Journal of Quantitative Economics
https://doi.org/10.1007/s40953-022-00298-8

ORIGINAL ARTICLE

Trade Structure and Economic Growth in Emerging and Developing Asia: A Dynamic Panel Analysis

Kaveri Deb[1]

Accepted: 27 March 2022

Abstract

A country's structure of trade and its impact on the economic growth of nations, has added a new dimension to the literature on trade and growth. That a country's specialization in different products is important in determining the pattern of growth, is being increasing realized and explored in related emerging literature. The current paper associates itself with this idea, and by means of One Step System Generalized Method of Moments estimator applied to dynamic panel models, tries to determine how the structure of trade has influenced the growth rate in the fastest growing region of the world—the emerging and developing Asia. The paper uses alternative measures of trade structure constructed after classifying the merchandise trade data into several categories on the basis of resource, skill and technological requirements. The approach adopted in this paper is thus quite exhaustive, and analyses the problem for the selected region in a manner not attempted in any of the existing studies. Our analysis suggests contradictory results, with measures based on trade specialization highlighting the growth enhancing effect of high skill and technology intensive manufactures, while measures based on trade shares in GDP revealing the growth retarding effects of primary products. Hence, the study reveals that the effect of trade structure on economic growth is dependent upon its adopted definition.

Keywords Trade structure · Economic growth · Skill · Dynamic panel model

JEL Classification F14 · F43 · C23 · C43

Introduction

International trade is considered to be an important medium through which a country can achieve higher levels of economic growth. As recognized in theory, greater trade participation benefits a country through several channels. Firstly, trade leads

✉ Kaveri Deb
kaveri@iiitg.ac.in

[1] Indian Institute of Information Technology Guwahati, Bongora, Guwahati, Assam 781015, India

Published online: 09 May 2022

to improved allocation of resources. If a country specializes according to its comparative advantage, it concentrates on the production of those products in which it is most efficient, and this eventually implies maximum efficient utilization of its resources. Secondly, producing for the world market enables a country to reap the benefits of economies of scale, which a closed economy would not be able to access. Thirdly, producing for the world market also induces the country to adopt more skill intensive techniques in production, and produce better quality products. Adoption of more efficient production techniques and managerial procedures often spills over to the rest of the economy (Wörz 2005). The end result is an increase in productivity in the economy, which has a positive impact on growth. Lastly, higher export by a nation is also a means to earn more foreign exchange to pay for greater imports of intermediate goods and other capital goods required in production. Thus, ability to import greater quantities of such products has a positive feedback effect on growth through improved productivity. As identified by Rodrik (1989a, b) direct imports of capital goods and access to new knowledge and technology embodied in imported goods can indirectly promote growth of nations, and exports by generating foreign exchange just provide the means to the end.

A review of the existing empirical literature on trade and growth would however reveal lack of consensus on the impact of trade on economic growth of nations (Dollar 1992; Ben-David 1993; Sachs and Warner 1995; Edwards 1998; Lawrence and Weinstein 1999; Rodriguez and Rodrik 2001; Baldwin 2003). As a result, the emerging literature in this area has shifted towards analyzing how the structure of trade determined by its pattern of product specialization (whether inter or intra-industry) or by its trade concentration in selective product categories, plays a role in influencing its economic growth. Trade specialization in different products may have differing impacts upon the growth of nations, with some promoting growth and some retarding growth. Hence, any general study on the impact of trade on economic growth of countries may prevent the researchers from arriving at a definitive conclusion.

The current paper by making a note of this fact, tries to determine how the structure of trade has influenced the economic growth amongst the emerging and developing nations of Asia. Our interest in emerging and developing Asia is motivated by the region's rapid growth over the past few years compared to other regions of the world. The classification of countries into emerging and developing Asia is adopted from IMF.[1] Notably, the region has witnessed lower GDP and per capita GDP compared to advanced nations and other emerging and developing regions of the world. Nevertheless, the region's growth in both the indicators, as well as its share of per capita GDP in world total, has surpassed the advanced and other emerging and developing nations. These observations would be evident from the figures in Table 1. IMF has even projected higher values for these indicators compared to any other regions of the world, for the year 2021. Thus, the region may have the capability to recover at a faster rate even under the current pandemic.

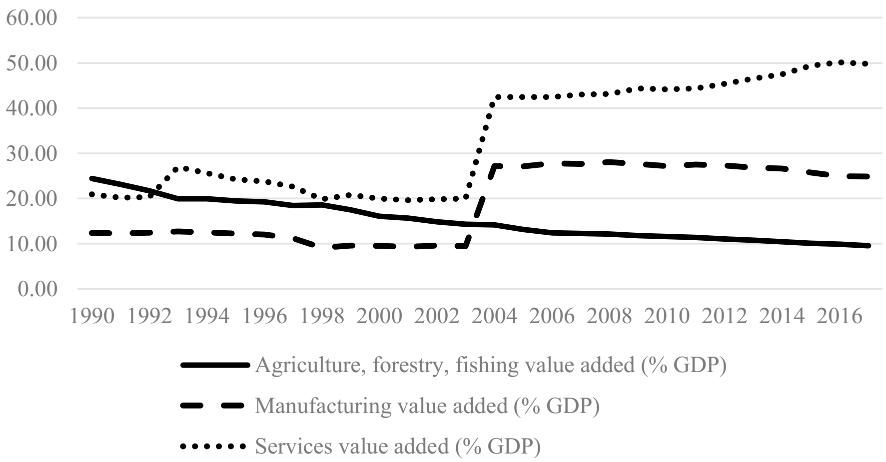
[1] The list of countries who are a part of emerging and developing Asia are provided in Appendix 1.

Table 1 Regional growth indicators

Region	Indicator	2018	2019	2020	2021 (projected)
Advanced Economies	GDP constant Prices (annual % change)	2.3	1.64	− 4.71	5.14
	Per Capita GDP (PPP) constant at 2017 prices (annual % change)	1.87	1.24	− 5.11	4.78
	GDP (PPP) share of world total (%)	43.55	43.10	42.50	42.18
European Union	GDP constant Prices (annual % change)	2.32	1.74	− 6.12	4.36
	Per Capita GDP (PPP) constant at 2017 prices (annual % change)	2.12	1.54	− 6.29	4.20
	GDP (PPP) share of world total (%)	15.53	15.39	14.95	14.74
Emerging and Developing Asia	GDP constant Prices (annual % change)	6.42	5.28	− 1.03	8.57
	Per Capita GDP (PPP) constant at 2017 prices (annual % change)	5.57	4.43	− 1.90	7.75
	GDP (PPP) share of world total (%)	30.65	31.42	32.16	32.95
Emerging and Developing Europe	GDP constant Prices (annual % change)	3.43	2.43	− 2.04	4.44
	Per Capita GDP (PPP) constant at 2017 prices (annual % change)	3.28	2.26	− 2.23	4.27
	GDP (PPP) share of world total (%)	7.65	7.63	7.74	7.63
Latin America and the Caribbean	GDP constant Prices (annual % change)	1.18	0.18	− 7.01	4.62
	Per Capita GDP (PPP) constant at 2017 prices (annual % change)	0.23	− 1.13	− 8.07	3.70
	GDP (PPP) share of world total (%)	7.80	7.58	7.28	7.19
Middle East and Central Asia	GDP constant Prices (annual % change)	2.01	1.40	− 2.86	3.71
	Per Capita GDP (PPP) constant at 2017 prices (annual % change)	− 0.20	− 0.57	− 5.13	1.19
	GDP (PPP) share of world total (%)	7.30	7.20	7.20	7.01
Sub Saharan Africa	GDP constant Prices (annual % change)	3.2	3.18	− 1.93	3.41
	Per Capita GDP (PPP) constant at 2017 prices (annual % change)	0.53	0.53	− 4.53	0.82
	GDP (PPP) share of world total (%)	3.07	3.08	3.12	3.05

