**PRELIMINARY AND INCOMPLETE**

**NOT FOR QUOTATION**

# Measuring the Impact of China's Exports Growth on its Asian Neighbours

Yoke Fong KONG[a*], Richard KNELLER[b]
[a]School of Economics, University of Nottingham Malaysia Campus, Malaysia, GEP.
[b]School of Economics, University of Nottingham, United Kingdom, GEP, CESIfo.

Prepared for the 14th ETSG Conference at Leuven, Belgium
13 - 15 Sept 2012

**Abstract:**
The rise of China as an economic power has led to concern in many countries, especially among Asian countries, that this development poses a serious threat to their own economic performance and in particular their ability to export. The empirical support for this view remains inconsistent however: with mixed evidence for the view that Chinese exports has harmed or helped exports by other Asian economies and which countries are more or less affected. One explanation for these inconsistencies might include the various biases that follow from the use of a gravity model that is specified in an a-theoretical manner. In this paper, we study the effect of the Chinese exports growth on those by other Asian countries using the empirical framework outlined by Baldwin and Taglioni (2006). The disadvantage of this approach is that we capture the relative effect rather than its direction. That is, when using the theoretically robust gravity model we are able to identify which countries are more or less harmed by Chinese exports and not whether the effect is positive or negative. To identify that we use instead trade on parts and components and final goods. Taken together we evidence of a positive relation between Chinese and its Asian neighbours' exports, with countries with greater endowments of human capital and capital-labour ratio benefiting most from this growth.

*JEL classification:* F14

*Keywords:* China; Asian countries; trade; gravity model

---

*Corresponding author: School of Economics, The University of Nottingham Malaysia Campus, Jalan Broga, 43500 Semenyih, Selangor, Malaysia.
E-mail address: ksyx1kyn@nottingham.edu.my

## 1. Introduction

The growth of Chinese exports during the course of the past three decades has led to concern in many countries that this poses a serious threat to their own export performance. This concern seems to be particularly acute for Asian countries that have similar trade structure with China. There are mixed empirical evidence for the view that Chinese exports has harmed or helped exports by other Asian economies and which countries are more or less affected. Even among the studies that employing gravity model, the evidence is inconclusive. These studies differ in the underlying estimating equation and none uses the theoretically consistent gravity model proposed by Baldwin and Taglioni (2006). This might suggest that part of the explanation for the inconsistency of evidence from this literature may result from the various biases that occur when the gravity model is specified in an a-theoretical manner.

In Baldwin and Taglioni (2006), the authors describe three types of mistakes in gravity models, which they label bronze, silver and gold. The bronze mistake is the inappropriate deflation of nominal trade values by the US aggregate price index.[1] The silver mistake is the use of the log of the average rather than the average of the logs. The gold mistake - the most serious and most commonly made mistake – occurs from the omission of relative price terms and bilateral trade costs. They demonstrate that the effects of these various bias are removed when including a full set of bilateral, origin-time and destination-time dummies in the gravity model. Baier and Bergrstrand (2007) take a somewhat different route to the same solution.

The theoretically consistent gravity model has a somewhat inconvenient property when trying to model the impact of the rise of Chinese exports on other East Asian countries though. The variable of Chinese exports to a given country destination, which is used to capture the China impact, are perfectly collinear with the country-time dummies. The effect of Chinese exports on trade by third countries cannot therefore, be separated

[1] This is done by Greenaway et al. (2008) and Eichengreen et al. (2007). However, by then including time dummies they remove this effect (Baldwin and Taglioni, 2006).

from the multilateral resistance parameters, or indeed any other country-time varying factor that may be omitted from the regression and that one chooses to control for with a series of country-time dummies.

