08	12 (Administrative and Commercial Managers
24	Other Professionals	Could either be 24, 25 or 26	24 (Business and Administration Professionals)
33	Teaching Associate Professionals	Not in ISCO 08	33 (Business and Administration Associate Professionals)
34	Related Associate Professionals	Could either be 33, 34 or 35	33 (Business and Administration Associate Professionals)
41	Office Clerks	Could either be 41, 43 or 44	41 (General and Keyboard Clerks)
51	Personal and Protective Services Workers	Could either be 51, 53 or 54	51 (Personal Services Workers)

3. 2-digit PSIC 2009 codes were mapped to ISIC 4. According to the Philippine Statistics Authority, "Starting January 2012 LFS, the codes for industry adopted the 2009 Philippine Standard Industrial Classification (PSIC)… The 2009 PSIC was patterned after the United Nations International Standard Industrial Classification (UN-ISIC) Revision 4, but with some modifications to reflect national situations and requirements. At the 2-digit level, PSIC-2009 is consistent with ISIC-Rev 4." Hence, 2-digit PSIC 2009 codes were taken to be identical to ISIC 4 codes. Concordance tables

from ISIC 4 to ISIC 3.1 and then from ISIC 3.1 to ISIC 3 were used to map PSIC 2009 codes to ISIC 3.

XI. SRI LANKA Notes

General Notes:

1. All data are based on the Labour Force Surveys.
2. Employment levels are based on all workers.
5. Wages refer to the earnings of wage workers only.
6. Wages are annualized by multiplying monthly earnings by 12 months.

Notes on year 2002-2007, 2009-2012:

6. The survey uses Sri Lanka Standard Industrial Classification (SLSIC) 3. SLSIC 3 is the local version of ISIC 3. The following 2-digit SLSIC 3 codes were recoded as follows for consistency with ISIC 3:

SLSIC 3	ISIC 3	Industry name
2, 3, 4	1	Agriculture, hunting and related service activities
5	2	Forestry, logging and related service activities
6	5	Fishing, operation of fish hatcheries and fish farms; service activities
82, 83	80	Education
96	95	Private households with employed persons
13	14	Other mining and quarrying

7. It is assumed that 96 is likely to be most related to 95 as they both fall under P "Private household with employed persons." 82 and 83 are recoded to 80 for the same reason, i.e., if we were to work with 1-digit industries, these 2 would have fallen into industry 80. Similar reason for 13 being recoded to 14.
8. The survey uses Sri Lanka Standard Classification of Occupations (SLSCO) 08, which is derived from ISCO - 88. Thus, occupations are classified according to the International Standard Classification of Occupation (ISCO) - 1988.
9. Employment levels and distribution by industry and occupation are consistent with the numbers published in ILOSTAT and the Sri Lanka Labor Force Survey Reports.

10. Monthly wage is taken from the only earnings variable in the microdata, which refers to either wages/salary last month or the daily wage rate multiplied by the number of days worked last month. The microdata in 2002 only asks if there is any payment in kind but does not contain a numerical value of any payment in kind. Two types of validation exercises were undertaken: first, mean and median wage estimates were compared with published Sri Lanka Labor Force Survey estimates and second, wages by 1-digit ISCO-08 were compared with numbers from ILOSTAT (for 2010-2011 only)
11. For years 2004 and 2005, the indicator for "working" was disregarded because of data issues. It was assumed that workers with employment and occupation information are "working." Estimates were closed to the published numbers in the Sri Lanka LFS Annual Report. For instance, total employment reported in Sri Lanka LFS 2004 Annual Report was 7,394,559. Tabulations by industry yielded a weighted frequency count totaling 7,352,517.

Notes on year 2013-2017:

- From 2013 onward, the survey uses Sri Lanka Standard Classification of Occupation - 2008 (SLSCO – 08) to classify occupations. This Classification is derived from the International Standard Classification of Occupation – 2008 (ISCO – 08). [Source: LFS 2013-2017 Annual Reports]
- The survey uses Sri Lanka Standard Industry Classification Rev. 4 (SLSIC Rev.4) derived from the International Standard Industry Classification Rev.4 (ISIC Rev.4) for Industry classification. [Source: LFS 2013-2017 Annual Reports]
- Employment levels and distribution by industry and occupation are consistent with the numbers published in the Annual Reports from 2013-2017.
- Wages of monthly salary earners are taken as the sum of gross salary for last month (including all allowances), additional earnings during last month (overtime payment, etc.), and income in kind (if there is any). Wages of daily wage earners are taken as the sum of total cash income last month and income in kind (if there is any). The monthly wage of wage workers is taken as the combined wages of monthly salary earners and daily wage earners last month.
- Mean and median monthly wage of monthly salary earners and daily wage earners are close to the numbers published in the LFS 2013-2017 Annual Reports. Average monthly wages of employees (based on ISCO-08 1-digit classification) are close to the numbers reported in ILOSTAT.

XII. TAIPEI,CHINA Notes:

1. Industry codes were first harmonized within Taipei across Revisions 6-8/9. It was then mapped to ISIC 3 based on 2-digit industry description.
2. Occupation codes were harmonized within Taipei Revisions 5-7 then mapped to ISCO 88 or ISCO 08, depending on which of these two international occupation classifications closely match the local industry classification.

Notes on MUS 2000 and 2001:

1. 2-digit industry codes are based on Taiwan Industrial Classification (TIC) Rev 6; 2-digit occupation codes based on Taiwan Occupation Classification (TOC) Rev 5
2. Taiwan Occupation Classification Rev 5 value labels is close to that of ISCO 88. So 2-digit TOC Rev 5 was first mapped to 2-digit ISCO 88 and then to 2-digit ISCO 08.
3. TIC Rev 6 code 61 with value label "Transport" maps to ISIC 3 codes 60 ("Land Transport; Transport via Pipelines"), 61 ("Water Transport") and 62 ("Air Transport"). It was recorded as code 60. TIC Rev 7 code 65 with value label "Financing and Auxiliary Financing" maps to two ISIC 3 2-digit codes, namely code 65 ("Financial Intermediation") and code 67 ("Activities Auxiliary to Financial Intermediation"). It was recorded as code 65.

Notes on MUS 2002 to 2006:

1. 2-digit industry codes are based on Taiwan Industrial Classification (TIC) Rev 7; 2-digit occupation codes based on Taiwan Occupation Classification (TOC) Rev 5
2. Taiwan Occupation Classification Rev 5 value labels is close to that of ISCO 88. So 2-digit TOC v5 was first mapped to 2-digit ISCO 88 and then to 2-digit ISCO 08.
3. TIC Rev 7 code 62 with value label "Financing and Auxiliary Financing" maps to two ISIC 3 2-digit codes, namely code 65 ("Financial Intermediation") and code 67 ("Activities Auxiliary to Financial Intermediation"). It was recorded as code 65.

Notes on MUS 2007 to 2010:

1. 2-digit industry codes are based on Taiwan Industrial Classification (TIC) Rev 8/9; 2-digit occupation codes based on Taiwan Occupation Classification (TOC) Rev 5
2. Taiwan Occupation Classification Rev 5 value labels is close to that of ISCO 88. So 2-digit TOC v5 was first mapped to 2-digit ISCO 88 and then to 2-digit ISCO 08.
3. A many-to-one mapping can be constructed between 2-digit TIC 8/9 and 2-digit ISIC 3. No one 2-digit TIC value label corresponds to more than one 2-digit ISIC 3 value label.

Notes on MUS 2011 to 2013:

1. 2-digit industry codes are based on Taiwan Industrial Classification (TIC) Rev 8/9; 2-digit occupation codes based on Taiwan Occupation Classification (TOC) Rev 5
2. Taiwan Occupation Classification Rev 6 value labels is close to that of ISCO 08. So 2-digit TOC v6 was mapped to 2-digit ISCO 08.

3. A many-to-one mapping can be constructed between 2-digit TIC 8/9 and 2-digit ISIC 3. No one 2-digit TIC value label corresponds to more than one 2-digit ISIC 3 value label.

XIII. THAILAND Notes

1. Reference period for employment, industry, and occupation is 7 days.
2. Wages were computed as follows:
    a. Hourly wage is multiplied by average number of hours worked daily to get daily wage.
    b. Daily wage is multiplied by 21.5 to get monthly wage.
    c. Weekly wage is multiplied by 4.2 to get monthly wage.
    d. Monthly wage is annualized by multiplying it by 12.

Notes on LFS 2000:

1. Industry classification used is not disclosed in published reports. Instead, mapping to the International Standard Industrial Classification (ISIC) Revision 4 by the Asian Development Bank (ADB) team for the Key Indicators for Asia and the Pacific (KI) 2015 is used.
2. ISIC Rev. 4 codes are converted to 2-digit ISIC Rev. 3 codes using correspondence tables for ISIC Rev. 4 and ISIC Rev. 3.1, and ISIC Rev. 3.1 and Rev. 3.
3. Occupation classification used is not disclosed in published reports. Instead, mapping to the International Standard Classification of Occupation (ISCO) 2008 by the ADB KI 2015 team is used.
4. Employment level is consistent with figures from the Bank of Thailand (BOT) and ILO Stat.
5. Average wages by industry groups are consistent with the numbers reported by BOT.

Notes on LFS 2005 and 2010:

1. According to the LFS reports and data dictionaries, industry is based on ISIC Rev. 3.
2. For LFS 2010, microdata industry code 39 (industry label not disclosed in reports) is recoded to ISIC Rev. 3 code 37, which is the closest manufacturing industry code.
3. According to the LFS reports and data dictionaries, occupation follows the Thailand Standard Classification of Occupations (TSCO) 2000.
4. TSCO 2000 codes are mapped to ISCO-08 using ADB KI 2015 team's concordance table.
5. Employment levels are consistent with figures from the Bank of Thailand (BOT) and ILO Stat.
6. Average wages by industry groups are consistent with the numbers reported by BOT.

Notes on LFS 2011-2018:

1. For LFS 2011-2017, industry follows the Thailand Standard Industrial Classification (TSIC) 2009, which is based on ISIC Rev. 4. Industry classification used for LFS 2018 is not disclosed in the documentations. However, upon checking, microdata codes can be mapped to TSIC 2009 at 2-digit level.
2. ISIC Rev. 4 codes are converted to 2-digit ISIC Rev. 3 codes using correspondence tables for ISIC Rev. 4 and ISIC Rev. 3.1, and ISIC Rev. 3.1 and Rev. 3.
3. For LFS 2011-2017, occupation follows ISCO-08. Classification used for LFS 2018 is not disclosed in the documentations; but microdata codes can be mapped to ISCO-08 at 2-digit level.
4. Employment levels are consistent with figures from the Bank of Thailand (BOT) and ILO Stat.
5. Average wages by occupation groups are consistent with the numbers reported by ILO Stat.

XIV. VIET NAM Notes

1. Reference period for employment, wage, industry, and occupation is 7 days.
2. According to the LFS reports, for LFS 2009, 2010, 2013, and 2014, industry codes follow the Viet Nam Standard Industrial Classification (VSIC) 2007, which is based on the International Standard Industrial Classification (ISIC) Revision 4.

   For LFS 2007, 2012, and 2016, industry classification used is not disclosed in the LFS reports. However, upon checking, all microdata codes can be mapped to VSIC 2007 at 2-digit level.

3. For LFS 2007, occupation classification used is not disclosed. However, upon checking, all microdata codes can be mapped to the International Standard Classification of Occupations (ISCO) 1988.

   According to the LFS reports, LFS 2009, 2010, 2013, and 2014 follow the Vietnam Occupation Standard Classification (VSCO) 2009, which is based on ISCO 2008.

   For LFS 2012, and 2016, occupation classification used is not disclosed in the LFS reports. However, upon checking, all microdata codes can be mapped to VSCO 2009 at 2-digit level.

4. Further recoding was done for some microdata codes for consistency with ISIC or ISCO:

LFS year	VSIC 07	ISIC Rev 4

2010	-1 (Unknown industry according to IHSN data dictionary)	Left blank [recode Q18 (-1 = .)]
2013	8322 [No such code in VSIC 07; might be a typo]	8422 (National Defence)

LFS year	VSCO 98	ISCO 88
2007	00 (Army)	01 (Armed forces)
	- 12 (The National Assembly and the President's Office) - 13 (Government) - 14 (The People's Courts and the People's Procuracy) - 15 (People's Councils & People's Committees (including local specialized agencies, except judiciary & unions)) - 16 (Mass organizations: the Fatherland Front, the Labor Confederation, the Women's Union, the Farmers' Association, the Youth Union of Ho Chi Minh City, the Veterans Association) - 17 (Humanitarian, humanitarian and other specialized organizations)	11 (Legislators and senior officials)
	18 (Union Agencies, General Corporations and Equalities Producing Material Products and Services (Including the management of a consortium, a corporation or a large university with three directors (and the equivalent) above))	12 (Corporate managers)
	19 (Companies, enterprises, enterprises that create material products and services, and small schools (including directors, deputy directors running a company, enterprise, enterprise, small school with assistance). of another director and / or of a (few))	13 (General managers)
	79 (Artisans and other related workers are not allocated)	74 (Other craft and related trades workers)

LFS year	VSCO 09	ISCO 08
2009	244 (Regulatory government associate professionals)	335 (Government regulatory associate professionals)
	- 12 (Leaders of National Assembly and Office of President) - 13 (Leaders of Government) - 14 (Leaders of People Court and People's Procuracy) - 15 (Leaders of People's Council and People's Committee in provinces (includes provincial professional agencies; except judiciary and union)) - 16 (Union; Fatherland Front; Federation of Labour, Women Association; Farmer Association; Ho Chi Minh Youth Union; Veterans' Organization) - 17 (Leaders of proprietor and charity organizations, and for other special benefit) - 18 (Leaders of Corporations, General Companies and equivalence making material and service product)	11 (Chief Executives, Senior Officials and Legislators)
	36 (Teaching associate professionals)	23 (Teaching Professionals)
	50 [No such code in VSCO 08; might be a typo]	51 (Personal Services Workers)
	70 [No such code in VSCO 08; might be a typo]	71 (Building and Related Trades Workers (excluding Electricians))
2010	-1 (Unknown occupation according to IHSN data dictionary)	Left blank [recode Q14 (-1 = .)]
	244 (Regulatory government associate professionals)	335 (Government regulatory associate professionals)
	- 12 (Leaders of National Assembly and Office of President) - 13 (Leaders of Government) - 14 (Leaders of People Court and People's Procuracy) - 15 (Leaders of People's Council and People's Committee in provinces (includes provincial professional agencies; except judiciary and union)) - 16 (Union; Fatherland Front; Federation of Labour, Women	11 (Chief Executives, Senior Officials and Legislators)

	Association; Farmer Association; Ho Chi Minh Youth Union; Veterans' Organization) - 17 (Leaders of proprietor and charity organizations, and for other special benefit) - 18 (Leaders of Corporations, General Companies and equivalence making material and service product)	
	36 (Teaching associate professionals)	23 (Teaching Professionals)
	20 [No such code in VSCO 08; might be a typo]	21 (Science and Engineering Professionals)
	30 [No such code in VSCO 08; might be a typo]	31 (Science and Engineering Associate Professionals)
	40 [No such code in VSCO 08; might be a typo]	41 (General and Keyboard Clerks)
	50 [No such code in VSCO 08; might be a typo]	51 (Personal Services Workers)
	60 [No such code in VSCO 08; might be a typo]	61 (Market-oriented Skilled Agricultural Workers)
	70 [No such code in VSCO 08; might be a typo]	71 (Building and Related Trades Workers (excluding Electricians))
	90 [No such code in VSCO 08; might be a typo]	91 (Cleaners and Helpers)
2012	244 (Regulatory government associate professionals)	335 (Government regulatory associate professionals)
	- 12 (Leaders of National Assembly and Office of President) - 13 (Leaders of Government) - 14 (Leaders of People Court and People's Procuracy) - 15 (Leaders of People's Council and People's Committee in provinces (includes provincial professional agencies; except judiciary and union)) - 16 (Union; Fatherland Front; Federation of Labour, Women Association; Farmer Association; Ho Chi Minh Youth Union; Veterans' Organization) - 17 (Leaders of proprietor and charity organizations, and for other special benefit)	11 (Chief Executives, Senior Officials and Legislators)

	- 18 (Leaders of Corporations, General Companies and equivalence making material and service product)	
	36 (Teaching associate professionals)	23 (Teaching Professionals)
2013	244 (Regulatory government associate professionals)	335 (Government regulatory associate professionals)
	- 12 (Leaders of National Assembly and Office of President) - 13 (Leaders of Government) - 14 (Leaders of People Court and People's Procuracy) - 15 (Leaders of People's Council and People's Committee in provinces (includes provincial professional agencies; except judiciary and union)) - 16 (Union; Fatherland Front; Federation of Labour, Women Association; Farmer Association; Ho Chi Minh Youth Union; Veterans' Organization) - 17 (Leaders of proprietor and charity organizations, and for other special benefit) - 18 (Leaders of Corporations, General Companies and equivalence making material and service product)	11 (Chief Executives, Senior Officials and Legislators)
	36 (Teaching associate professionals)	23 (Teaching Professionals)
2014	244 (Regulatory government associate professionals)	335 (Government regulatory associate professionals)

	- 12 (Leaders of National Assembly and Office of President) - 13 (Leaders of Government) - 14 (Leaders of People Court and People's Procuracy) - 15 (Leaders of People's Council and People's Committee in provinces (includes provincial professional agencies; except judiciary and union)) - 16 (Union; Fatherland Front; Federation of Labour, Women Association; Farmer Association; Ho Chi Minh Youth Union; Veterans' Organization) - 17 (Leaders of proprietor and charity organizations, and for other special benefit) - 18 (Leaders of Corporations, General Companies and equivalence making material and service product)	11 (Chief Executives, Senior Officials and Legislators)
	36 (Teaching associate professionals)	23 (Teaching Professionals)
2016	244 (Regulatory government associate professionals)	335 (Government regulatory associate professionals)
	- 12 (Leaders of National Assembly and Office of President) - 13 (Leaders of Government) - 14 (Leaders of People Court and People's Procuracy) - 15 (Leaders of People's Council and People's Committee in provinces (includes provincial professional agencies; except judiciary and union)) - 16 (Union; Fatherland Front; Federation of Labour, Women Association; Farmer Association; Ho Chi Minh Youth Union; Veterans' Organization) - 17 (Leaders of proprietor and charity organizations, and for other special benefit) - 18 (Leaders of Corporations, General Companies and equivalence making material and service product)	11 (Chief Executives, Senior Officials and Legislators)

	36 (Teaching associate professionals)	23 (Teaching Professionals)
	67 [No such code in VSCO 08; might be a typo]	63 (Subsistence Farmers, Fishers, Hunters and Gatherers)
	97 [No such code in VSCO 08; might be a typo]	96 (Refuse Workers and Other Elementary Workers)

5. ISIC Rev. 3.1 and ISIC Rev. 4 codes are converted to 2-digit ISIC Rev. 3 codes using correspondence tables for ISIC Rev. 4 and ISIC Rev. 3.1, and ISIC Rev. 3.1 and Rev. 3.
6. ISCO 88 codes are harmonized to ISCO 2008 codes using the concordance between ISCO-88 and ISCO-08.
7. Employment and wage levels are consistent with figures from LFS reports and the ILO Stat.