Source: World Economic Outlook April 2021, IMF

Note: *PPP* purchasing power parity

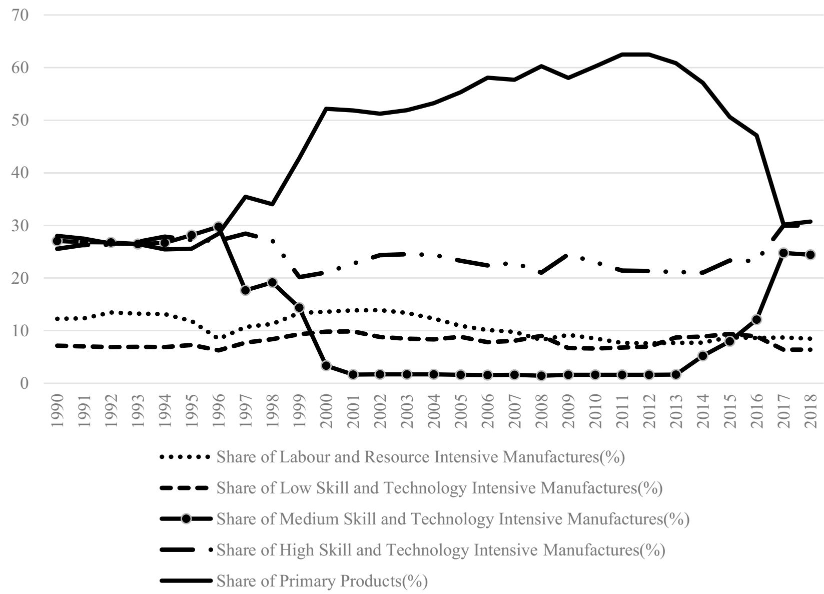


Source: World Development Indicators, World Bank

Fig. 1 Sectoral value added share in GDP (%)

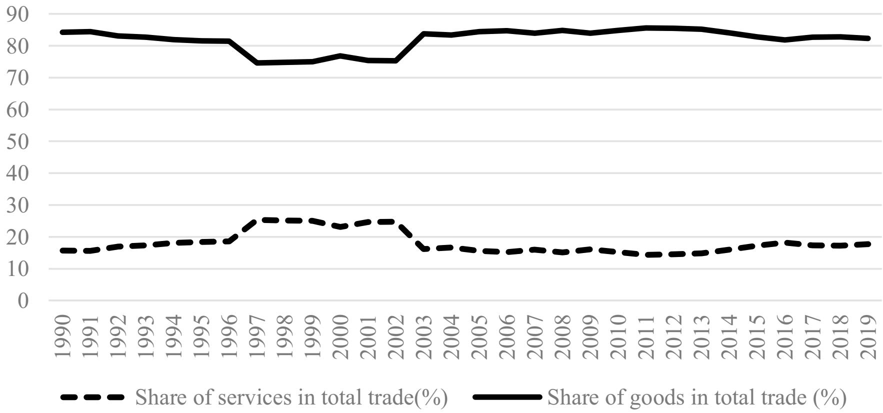
The region is characterized by countries largely dependent upon agriculture, mining, extractive industries, labour and low skill intensive industries. Some of the island nations are chiefly dependent upon revenues from the issuance of fishing licenses, inflows of remittances and foreign aid. The region is also comprised of a number of rapidly industrializing countries, which have made conscious attempts at transiting from dependence on primary sector to dependence on medium and high skill and technology intensive industries. In recent past however, in aggregate, the countries in the region have experienced structural transformation with growing share of non-traditional sectors such as manufacturing and services in GDP, and declining share of traditional sectors such as agriculture, forestry and fishing. Figure 1 below demonstrates that since 1993, services contributed most to the GDP of these countries. Agriculture, forestry and fishing maintained a higher share compared to manufacturing till 2003. Since 2004 however, manufacturing turned out to be the second largest contributor to GDP of the region, due to declining share of agriculture.

Such structural change is in many ways induced by changes in structure of trade measured by declining share of traditional sectors and improving shares of medium and high skill intensive sectors in total trade. As evident from Fig. 2, although the countries in the region have been predominantly primary product traders in the world market, the sector has been experiencing declining importance since 2012. Figure 2 also demonstrates the prominence of high skill and technology intensive manufactures in total trade of the region. Since 2016, the medium and high skill and technology intensive manufactures are seen to be catching up with trade in primary products. Noticeably, such changes in trade structure have involved merchandise only. Most services due to their non-tradable nature, continue to demand lesser attention in studies on trade. Figure 3 demonstrates that as expected, the region is dependent more on trade in merchandise than services.



Note: Classification of Merchandise/goods trade into 5 categories is adopted from UNCTAD Trade and Development Report 1996, as detailed in the Section 3. Data from Comtrade Database, United Nations.

Fig. 2 Merchandise sectoral shares in total trade (%): classification on the basis of resources, skills and technological requirements



Source: World Development Indicators, World Bank

Fig. 3 Share of goods and services in total trade (%)

Growing involvement of countries in global production networks induced by improved communication and information technology, reduced trade barriers and development in manufacturing technologies, is one of the chief reason for changing trade structure in emerging and developing countries. Fragmentation of production process across countries instigates structural change in international trade (Saygılı and Saygılı 2011). Such changes in trade structure also induces sectoral reallocation of factors of production and changes in industrial value added, resulting in structural change in the economy. According to Alessandria et al. (2021) structural transformation can also be due to trade shocks experienced in the form of increased demand for exports or imports. An impressive body of literature analyze how international trade have contributed towards structural change in economies (Echevarria 1995; Matsuyama 2009; Desmet and Parente 2012; Uy et al. 2013; Betts et al. 2017; Swiecki 2017; Teignier 2018; Cravino and Sotelo 2019).

The changes in trade structure by changing the structure of the economy, have important implications for economic growth of nations. The current paper therefore explores how changes in structure of trade has influenced the economic growth in the selected region. Thus the paper gives weightage to the kind of trade, not to trade as a whole, and proceeds to determine the former's role towards the economic growth. However, as evident from Figs. 1 and 3, services despite being the biggest contributor to the GDP of the region, continues to be largely non-tradable. Hence, the effect of changes in trade structure on economic growth is analyzed by considering merchandise only.

To identify the trade structure of the region, we first classify merchandise trade into primary products and manufactures. Trade in manufactures is further classified into four categories on the basis of resources, skills and technological requirements.[2] Next, several alternative indicators of trade structure are constructed by considering different categories of merchandise.

The alternative indicators of trade structure considered in this paper are, the shares of exports and imports in Gross Domestic Product (GDP) of a country, the Revealed Comparative Advantage (RCA) index of Balassa (1965), and the Intra-Industry Trade (IIT) index proposed by Grubel and Lloyd (1975). Thus, a country's trade structure is determined in this paper not only by the shares of exports and imports in GDP, but also by the patterns of inter and intra-industry specialisation. Trade specialisation plays an important role in altering the export/import shares of different sectors in GDP, and are quite rightfully additional measures of trade structure. Further, exports and imports are considered separately in the analysis to recognise the fact that exports and imports act on economic growth through different channels. Imports are more likely to influence economic growth through technology and knowledge spillovers. Exports on the other hand act more through productivity

[2] The act of classifying merchandise on the basis of resources, skill and technological requirements have been motivated from the works of Krugman (1987), Hansen (1997) and Grossman and Helpman (1991), who in their supply oriented neoclassical trade and growth models, promoted the role of technological spillovers and learning-by-doing towards the growth of nations. It follows, trade in certain products by permitting knowledge spillovers and learning-by doing, provides better opportunities for a country to grow.

differentials and economies of scale (Wörz 2005). Hence, their effects on economic growth may turn out to be different.