In light of the above problem, we study the effects of Chinese exports on the exports of other Asian countries by using the theoretically consistent gravity model of Baldwin and Taglioni (2006) and taking into account the differences in the characteristics of Asian countries. This approach stems from the well-recognised theoretical ground that the relative factor endowment across countries is playing a vital role in shaping the patterns of specialisation and trade. With the rising Chinese exports, differences in the characteristics of Asian countries will also determine the likely impact that a counter encounter. The disadvantage of our methodology is that we cannot derive the overall magnitude of the effects of Chinese trade on exports by other Asian economies exports, the level effect. We can only tell whether a country is more or less affected than another, the relative effect.

The rest of the paper is organized as follows. Section 2 reviews the related studies on China impact. Section 3 discusses the gravity model and estimation issue. Section 4 describes the data and empirical specification adopted. The results of our examination on the impact of China's export expansion, using both the method adopted by the existing literature and our preferred specification, are reported in Section 5. Section 6 concludes.

## 2. The Impact of China's Emergence - A Literature Review

In comparison to many of its Asian neighbours, in which their shares either contract or remain unchanged, China's share in global manufacturing exports has been rising continuously overtime (see Table 1). In 1994, Chinese exports accounted for just 3.30% of world manufacturing exports. By 2008, this share had increased to 13.05%. Not surprisingly, the growth rate of Chinese manufacturing exports is accordingly stronger than for other Asian countries. Since 2002, China's growth rate of exports has maintained

at double digits following its accession to the WTO, despite a 10% point drop during the global financial crisis of 2007 and 2008.

**Table 1**
Shares in World Manufacturing Exports (%)

| Year | China | Hong Kong | Indonesia | Japan | Malaysia | Philippines | Rep. of Korea | Singapore | Thailand |
|---|---|---|---|---|---|---|---|---|---|
| 1994 | 3.30 | 4.67 | 0.69 | 12.53 | 1.44 | 0.19 | 2.95 | 2.64 | 1.08 |
| 1996 | 3.37 | 4.42 | 0.68 | 10.32 | 1.57 | 0.45 | 3.04 | 2.76 | 1.05 |
| 1998 | 3.96 | 4.02 | 0.53 | 9.02 | 1.42 | 0.65 | 2.82 | 2.29 | 0.97 |
| 2000 | 4.82 | 4.22 | 0.77 | 9.86 | 1.73 | 0.76 | 3.40 | 2.58 | 1.13 |
| 2002 | 6.24 | 4.10 | 0.66 | 8.27 | 1.60 | 0.69 | 3.18 | 2.25 | 1.08 |
| 2004 | 8.33 | 3.84 | 0.55 | 8.06 | 1.47 | 0.55 | 3.55 | 2.54 | 1.12 |
| 2006 | 10.97 | 3.73 | 0.54 | 7.19 | 1.44 | 0.50 | 3.56 | 2.62 | 1.20 |
| 2008 | 13.05 | 3.41 | 0.52 | 6.80 | 1.06 | 0.40 | 3.58 | 2.32 | 1.25 |

Note: Data are at the 1-digit level.
Source: Computed from UN Comtrade database.

Within the manufacturing sector, SITC 7 and 8 have been the main movers for Chinese exports expansion. Parts and components are mainly come from SITC 7 and 8, in which the international fragmentation production is most extensive. These are relatively sophisticated products that require relative high technology. In contrast, final goods may be produced by simply assembled by parts and components. It is interesting to note that share of parts and components exports for China is far less than the share of final good exports. In addition, the share of parts and components in total manufacturing imports is higher than its exports. On the other hand, exports of final goods were always more than the imports of final goods (see Table 2).

For all other Asian exporters studied here, China has been one of their main trading partners. In general, the shares of parts and components exports to China are greater than the respective countries' shares of total manufacturing exports (Table 3). This suggests that the link between China and its Asian neighbours has become unprecedentedly closer - an indication of the increasing international fragmentation in the region. Indirectly, this trend may also imply that the capability of China in producing more sophisticated products is still limited as it still relies on the skill and technology of its more advanced neighbours.

**Table 2**
China's Manufacturing Exports and Imports (US$ billion in real terms)

| Year | Exports | | | | Imports | | | |
|---|---|---|---|---|---|---|---|---|
| | Total manufacturing | Parts and components | Final goods | Share of P& C (%) | Total manufacturing | Parts and components | Final goods | Share of P& C (%) |
| 1994 | 67.18 | 4.82 | 62.36 | 7.18 | 65.27 | 10.29 | 54.97 | 15.77 |
| 1996 | 80.60 | 7.37 | 73.23 | 9.15 | 67.42 | 13.86 | 53.56 | 20.56 |
| 1998 | 98.14 | 10.69 | 87.45 | 10.89 | 67.78 | 18.50 | 49.28 | 27.30 |
| 2000 | 127.08 | 17.43 | 109.65 | 13.72 | 96.72 | 31.08 | 65.64 | 32.13 |
| 2002 | 162.05 | 26.53 | 135.52 | 16.37 | 128.81 | 43.02 | 85.80 | 33.39 |
| 2004 | 284.62 | 49.21 | 235.41 | 17.29 | 222.08 | 80.49 | 141.59 | 36.24 |
| 2006 | 437.81 | 77.20 | 360.61 | 17.63 | 284.35 | 113.23 | 171.12 | 39.82 |
| 2008 | 562.17 | 79.44 | 482.73 | 14.13 | 264.00 | 59.25 | 204.75 | 22.44 |

Note: Data are at the 5-digit level aggregated.
Source: Computed from UN Comtrade database.

**Table 3**
Share of Manufacturing Exports to China (%)

| Year | | Indonesia | Hong Kong | Japan | Malaysia | Philippines | Rep. of Korea | Singapore | Thailand |
|---|---|---|---|---|---|---|---|---|---|
| 1994 | Manufacturing | 2.79 | 31.17 | 4.63 | 2.01 | 0.37 | 6.14 | 1.41 | 0.65 |
| | PC | 0.14 | 43.84 | 2.44 | 0.29 | 0.11 | 2.10 | 1.04 | 0.55 |
| 1996 | Manufacturing | 2.14 | 31.25 | 5.05 | 1.71 | 0.43 | 8.27 | 1.93 | 1.45 |
| | PC | 0.35 | 42.11 | 3.87 | 0.63 | 0.14 | 4.17 | 2.06 | 1.80 |
| 1998 | Manufacturing | 3.57 | 31.52 | 4.94 | 1.73 | 0.62 | 8.50 | 3.23 | 2.64 |
| | PC | 0.62 | 44.87 | 5.46 | 1.35 | 0.67 | 5.46 | 3.37 | 4.82 |
| 2000 | Manufacturing | 2.97 | 32.59 | 6.10 | 2.48 | 1.20 | 9.89 | 3.73 | 3.16 |
| | PC | 1.22 | 49.27 | 6.39 | 2.49 | 1.54 | 8.40 | 3.79 | 4.79 |
| 2002 | Manufacturing | 3.86 | 37.74 | 9.18 | 4.72 | 3.43 | 14.20 | 5.67 | 4.33 |
| | PC | 2.42 | 60.60 | 10.40 | 5.94 | 4.52 | 15.70 | 5.15 | 6.04 |
| 2004 | Manufacturing | 5.01 | 42.72 | 12.58 | 5.70 | 6.32 | 19.21 | 7.95 | 6.28 |
| | PC | 3.23 | 64.15 | 14.97 | 7.03 | 7.27 | 26.00 | 8.18 | 7.33 |
| 2006 | Manufacturing | 4.57 | 46.11 | 13.68 | 6.93 | 10.04 | 20.90 | 10.72 | 7.95 |
| | PC | 3.41 | 67.86 | 17.49 | 8.86 | 13.94 | 29.19 | 12.64 | 8.25 |
| 2008 | Manufacturing | 3.83 | 43.44 | 14.61 | 7.39 | 12.22 | 20.36 | 8.59 | 8.54 |
| | PC | 2.73 | 63.67 | 18.98 | 7.87 | 16.48 | 28.11 | 9.12 | 8.15 |

Note: Data are at the 5-digit level aggregated.
Source: Computed from UN Comtrade database.

Given the statistical facts highlighted above, it is perhaps no surprise that concern about the Chinese impact is widespread. This can be seen from the growing number of literature examining the impact of China's emergence on African countries (Geda and Meskel, 2008; Giovannetti and Sanfilippo, 2009), Latin America (Jenkins et al., 2008; Lall and Weiss, 2005; Moreira, 2007) as well as Asian countries. In these studies, a number of alternative methodologies have been employed where these include computable general equilibrium modelling (Ianchovichina and Martin, 2001; Ianchovichinaand Walmsley, 2005); measures of its revealed comparative advantage

(Shafaeddin, 2004); or using RCA together with constant market share analysis (Holst and Weiss, 2004); comparisons of the degree of overlap in export structures (Lall and Albaladejo, 2004); and econometric analysis of export growth equations (Ahearne et al., 2003). Here we focus only on those studies using gravity modelling.

Three closely related studies using gravity modelling can be found in the literature. The first one is from Eichengreen et al. (2007). The authors study the China impact on 13 Asian exporting countries at the aggregate level as well as at the SITC one- to three-digit level for the period 1990-2003. The main conclusions are that China's growth has a positive effect on the exports of high income Asian countries (Japan, Singapore, and South Korea) that are exporters of capital goods, and on the exports of middle income countries (Malaysia and the Philippines). A negative effect is observed on the exports of low-income Asian (Bangladesh, Cambodia, Sri Lanka, and Pakistan) that are dependent on the production and sale of consumer goods.

The study by Greenaway et al. (2008) reaches the opposite conclusion. Using data at the aggregate level for period 1990-2003, the authors conclude that there is no evidence of export displacement for low-income countries (Bangladesh, Cambodia, India, Pakistan, Vietnam), which have comparative advantage in unskilled labour-intensive. Exports of the high-income economies (Korea, Singapore, Japan) are most adversely affected, which implies that China's comparative advantage has changed from production of low technology, low-skilled intensive goods to high value added and less labour-intensive manufacturing. Despite the fact that China's economic growth spurred higher imports from its neighbours, with more advanced Asian countries benefiting the most, this, however, did not rise sufficiently to offset the displacement effect in third markets.

The third related study is that conducted by Athukorala (2009). This paper examines the impact of China's rising exports during 1992-2005 using data at the SITC five-digit level. This study includes 39 importing countries which satisfy the criteria that each of which accounted for 0.1% or more of manufacturing trade in 2000/1. The author is of the view that the fear of export crowding-out has been exaggerated in the current

debate. He argues instead that China's rapid integration into global production networks as a major assembly centre has created new opportunities for other East Asian countries to specialise in parts and components production and assembly. The impact of China's world market penetration in labour-intensive manufactured goods mainly should therefore be felt by the high-wage East Asian NIEs. The author also notes that the share of parts and components in total machinery imports to China have grown much faster than exports of these products. Given that the production of parts and component is generally more capital and technology intensive than final goods, this suggests that China's export success has been underpinned largely by its relative abundance of labour. This is true especially when data on trade components is excluded, more than 80% of total China's manufacturing exports are in fact labour-intensive products.

## 3. Gravity Model and Estimation Issues

The success of the gravity model in empirical studies has led to its application in wide range of economics fields including the study of the impact of Chinese trade expansion. This formulation indicates that bilateral trade flows increase with economic mass of exporter (i) and importer (j), and decrease with the distance between i and j. Empirically, this simple equation is often augmented to include other proxies for trade fictions such as common language, borders etc. In recent years, various developments have been witnessed that seek to provide gravity model with more formal foundations and its empirical application. One of these is the work by Anderson and Wincoop (2003) concerning the importance of properly controlling for multilateral price/resistant terms. The concept of price terms arose from the idea that trade flows between exporters and importers, after controlling for size, not only depend on bilateral trade barriers, but also depends on average trade barrier with all trading partners.

Anderson and Wincoop (2003) propose that one way to account for multilateral resistance terms is by using the country-specific dummies.[2]Subsequent papers point out

[2] See also Feenstra (2003) Chapter 5.

that this suggestion is limited to cross-section analysis. In a panel setting, multilateral resistance terms would be time varying. Matyas (1997) proposes that when panel data is used, the proper econometric specification should be one that with time, exporter and importer effects. This panel set-up is however viewed as restrictive by Egger and Pfaffermayr (2003) since possible interactions between the exporter and importer dimensions are omitted. According to Egger and Pfaffermayr (2003), the proper panel specification should include Matyas's three main effects and additionally the time invariant bilateral interaction (country-pair effects). Other researchers argue (Baier and Bergstrand, 2007; Baldwin and Taglioni, 2006; Subramanian and Wei, 2007) that the introduction of time, exporter, importer and country-pair effects on panel data only remove part of the bias, not all. These papers propose that the ideal specification for empirical panel analysis should be one that with time-varying country and time invariant country-pair fixed effects. This important aspect, however, has not always been given consideration by the existing empirical literature including that study the impact of Chinese trade expansion. This has been labeled by Baldwin and Taglioni (2006) as gold mistake.

In the study of Chinese impact from its rising exports, apart from endogeneous bias caused by the omission of multilateral resistance terms, there is another potential cause of omitted variable problem. In a gravity equation, Chinese exports to the same third markets as other Asian countries' has been included as a measure of the impact of Chinese export expansion. There is a potential endogeneity of this Chinese exports variable as any unobserved factor that affect a country's imports from one of the exporters are also likely to have an impact on the imports from China. To deal with this problem, the existing literature employs instrumental variable (IV) based estimators on gravity equation in examining the China impact.[3] Arguably, this approach is less suitable for the present study. Very often, the use of a particular type of instrumental variable constrains the employment of theory-consistent specification of the gravity model, which also deals with the endogeneous bias that caused by the omission of multilateral

[3] The widely used IV based estimators are two stages least squares (2SLS) and generalized methods of moments (GMM).

resistance terms. Consequently, this can lead to the results obtained by IV technique are quite unstable.

To account for the endogeneity problem highlighted above, the ideal gravity model will be that with time-varying country (it and jt) and time invariant country-pair (ij) fixed effects. Such model set-up, however, cannot be applied to the present context in a straightforward manner. Our variable of interest - the China's exports to the same third markets of other Asian exporters - is perfectly collinear with the time-varying country dummies. The effect of Chinese exports on trade by third countries cannot therefore be separated from the multilateral resistance parameters, or indeed any other country-time varying factor that may be omitted from the regression and a series of country-time dummies are added in order to control for. In light of this problem and in order to examine the effect of the growth of Chinese exports by using the theoretically consistent gravity model of Baldwin and Taglioni (2006), we adopt a gravity set-up that involves difference-in-difference approach with time-varying exporter and importer effects. This approach explores the differences in the characteristics of Asian countries. In simple words, we interact the Chinese exports variable with the country characteristics that we seek to examine.

The identifying assumption that we make is that the particular factor endowments of a country make it more (or less) vulnerable to Chinese exports in third-country markets. Motivation for such a possibility is relatively plentiful. Firstly, it might be seen to draw directly from the evidence for parameter heterogeneity found in Eichengreen et al. (2007) and Greenaway et al. (2008), albeit where those studies use the income level of different countries. A more important motivation is from Schott (2008) who investigate the impact of the rise of Chinese exports for developed economies by comparing the set of products China exports to the United States with the bundle of products exported by the OECD. Using the Heckscher-Ohlin model, Schott (2008) demonstrates that with endowment driven specialization the effects of Chinese exports should be felt most keenly by countries with similar factor endowment, although he notes that China's export overlap with the OECD is much greater than one would predict given its low wages.

A second motivation comes from the view that the trade in parts and components, the fragmentation of the production process, has increased dramatically amongst the East Asian countries (Kimura et al. 2007). International production of fragmentation involves the breaking down of the integrated process into separate production blocks that could be performed in different countries. These fragmented production blocks are connected by service links ranging from activities of coordination, monitoring to transportation. According to Jones and Kierzkowski (1990), in the context of international fragmentation trade, the traditional law of comparative holds but now it applies at the level of production process. On the Heckscher-Ohlin basis for trade, factor intensities vary across production blocks, countries vary in their relative factor endowment and thus the relative factor prices. Lower costs of production that is resulted from these two aspects will drive the producers to separate and locate different production blocks to country where there is relative abundance of the type of factor endowment used relatively more intensively in the production blocks concerned.[4] Building on the model of fragmentation by Jones and Kierzkowski (1990), Kimura et al. 2007 show that fragmentation of trade builds on the complementarities that come from the differences between country characteristics. A similar type of argument can be found in Athukorala (2009).

It is clear from the above literature that country characteristics play an important role in respect of the China impact. For final goods, a country specialises and exports products of which the production is intensive in factors that the country is abundantly endowed by virtue of the Heckscher-Ohlin model. For trade in parts and components, the international fragmentation model explains that differences in country characteristics induce producers to separate and locate different production stages according to the countries' relative advantages at the stages concerned. Applying these frameworks to the study of the impact of Chinese export expansion, we would therefore anticipate that countries with different factor endowments to China will be less adversely affected compared to countries that are more similar. In comparison, under the model of fragmentation, we would anticipate that countries which have fewer similarities to China

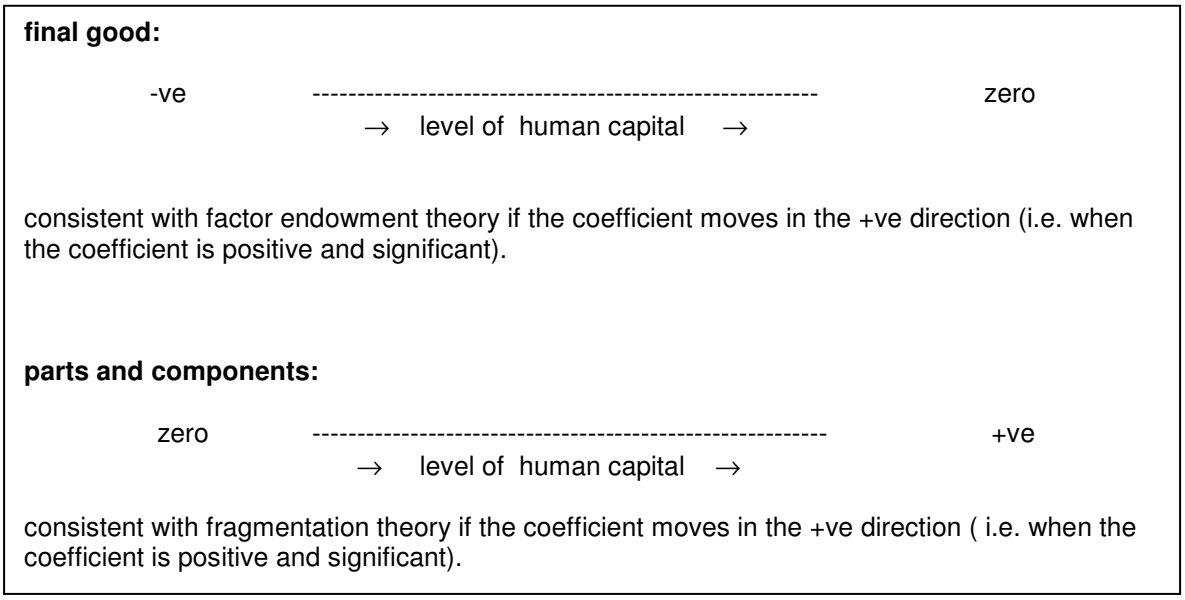
[4] Gain from fragmentation can also be explained by using the Ricardian technologically based differences in comparative advantage. Technological capabilities are a source of comparative advantages.

will benefit from increased trade in parts and components. These predictions are summarised in the second column of Table 4. Under the difference-in-difference approach, the Chinese exports variable is interacted with a particular country characteristics that we seek to examine. If we look at cross-country differences in human capital stock, we anticipate that Asian exporters with larger human capital stock relative to China will not be adversely affected by the Chinese export expansion. While under the fragmentation model, Asian exporters with larger human capital stock relative to China will benefit more from the rise of Chinese exports. These relative effects are summarised in the last column of Table 4. In sum, as presented by the horizontal lines in Figure1, under both the factor endowment and fragmentation models, we would therefore anticipate the country factor and Chinese trade to be positive (the coefficient of the interaction variable is accordingly expected to be positive), even though the total (relative) effect of Chinese trade in the first model is negative and zero in the second.

**Table 4**
Theorectical Predictions of the Impact of Chinese Export Expansion

| **Model** | **Chinese exports to third markets (level effect)** | **Asian exporter's characteristics (Human capital stock)** | **Net effect (relative effect** |
|---|---|---|---|
| Factor endowment (Heckscher-Ohlin)<br><br>(Final goods) | -ve<br>(countries with similar factor endowments to China will be more adversely affected compared to countries that are less similar) | more than China<br>similar to China | zero<br>-ve |
| Fragmentation<br><br>(Parts and components) | +ve<br>(countries with fewer similarities to China will benefit from Chinese exports expansion) | more than China<br>similar to China | +ve<br>zero |

**Figure 1**
Relative effect of Chinese Export Expansion




With reference specifically to trade in parts and components, recently, a new issue emerged as to whether gravity specification with GDP variables to proxy the economic mass are suitable for analysis involving this type of trade. This question arose from the observation that trade is measured on a gross sales basis while GDP is measured on a value added basis. According to Baldwin and Taglioni (2011), unlike final goods, demand for parts and components are generated by the destination country's gross production of a good, not its value-added in that particular good. If the ratio of local to imported content does not change over time, value added is a reasonable proxy for gross output. However, for regions where production networks are prominent, value added will be a poor proxy. In other words, while the use of GDPs are the good supply and demand proxies for final goods, they are less appropriate in the context of trade in parts and components. Gravity equation will be misspecified if this aspect is ignored. In turn, this will give rise to omitted variable biases.

Baldwin and Taglioni (2011) address that the impact of mass-variable misspecification is not great if: (i) trade in intermediates is proportional to trade in final goods, or (ii) when the study involving a broad set of nations and commodities (e.g. Rauch (1999), Brun et al. (2005), Berthelon and Freund (2008), Bergstrand and Egger

(2010)). Nevertheless, the impact can be large when intermediate goods constitute significant portion of total trade. It follows that those studies employing the standard form of gravity equation in analising components trade flows may subject to the problem of omitted variable biases. While proposing an alternative proxy, the authors point out that mass-variable misspecification is not an issue if fixed effects model, the one that we are using in this study, is adopted.

A further issue involving trade in parts and components is that apart from differences in country location advantages, this type of trade is very sensitive to service link costs. In the literature, the common variable used to account for cross-country differences in location advantages includes relative wages adjusted for labour productivity (Athukorala, 2009; Athukorala and Yamashita, 2006) and/or differences in GDP per capita (Athukorala and Yamashita, 2006; Kimura et al., 2007). To account for costs of service link, which variable to be used is however a complicated issue. Empirically, service link costs are hard to measure due to the diversity of such costs and availability of data. Inclusion of variables such as bilateral geographical distance, adjacency may only control for certain aspects of service link costs (transportation costs for example). