Supply Chain Disruptions and Resilience of Sri Lankan Exports

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Summary

Despite sitting on the periphery of the global supply chain nexus, Sri Lanka was not spared by the disruptions caused by Covid-19 restrictions and Russian war in Ukraine. Ongoing rivalry between the US and China are going to change the phase of globalization with the formation of new alignments. Despite being an advocate of fair practices in production and trading, industrial policies of the US are changing in favor of domestic producers and domestic production. Resilience instead of efficiency has come to prominence. Within this context Sri Lanka has to consider ways of developing resilient exports. The main objective of this exercise is to assess the import content of various export categories of Sri Lanka and open room for policy discussions on developing the export sector that can withstand severe disruptions to the global supply chain.

Methodology: We estimated the imported input content of exports (commonly known as backward linkages) by formulating export supply functions under the assumption that Sri Lanka is a price taker in the world market. This stands in contrast to the common practice of estimating export demand functions under the same assumption. Import leakage from tourist earnings and workers' remittances is estimated through import demand equations. The years 2019-21 were not used in the estimation because of the sharp breaks in the data series due to the Easter Bombing in 2019 and subsequent Covid-19 restrictions. As a cross check we also estimated the input content of output from input-output (IO) data over the period 2007-2018. Although the data and methodologies are very different, the basic patterns that emerged on input content of output (from IO tables) and import content of exports (from regression estimates) are unexpectedly very similar.

Results: The table below provides the average estimates (average over 2007-2018) of input content of output from IO tables and import content of exports from regression estimates. Note that one

minus the input content is the value-added content of output. The import content can be interpreted as cents per dollar of export earnings or simply expressed as percentages. In the main text we discuss the results in detail. The most salient observations from the exercise and some policy implications are presented below in itemized form.

Import content of exports supplemented by input content of output (average 2007-2018

Sector and Category	Input content of output (IO tables based)	Import content of exports (Regression based)
Agriculture	0.26	0.19
Service	0.33	0.23
Industry	0.51	0.46
Agriculture excluding tea	-	0.14
Remittances	-	0.15
Services excluding tourism	-	0.22
Tourism	-	0.27
Tea	-	0.29
Industry excluding Textiles & Garments	0.48	0.40
Textiles & Garments	0.56	0.41
Petroleum	0.83	0.79

For workers' remittances and tourist earnings the interpretation is import leakage.

1. Although the industrial sector has been the main export earner for the country, after netting out the import content the service sector has come to prominence after 2014. However, the service sector showed the least resilience. Devastating effects of Easter bombing and Covid-19 have fallen disproportionately on the service sector (both tourist and non-tourist services).
   (a) Despite the rapid expansion of the service exports after 2009, there has been no proportionate increase in the import content. This is obviously a healthy development.
   (b) A comparison with Thailand, a very popular tourist destination, indicates that Sri Lanka enjoys a natural advantage in tourism and this needs to be enhanced further by creating an atmosphere where tourists are tempted to spend more. Despite the lack of resilience, tourism can be used to create a buffer of foreign exchange earnings during good times.
   (c) Workers' remittances show some resilience though there has been a slowing down (in USD terms) as a result of falling numbers of migrants after 2014. Instead of supplying poor mothers as housemaids to the world that entails substantial (less assessed) social costs,

policies are needed to lure back skilled Sri Lankan emigrants with their savings for a steady supply of talent and foreign exchange.

2. The industrial sector shows the highest imported input content, about 46 cents per dollar worth of exports; this drops to about 40 cents after excluding petroleum exports. The industrial sector has shown higher resilience than the service sector during the troubled times. Global value chain dependence of the industrial sector is unavoidable. Studies show that the vulnerability of the industrial sector is higher when the suppliers are highly concentrated in a few geographical locations. The recommendation in these studies is to diversify the supply sources. The practicality of this recommendation for small firms needs to be assessed. The better alternative is the diversification of the industrial sector that may automatically reduce the supplier concentration.
3. The agricultural sector shows the highest value added content and the lowest imported input content though specific crops are more import dependent. The sector has shown the highest resilience to the shocks.
   (a) Tea exports show a higher and increasing dependence on imported inputs, on average every dollar worth of tea exports contains about 29 cents of imports. These inputs include fertilizer and agrochemicals. (Rice production also depends heavily on these inputs but we did not assess rice because it is not an export crop.)
   (b) The share of tea in agricultural exports has diminished over the years because of the pickup of other agricultural exports which are very low in imported inputs (0.14 cents per dollar worth of other agricultural exports).
   (c) As a source of foreign exchange, the agricultural sector is yet to realize its potential. Low imported input content in agricultural exports insulates the sector from global supply chain disruptions. Developing the agriculture sector for both food security and exports is a challenge that Sri Lanka has to handle head on.
   (d) Even Singapore is moving in the direction of high-tech farming to ensure some domestic supply of food products. However, these methods are highly energy intensive and having to rely on imported fossil fuel takes us back to square one. Resilience also requires harnessing other energy sources such as solar power.

1. Introduction

As globalization evolves new trade patterns emerge. One key aspect of this evolution is the spread of global value chains (GVCs) or supply chains across many countries. Instead of domestic specialization and international trading that has been the general practice for long time, the specialization under the GVC structure occurs internationally. Production fragmentation across borders and international specialization have enhanced comparative advantages a company can derive. Over the last three decades at a global level the GVC trade of intermediate goods and services has outgrown the traditional trade of final goods and services (Ignatenko et al. 2019). Even a relatively closed economy like India has been undergoing this transformation (Goldar et al. 2020).

There is a large literature that highlights the benefits of GVC participation (see for example, OECD 2013, Ignatenko et al. 2019, Greenville et al. 2019, George 2021, Brenton et al. 2022 and the references therein). These benefits include productivity and efficiency gains through specialization and economies of scale and lower prices for consumers and improvements in per capita incomes of the participating countries. Technological advancements that enabled remote-work enhanced the transition further to a borderless world and globalization appeared unassailable.

However, the unexpected supply chain disruptions by the Covid-19 pandemic and the Russian war in Ukraine have rung alarm bells across the globe and 'resilience', instead of efficiency, has become the buzzword of the day.

Arriola et al. (2021) using OECD's computable general equilibrium trade model (METRO) find sizable impact from Covid-19 disruptions on their list of countries; the vulnerability to shocks increases when suppliers or clients are highly concentrated. Schwellnus et al. (2023), using panel regression models to assess how upstream supply shocks affect the output growth, show that domestic production disruptions intensify when suppliers are highly concentrated. Wuri et al. (2022) also, using a panel regression approach with forward and backward linkages from input-output data, note the decline in GVC participation as a result of Covid-19 restrictions. A study by OECD (2022) documents the interruptions to critical raw materials caused by the Russian war in Ukraine. The study shows that the security of supply of raw materials, which are crucial for industrial production and green transformation, is at risk due to export restrictions, bilateral

dependencies, lack of transparency and persistent market asymmetries, including the concentration of production in only a few countries.

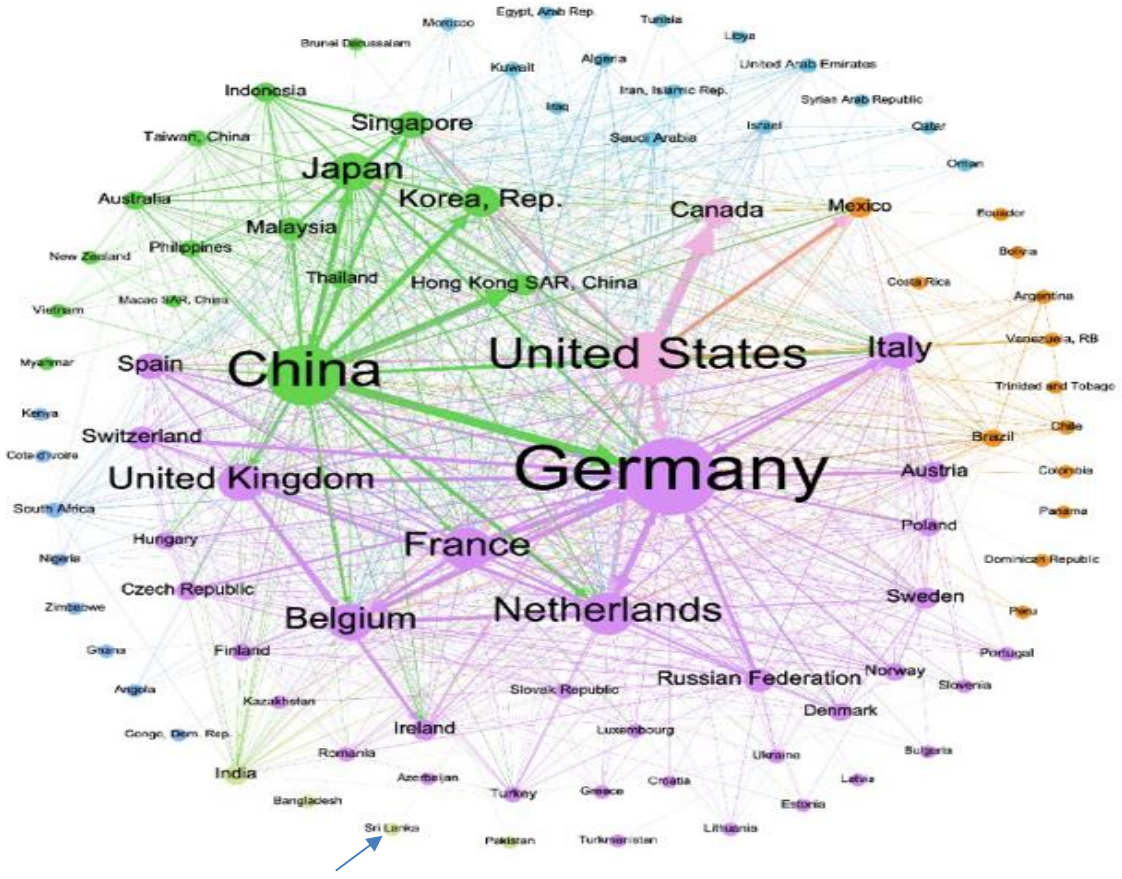
Not only the industrial and service sectors, the food and agriculture sector has also evolved along the lines of GVCs and deemed to be a beneficial development (Greenville et al. 2019, OECD 2020a). However, Covid-19 restrictions severely affected the food supply chain involving agricultural production, food processing, transportation and logistics (OECD 2020b). Ruta, (2022), using a static version of the global computable general equilibrium model ENVISAGE, assessed the direct impact of the Russian war in Ukraine on world trade and investment. Under the commodity market channels of the model the study finds immediate disruptions to food and energy sectors with sharp increases in prices and negative consequences affecting asymmetrically the exporting and importing countries. Disruptions to food supply chains have the potential to drive people to starvation in some countries.

Despite pointing out the disruptions to all the sectors, these studies in general do not recommend moving away from offshoring to reshoring and going back to the old trade regimes. Estimates by the International Monetary Fund (2023) indicate that the cost of decoupling could be as high as 7% of world GDP. Various studies recommend working out ways to improve resilience of GVC participation. Diversification of GVC channels is one recurrent recommendation that comes out from these studies. For small-scale companies, however, such global diversifications may not be that practical. Clearly the global economic order will change. As El-Erian (2023) points out the cracks of globalization appeared even before the Covid-19 pandemic; for example, the Brexit and deepening the divide between the US and China under Donald Trump. He argues, however, that instead of deglobalization a 'fragmented globalization' process may emerge with near-shoring and friend-shoring as likely scenarios. The Singapore Prime Minister Lee Hsien Loong points out that the divided world needs new ground rules so that the global trade can continue apace (The Straits Times, Apr 2, 2023).

Sri Lanka sits in a far corner of the periphery of the GVC network (Figure 1). Nevertheless, Sri Lankan industries were also disrupted by the Covid-19 lockdowns that led to substantial job losses. Obviously, the subsequent collapse of the Sri Lankan economy in 2022 is a result of accumulated problems that needs a separate analysis. The objective of this exercise is to assess the import content of Sri Lankan exports by category and open room for discussions on developing resilient

participation in the global value chain. The higher the reliance on imported inputs the higher the exposure to supply chain disruptions in the absence of other measures for resilience. Therefore, an assessment of import content of exports provides first-round information for the formulation of resilient policies. Of particular interest in this regard is food security. Even Singapore with limited land space is now very concerned about food security not only because of the pandemic experience but also because of natural disasters such as floods interrupting the food supply chain (The Straits Times, Mar 6, 2023). Singapore is venturing into home grown vegetable products through vertical farming (Tatum 2020).

Figure 1. Global value chain participation network 2019

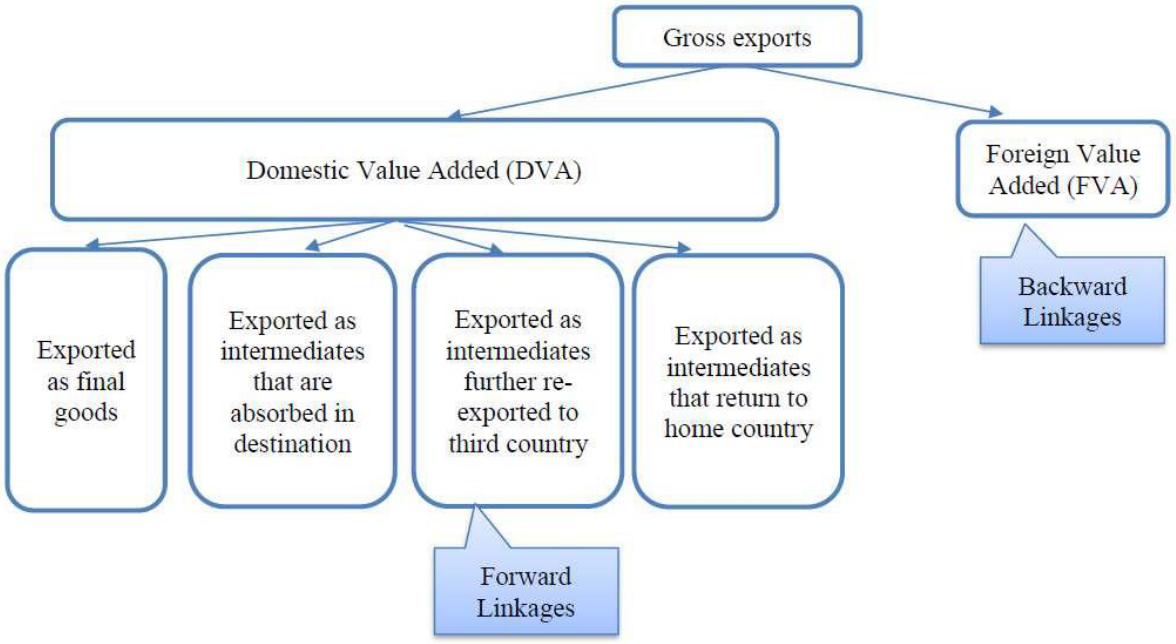


Source: Qian et al. (May 2020), World Bank Blogs

2. Methodology

One methodology to analyze the GVC participation of a country is to use multi-country Input-Output (IO) tables such as World Input-Output Database (WIOD), ADB Multiregional Input-Output, Trade in Value Added (TiVA), and EORA Global Supply Chain database (see Borin et al. 2021 for details). The analysis basically involves assessing the foreign value-added (FVA) content and domestic value-added content (DVA) of gross exports as illustrated in Figure 2. More specifically the focus is on backward linkages and forward linkages. Borin et al. (2021), however, point out that this methodology tends to systematically over-estimate backward linkages for all the countries they analyzed. Nevertheless, these IO-based analyses provide valuable insights. Unfortunately, only the ADB database includes Sri Lanka and these IO tables are not very amenable to measuring forward and backward linkages. We, therefore, resort to other methods to obtain rough estimates of the import content of Sri Lanka's exports (backward linkages) that provide the information we need for the discussion on policy formulations for resilient exports.

Figure 2. Decomposition of gross exports into value-added exports



Source: Ignatanko et al. (2019)

Since data on imported input content in each export category is not available, we have to devise a method to estimate the import content. One way to do this is to conduct an extensive survey of exporters and obtain their estimates of the import content in their exports. This approach is unlikely to produce meaningful results because some exporters may not be aware of the exact import content in their export products. Even if the exporter is the direct importer and knows exactly how much he spends on imported inputs, there are imports that enter his production process indirectly. In general, importers and exporters are not the same people and importers sell their imports to export producers by keeping a profit margin. Therefore, isolating the import content in exports through a survey is not clear cut.

Given these difficulties it seems more appropriate to estimate the import content in exports using some econometric techniques applied to available import and export data. One way to do this is to estimate an appropriate export function and estimate the import content. After examining various approaches adopted by researchers Abeysinghe and Choy (2007) developed a theoretical model and estimated export supply functions for Singapore under the assumption that exporters in Singapore are price takers in the world market. We adapt this approach in this exercise. To set the background, however, it is worth summarizing the discussion given in Abeysinghe and Choy (2007).

The most common approach, especially because of the data availability, is to estimate an export demand equation. In a simplified format the export demand function can be written as $X = f(P^x, P^w, Y^w)$, where X *i*s the export volume of a given category, P^x is the relevant export price index, P^w is a price index for competing goods in the importing countries, Y^w is a real income index of the importing countries. Given P^w and Y^w, the export demand forms a negative relationship with export price giving us the standard downward sloping demand curve. The key underlying assumption hear is that the exporter is a price taker (P^x is assumed to be given exogenously) with an infinitely elastic export supply. Although this scenario is more likely for import demand, this is highly counter intuitive for a small country export supplier. The small export supplier is not in a position to supply the entire demand coming from the rest of the world.[1]

[1] Abeysinghe and Choy (2007) discuss other issues with the export demand approach.

An alternative is not to assume that the exporter is a price taker and formulate both export demand and supply functions (Goldstein and Khan, 1978). A simplified export supply function can be written as $X = f(P^x, P^{rm}, P^d, K)$, where P^{rm} is a price index for imported raw materials, P^d is a price index for domestic inputs, and K represents production capacity measured by a suitable variable like the capital stock. In this setting both the export quantity and export price are endogenously determined by demand and supply forces as in the standard demand-supply framework. Although this is likely for big players in large countries, small country exporters are more likely to face world-market determined export prices. Riedel (1988) took the challenge of testing the price taking hypothesis within the context of Hong Kong exports and drew the conclusion that Hong Kong exporters are price takers facing an infinitely elastic demand line with a positively sloping supply curve. Riedel's estimation method led to a vigorous debate in the literature (see Abeysinghe and Choy, 2007). Nevertheless, these studies alerted the researchers to the inherent theoretical inconsistency of estimating an export demand equation under the assumption of price taking bahaviour.

Abeysinghe and Choy (2007) engaged in a comprehensive empirical study within the context of Singapore to test various underlying hypotheses in export function specifications and came to the conclusion that the price taking behaviour is not rejected but "…neither a standard demand or supply equation, nor a simultaneous demand-supply system, provides an adequate model for Singapore's exports." Based on these findings they formulated a new theoretical model that shows that exports depend positively on the product price, past, present and expected new orders and negatively on input prices and other costs. This is essentially an export supply function under the price taking assumption but with demand forces entering through orders. Under some conditions this function reduces to a standard export supply function mentioned above. Since data on orders are not easily available, they can be captured by various proxies that include both demand and supply variables. A simplified form of this export function can be written as $X = f(P^x, TC, Y^w, K)$, where *TC* is a composite cost variable.

We adapt this formulation in the present exercise. We use imports (*M*) among other variables to capture the response of export producers to increasing orders. In linear form the export equation for time series data can be written as

$$X_t = \alpha_0 + \alpha_1 X_{t-1} + \beta_1 M_t + \beta_2 M_{t-1} + \gamma' Z_t + u_t \qquad (1)$$

where Z_t represents a vector of other control variables in the regression and u_t is the standard disturbance term. After estimating (1), predicted exports are obtained as

$$\hat{X}_t = \hat{\alpha}_0 + \hat{\alpha}_1 X_{t-1} + \hat{\beta}_1 M_t + \widehat{\beta_2} M_{t-1} + \hat{\gamma}' Z_t \qquad (2)$$

We can estimate the import content in exports as

$$\hat{X}_t^m = \hat{\beta}_1 M_t + \hat{\beta}_2 M_{t-1} \qquad (3)$$

and the ratio $\hat{X}_t^m / X_t$ provides the proportion of import content of exports. Note that if *X* and *M* do not share a common trend then $\beta_1$and β_2 take opposite signs. If these two coefficients are of the same magnitude with opposite signs, then the trend in *M* does not determine the trend in *X*. It should also be noted that we did not use the commonly used log-linear formulation because it is not very amenable for the partial projection that we follow in (3). This is because the underlying specification of the log-linear model is multiplicative.

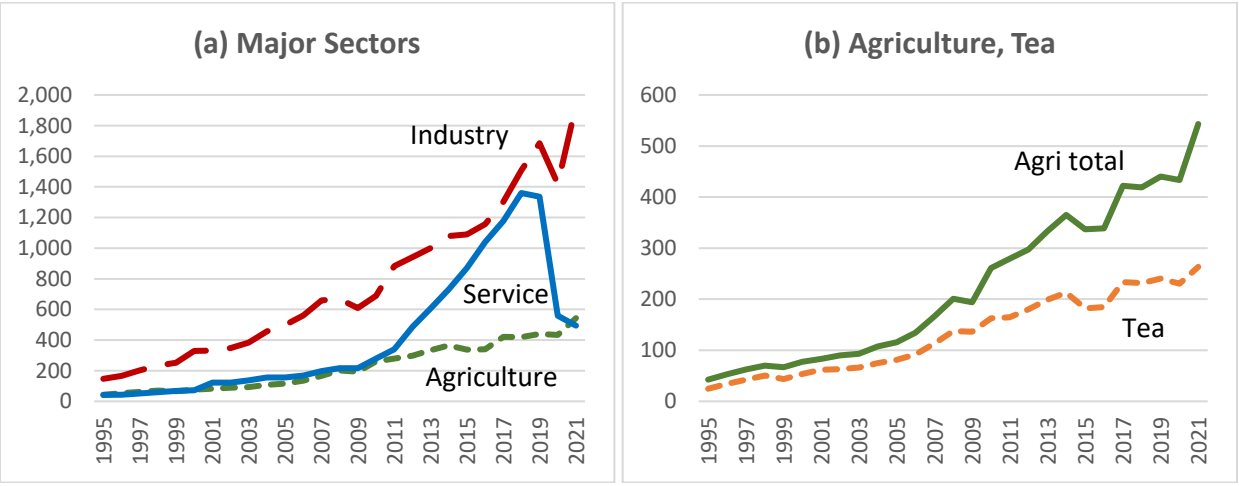
Although we wanted to estimate the export supply function (1) by category with each category broken down into detailed components, we were able to find the required time series data only for the broad categories. For imports, we use the sum of intermediate and investment imports because our primary focus is on imported input content. For other variables (*Z*) we use import and export price indices (unit value indices, *Pm/Px*) of the relevant categories, an index of real GDP of Sri Lanka's trading partners (FORGDP), some dummies and trend variables where necessary. Time series data over 1995-2018 were used for estimation; years 2019-2021 were dropped because of the breaks in the data series due to the Easter bombing attack in 2019 and Covid-19 shocks. As explained later tourist earnings and workers' remittances are modeled differently. Further details with regression estimates are provided in the Appendix. Data for the exercise was obtained from various online outlets and printed documents and the sources are mentioned at the relevant places in the text.

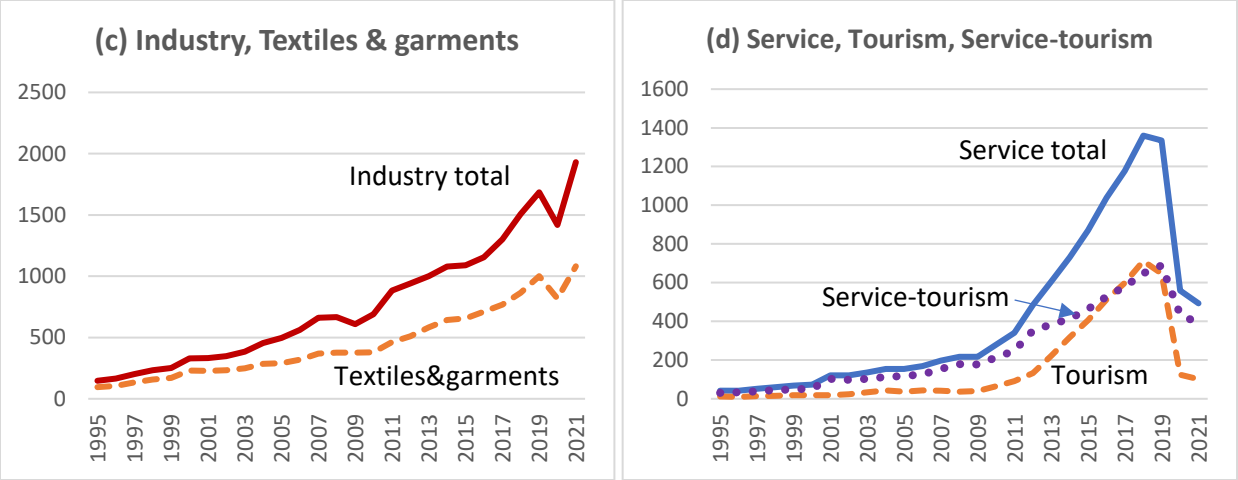
3. Import content by export category

For an overview Figure 3 plots export earnings (Rs billion, values at current market prices) of the three major sectors and the leading component of each sector. The main features, without netting out the import content, are:

1. The industrial sector has been the main export earner,
2. The service sector has been catching up after the LTTE war ended in 2009,
3. The pick-up of the service sector after 2009 is mainly due to the pick-up of tourist earnings,
4. The agricultural sector is yet to realize its potential,
5. The widening gap between the sector total and the leading component indicates the occurrence of some diversification in each sector,
6. Devastating effects of Easter bombing in 2019 and Covid-19 have fallen disproportionately on the service sector (both tourist and non-tourist services),
7. The resilience of the agricultural sector, and to a larger extent of the industry sector to Easter bombing and Covid-19 shocks are notable.
8. Rupee depreciation (increase in LKR exchange rate per unit of foreign currency) has continued over the period leading to higher earnings in rupee terms. The expectation of a depreciating exchange rate is not very conducive for improving cost efficiency of export producers.

Figure 3. Export earnings (Rs bn) by major sector and leading component in each sector





Data source: Central Bank of Sri Lanka. All numbers are at current market prices (nominal)

A comparison of gross export earnings does not account for the imported input content. The main objective of our exercise is to examine this aspect in as much detail as possible. However, given the data constraint we had to settle down to some broad categories of exports. Regression estimates are reported in Appendix, Table A1. As a cross check we obtained value-added shares of output by category from the ADB IO tables, available annually since 2007 (Appendix Table A2). In the IO tables there are 17 categories under industries and 16 under services. Tables 1 provides the value-added shares with the subsectors ranked. These values are averages over 2016-18; 2019-2021 were dropped because of the disruptions due to Easter bombing and Covid-19 shocks. To obtain aggregated values for the industry and service sectors we obtained the output share weighted average of value-added shares for each sector. One minus the value-added share is the input content share of output. Table 2 provides the average estimates of import content shares of exports obtained from regression estimates; the average values are computed to smoothen some erratic fluctuations. The main features that emerge from these tables are:

1. On average, the value-added content of output is the highest in the agricultural sector followed by service and industrial sectors.
2. Correspondingly the import content is the highest in industrial exports.
3. The import content of service exports is higher than that of agricultural exports though components may differ.

Table 1. Value-added share of major sectors (subsectors ranked by value-added share)

	Value added share
(a) Agriculture	Average 2016-18
Agriculture, hunting, forestry and fishing	**0.7437**
(b) Industry	
Mining and quarrying	0.8178
Food, beverages, and tobacco	0.6008
Wood and products of wood and cork	0.5994
Manufacturing, nec; recycling	0.5656
Electricity, gas, and water supply	0.5528
Transport equipment	0.5428
Electrical and optical equipment	0.5425
Construction	0.5371
Chemicals and chemical products	0.5178
Leather, leather products, and footwear	0.4747
Basic metals and fabricated metal	0.4703
Other nonmetallic minerals	0.4626
Rubber and plastics	0.4434
Textiles and textile products	0.4290
Machinery, nec	0.3309
Pulp, paper, paper products, printing, and publishing	0.2939
Coke, refined petroleum, and nuclear fuel	0.1225
Weighted average	**0.5200**
(c) Service	
Public administration and defense; compulsory social security	0.9343
Education	0.8928
Health and social work	0.8924
Real estate activities	0.8144
Retail trade (excluding motor vehicles, motorcycles); repair household goods	0.7837
Sale, maintenance, repair of motor vehicles and motorcycles; retail sale of fuel	0.7831
Wholesale trade and commission trade (excluding motor vehicles, motorcycles)	0.7823
Financial intermediation	0.7142
Renting of M&Eq and other business activities	0.6397
Air transport	0.6371
Inland transport	0.5718
Other supporting and auxiliary transport activities; activities of travel agencies	0.5710
Water transport	0.5547
Other community, social, and personal services	0.5471
Hotels and restaurants	0.5066
Post and telecommunications	0.4002
Weighted average	**0.6718**

Source: Computed from ADB IO tables.

Table 2. Import content shares of exports (average values)

Year	Industry				Service			Agriculture			Total
Range	Total	Petroleum	Textiles/ garments	Other	Total	Tourism	Other	Total	Tea	Other	Exports
1995-99	**0.32**	1.02	0.27	0.35	**0.25**	0.15	0.27	**0.14**	0.20	0.12	**0.30**
2000-04	**0.32**	1.32	0.26	0.33	**0.20**	0.21	0.19	**0.17**	0.22	0.17	**0.31**
2005-09	**0.39**	0.94	0.35	0.32	**0.23**	0.08	0.27	**0.18**	0.26	0.17	**0.38**
2010-14	**0.47**	0.74	0.45	0.42	**0.25**	0.30	0.22	**0.19**	0.29	0.13	**0.44**
2015-18	**0.46**	0.79	0.41	0.42	**0.20**	0.23	0.17	**0.19**	0.33	0.12	**0.43**

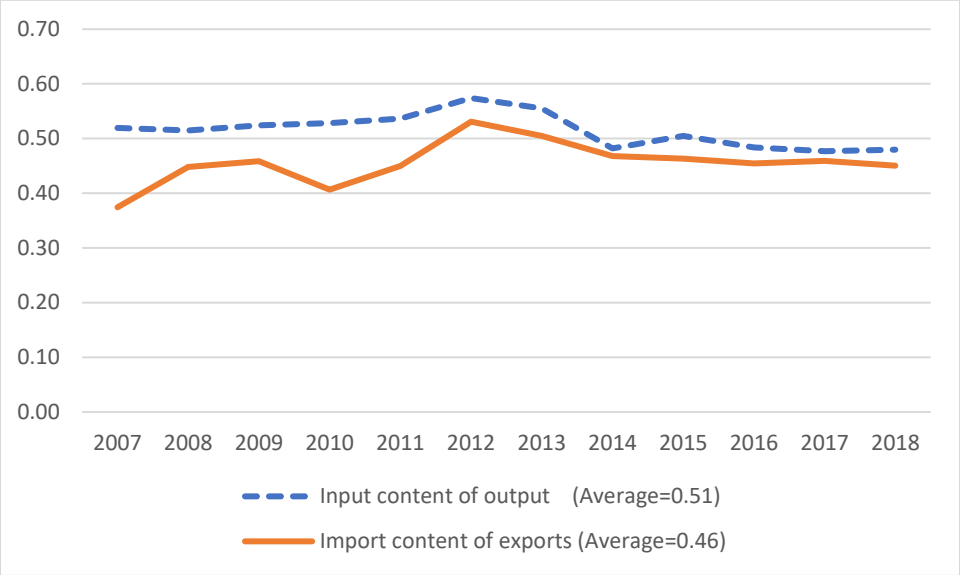
Note: The numbers can be interpreted as cents per dollar worth of export earnings or simply in percentage terms. Red numbers are discussed in the text.
Source: Authors' computations

In the following sub-sections, we examine the industrial sector first, followed by service and agricultural sectors. Where possible we juxtapose the input content of output with import content of exports to gain further insights. Finally, we examine workers' remittances, the largest foreign exchange provider for Sri Lanka to understand the long-term viability of the sector.

3.1 Industrial exports

The industrial sector shows the highest imported input content of exports with some upward trend till about 2012 (Table 2). Figure 4 shows the IO-based input content of output and regression-based import content of exports for the period 2007-2018. Although these data come from very different sources and methods, the trends seen in Figure 4 are unexpectedly similar. After 2012 there has been a slight downward trend in both input content and import content. This is a healthy sign and suggestive that competition forces firms to be more cost efficient. Over the same period, however, the two lines move close to each other indicating the dominance of imported inputs in industrial production. This seems to emanate more from 'petroleum industry' and 'other industries', not from 'textiles and garments' as seen in Figures 5-7. This stands in contrast to service (Figure 8) and agriculture (Figure 12) sectors where the gap between the two curves is much wider. On average, over the period 2007-18 every one dollar of industrial exports contained about 46 cents of imports; in other words the imported input content of industrial exports is about 46%.

Figure 4. Industry: input content share of output and import content share of exports



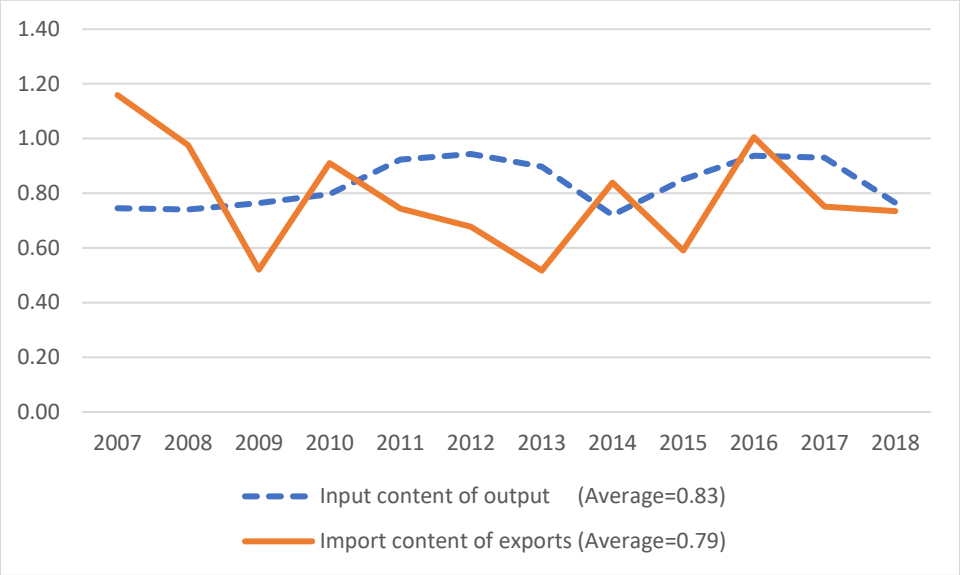
Source: Authors' computations from IO tables and regression estimates

3.1.1 Petroleum exports

We faced difficulties in getting meaningful estimates for the petroleum exports equation. After some trials we realized that it is the heavy import content in petroleum exports that renders the other variables in equation (1) less significant. Moreover, for some years the import content share turns out to be more than one (red numbers in Table 2). Although this is attributable to estimation errors, it is indicative of the lack of value addition in petroleum exports. In other words, in certain years petroleum exports are nothing but re-exports of imported refined petroleum. As a cross check we obtained from the IO tables the input share of the output of 'coke, refined petroleum and nuclear fuel' (Appendix Table A1). Figure 5 plots our estimates of import content of petroleum exports and input content of petroleum output from the IO tables. These estimates are very close to each other with an overall average of about 80% of input content (averaged over the period 2007-18).[2] The disastrous consequences of disruptions to petroleum supply in 2022, both due to domestic and international reasons, is a recurrent reminder to Sri Lankans the need for measures to secure sufficient supplies of this crucial import to withstand the supply shocks over a short period of time.

[2] The closeness of these estimates, based on our a priori knowledge of high import content, is indicative that our estimation method is, in general, sound.

Figure 5. Petroleum: input content share of output and import content share of exports

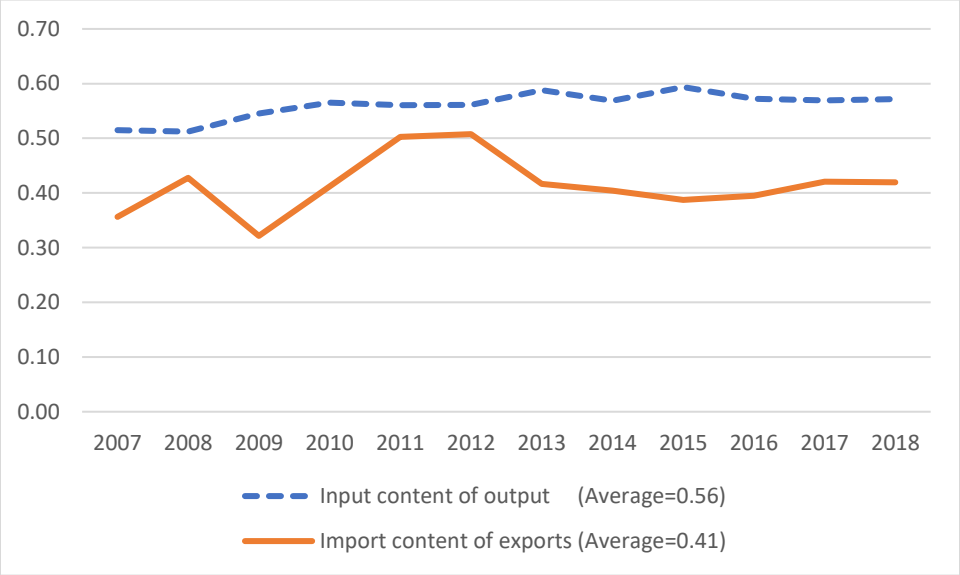


Source: Authors' computations from IO tables and regression estimates

3.1.2 Textiles and Garments

After workers' remittances, textiles and garments (also referred to as apparel and textiles) is the largest foreign exchange earner for Sri Lanka. Figure 6 shows a systematically much higher input content of output than the import content of exports. This highlights the role of domestic inputs, labour input specifically. On average, every dollar of exports of textiles and garments contains 40-45 cents of imports (Table 2). Overall value addition of the sector is about 44 cents for every dollar worth of output. Combined with the information in Table 2 there has been an increase in both the input content and import content before stabilizing. This reflects some departure from 'high input, high output' scenario towards improvements in total factor productivity.

Figure 6. Textiles and Garments: input content share of output and import content share of exports

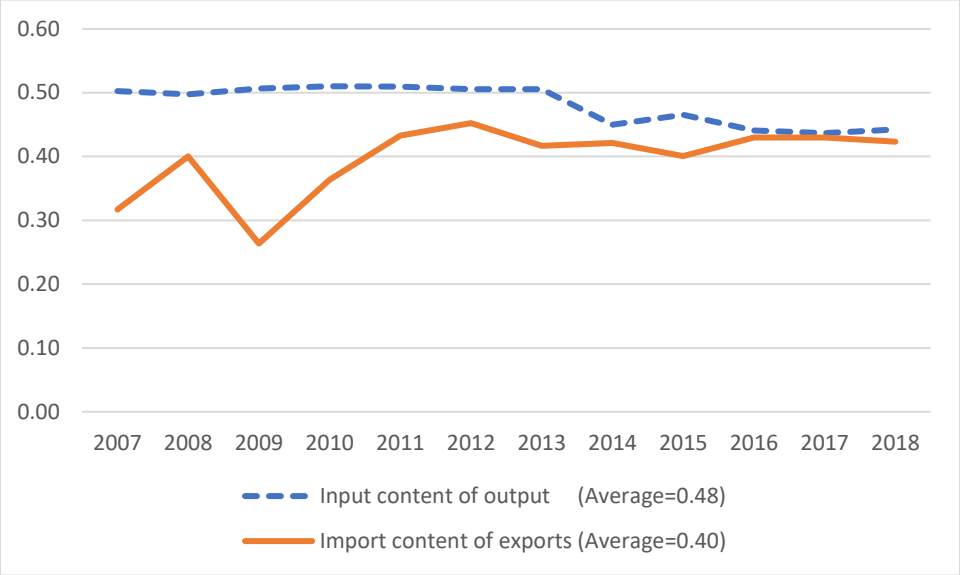


Source: Authors' computations from IO tables and regression estimates

3.1.3 Other industries

Other industries constitute all industries excluding textiles and garments, and petroleum. Figure 7 plots the IO-based input content of output and regression-based import content of exports. Input content shows a slight downward trend after 2013 reflecting some improvement in cost efficiency. Input content and import content lines almost coinciding after 2015 is likely to be an estimation error. The average numbers in Figure 7 are more informative with about 40% import content, somewhat lower than that of the textiles and garments industry. Nevertheless, it is likely, as we saw in Figure 4 on all industries, that the industrial sector may have turned out to be more import dependent over the years.

Figure 7. Other industries: input content share of output and import content share of exports

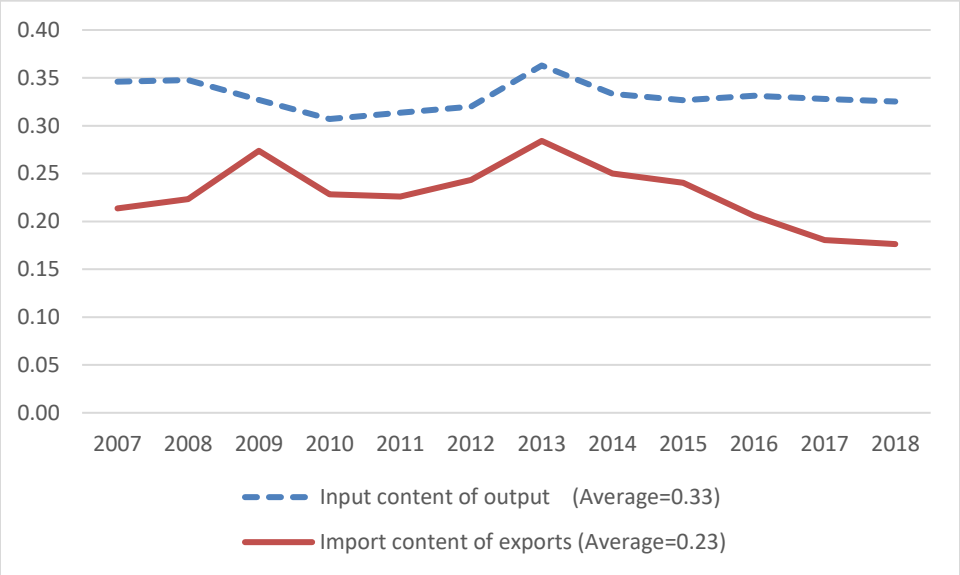


Source: Authors' computations from IO tables and regression estimates

3.2 Service exports

As discussed in Section 3.2.1 below, modelling tourist earnings has to be done differently. Therefore, we subtracted tourist earnings from service exports and modelled 'other services = service exports – tourist earnings' as in equation (1) and then took the weighted average of the import content shares of other services and tourist earnings, with weights being the export shares of total service earnings. Figure 8 plots the IO-based input content of output and regression-based import content of service exports over the period 2007-18. The import content shares in Table 2 do not show a specific trend. Nevertheless, Figure 8 shows a close resemblance of input content of output and import content of service exports with a downward trend after 2012. The sharper drop in import content indicates that as service exports expanded rapidly after 2009, especially tourist earnings, there has been no proportionate increase in import content. This is obviously a healthy development.

Figure 8. Services: input content share of output and import content share of exports



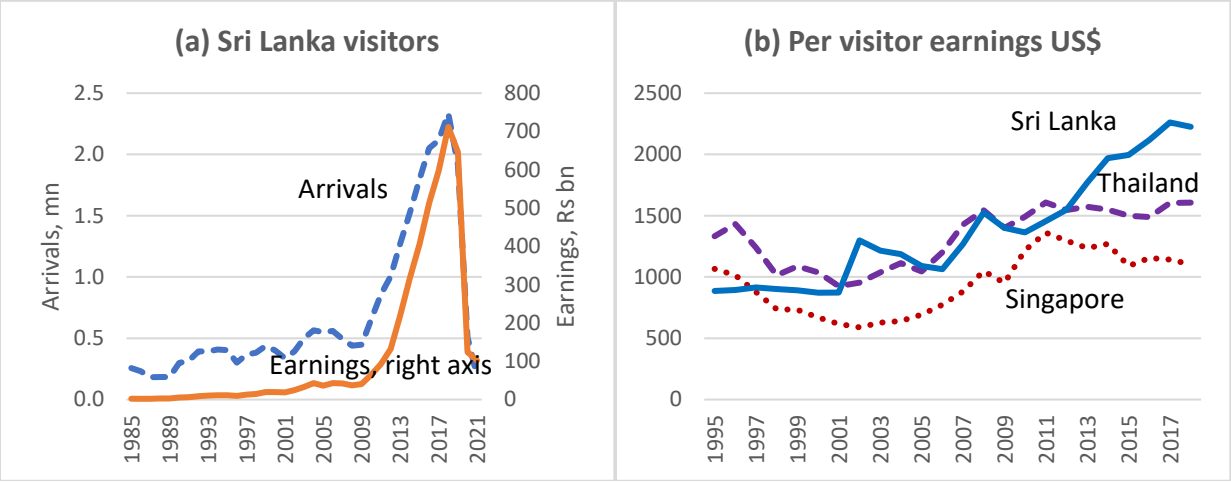
Source: Authors' computations from IO tables and regression estimates

3.2.1 Tourism

The largest component of service exports is earnings from international tourists, the third largest foreign exchange earner for Sri Lanka (after workers' remittances and textiles and garments). Figure 9(a) plots tourist arrivals in Sri Lanka and tourist earnings (same as tourist expenditure). Tourist arrivals is a perfect predictor of tourist earnings. For a contrast we also collected arrival and earnings data for Singapore and Thailand, two popular tourist destinations in Southeast Asia. In 2018 Sri Lanka received 2.3 million international tourists whereas small Singapore with only 5.4 million population (including non-citizens) received 18.5 million and much bigger Thailand received 38.2 million. However, when we convert tourist earnings to per visitor basis an interesting contrast emerges. Figure 9(b) shows that per visitor tourist earnings or expenditure in Singapore is much lower than that of Sri Lanka and Thailand. This difference emerges from the difference in length of stay; in Singapore the average number of tourist nights is 3-4 whereas in Sri Lanka and Thailand this exceeds 10 nights. What is even more interesting is that after 2011 per visitor earnings in Sri Lanka has increased outpacing Thailand. Regression estimates (using data over 1995-2018) show that one percent increase in tourist arrivals increases tourist earnings in Sri Lanka (in USD) by 1.6% (a similar estimate for Singapore) whereas for Thailand the increase is lower

around 1.3%. (These are very robust estimates.) Sri Lanka seems to enjoy a natural advantage in tourism and this needs to be enhanced further by creating an atmosphere where tourists are tempted spend more.

Figure 9. Tourist arrivals and earnings



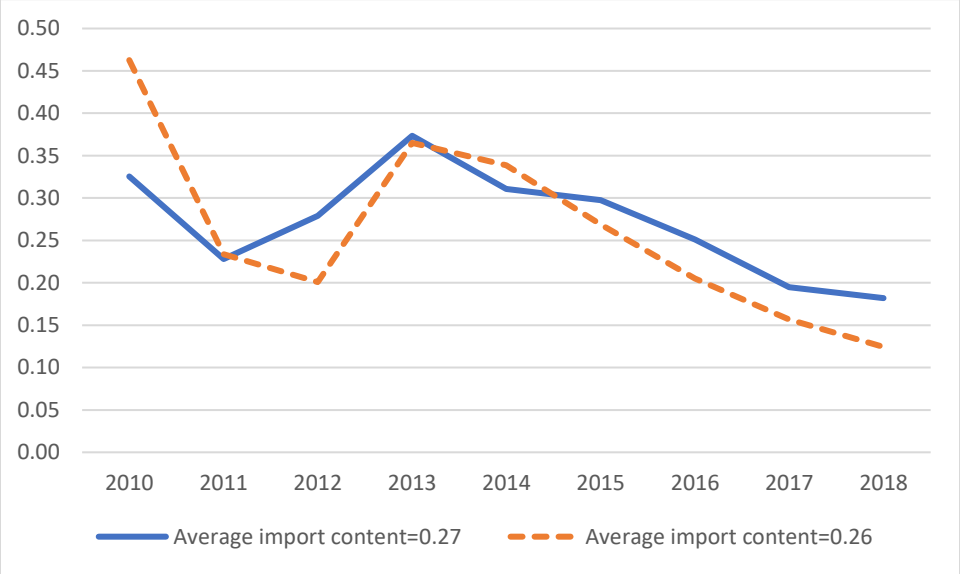
Source: (a) Central Bank of Sri Lanka, (b) Computed from World Bank data

The rapid increase in tourist arrivals after ending the nearly 30-year LTTE war in 2009 and the collapse due to Easter bombing in 2019 and Covid-19 are quite obvious in Figure 9(a). These structural changes pose modelling problems. Moreover, the export supply function approach we adopted above is not suitable for tourism; what matters is demand for tourism. Some studies have examined the demand for imports resulting from tourism (Hermandez-Marin, 2007). This demand for imports is the general demand for imports not just the demand for imported inputs. Bhavan (2019) has examined the link between tourism and imports in the Sri Lankan context and concluded that causality runs from tourism to demand for imports.

Nevertheless, we estimated two very different models, an import demand function with tourist expenditure as an independent variable and a tourism demand function with import as an independent variable. (Details are given in Appendix under Table A1.) The average estimates of import content in tourist expenditure from these two models are similar. The estimates reported in Table 2 are from the import demand model. Figure 10 plots the import content in tourist expenditure from the two models over 2010-2018. We cannot obtain the corresponding input content from the IO tables because tourist expenditure is hidden in various service categories like

hotels and restaurants. As with 'other service earnings', the downward slope of the lines indicates that as the tourist industry expanded there has not been a proportionate increase in import content. The import content estimates indicate that every dollar of tourist expenditure contains on average 20-30 cents of imports.

Figure 10. Import content in tourist expenditure



Note: Solid line estimates are from a model with imports as the dependent variable and dashed line estimates are from a model with tourist expenditure as the dependent variable.
Source: Authors' computations from regression estimates

3.3 Agriculture

Ironically a country that was known to be the granary of the East now imports even rice, not because for variety but because of insufficient local production. This is Sri Lanka. The country's agricultural production contributes only about 7% to its relatively low-level gross domestic product. Although the agricultural share in GDP in Thailand is not much bigger (only about 8.5%), its GDP is about 4-5 times larger than that of Sri Lanka (2015-18 averages). Thailand is a major exporter of agricultural products in Asia. For a contrast Figure 11 plots the agricultural exports of Sri Lanka and Thailand in index number format by setting 1995 to 100. Although Thailand is a

much bigger country than Sri Lanka both in terms and land area and population size, the graph is instructive to see the rapid departure in their agricultural exports.

Figure 11. Agricultural exports of Sri Lanka and Thailand (constant price, index form)

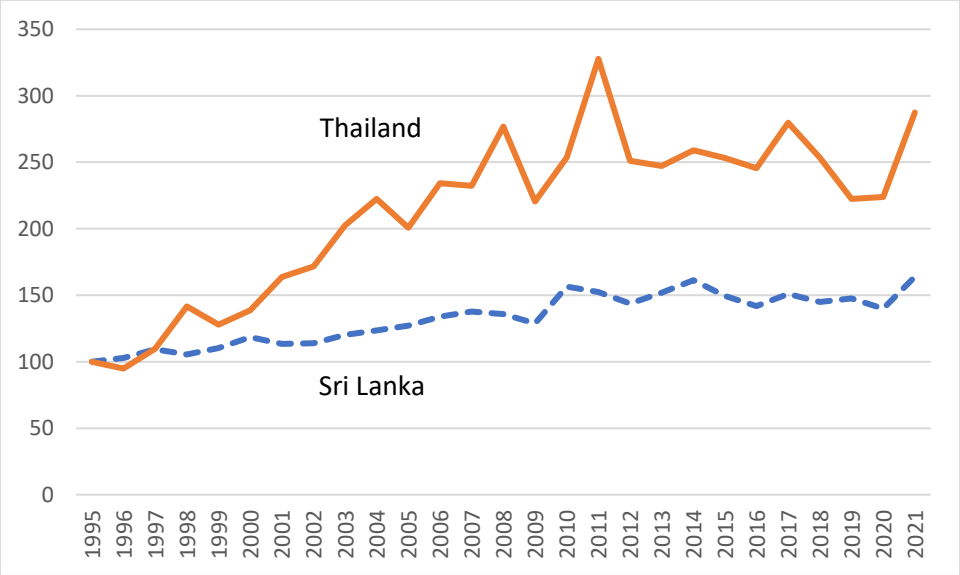
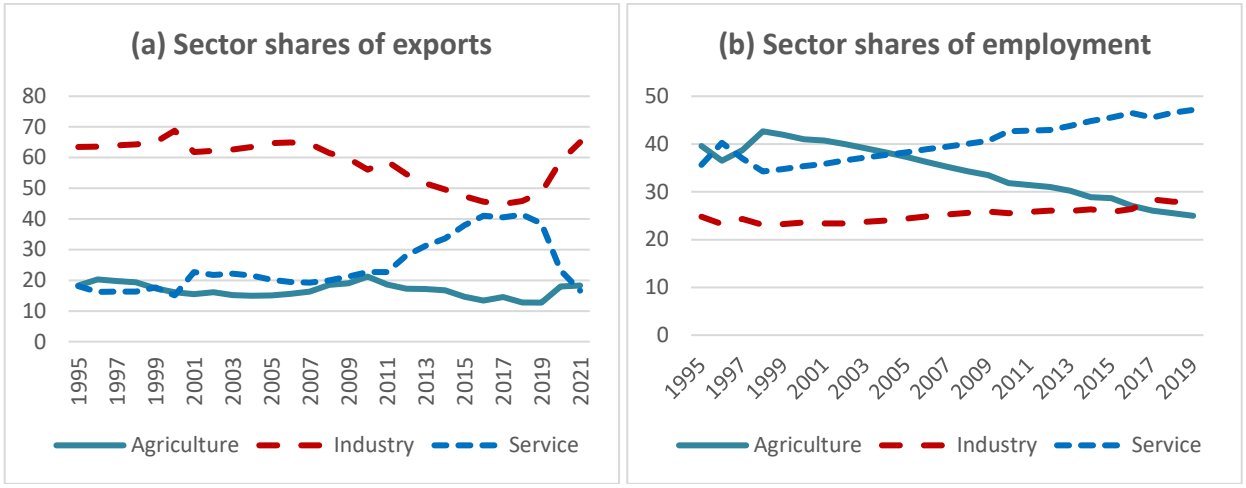


Figure 12 shows Sri Lanka's export earning and employment shares of the three major sectors. Both industry and agriculture shares drop after 2009 till the onset of Covid-19 restrictions primarily because of the rapid pick up of the service sector. The agriculture share drop is also due to the slowing of agricultural exports (at constant price) after 2012 as seen in Figure 11 above. What is most notable is the sharp drop in employment share of the agricultural sector. From about 43% in the early 1990s the agricultural employment share drops to about 25% by 2019 while service sector employment share rises from 35% to 47% over the same period. Over this period the industrial sector employment share rises marginally from 22% to 28%. The low labour intensity of the industrial sector is a global phenomenon.

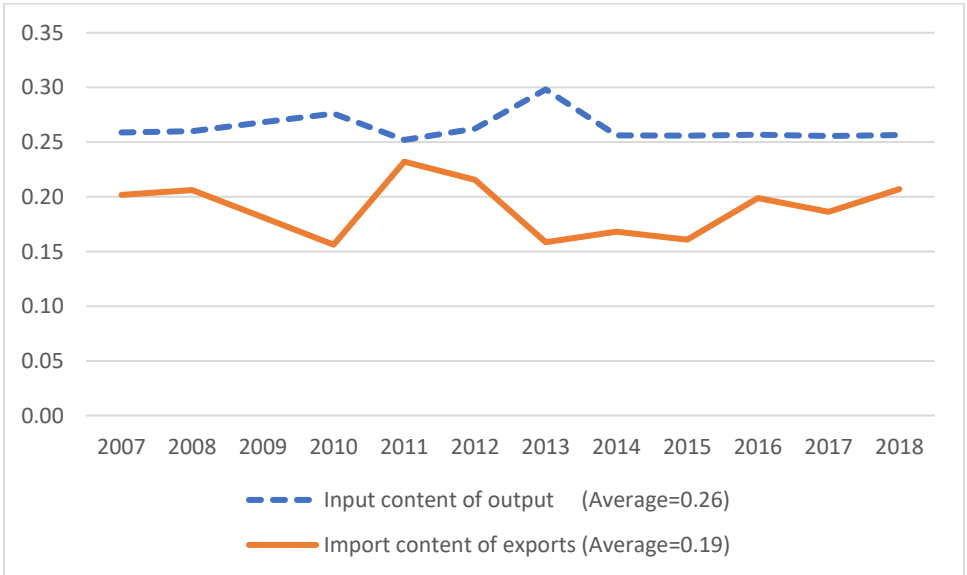
Figure 12: Export earnings and employment shares by sector



Source: (a) Central Bank of Sri Lanka, (b) World Bank

Figure 13 shows the IO-based input content share of agricultural output and regression-based import content share of agricultural exports. The wider gap between the two lines indicates, as in the service sector, the bigger role played by domestic inputs in the agricultural sector. This contrasts with the industrial sector.

Figure 13. Agriculture: input content share of output and import content share of exports



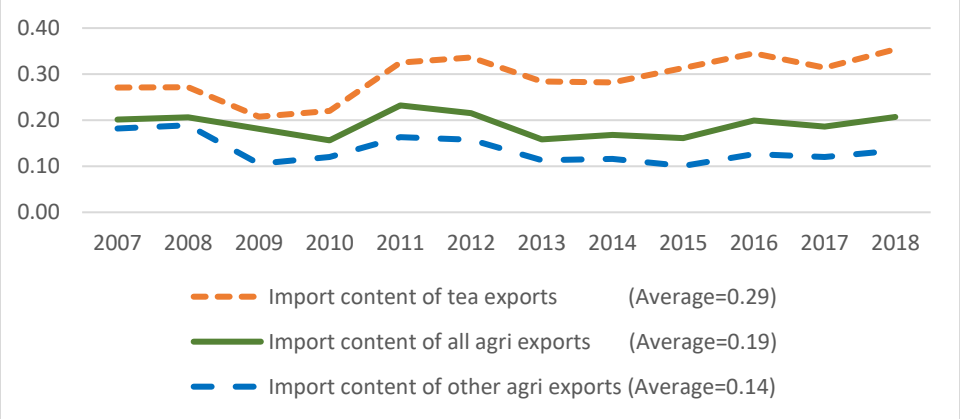
Source: Authors' computations from IO tables and regression estimates

3.3.1 Tea and other agricultural exports

Although we wanted to study different types of agricultural exports, the lack of relevant data in the form of sufficiently long time series posed a problem. Even though data is available for coconut and rubber exports, we failed to find good regression estimates probably because of the very low import content in these exports. With some short time series we also tried to study vegetable and spices exports but the effort did not pay off. Vegetables exports are of particular interest because the import content in vegetables is likely to be large resulting from the heavy use of agrochemicals in vegetable farming. (We did not study rice because it is not an export crop.) We finally settled down to analyzing tea exports and other agricultural exports (= total agri exports – tea exports) separately. These products do not have separate classifications in the IO tables.

Figure 14 shows the import content of tea exports and other agricultural exports; total agricultural exports are also included to highlight some features. Tea exports show an increasing trend in imported input content which is also much larger than that of other agricultural exports. Although the average over 2007-2018 is 0.29, the numbers since 2015 are in the range of 0.30 – 0.35 per one dollar of tea exports. Although tea is the main agricultural export, the total exports curve is weighed down by other agricultural exports. This is because the share of tea exports in total agricultural exports has declined from about 70% in 2000 to 55% in 2019. This means that other agricultural exports are catching up which is a welcome change. Of particular interest is that the import content of other agricultural exports is very low, in the range of 0.10-0.15 after 2014. This is informative in relation to developing resilient agricultural exports.

Figure 14. Import content share of tea and other agricultural exports



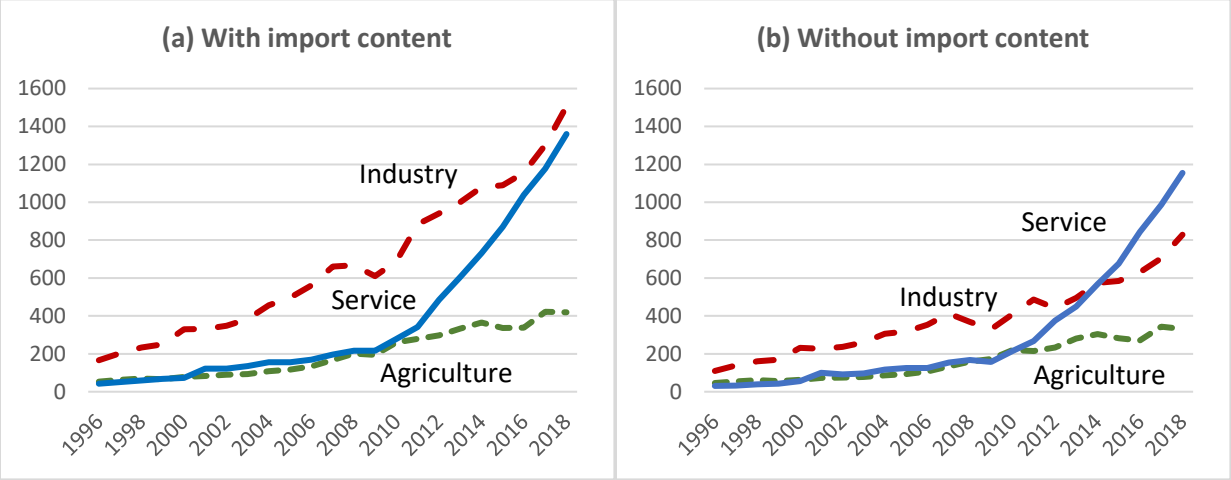
Source: Authors' computations from regression estimates

3.4 Major sectors with and without import content

At this stage it is worth looking at how the three major sectors compare with and without import content. Figure 15 plots the sector export data as in Figure 3(a) after dropping the shock years 2019-21 and the same data after removing the import content. The main features that emerge from Figure 15 are:

1. After netting out the import content the service sector's net foreign exchange contribution to the economy has surpassed that of the industrial sector after 2014.
2. The gap between the industrial sector and the agricultural sector has narrowed down substantially (Figure 4(b)) primarily because of the lowering of the industrial sector values after netting out the high import leakage.
3. The above point highlights the agricultural sector's potential for increasing net foreign exchange contributions to the economy.

Figure 15. Export earnings (Rs bn) by sector with and without import content



Source: Central Bank of Sri Lanka and authors' computations

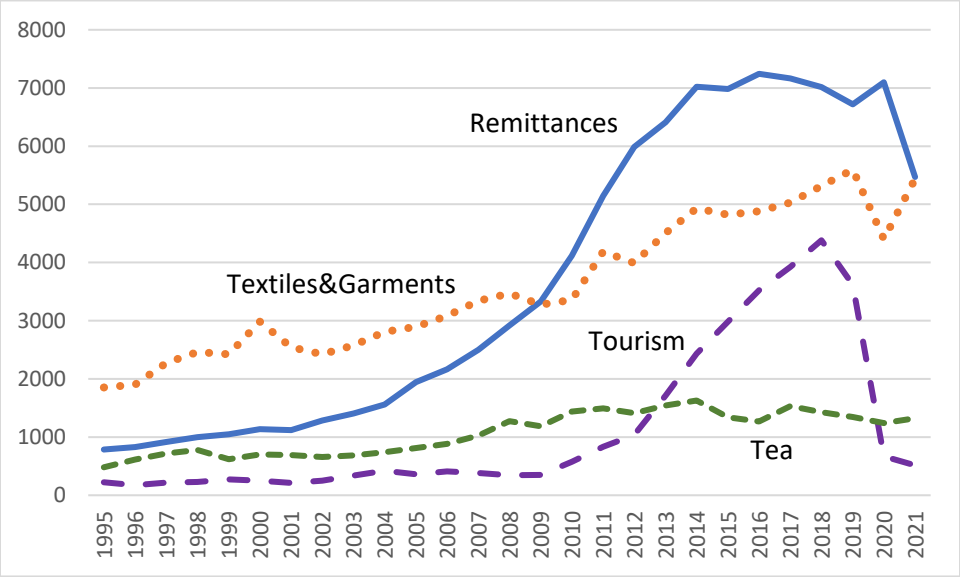
3.5 Workers' Remittances

Remittances from Sri Lankans working overseas have emerged as the largest foreign exchange source for Sri Lanka.[3] Unlike tourist earnings, remittances proved to be a more resilient foreign exchange source for the country. The slow growth of remittances seen in Figure 16 during 2014-2019 is primarily due to a fall in the migrant workforce as a result of the government trying to regulate the migration of low-skilled workers (Central Bank Annual Reports 2015, 2016), see Figure 17). Nevertheless, rupee depreciation (the increase in the LKR exchange rate per unit of foreign currency) helped in providing a steady increase in remittances in rupee terms. Table 3 provides a summary of remittances Sri Lanka received by region. As is well known, the Middle East is the largest source of remittances though the share has decreased over the years with the emergence of other sources like the European Union and other Asian countries.

Although free from any direct import content, remittances, just like tourist expenditure, may involve leakages through increased demand for imported goods especially for house renovations, and vehicle and other durable purchases. We tried to estimate this leakage through an import demand equation similar to the tourism equation (Appendix Table A1) but without much success. Some estimates based on a first-difference specification indicate that on average the import leakage is about 15 cents per one dollar of remittance. Unlike tourist expenditure that accrues mostly to established business entities such as hotels and restaurants and transport agencies, remittances mostly accrue to low-income households whose demand for imported consumption goods is minimal. In the next two sections we discuss two other issues in relation to the sustainability of remittances.

[3] Although workers' remittances do not fall under exports of goods and services, they are part of the current account of the balance of payments. In fact, workers' remittances have been a major source of external financing for many developing countries (Ratha, 2005). Sri Lanka is listed to be among the top 20 recipients of remittances in the world (Lasagabaster et al., 2005).

Figure 16. Major sources of foreign exchange inflows (US$ million)



Source: Central Bank of Sri Lanka

Table 3. Workers' remittances (US$ million) and share by region

	Middle East	European Union	Far East Asia	Europe-other	North America	South East Asia	Australia and New Zealand	South Asia	Other	Total
1995	423	108	55	37	58	15	7	5	19	727
2000	730	156	68	59	78	22	12	8	27	1160
2005	1,089	355	86	135	125	38	29	19	43	1,919
2010	2,474	724	247	177	140	144	82	58	70	4,116
2015	3,769	1,222	698	307	209	391	161	98	126	6,980
2018	3,592	1,312	849	309	182	407	154	154	56	7,015
2019	3,459	1,263	826	282	161	376	175	134	40	6,717
2020	3,673	1,350	870	305	178	408	178	114	28	7,104
2021	2,834	1,032	686	231	126	324	143	93	21	5,491
					Share%					
1995	58.2	14.9	7.6	5.1	8.0	2.1	1.0	0.7	2.6	100
2000	62.9	13.4	5.9	5.1	6.7	1.9	1.0	0.7	2.3	100
2005	56.7	18.5	4.5	7.0	6.5	2.0	1.5	1.0	2.2	100
2010	60.1	17.6	6.0	4.3	3.4	3.5	2.0	1.4	1.7	100
2015	54.0	17.5	10.0	4.4	3.0	5.6	2.3	1.4	1.8	100
2018	51.2	18.7	12.1	4.4	2.6	5.8	2.2	2.2	0.8	100
2019	51.5	18.8	12.3	4.2	2.4	5.6	2.6	2.0	0.6	100
2020	51.7	19.0	12.2	4.3	2.5	5.7	2.5	1.6	0.4	100
2021	51.6	18.8	12.5	4.2	2.3	5.9	2.6	1.7	0.4	100

Source: Central Bank of Sri Lanka

Table 4. Approximate number of registered workers by region

	Middle East	Italy	Far East Asia	UK	North America	South East Asia	Australia and New Zealand	South Asia	Other	Total
2010	194820	15	5165	22	18	5897	26	4344	57,200	267,507
2015	178834	78	5301	10	10	7447	25	5243	66,495	263,443
2018	137653	34	5698	10	18	5832	356	8153	53,457	211,211
2019	134057	72	7638	25	35	6454	500	8625	45,681	203,087
2020	35012	25	2534	11	30	1334	133	2724	11,908	53,711
2021	74651	33	2394	28	31	1486	25	8026	35,590	122264

Source: Computed from Sri Lanka Bureau of Foreign Employment http://www.slbfe.lk/file.php?FID=696

3.5.1 Skilled migrants and backward linkages

Economic benefits of remittances are well understood, for example, enhancing household income and lifting many out of poverty, generating multiplier growth effects on the economy and replenishing foreign exchange reserves of the country. Most of the remittances are generated by low-skilled migrants to Middle Eastern countries. There are issues, however, regarding economic benefits arising from skilled migration. Table 4 shows the approximate number of Sri Lankans registered as working overseas by region or country. What is immediately noticeable is the large numbers in the Middle East and very small numbers in developed countries like Australia and the UK. This stands contrary to what we know. As per 2011 Australian population census the number of Sri Lankans living and working in Australia exceeded 86,000. Similarly New Zealand population census 2018 shows more than 16,000 Sri Lankans living there. Apart from family migration this includes a large number of skilled migrants who have basically left Sri Lanka for good. Their economic linkages with the home country are likely to be low. What is happening here is that more skilled people usually migrate to developed countries looking for green pastures and take their family members with them and the need for sending money back is not as dire as that for temporary migrants from poor families.

These arguments raise two basic questions: 1. Is it the case that the higher the level of skills the lower the level of remittance flow back to the home country? 2. Is skilled migration a double blow to the country? The latter refers to their low remittances and the impact on long-term growth of

the economy due to the loss of skills. These questions entail two important hypotheses that need to be tested rigorously. The available data by skill categories is not very amenable to test these hypotheses because the records at the Sri Lanka Bureau of Foreign Employment (SLBFE) do not include a large number of professional migrants who have not registered with the Bureau. There is some literature that could shed light on the first question. Niimi et al. (2008) find that remittance flow is lower for more educated migrants. Faini (2007) shows that the opinion that negative effects of brain drain can be mitigated by the positive effects from remittances is not generally true.

Research pertaining to the second question is lacking. One could argue that low-skilled migrants not only remit money but also come back home when their contracts are over. Skilled migrants, on the other hand, not only not remit money but also do not return home, perhaps with the exception of a very few. Nevertheless, the following possibilities are also there:[4]

(a) Highly skilled migrants may invest capital back in their home countries. Some of these investments may be in more advanced industries/services than are typically available in the home country. Important new skills and technology can be brought through these investments.
(b) Highly skilled migrants may also collaborate with nationals in the home countries, again often at a higher level of knowledge and technology than is available to individuals in the home country. University academics in advanced countries establishing research collaborations with academics in home (developing) countries is an example of these benefits.
(c) Skilled individuals living in foreign countries may also generate social benefits, such as political and diplomatic benefits, to developing countries.

To what extent these backward linkages exist in the Sri Lankan context remain to be examined. Furthermore, how these backward linkages translate into foreign exchange earnings need to be worked out.

Anecdotal evidence from the past indicates that many Sri Lankans who studied and worked in developed countries returned because they could live a much better life in Sri Lanka with their savings. This process has slowed down substantially and even those who return leave the country again after a couple of years because of problems such as children's education and many

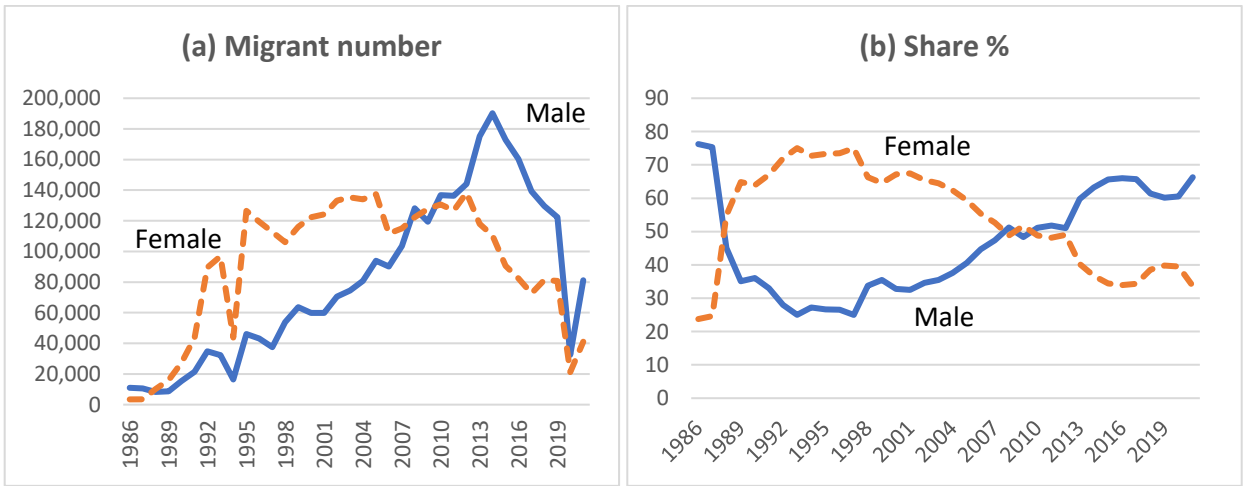
[4] These points were raised by Harsha Aturupane.

disruptions to services resulting from political agitations. A steady source of foreign exchange arises if skilled migrants continue to return after a stint overseas. Such overseas exposures sharpen their skills. As the saying goes, the overseas exposure saves their brains from drains. Instead of relying on housemaids for foreign exchange supply (see next Section) policies to lure back the skilled migrants pay off in the long run both economically and socially.

3.5.2 Female migrants and social cost

Figure 17 shows the number of registrations with SLBFE of migrant workers by sex. There has been a substantial drop in the registered numbers since 2014 mostly due to the government trying to streamline the migration of low-skilled workers including housemaids. In the mid-1990s more than 70% of these labour migrants were females. The female share declines to 34% by 2017 and then started to fluctuate. Examining the numbers by skills categories show that in the mid-1990s more than 90% of the female workers were housemaids. This declines to about 75% on average over 2017-21. Most of these housemaids work in the Middle Eastern countries.

Figure 17. Male and female Sri Lankans registered for overseas work



Source: http://www.slbfe.lk/file.php?FID=696

Economic hardships drive poor families to sacrifice mothers to work as housemaids overseas. Social cost of this arrangement is documented to some extent (Ukwatta 2010, Senarathna 2012, Jayasuriya and Opeskin 2015, Dunusinghe 2020, Central Bank 2020, Zhou et al. 2022). Effects

on children, in particular, include poor academic performance, lack of concentration, lack of progress despite additional help, aggression, cruelty, stealing, hyperactivity, disruptive behavior and becoming victims of physical, psychological, emotional, and sexually abuse. Zhou et al. (2022) find that parental migration significantly affects the physical and mental health of rural children in China. They find that 42.5% of such rural children in China are depressed and about 15% suffer from mobile phone addictions.

There is a growing field of study on early childhood development that points out how both positive and negative imprints created during the formative years of a child continue to last long and affect the behaviour even in adulthood. A hypothesis that needs to be tested is that the substantial increase drug addiction and youth crimes in Sri Lanka are related to absent mothers when these youth were young children.

Apart from the effects on children the hardships and abuses the housemaids undergo silently remain unrecorded. Other problems arising from extramarital affairs also remain largely unrecorded. Even on the economic side, Sri Lankan housemaids may get lower wages than those from other countries like the Philippines where there are government stipulated laws on minimum wages that the overseas employers need to pay.

Although the economic benefits may outweigh the social cost of the sacrifice the mothers make by working overseas, this is not a subject that should be assessed on a cost-benefit basis, not a sacrifice worth pursuing for the country as a whole. As pointed out in the previous section sustainability of workers' remittances requires sending out more skilled workers. Diverting funds to train such skills and supplying skilled migrants, instead of housemaids, to the world with backward linkages should become a priority policy consideration.

4. Concluding Remarks

The summary at the begging contains the key results and some policy implications and emphasized the importance of capitalizing on the resilience of the agricultural sector. In this section we want to draw attention to one stumbling block that stands on the way in realizing the potential of the agricultural sector for both food security and export earnings. While studying district level

disparities and how districts have converged and diverged over the last decade under different indicator categories, we came to notice three distinct features in agriculture labour productivity relative to industry and service sectors. 1.Agriculture labour productivity is substantially lower across all the districts. 2. Agriculture labour productivity has been stagnant across all the districts except for Colombo and Gampaha districts. 3. Labour productivity in industry and service sectors show some progressive convergence of the districts but not so in the agriculture sector. Despite the falling share of employment in agriculture this labour productivity conundrum persists (Abeysinghe and Gunarathna 2022).

Among productivity measures, labour productivity takes a prominent place for a number of reasons. First, improving living standards requires sustained growth in labour productivity. Second, from time immemorial man has used tools and knowhow to improve his productivity. Therefore, other factors of production (physical capital, human capital, innovation) play complementary roles in the task of improving labour productivity. Third, the competitiveness of modern economies depends on to what extent improvements in labour productivity could counter rising labour costs.

The key question is why the agriculture labour productivity is not only low but also stagnant. It is unlikely that it is the lack of productivity enhancing factors such as land, water, technical knowhow etc. that has led to lower labour productivity in agriculture. The problem seems to lie in the pricing of the agricultural products. The aggregate output or value added is obtained using prevailing prices and then deflated to obtain the constant price output or value added. In value terms, the standard labour productivity measure is nothing but an alternative measure of per-capita income of agricultural workers (Abeysinghe, 2020). Low and stagnant labour productivity, therefore, means that the incomes of famers and other agricultural workers are lower than that of industrial and service sector workers. Casual observations confirm this.

Concerted effort is needed to uplift the income levels of the agricultural workers. Subsidies and price support schemes are not sustainable. One area to consider is the role of the middleman in agriculture. Often there is a substantial difference in the price a farmer gets and the price at which the product is sold in urban areas. Anecdotally we can notice a vast difference in income levels of atomistic farmers and monopolistic middlemen in agriculture. This is where a well-designed government program is needed to remove the middleman so that farmers could get their products

directly to the final destinations and receive a higher price. A well-designed program should include ways to minimize government inefficiencies. One way to minimize inefficiencies, as practiced in Singapore, is to include a performance-based earnings component in the salaries of government employees. Another aspect is the export orientation of agriculture. Export-oriented agricultural products may seek a higher price. In particular, in many countries including Sri Lanka, organic agricultural products are lot more expensive than their non-organic counterparts. We will leave these as open questions for discussion.

Acknowledgements

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References

Abeysinghe T and Choy K M (2007), *The Singapore Economy: An Econometric Perspective,* (Research Monograph, Feb 2007, London: Routledge. Paperback edition issued in Oct 2008).

Abeysinghe T (2020), "Corona Squeeze of the Sri Lankan economy: Sectoral outlook", *Journal of Humanities and Social Sciences*, 2(2), Available at https://gamanicoreafoundation.lk/publications/

Abeysinghe T (2020) "Introduction" to *Quality adjusted labour input in ASEAN and Subnational economies of China, India and Indonesia*, Edited by Abeysinghe, Tilak and Zhang, Xuyao, Asia Competitiveness Institute, National University of Singapore (available online).

Abeysinghe T and Gunarathna N (2022), "Disparities of Subnational Economies of Sri Lanka Launching the District Development Index (DDI)", Available at https://gamanicoreafoundation.lk/publications/

Arriola C et al. (2020), "Efficiency and risks in global value chains in the context of COVID-19", *OECD Economics Department Working Papers*, No. 1637, OECD Publishing, Paris, https://dx.doi.org/10.1787/3e4b7ecf-en.

Arriola C, Kowalski P, Tongeren F V (2021), "The Impact of COVID-19 on Directions and Structure of International Trade", OECD Trade Policy Paper 252, *OECD Publishing.*

Athukorala P and Wagle S (2022), "The sovereign debt crisis in Sri Lanka: Causes, policy response and prospects", UNDP Policy Paper.

Bhavan T (2019), "Does inbound tourism encourage trade deficit in Sri Lanka?" *Asian Development Policy Review*, 7(4), 253-260.

Borin A M. Mancini and Taglioni D (2021), "Countries and Sectors in GVCs". Policy Research Working Paper; No. 9785. World Bank, Washington, DC.

Brenton P, Ferrantino M J and Maliszewska M (2022), "Reshaping Global Value Chains in Light of COVID-19" *World Bank Group.* Washington.

Central Bank of Sri Lanka (2019), "Adoption of modern technologies in agriculture", Annual Report, Box 4, item, *Central Bank of Sri Lanka.* Colombo.

Central Bank of Sri Lanka (2020), "Workers' Remittances: Trends, Issues and Way Forward", Annual Report, Box 4 item, *Central Bank of Sri Lanka.* Colombo.

Dunusingha P (2020), "Impact of Parental Migration on Children's Education and Protection: Evidence from Sri Lanka", *Journal of Social Sciences and Humanities Review*, 5(2): 98-128.

El-Erian M A (2023), Fragmented globalization, Project Syndicate (online, Mar 8, 2023).

George A, Li C, Lim J Z, Xie T (2021) "From SARS to COVID-19: The evolving role of China-ASEAN production network", *Economic Modelling*, 101(August 2021).

Faini R (2007), "Remittances and the Brain Drain: Do More Skilled Migrants Remit More?" *World Bank Economic Review* 21(2), 177–91.

Goldstein M and Khan M S (1978), "The supply and demand for exports: A simultaneous approach," *Review of Economics and Statistics*, 60, 275–286.

Goldar B, Das D K, Das P C and Gupta N (2020), "Domestic Versus Imported Contents In Exports: The Case Of India's Merchandise Trade", *Journal of South Asian Development*, 15(1), 62–96.

Greenville J, Kawasaki K, Flaig D, Carrico C, (2019. 02. 22) "Influencing GVCs through Agro-Food Policy and Reform" OECD Food, Agriculture and Fisheries Papers, No. 125, http://dx.doi.org/10.1787/9ce888e0-en , (Accessed 23.02.2023).

Hermandez-Marin, R. (2007), "Tourism events: Impact on imports", *International Journal of Event Management Research*, Vol 3, No 1. Pp 15-28.

Ignatenko Anna, Faezeh Raei, and Borislava Mircheva (2019) Global Value Chains: What are the Benefits and Why Do Countries Participate?, IMF Working Paper WP/19/18.

International Monetary Fund (2023), World Economic Outlook: A Road to Recovery, World Economic Outlook, April 2023: A Rocky Recovery (imf.org).

Jayasuriya R, Opeskin B (2015) "The Migration of Women Domestic Workers from Sri Lanka: Protecting the Rights of Children Left Behind", *Cornell International Law Journal*, 48.

Khan H and Abeysinghe T (2002) "Tourism in Singapore: Past experiences and future outlook", *Singapore in the 21st Century: Issues and Strategies*, edited by Koh, AT, Lim, KL, Hui, WT, Rao, B., and Chng, MK, McGraw-Hill.

Lasagabaster E, Maimbo S M, Hulugalle S (2005) "Sri Lanka's Migrant Labor Remittances: Enhancing the Quality and Outreach of the Rural Remittance Infrastructure", *World Bank Policy Research*, Working Paper 3789.

Niimi Y, Ozden C, Schiff M (2008) "Remittances and the Brain Drain: Skilled Migrants Do Remit Less!", *Asian Development Bank*, Philippines.

OECD (2013), "Interconnected Economies: Benefiting from Global Value Chains", OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264189560-en.

OECD (2020a), "COVID-19 and global value chains: Policy options to build more resilient production networks".

OECD (2020b) “Food Supply Chains and COVID-19: Impacts and Policy Lessons”, *OECD Web Site*. https://www.oecd.org/coronavirus/policy-responses/food-supply-chains-and-covid-19-impacts-and-policy-lessons-71b57aea/ .

OECD (2022), “The supply of critical raw materials endangered by Russia’s war on Ukraine”, *OECD Web Site*. https://www.oecd.org/ukraine-hub/policy-responses/the-supply-of-critical-raw-materials-endangered-by-russia-s-war-on-ukraine-e01ac7be/ , (Accessed 09.03.2023).

Qiang C Z, Liu Y, Paganini M and Steenbergen V (2020), “Foreign direct investment and global value chains in the wake of COVID-19”, World Bank Blogs (May 01, 2020).

Ratha D(2005), “Workers’ Remittances: An Important and Stable Source of External Development Finance, *ResearchGate,* https://www.researchgate.net/publication/254666406, (Accessed 17.03.2023).

Riedel, J. (1988), “The demand for LDC exports of manufactures: Estimates from Hong Kong”, *Economic Journal*, 98, 138–148.

Ruta M (2022) “The Impact of the War in Ukraine on Global Trade and Investment” *World Bank Group.* Washington.

Schwellnus et al. (2023) “Policies to strengthen the resilience of global value chains: Empirical evidence from the COVID-19 shock”, *OECD Science, Technology and Industry Policy Papers*, https://www.oecd.org/publications/policies-to-strengthen-the-resilience-of-global-value-chains-fd82abd4-en.htm , (Accessed 09.03.2023).

Senaratna B C V (2012) “Left-behind children of migrant women: Difficulties encountered and strengths demonstrated”, *Sri Lanka Journal of Child Health*, 41(2): 71-75.

Tatum, M (2020) MIT Technology Review: Inside Singapore’s huge bet on vertical farming (Oct 13 ,2023)
https://www.technologyreview.com/2020/10/13/1009497/singapore-vertical-farming-food-security/ Accessed on Mar 24, 2023

Ukwatta S (2010) “Economic and Social Impact of the Migration of Sri Lankan Transnational Domestic Workers on Families and Children Left Behind” ,*The University of Adelaide.*

Wuri J, Widodo T, and Hardi A S (2022) “Global Value Chains Participation during the COVID-19 Pandemic: A Dynamic Panel Approach” *Economies* 10, 121.https://doi.org/10.3390/economies10050121 ,(Accessed 04.03.2023).

Zhou M, Bian B, Zhu W, Huang L (2022) “. The Impact of Parental Migration on Multidimensional Health of Children in Rural China: The Moderating Effect of Mobile Phone Addiction”, *MPDI Journal,* 10,44, . https://doi.org/10.3390/children10010044 (Accessed 06.04.2023).

Appendix

Table A1. Regression estimates for computing import content of exports
(Some notes after the table)

	Total exports			Industry		
	Coeff	Elasticity	t-stat	Coeff	Elasticity	t-stat
Intercept	-358985	-	-1.87	-523695	-	-2.83
Lagged dependent variable	0.2202	0.201	0.83	-0.0156	-0.014	-0.06
Import	0.2889	0.385	5.46	0.1398	0.242	3.36
Lagged import	0.0147	0.018	0.14	0.1155	0.181	1.52
FORGDP	4709	1.036	2.45	5360	1.616	3.06
Pm/Px	-184475	-0.231	-2.20	-108632	-0.197	-1.95
	Textiles & garments			**Petroleum**		
	Coeff	Elasticity	t-stat	Coeff	Elasticity	t-stat
Intercept	-74127		-0.73	-4026		-1.81
Lagged dependent variable	0.2959	0.271	1.15	0.4490	0.383	2.40
Import	0.1182	0.349	3.14	0.0410	1.665	4.92
Lagged import	0.0369	0.099	1.00	-0.0241	-0.884	-2.15
FORGDP	1746	0.853	1.61	-	-	-
Pm/Px	-189597	-0.381	-2.00	-	-	-
	Other industry			**Agriculture**		
	Coeff	Elasticity	t-stat	Coeff	Elasticity	t-stat
Intercept	-226817		-2.74	-43249	-	-0.88
Lagged dependent variable	0.2079	0.191	0.85	0.6013	0.552	2.30
Import	0.0941	0.163	4.17	0.0481	0.283	1.77
Lagged import	-0.0137	-0.022	-0.46	-0.0190	-0.101	-0.78
FORGDP	1546	0.466	2.59	1055	1.026	2.40
Pm/Px	27417	0.050	1.08	-99407	-0.502	-2.11
	Tea			**Other agriculture**		
	Coeff	Elasticity	t-stat	Coeff	Elasticity	t-stat
Intercept	-42169		-0.89	-75147		-1.72
Lagged dependent variable	0.3851	0.357	1.81	0.2638	0.239	1.38
Import	0.0287	0.276	1.66	0.0139	0.212	1.05
Lagged import	0.0008	0.002	0.04	-0.0055	-0.076	-0.43
FORGDP	516	0.819	1.47	833	2.096	2.78
Pm/Px	-13537	-0.112	-0.59	-30379	-0.508	-3.93

Table A1 continued

	Service without tourism			Tourism Tourist earnings		
	Coeff	Elasticity	t-stat	Coeff	Elasticity	t-stat
Intercept	-62103	-	-2.36	6331		0.80
Lagged dependent variable	-0.0745	-0.0657	-0.41	0.7514	0.6372	15.66
Import	0.0042	0.0217	0.23	-0.0744	-0.9195	-5.28
Lagged import (-1)	0.0395	0.1841	2.28	-0.0247	-0.2732	-1.22
Lagged Import (-2)	-	-	-	0.0658	0.6548	3.12
Lagged Import (-3)	-	-	-	0.0529	0.4731	2.88
NEER	1433	0.6341	2.66	-	-	-
t	2220	0.1272	0.77	843	0.1466	0.86
t_2009	43165	0.3722	5.47	16788	0.2264	3.76
				Import demand		
Intercept	-	-	-	509473	-	1.59
Lagged dependent variable	-	-	-	0.7822	0.740	5.08
GDP-Tourist expenditure	-	-	-	0.0503	0.153	1.00
Tourist expenditure	-	-	-	0.6881	0.048	0.56
Lagged Tourist expenditure	-	-	-	-0.5437	-0.032	-0.40
Pm/P	-	-	-	-287840	-0.253	-1.54

Note: R sq ranges over 0.97-0.99 in all the regressions except for Petroleum with R sq=0.94.
Elasticity estimates are using the average values of the variables. Tourist earnings=tourist expenditure.

With the exception of the equations for tourism, the rest in the table corresponds to the export supply function given in (1), Section 2. In this specification the dependent variable is the export earnings (nominal) of the relevant category. Import variable is the sum of intermediate and investment imports (nominal). Pm the unit value index for intermediate inputs and Px is the unit value index of the relevant export category. It should be noted that these are not proper import and export price indexes. Being an export supply function, we expect the coefficient of Pm/Px to take a negative value. FORGDP (foreign GDP) is derived from export-share weighted real GDP growth rate of Sri Lanka's trading partners, 61 economies including the rest of the world (Abeysinghe, 2020). We retained all these variables in the regression even if some of them had statistically insignificant coefficient estimates. The estimation was over the period 1995-2018; 2019-2021 were dropped because of the Easter bombing and Covid-19 shocks. Some other outlier corrections were done to reduce their influence on the estimates.

Service exports (without tourist earnings) had to be modelled differently because of the structural change after 2009 (Figure 3). In the regression t and t_2009 are time trend values to provide changing slope of the trend line; t=1,2,3,… and t_2009 =0 till 2009 and 1,2,3,,, from 2010 onwards.

This specification provides a segmented trend line. NEER is export weighted nominal effective exchange rate (measured as rupees per foreign currency unit) (courtesy of Athukorala 2022). We dropped FORGDP from this regression to reduce the collinearity problem; the trend variable stands as a proxy of FORGDP.

Despite many permutations, obtaining a satisfactory regression for tourism was a challenge both due to data constraints and the structural change in the data series after 2009 seen in Figure 3. First we tried to construct a proper tourism demand model as in Khan and Abeysinghe (2002) by computing a tourist arrival share weighted exchange rate and other variables. But this did not work well and we settled down to the model given in the upper panel under tourism of Table A1. Then taking into consideration Bhavan's (2019) finding that causality runs from tourism to import demand we estimated an import demand function with tourist expenditure as an additional variable. Both models were estimated using data over 1985-2018. Although our preferred model is the import demand function, its estimated coefficients of the key variables are not statistically significant but carry the correct signs. However, the two models, though very different, provide very similar estimates on the import content of tourist earnings. With regard to workers' remittances please refer to Section 3.5.

Table A2. Gross value added share of total output by category (from IO tables)

Year	Agriculture, hunting, forestry, and fishing	Mining and quarrying	Food, beverages, and tobacco	Textiles and textile products	Leather, leather products, and footwear	Wood and products of wood and cork	Pulp, paper, paper products, printing, and publishing	Coke, refined petroleum, and nuclear fuel	Chemicals and chemical products
2000	0.74	0.81	0.83	0.58	0.70	0.79	0.85	0.27	0.58
2007	0.74	0.83	0.47	0.48	0.51	0.58	0.45	0.26	0.46
2008	0.74	0.83	0.47	0.49	0.52	0.58	0.46	0.26	0.46
2009	0.73	0.83	0.46	0.45	0.49	0.56	0.46	0.24	0.48
2010	0.72	0.83	0.45	0.43	0.47	0.56	0.46	0.20	0.51
2011	0.75	0.82	0.48	0.44	0.37	0.48	0.45	0.08	0.34
2012	0.74	0.83	0.48	0.44	0.37	0.47	0.43	0.06	0.34
2013	0.70	0.78	0.51	0.41	0.39	0.50	0.32	0.10	0.40
2014	0.74	0.82	0.61	0.43	0.46	0.61	0.29	0.28	0.52
2015	0.74	0.82	0.57	0.41	0.44	0.57	0.28	0.15	0.49
2016	0.74	0.82	0.60	0.43	0.47	0.60	0.29	0.06	0.52
2017	0.74	0.82	0.60	0.43	0.48	0.60	0.30	0.07	0.52
2018	0.74	0.82	0.60	0.43	0.47	0.60	0.29	0.23	0.52
2019	0.74	0.82	0.60	0.43	0.46	0.60	0.29	0.23	0.51
2020	0.74	0.82	0.60	0.42	0.45	0.59	0.29	0.22	0.51

Year	Rubber and plastics	Other nonmetallic minerals	Basic metals and fabricated metal	Machinery, nec	Electrical and optical equipment	Transport equipment	Manufac turing, nec; recycling	Electricity, gas, and water supply	Construc ction
2000	0.49	0.79	0.72	0.87	0.30	0.40	0.63	0.48	0.51
2007	0.50	0.43	0.41	0.52	0.53	0.51	0.56	0.59	0.48
2008	0.50	0.43	0.42	0.54	0.54	0.53	0.57	0.59	0.48
2009	0.48	0.43	0.40	0.51	0.53	0.51	0.57	0.58	0.47
2010	0.46	0.43	0.41	0.48	0.52	0.51	0.57	0.58	0.46
2011	0.44	0.49	0.36	0.55	0.43	0.48	0.54	0.47	0.49
2012	0.44	0.50	0.35	0.51	0.40	0.44	0.54	0.47	0.50
2013	0.42	0.45	0.38	0.34	0.44	0.46	0.53	0.45	0.48
2014	0.45	0.45	0.48	0.27	0.55	0.55	0.57	0.48	0.51
2015	0.42	0.43	0.45	0.26	0.54	0.54	0.54	0.48	0.52
2016	0.44	0.46	0.47	0.33	0.54	0.54	0.56	0.55	0.54
2017	0.44	0.47	0.48	0.33	0.55	0.55	0.57	0.56	0.54
2018	0.44	0.46	0.47	0.33	0.54	0.54	0.57	0.55	0.54
2019	0.44	0.45	0.46	0.33	0.53	0.53	0.56	0.55	0.53
2020	0.44	0.45	0.45	0.32	0.52	0.52	0.56	0.54	0.53

Year	Sale, maintenance, repair of motor vehicles, motorcycles, fuel retail sale	Wholesale trade and commission trade, except for motor vehicles, motorcycles	Retail trade, except of motor vehicles and motorcycles; repair of household goods	Hotels and restaurants	Inland transport	Water transport	Air transport	Other supporting and auxiliary transport activities
2000	0.08	0.89	0.08	0.53	0.62	0.04	0.05	0.09
2007	0.79	0.81	0.77	0.55	0.60	0.83	0.32	0.62
2008	0.79	0.81	0.77	0.55	0.61	0.84	0.33	0.63
2009	0.78	0.81	0.76	0.54	0.61	0.89	0.30	0.63
2010	0.76	0.81	0.74	0.54	0.61	0.97	0.29	0.64
2011	0.78	0.81	0.77	0.52	0.61	0.97	0.25	0.65
2012	0.78	0.81	0.76	0.53	0.61	0.97	0.25	0.66
2013	0.74	0.75	0.73	0.50	0.56	0.65	0.35	0.57
2014	0.78	0.78	0.78	0.52	0.57	0.55	0.62	0.57
2015	0.78	0.78	0.78	0.52	0.57	0.55	0.63	0.57
2016	0.78	0.78	0.78	0.51	0.57	0.55	0.63	0.57
2017	0.78	0.78	0.78	0.51	0.57	0.55	0.64	0.57
2018	0.78	0.78	0.78	0.51	0.57	0.55	0.64	0.57
2019	0.78	0.78	0.78	0.50	0.57	0.55	0.62	0.57
2020	0.78	0.78	0.78	0.50	0.57	0.55	0.61	0.57

Year	Post and telecommunications	Financial intermediation	Real estate activities	Renting M&Eq and other business activities	Public administration and defense; compulsory social security	Education	Health and social work	Other community, social, and personal services
2000	0.39	0.77	0.82	0.66	0.94	0.89	0.89	0.57
2007	0.49	0.83	0.82	0.49	0.78	0.89	0.65	0.43
2008	0.49	0.83	0.83	0.49	0.78	0.89	0.65	0.44
2009	0.40	0.84	0.82	0.56	0.86	0.89	0.76	0.51
2010	0.34	0.84	0.82	0.62	0.95	0.89	0.88	0.57
2011	0.30	0.81	0.81	0.61	0.94	0.90	0.88	0.57
2012	0.31	0.81	0.81	0.61	0.94	0.90	0.87	0.57
2013	0.33	0.74	0.77	0.59	0.89	0.85	0.84	0.53
2014	0.40	0.76	0.81	0.63	0.93	0.89	0.90	0.54
2015	0.40	0.76	0.81	0.63	0.93	0.89	0.89	0.54
2016	0.40	0.71	0.81	0.64	0.93	0.89	0.89	0.55
2017	0.40	0.72	0.82	0.64	0.93	0.89	0.89	0.55
2018	0.40	0.71	0.81	0.64	0.93	0.89	0.89	0.55
2019	0.39	0.71	0.81	0.63	0.93	0.89	0.89	0.54
2020	0.39	0.71	0.81	0.63	0.93	0.89	0.89	0.54

Source: Calculated from Input-Output tables from the Asian Development Bank.