The relationship between trade structure and economic growth (measured by real per capita GDP at purchasing power parity) of nations is analysed by means of one step system Generalised Method of Moments (GMM) estimator applied to estimate dynamic panel models fitted to the data on a sample of 30 countries over the period 2005–2019.

Our analysis suggests that different measures of trade structure have different implications for the growth of the region. While trade specialisation highlight the importance of high skill and technology intensive manufactures in increasing the per capita income of the region, trade shares of primary products in GDP have worked in the opposite direction. Labour and resource intensive manufactures, and low skill and technology intensive manufactures have increased income only via their higher export shares in GDP. Medium skill and technology intensive manufactures have contributed towards higher economic growth only through inter-industry specialisation in such sectors.

The rest of the paper is organized as follows. In "Review of the Literature" section a brief review of the existing literature is presented. "Data and Methodology" section provides a description of the sources of data, and the methods used for analysis. In "Discussion of Results" the results are discussed, and "Summary and Conclusion" section summarizes and concludes the paper.

Review of the Literature

The relationship between trade structure and economic growth has been explored in a number of existing studies. Greenaway et al. (1999) for instance, after categorizing exports into fuel, food, metal, other primary, machinery, textiles and other manufactures, for a group of 69 countries over the period 1975–1993 by means of a dynamic panel model, identified fuel, metal and textile industries to positively influence economic growth. Amable (2000) introduced the indices of inter-industry specialization, trade dissimilarity, and comparative advantage in electronics as independent variables in a growth model incorporating 39 heterogeneous countries for the period 1965–1990. He found inter-industry specialization and comparative advantage in electronics, to have a significant positive influence on GDP growth. Laursen (1998, 2000) by fitting the data from a sample of 18 OECD countries for the period 1972–1990 to a fixed effects panel data model found that specialization in fast growing sectors (intensive in higher levels of skills and technology), has contributed towards GDP growth of these nations. Peneder (2003) by fitting the relevant data from a sample of 28 OECD countries from 1990 to 1998 to a dynamic panel model found that specialization in services (measured by the share of services in total value added of a country) has negatively influenced growth. The author justified his findings by realizing that productivity improvements in this sector cannot be readily transformed to higher GDP growth. However, like Laursen, he found a positive influence of trade specialization in high skill and technology intensive sectors (measured by the share of a sector in total exports of a country, relative to the share of OECD in its total exports) on growth. Lederman and Maloney (2003) by means of OLS cross sectional regression model and dynamic panel regression model fitted to a sample of 65 developed and developing countries for the years 1980–1999, found that trade structure indicated by natural resource abundance (measured by the share of natural resource exports in total exports) and export concentration (measured by Herfindahl's index) has impacted economic growth of the countries. While natural resource abundance has increased growth, export concentration has reduced growth. Wörz (2005) fitted the data on exports and imports (categorized on the basis of skill intensity) as a share of GDP for a group of 43 countries over the years 1981–1997, to a dynamic panel regression model. She found that trade in medium skill intensive industries had a positive impact on growth. But similar effect was not observed with high skill intensive industries. The author ascribed the outcomes to the fact that medium skilled technologies are more easily accessible and have better knowledge spillover effects. Industries requiring higher levels of skills on the other hand are at a nascent stage of development with low levels of productivity, even in many developed countries. After categorizing the sample into high income OECD countries and developing Asian and Latin American countries, the author noted some other significant results. Higher shares of exports from low skill intensive industries in GDP have contributed to GDP growth of developing nations, but not of developed nations. In contrast, higher shares of imports from low skill intensive industries have positively influenced the GDP growth of OECD nations, but not that of non-OECD nations. The author assigned this positive influence of low skill intensive imports in OECD countries to, freeing up resources for utilization in domestic industries requiring sophisticated technologies. Sohn and Lee (2010) applied a dynamic panel estimation method to the data on 66 countries for the period 1991–2004 to determine the influence of trade structure variables on the economic growth of the selected nations. The trade structure variables used by the authors were based on factor proportions theory of Heckscher–Ohlin and its dynamic extension—the Rybczynski theorem, the intra-industry trade model, and endogenous growth model. Accordingly, the authors used the ratio of exports of capital intensive to labour intensive goods divided by the ratio of capital to labour, Grubel–Llyod's intra-industry trade index, and the ratio of FDI to trade to represent trade structure of countries. In addition, the authors used Herfindahl's export concentration index and an index of Free Trade Area (FTA) to measure the trade structure of countries.[3] They found all the considered trade structure variables to have significant effects on the economic growth of nations. The effects are however positive for all variables, except export concentration index. The index was found to depress economic growth, implying a concentrated export structure may not always favor growth.

A brief review of the existing literature suggests that they have tried to address the issue of association between trade and growth by moving beyond the purview of aggregate trade of nations. These papers have considered different products, or

[3] The FTA index is used to represent particularly the institutional trade structure of countries. It is measured by the ratio of free market size to domestic market size. The index value varies between unity and infinity. The lowest value of unity will be taken by countries with no FTA, while countries with FTA will have values greater than unity.

products classified on the basis of resources, skill and technological intensity, or different measures of trade specialization and openness without referring to different product categories, to represent the trade structure of a country. Trade structure is definitely important for economic growth and increasing number of literature on the issue of trade and growth are realizing this aspect.

The current paper is motivated primarily from the works of Wörz (2005), Lederman and Maloney (2003) and Sohn and Lee (2010). Keeping aside the fact that none of the papers explore the economic growth of the world's fastest growing region, they also fall short of a few aspects, the amalgamation of which has been considered in the present paper. For instance, Wörz (2005) categorized trade on the basis of skill intensity, which is essential as it permits an analysis of the role of knowledge spillovers, technological up gradation and learning-by-doing towards the growth of nations. But the author considered limited measures of trade structure to determine the relationship between economic growth and structure of trade. Consideration of alternative measures of trade structure is important, as it helps in ascertaining whether different measures of trade structure complement or contradict each other. Lederman and Maloney (2003) and Sohn and Lee (2010) on the other hand, considered alternative measures of trade structure. But their approach is limited as they do not categorize trade on the basis of skill and technological requirements. The present paper by considering alternative measures of trade structure classified on the basis of resources, skills and technological requirements, determines the relationship between economic growth and the structure of trade for emerging and developing Asia.

Data and Methodology

Time series data on merchandise exports and imports on the basis of 3 digit Standard International Trade Classification (SITC) rev.3 for the set of 30 emerging and developing countries of Asia are accessed from United Nations Comtrade Database. The time periods considered for the analyses are from 2005 to 2019. Data on per capita GDP at purchasing power parity at 2017 constant prices, current GDP, gross capital formation as a percentage of GDP, and total population for each country are accessed from the World Development Indicators, World Bank.

The sector wise merchandise trade data are categorized into primary goods and manufactures. Manufacturing trade data are further disaggregated into 4 categories on the basis of skill content of factors of production and technological requirements in the production process—(1) labor and resource intensive manufactures; (2) low skill and technology intensive manufactures; (3) medium skill and technology intensive manufactures; (4) high skill and technology intensive manufactures.[4] This categorization of merchandise trade is adopted to understand the importance of resource, skill and technological up-gradation for the growth of the region. If a

[4] This categorization is adopted from UNCTAD Trade and Development Report 1996. The list of products under each category is provided in Appendix 2.

country's trade structure is such that it exports mostly medium and high skill and technology intensive manufactures, the country may achieve faster and long lasting economic growth through innovations and technological up gradation. However, to realize these benefits, the country must be developed enough to sustain higher productivity levels in such industries. Otherwise export expansion in such products (through inter or intra-industry specialization) may produce opposite result. Imports of technologically advanced products also have greater knowledge spillover effects than import of technologically backward products (Wörz 2005). However, imports of technologically advanced products may negatively impact economic growth if the country is not developed enough to extract the embodied technology and knowledge, and put them to their use via learning-by-doing. Hence, domestic industries may succumb to foreign competition, producing adverse effects on income and growth. If a country maintains higher exports from low skill and labour intensive sectors, positive impacts on economic growth may be realized through dissemination of benefits arising from greater scope for economies of scale. However, such benefits may be reaped only till the medium run, as the effects of higher scale of production will soon exhaust (Wörz 2005). Greater imports of low skill and labour intensive products may help in the growth of a nation by freeing up resources to be used productively in other higher value added activities. But greater import of such products may also hamper growth by destroying domestic industries. Similar arguments can also be presented with respect to primary product imports. Greater exports from the primary sector may benefit a country for some time, but gradually the disadvantages arising from terms of trade deterioration, diminishing returns and simultaneous contraction of other industries (termed as Dutch Disease) may have negative impacts upon the growth of nations.

The yearly measures of trade structure are constructed for each country for each of the 5 considered merchandise categories. The trade structure of countries is measured by several alternative indicators.[5] First, the shares of exports and imports in GDP of a country for 5 merchandise categories is used to represent the structure of trade.

The second measure of interest is the Revealed Comparative Advantage (RCA) Index of Balassa (1965). The index can algebraically be expressed as:

$$RCA = \frac{X_i^c / X_t^c}{X_i^w / X_t^w} \tag{1}$$

X_i^c: exports from merchandise category i by country c.
X_t^c: total exports by country c.
X_i^w: exports from merchandise category i by world.
X_t^w: total world exports.

[5] Although the existing literature have considered a few other indicators of trade structure like Herfindahl's export concentration index, trade dissimilarity index and inter-industry specialisation index, the indicators considered in this paper are comprehensive. Moreover, they are suitable for the analysis, as they will be better able to explain the rapid growth in per capita income of the region.

The index therefore measures the extent to which a country's share of a merchandise category in its total exports exceeds the world's share. The index will always take a positive value, with a value greater than unity implying comparative advantage, and a value less than unity implying comparative disadvantage by a country in the considered category. The index is based on the Ricardian and Heckscher–Ohlin model of comparative advantage. Although these models do not establish any direct relation between a country's comparative advantage and economic growth, it can be assumed that trade according to comparative advantage, by ensuring higher economic welfare will promote greater economic growth.

The third variable to measure trade structure is the Intra-Industry Trade (IIT) index proposed by Grubel and Lloyd (1975). The index in its algebraic form is stated as:

$$IIT = 1 - \frac{\sum_{i=1}^{n} \left| X_i^c - M_i^c \right|}{\sum_{i=1}^{n} \left(X_i^c + M_i^c \right)} \tag{2}$$

The variables X_i^c and M_i^c denote exports and imports from sector i in a particular merchandise category by country c. n is the total number of sectors within a particular category from where exports or imports have taken place. The index takes a value between 0 and 1, with higher values indicating greater degree of intra-industry trade in a country. Intra-industry trade permits countries to take advantage of economies of scale, and hence benefit from productivity gains, which ultimately lead to faster economic growth (Krugman 1979).

The impact of trade structure on economic growth of the region is determined by a dynamic panel model using one step system GMM estimator, as suggested by Arellano and Bover (1995) and Arellano and Bond (1998). GMM can control for endogeneity of the lagged dependent variable in the dynamic panel model. Two types of GMM estimators are identified in the literature—difference GMM and system GMM. Difference GMM proposed by Arellano and Bond (1991) rectifies endogeneity by first considering the first difference of all variables so as to remove unobserved individual fixed effects, and then applying GMM estimation technique with lags of the original endogenous variables as instruments to estimate the model. System GMM on the other hand considers a system of two equations—the original equation or the levels equation, and the transformed equation in first differenced form. The levels equation uses lagged first difference of the endogenous variables as GMM instruments, and the transformed equation uses the lags of the original endogenous variables as GMM instruments.[6] The idea of building a system of equations therefore results in usage of more instruments, thereby increasing the efficiency of the estimated model. Compared to difference GMM, system GMM estimator is also identified to be more efficient, and robust to the presence of heteroscedasticity and autocorrelation. These features of system GMM estimator have been the motivation for choosing it over difference GMM estimator.

[6] For the levels equations, system GMM assumes that the lagged first difference of the endogenous variables used as instrument, is uncorrelated with the unobserved individual fixed effects (Roodman 2009).

Separate dynamic panel regressions for separate indicators of trade structure are run. The log transformation of real per capita GDP at purchasing power parity (*lnPCY*) is regressed upon its own first and second period lags, and the first period lag of trade structure variable. The second period lag of per capita GDP is incorporated as GMM (internal) instrument, and the second period lag of trade structure variable is incorporated as external instrument, while estimating the models. The trade structure variable is included with a lag in the regression model, to allow some time for changes in structure of trade to impact economic growth.[7] Logarithmic transformation of total population (*lnPop*) and gross capital formation as a share of GDP (*GCFratio*) are considered as additional control variables in the regression models. The effect of population growth on economic growth has been extensively analysed in the literature. It is now apparent that higher population growth may increase or decrease economic growth, depending upon how it influences per capita GDP of a country (Peterson 2017). The classical and neo classical growth models considered a negative association between population growth and economic growth. But the endogenous growth models by considering the importance of research and development, predicted a positive association between population growth and economic growth. Gross capital formation as a share of GDP is considered to account for the role of higher investments towards economic growth of the region. Separate dummies for the years 2007, 2008 and 2009 are introduced into the regression models to account for the years of financial crisis.

The regression models considered for analysis can thus be represented as follows:

$$
\begin{aligned}
lnPCY_t^c = \gamma_0 + \gamma_1 lnPCY_{t-1}^c + \gamma_2 lnPCY_{t-2}^c + \sum_{j=1}^{5} \beta_j \left(\frac{X_j^c}{GDP^c} \right)_{t-1} \\
+ \gamma_3 GCFratio_t^c + \gamma_4 lnPop_t^c + year2007 + year2008 + year2009 + \varepsilon_t^c
\end{aligned}
\tag{3}
$$

$$
\begin{aligned}
lnPCY_t^c = \gamma_0 + \gamma_1 lnPCY_{t-1}^c + \gamma_2 lnPCY_{t-2}^c + \sum_{j=1}^{5} \beta_j \left(\frac{M_j^c}{GDP^c} \right)_{t-1} \\
+ \gamma_3 GCFratio_t^c + \gamma_4 lnPop_t^c + year2007 + year2008 + year2009 + \varepsilon_t^c
\end{aligned}
\tag{4}
$$

$$
\begin{aligned}
lnPCY_t^c = \gamma_0 + \gamma_1 lnPCY_{t-1}^c + \gamma_2 lnPCY_{t-2}^c + \sum_{j=1}^{5} \beta_j RCA_{jt-1}^c + \gamma_3 GCFratio_t^c \\
+ \gamma_4 lnPop_t^c + year2007 + year2008 + year2009 + \varepsilon_t^c
\end{aligned}
\tag{5}
$$

[7] Consideration of first period lag of the trade structure variable also enables us to address the problem of endogeneity associated with the variable. However, the first period lag of the variable could be predetermined, implying its association with the past values of error term. The issue could be addressed by including the lags of trade structure variable as GMM instruments, but that results in number of instruments to exceed the number of individual units in the panel. In order to avoid this problem, the first period lag of trade structure variable is considered as exogenous, with the second period lag of the variable as external instrument. The adopted approach may address the issue of predetermined variable to some extent, if not mitigate it.

$$lnPCY_t^c = \gamma_0 + \gamma_1 lnPCY_{t-1}^c + \gamma_2 lnPCY_{t-2}^c + \sum_{j=1}^{5} \beta_j IIT_{jt-1}^c + \gamma_3 GCFratio_t^c + \gamma_4 lnPop_t^c + year2007 + year2008 + year2009 + \varepsilon_t^c \quad (6)$$

In all the above regression specifications, c and t account for the country and time period under consideration respectively. j accounts for the 5 categories of merchandise considered in the paper. ε is the random error component.

It is to be noted however, that introduction of control variables *lnPop* and *GCFratio* altogether in the model causes the number of instruments to exceed the number of groups in the panel. As efficient GMM estimation requires that the number of instruments must be less than the number of individual units in a panel, the control variables are introduced one at a time in the models. First, the regressions without any control variables are run. Then the control variables are introduced in the models one at a time to note the changes in results. Further, the results are reported not only by including the dummies for the 3 considered years, but also by excluding the year dummies. All the regression models are run with robust estimate of standard errors.

Based on the estimated regression coefficient β_j, the null hypothesis of no relation between per capita GDP and individual trade structure variables for each product category is tested against the alternative hypotheses of positive or negative association between them. After running the regressions, the models are tested for the absence of second order autocorrelation (using Arellano Bond test), and for exogeneity of instruments as a group (using Hansen's test for overidentifying restrictions).[8] Absence of second order autocorrelation supports the usage of $lnPCY_{t-2}^c$ as a GMM instrument in the regression models. Acceptance of strict exogeneity of instruments establishes the validity of the instruments used in the models.

Discussion of Results

The results of the regressions with alternative indicators of trade structure are reported in Tables 2, 3, 4 and 5. In all the reported regression models, the coefficient for the first lag of the dependent variable is statistically significant. The same does not however follow for the second lag of the dependent variable. The F statistics are statistically significant for all the fitted regression models, confirming the joint significance of the estimated coefficients. The Arellano Bond test for second order autocorrelation is found to be statistically insignificant for most models. In a few cases, particularly in Table 5, the existence of second order autocorrelation can be noticed. However, as the regressions are run with the robust estimates of standard errors, it may be assumed that the estimated standard errors are robust to the

[8] We can rely here on Hansen's test rather than Sargan's test for overidentified restrictions, as we are using system GMM estimator. Sargan's test is more appropriate after difference GMM estimates. Further, unlike Sargan's test, Hansen's test does not rely on the assumptions of homoscedasticity and no serial correlation of the error term.

Table 2 Dynamic panel regression results with export to GDP ratio: dependent variable $lnPCY_t$

Variables/models	(1)		(2)		(3)
	Without year	With year	Without year	With year	Without year
Constant	− 0.123 (0.353)	− 0.061 (0.583)	− 0.051 (0.683)	− 0.033 (0.779)	0.006 (0.961)
$lnPCY_{t-1}$	1.322*** (<0.001)	1.407*** (<0.001)	0.914*** (<0.001)	0.923*** (<0.001)	1.141*** (<0.001)
$lnPCY_{t-2}$	− 0.304* (0.081)	− 0.396** (0.010)	0.086 (0.671)	0.075 (0.688)	− 0.140 (0.379)
$\left(\frac{X}{GDP}\right)_{t-1}$ for primary products	− 0.113*** (0.005)	− 0.085** (0.024)	− 0.041 (0.288)	− 0.035 (0.314)	− 0.078** (0.045)
$\left(\frac{X}{GDP}\right)_{t-1}$ for labour and resource intensive products	0.803* (0.066)	0.603* (0.098)	0.466 (0.227)	0.389 (0.252)	0.445 (0.158)
$\left(\frac{X}{GDP}\right)_{t-1}$ for low skill and technology intensive products	0.133 (0.647)	0.044 (0.859)	0.707* (0.076)	0.684* (0.064)	− 0.083 (0.755)
$\left(\frac{X}{GDP}\right)_{t-1}$ for medium skill and technology intensive products	0.024 (0.972)	− 0.120 (0.828)	0.900 (0.222)	0.875 (0.222)	− 0.288 (0.605)
$\left(\frac{X}{GDP}\right)_{t-1}$ for high skill and technology intensive products	− 0.547 (0.171)	− 0.320 (0.328)	− 0.853 (0.122)	− 0.790 (0.155)	− 0.075 (0.787)
$lnPop_t$			0.005*** (0.002)	0.005*** (0.002)	
$GCFratio_t$					0.078 (0.125)
No. of countries	24	24	24	24	21
No. of instruments	19	22	20	23	20
No. of observation	196	196	196	196	172
F test	4,090,000*** (<0.001)	11,500,000*** (<0.001)	4,750,000*** (<0.001)	6,460,000*** (<0.001)	6,770,000*** (<0.001)
AR (1)	− 2.14** (0.032)	− 2.42** (0.016)	− 1.30 (0.194)	− 1.57 (0.116)	− 2.28** (0.023)
AR (2)	− 0.12 (0.907)	0.88 (0.379)	− 1.16 (0.248)	− 0.69 (0.492)	0.39 (0.695)
Hansen Test	13.21 (0.280)	16.13 (0.136)	13.77 (0.246)	16.09 (0.138)	13.86 (0.241)

Note: Figures in parenthesis denote p values. ***Significant at 1% level, **significant at 5% level, *significant at 10% level. The results for the regression model with year dummies and *GCFratio* as the control variable are not reported, as estimating the model results in the number of instruments to exceed the number groups, implying unreliable estimates

presence of not only heteroscedasticity, but also autocorrelation. As required, the Hansen test for overidentified restrictions is found to be statistically insignificant for all the fitted models.

According to the results reported in Table 2, on running the regression without year dummies, higher share of primary good exports in GDP decreased the per capita income of the region. The relation is however not statistically significant when population is controlled for. The findings with respect to primary products could be associated with the fact that greater engagement of workers in the primary sector have retarded economic growth either through diminishing returns (if other factors of production are not increasing simultaneously), or through reduction in output from other sectors via Dutch Disease. Increased investments in such sectors may not have influenced the relation considerably, as the estimated coefficient for primary export share remains statistically significant when investment share is controlled for. Inclusion of year dummies into the regression models does not alter the findings with respect to primary products.

In addition, as evident from Table 2, higher export share of labour and resource intensive manufactures significantly increased per capita income of the region, when population and investment share were not controlled for. Insignificance of the estimated coefficients with the introduction of population and investment share as controls may imply that increased workers and investments in such sectors have contributed towards the association.

Further, Table 2 exhibits, higher shares of low skill and technology intensive manufacture exports in GDP significantly increased per capita income of the region, only when population was controlled for. Thus, the relation does not seem to be influenced by greater involvement of workers in such sectors. Introduction of investment share as a control variable did not have any significant effect on the estimated coefficient.

Finally, Table 2 allows us to conclude that export shares of high skill and technology intensive products in GDP, had no impact on per capita income of the region.

As per the results reported in Table 3, higher import share of primary goods in GDP decreased the per capita income of the region, probably through its contractionary impact on domestic industries. The relation however turns insignificant when population is controlled for. Year dummies are not found to influence the results. Higher import shares of any other merchandise category do not seem to have influenced the growth of the region over the observed period. Thus, the structure of the region's import, as determined by the sectoral shares of imports in GDP of a country, did not benefit the region either by providing greater opportunities for knowledge spillover, or by freeing up resources to be used productively for other purposes.

According to Table 4, greater specialisation in medium skill and technology intensive sector has increased per capita income of the region. But introduction of control variables makes the relation statistically insignificant, particularly when year dummies are not included into the regression model. Inclusion of year dummies along with population control, retains the statistical significance of the estimated coefficient.

Table 3 Dynamic panel regression results with import to GDP ratio: dependent variable $lnPCY_t$

Variables/models	(1)		(2)		(3)
	Without year	With year	Without year	With year	Without year
Constant	0.310 (0.156)	0.574* (0.051)	0.171 (0.552)	0.311 (0.305)	0.136 (0.554)
$lnPCY_{t-1}$	1.055*** (<0.001)	0.900*** (0.003)	1.007*** (<0.001)	1.018*** (<0.001)	0.924*** (0.004)
$lnPCY_{t-2}$	− 0.084 (0.693)	0.043 (0.876)	− 0.027 (0.904)	− 0.049 (0.832)	0.061 (0.824)
$\left(\frac{M}{GDP}\right)_{t-1}$ for primary products	− 0.200** (0.018)	− 0.242** (0.035)	− 0.110 (0.439)	− 0.170 (0.249)	− 0.122** (0.046)
$\left(\frac{M}{GDP}\right)_{t-1}$ for labour and resource intensive products	− 0.131 (0.380)	− 0.286 (0.161)	− 0.051 (0.776)	− 0.129 (0.507)	0.043 (0.800)
$\left(\frac{M}{GDP}\right)_{t-1}$ for low skill and technology intensive products	0.321 (0.594)	0.375 (0.601)	0.341 (0.548)	0.239 (0.692)	− 0.183 (0.750)
$\left(\frac{M}{GDP}\right)_{t-1}$ for medium skill and technology intensive products	− 0.142 (0.333)	− 0.302 (0.272)	0.021 (0.914)	− 0.207 (0.376)	− 0.278 (0.199)
$\left(\frac{M}{GDP}\right)_{t-1}$ for high skill and technology intensive products	0.226 (0.247)	0.470 (0.202)	− 0.002 (0.992)	0.270 (0.283)	0.361 (0.154)
$lnPop_t$			0.003 (0.428)	0.001 (0.864)	
$GCFratio_t$					0.157** (0.034)
No. of countries	25	25	25	25	22
No. of instruments	19	22	20	23	20
No. of observation	242	242	242	242	199
F test	1,610,000*** (<0.001)	264,689.92*** (<0.001)	3,880,000*** (<0.001)	1,340,000*** (<0.001)	2,630,000*** (<0.001)
AR (1)	− 1.42 (0.155)	− 1.26 (0.208)	− 1.24 (0.216)	− 1.41 (0.160)	− 0.92 (0.356)
AR (2)	− 1.44 (0.150)	− 1.18 (0.238)	− 1.54 (0.123)	− 1.11 (0.265)	− 1.17 (0.241)
Hansen Test	16.12 (0.137)	10.09 (0.522)	15.81 (0.148)	12.06 (0.359)	13.51 (0.261)

Note: Figures in parenthesis denote p values. ***Significant at 1% level, **significant at 5% level, *significant at 10% level. The results for the regression model with year dummies and *GCFratio* as the control variable are not reported, as estimating the model results in the number of instruments to exceed the number groups, implying unreliable estimates

Further as evident from Table 4, greater specialization in high skill and technology intensive products has increased the per capita income of the region. The relation is however statistically insignificant when population is controlled for in the regression model. Thus, greater engagement of workers in industries producing high skill and technology intensive manufactures may have increased economic growth. But the result does not seem to be influenced by higher investments in such sectors. This is because, with the introduction of investment share as a control variable in the regression model, the estimated coefficient for trade specialisation in high skill manufactures continues to remain statistically significant.

Table 4 further shows that inter-industry specialisation in primary products, labour and resource intensive manufactures, and low skill and technology intensive manufactures, did not influence the per capita income of the region.

As per the results reported in Table 5, with the inclusion of year dummies, the region witnessed higher economic growth due to increased intra-industry trade in high skill and technology intensive manufactures. Exclusion of year dummies renders the relation statistically insignificant. Intra-industry specialisation in any other product category do not seem to have significantly influenced the growth of the region.

Summary and Conclusion

This paper attempts to determine how trade structure may have influenced the growth in per capita income of the emerging and developing Asia, after classifying the merchandise trade data into primary products, and manufactures categorised on the basis of resources, skills and technological requirements. The research objective is analysed by means of a dynamic panel regression model, using the shares of exports and imports in GDP, and the measures of inter and intra-industry specialisation. The findings suggest that trade shares and measures of trade specialisation have different impacts on growth. Trade shares reflect the negative impact of primary product trade on growth. There could be obvious reasons for this negative association such as, diminishing returns, contraction of other industries via Dutch Disease, and decline of domestic industries producing import substitutes. But this negative association is not supported by trade specialisation. Trade specialisation on the other hand, seem to uphold the importance of high skill and technology intensive manufactures in increasing per capita income of the region. The result seems to be dictated by the specialisation of certain countries such as China, India, Indonesia, Malaysia, Philippines, Thailand and Vietnam, in high skill and technology intensive sectors. Here again, trade shares of such sectors in GDP have no impact on growth of the region. Further, inter-industry specialisation do reflect the positive role of medium skill and technology intensive industries in increasing per capita income of the region. Other measures of trade structure fail to highlight the importance of such sectors. The positive role of labour and resource intensive manufactures, and low skill and technology intensive manufactures, is reflected only by the export shares of such sectors in GDP. No other measures of trade structure generate similar results.

Table 4 Dynamic panel regression results with RCA index: dependent variable $lnPCY_t$

Variables/models	(1)		(2)		(3)
	Without year	With year	Without year	With year	Without year
Constant	0.213 (0.110)	0.316** (0.012)	0.015 (0.938)	0.189 (0.278)	0.241** (0.014)
$lnPCY_{t-1}$	1.117*** (< 0.001)	1.017*** (< 0.001)	1.079*** (< 0.001)	0.972*** (< 0.001)	0.987*** (< 0.001)
$lnPCY_{t-2}$	− 0.139 (0.524)	− 0.051 (0.800)	− 0.086 (0.664)	0.003 (0.987)	− 0.014 (0.946)
RCA_{t-1} for primary products	0.002 (0.850)	0.003 (0.734)	0.003 (0.771)	0.004 (0.620)	− 0.001 (0.934)
RCA_{t-1} for labour and resource intensive products	0.001 (0.804)	− 0.002 (0.522)	0.001 (0.688)	− 0.002 (0.474)	− 0.002 (0.484)
RCA_{t-1} for low skill and technology intensive products	− 0.002 (0.649)	− 0.001 (0.888)	0.002 (0.788)	0.002 (0.617)	− 0.010 (0.148)
RCA_{t-1} for medium skill and technology intensive products	0.003** (0.015)	0.004*** (0.002)	0.002 (0.276)	0.003** (0.018)	0.002 (0.109)
RCA_{t-1} for high skill and technology intensive products	0.033** (0.049)	0.044** (0.022)	− 0.004 (0.885)	0.020 (0.466)	0.031** (0.043)
$lnPop_t$			0.005* (0.085)	0.003 (0.234)	
$GCFratio_t$					0.134** (0.033)
No. of countries	24	24	24	24	21
No. of instruments	19	22	20	23	20
No. of observations	196	196	196	196	172
F test	1,570,000*** (< 0.001)	847,039.21*** (< 0.001)	3,980,000*** (< 0.001)	1,320,000*** (< 0.001)	3,820,000*** (< 0.001)
AR (1)	− 1.70* (0.089)	− 1.63 (0.102)	− 1.72* (0.086)	− 1.70* (0.089)	− 1.87* (0.062)
AR (2)	− 0.84 (0.402)	− 0.35 (0.727)	− 1.02 (0.308)	− 0.68 (0.498)	− 0.55 (0.581)
Hansen test	13.56 (0.258)	14.97 (0.184)	14.14 (0.225)	15.71 (0.152)	13.22 (0.279)

Note: Figures in parenthesis denote p values. ***Significant at 1% level, **significant at 5% level, *significant at 10% level. The results for the regression model with year dummies and *GCFratio* as the control variable are not reported, as estimating the model results in the number of instruments to exceed the number groups, implying unreliable estimates

Table 5 Dynamic panel regression results with intra-industry trade index: dependent variable $lnPCY_t$

Variables/models	(1)		(2)		(3)
	Without year	With year	Without year	With year	Without year
Constant	0.395** (0.020)	0.437** (0.010)	− 0.313 (0.385)	0.421* (0.086)	0.333*** (0.001)
$lnPCY_{t-1}$	0.863*** (0.001)	0.837*** (<0.001)	1.204*** (<0.001)	1.079*** (<0.001)	0.689*** (0.005)
$lnPCY_{t-2}$	0.096 (0.677)	0.117 (0.539)	− 0.185 (0.346)	− 0.119 (0.673)	0.274 (0.208)
IIT_{t-1} for primary products	− 0.039 (0.617)	− 0.054 (0.524)	0.034 (0.620)	− 0.082 (0.315)	0.020 (0.733)
IIT_{t-1} for labour and resource intensive products	0.020 (0.663)	0.020 (0.646)	0.003 (0.941)	0.029 (0.507)	0.002 (0.969)
IIT_{t-1} for low skill and technology intensive products	− 0.011 (0.842)	0.006 (0.929)	− 0.031 (0.441)	0.015 (0.791)	− 0.024 (0.614)
IIT_{t-1} for medium skill and technology intensive products	0.008 (0.800)	0.002 (0.954)	− 0.032 (0.220)	0.009 (0.793)	0.004 (0.871)
IIT_{t-1} for high skill and technology intensive products	0.083 (0.127)	0.088* (0.082)	− 0.058 (0.467)	0.093** (0.036)	0.054 (0.112)
$lnPop_t$			0.012* (0.093)	− 0.003 (0.558)	
$GCFratio_t$					0.127** (0.026)
No. of countries	24	24	24	24	21
No. of Instruments	19	22	20	23	20
No. of observations	196	196	196	196	172
F test	542,051.74*** (<0.001)	320,692.13*** (<0.001)	2,940,000*** (<0.001)	959,048.55*** (<0.001)	1,490,000*** (<0.001)
AR (1)	− 1.29 (0.197)	− 1.59 (0.112)	− 2.05** (0.041)	− 1.56 (0.120)	− 1.05 (0.292)
AR (2)	− 1.67* (0.095)	− 1.42 (0.156)	− 0.40 (0.689)	− 0.11 (0.913)	− 1.69* (0.091)
Hansen Test	14.54 (0.204)	12.11 (0.355)	12.44 (0.332)	13.79 (0.245)	11.53 (0.400)

Note: Figures in parenthesis denote p values. ***Significant at 1% level, **significant at 5% level, *significant at 10% level. The results for the regression model with year dummies and *GCFratio* as the control variable are not reported, as estimating the model results in the number of instruments to exceed the number groups, implying unreliable estimates

The current study therefore highlights the fact that despite the possibilities of high correlation amongst different measures of trade structure, they may not converge to similar implications for a country or a region. Although a study on trade structure and economic growth is more intensive and informative, findings may significantly be dependent upon the considered measures of trade structure. Nevertheless, with rapid growth of developing and emerging nations attracting the attention of researchers around the world, the work in the current paper is definitely worthy of consideration.

Appendix 1

List of countries in the sample: Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Fiji, India, Indonesia, Kiribati, Lao PDR, Malaysia, Maldives, Marshall Islands, Micronesia, Mongolia, Myanmar, Nauru, Nepal, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Sri Lanka, Thailand, Timor-Leste, Tonga, Tuvalu, Vanuatu, Vietnam.

Appendix 2

Commodity description under different product categories

Product category	SITC Rev3 code	Commodity description
0	1	Live animals
0	11	Bovine meat
0	12	Other meat, meat offal
0	16	Meat, ed.offl,dry,slt,smk
0	17	Meat,offl.prpd,prsvd,nes
0	22	Milk and cream
0	23	Butter, other fat of milk
0	24	Cheese and curd
0	25	Eggs, birds, yolks, albumin
0	34	Fish, fresh, chilled, frozen
0	35	Fish, dried, salted, smoked
0	36	Crustaceans, molluscs etc
0	37	Fish etc. prepared, preserved not elsewhere classified (nes)
0	41	Wheat, meslin, unmilled
0	42	Rice
0	43	Barley, unmilled
0	44	Maize unmilled
0	45	Other cereals, unmilled
0	46	Meal, flour of wheat, msln
0	47	Other cereal meal, flours

Product category	SITC Rev3 code	Commodity description
0	48	Cereal preparations
0	54	Vegetables
0	56	Vegetables, prepared, preserved, nes
0	57	Fruit, nuts excluding oil nuts
0	58	Fruit, preserved, prepared
0	59	Fruit, vegetable juices
0	61	Sugars, molasses, honey
0	62	Sugar confectionery
0	71	Coffee, coffee substitute
0	72	Cocoa
0	73	Chocolate, other cocoa preparation
0	74	Tea and mate
0	75	Spices
0	81	Animal feed stuff
0	91	Margarine and shortening
0	98	Edible product preparations, nes
0	111	Non-alcoholic beverage, nes
0	112	Alcoholic beverages
0	121	Tobacco, unmanufactured
0	122	Tobacco, manufactured
0	211	Hides, skins(excluding furs), raw
0	212	Furskins, raw
0	222	OILSEED (sft. fix vegetable oil)
0	223	Oilseed (other fix vegetable oil)
0	231	Natural rubber, etc
0	232	Synthetic rubber, etc
0	244	Cork, natural, raw; waste
0	245	Fuel wood, wood charcoal
0	246	Wood in chips, particles
0	247	Wood rough, rough squared
0	248	Wood, simply worked
0	251	Pulp and waste paper
0	261	Silk
0	263	Cotton
0	264	Jute, other textile bast fibre
0	265	Vegetable textile fibres
0	266	Synthetic fibres
0	267	Other man-made fibres
0	268	Wool, other animal hair
0	269	Worn clothing, textile articles
0	272	Fertilizers, crude
0	273	Stone, sand and gravel
0	274	Sulphur, unrestricted. iron pyrs

Product category	SITC Rev3 code	Commodity description
0	277	Natural abrasives, nes
0	278	Other crude minerals
0	281	Iron ore, concentrates
0	282	Ferrous waste and scrap
0	283	Copper ores, concentrates
0	284	Nickel ores, concentrate, matte
0	285	Aluminium ore, concentrate etc
0	286	Uranium, thorium ores, etc
0	287	Ore, concentrate base metals
0	288	Non-ferrous waste, scrap
0	289	PRECIOUS metal ores, concentrates
0	291	Crude animal materials. nes
0	292	Crude vegetable materials, nes
0	321	Coal, not agglomerated
0	322	Briquettes, lignite, peat
0	325	Coke, semi-coke, ret. carbon
0	333	Petroleum oils, crude
0	334	Petroleum products
0	335	Residual petrol products
0	342	Liquefied propane, butane
0	343	Natural gas
0	344	Petroleum gases, nes
0	351	Electric current
0	411	Animal oils and fats
0	421	Fixed vegetable fat, oils, soft
0	422	Fixed vegetable fat, oils, other
0	431	Animal, vegetable fats, oils, nes
0	667	Pearls, precious stones
0	681	Silver, platinum, etc
0	682	Copper
0	683	Nickel
0	684	Aluminium
0	685	Lead
0	686	Zinc
0	687	Tin
0	689	Miscellaneous non-ferrous base metal
0	931	Special transaction not classified
0	961	Coin nongold noncurrent
0	971	Gold, nonmonetary excluding ores
1	611	Leather
1	612	Manufactures leather etc. nes
1	613	Furskins, tanned, dressed
1	633	Cork manufactures

Product category	SITC Rev3 code	Commodity description
1	634	Veneers, plywood, etc
1	635	Wood manufactures, nes
1	641	Paper and paperboard
1	642	Paper, paperboard, cut etc
1	651	Textile yarn
1	652	Cotton fabrics, woven
1	653	Fabrics, man-made fibres
1	654	Other textile fabric, woven
1	655	Knit crochet fabric nes
1	656	Tulle, lace, embroidery etc
1	657	Special yarn, textile fabric
1	658	Textile articles nes
1	659	Floor coverings, etc
1	661	Lime, cement, construction material
1	662	Clay, refrct. Construction material
1	663	Mineral manufactures, nes
1	664	Glass
1	665	Glassware
1	666	Pottery
1	821	Furniture, cushions etc
1	831	Trunk, suit-cases, bag, etc
1	841	Mens, boys clothing, x-knit
1	842	Women, girl clothing, x-knit
1	843	Men’s, boys clothing, knit
1	844	Women, girls clothing. knit
1	845	Other textile apparel, nes
1	846	Clothing accessories, fabric
1	848	Clothing, nontextile; headgear
1	851	Footwear
2	671	Pig iron, spiegeleisn, etc
2	672	Ingots etc. iron or steel
2	673	Flat-rolled iron etc
2	674	Flat-rolled plated iron
2	675	Flat-rolled, alloy steel
2	676	Iron, steel bar, shapes etc
2	677	Railway track iron, steel
2	678	Wire of iron or steel
2	679	Tubes, pipes, etc. iron, steel
2	691	Metallic structures nes
2	692	Containers, storage, transport
2	693	Wire products excluding electric
2	694	Nails, screws, nuts, etc
2	695	Tools

Product category	SITC Rev3 code	Commodity description
2	696	Cutlery
2	697	Household equipment, nes
2	699	Manufactures base metal, nes
2	785	Cycles, motorcycles etc
2	786	Trailers, semi-trailer, etc
2	791	Railway vehicles equipment
2	793	Ship, boat, float structures
2	895	Office, stationery supplies
2	899	Miscellaneous manufactured goods nes
3	621	Materials of rubber
3	625	Rubber tyres, tubes, etc
3	629	Articles of rubber, nes
3	711	Steam generator boilers, etc
3	712	Steam turbines
3	713	Internal combustion piston engine
3	714	Engines, motors non-electric
3	716	Rotating electric plant
3	718	Other power generating machinery
3	721	Agriculture machines, excluding tractors
3	722	Tractors
3	723	Civil engineering equipment
3	724	Textile, leather machines
3	725	Paper, pulp mill machines
3	726	Printing, bookbinding machines
3	727	Food-processing machines non domestic
3	728	Other machines, parts, special industries
3	731	Metal removal work tools
3	733	Machine-tools, metal-working
3	735	Parts, nes, for machine-tools
3	737	Metalworking machinery nes
3	741	Heating, cooling equipment, part
3	742	Pumps for liquids, parts
3	743	Pumps nes, centrifuges etc
3	744	Mechanical handling equipment
3	745	Other nonelectric machine, tool, nes
3	746	Ball or roller bearings
3	747	Taps, cocks, valves, etc
3	748	Transmissions shafts etc
3	749	Non-elect machine parts, etc
3	771	Electric power machinery parts
3	772	Electric switch. Relay circuit
3	773	Electricity distributing equipment nes
3	774	Electro-medical, xray equipment

Product category	SITC Rev3 code	Commodity description
3	775	Domestic, electric, non-electric equipment
3	778	Electric machine apparatus. nes
3	781	Passenger motor vehicles excluding bus
3	782	Goods, special transport vehicles
3	783	Road motor vehicles nes
3	784	Parts, tractors, motor vehicles
3	811	Prefabricated buildings
3	812	Plumbing, sanitary, equipment. etc
3	813	Lighting fixtures etc. nes
3	893	Articles, nes, of plastics
3	894	Baby carriage, toys, games
4	511	Hydrocarbons, nes, derivatives
4	512	Alcohol, phenol, etc. derivatives
4	513	Carboxylic acids, derivatives
4	514	Nitrogen-funct. compounds
4	515	Organo-inorganic compounds
4	516	Other organic chemicals
4	522	Inorganic chemical elements
4	523	Metallic salts, inorganic acid
4	524	Other chemical compounds
4	525	Radio-active materials
4	531	Synthetic colours, lakes, etc
4	532	Dyeing, tanning materials
4	533	Pigments, paints, etc
4	541	Medicines,etc.exc.grp542
4	542	Medicaments
4	551	Essential oil, perfume, flavouring
4	553	Perfumery, cosmetics, etc
4	554	Soap, cleaners, polish, etc
4	562	Fertilizer, except grp272
4	571	Polymers of ethylene
4	572	Polymers of styrene
4	573	Polymers, vinyl chloride
4	574	Polyacetal, polycarbonate
4	575	Other plastic, primary form
4	579	Plastic waste, scrap etc
4	581	Plastic tube, pipe, hose
4	582	Plastic plate, sheets, etc
4	583	Monofilament of plastics
4	591	Insecticides, etc
4	592	Starches, inulin, etc
4	593	Explosives, pyrotechnics
4	597	Prepared additives, liquids

Product category	SITC Rev3 code	Commodity description
4	598	Miscellaneous chemical products. nes
4	751	Office machines
4	752	Automatic data processing equipment
4	759	Parts, for office machines
4	761	Television receivers etc
4	762	Radio-broadcast receiver
4	763	Sound recorder, phonograph
4	764	Telecommunication equipment parts nes
4	776	Transistors, valves, etc
4	792	Aircraft, associated equipment
4	871	Optical instruments, nes
4	872	Medical instruments nes
4	873	Meters, counters nes
4	874	Measure, control instrument
4	881	Photograph apparatus etc. nes
4	882	Photo cinematographic supplies
4	883	Cinematic film exposed developed
4	884	Optical goods nes
4	885	Watches and clocks
4	891	Arms and ammunition
4	892	Printed matter
4	896	Works of art, antique etc
4	897	Gold, silverware, jewlery nes
4	898	Musical instruments etc

Note: Product category: 0—primary goods; 1—labor and resource intensive manufactures; 2—low skill and technology intensive manufactures; 3—medium skill and technology intensive manufactures; 4—high skill and technology intensive manufactures.

Funding No funding or grant was received to conduct the study.

Availability of Data and Material The relevant data used for analysis can be made available upon request.

Code Availability The Stata commands used to run the statistical analysis can be made available upon request.

Declarations

Conflict of interest There is no conflict of interest involved.

Ethics approval Not applicable.

Consent to participate Not applicable.

Consent for publication Not applicable.

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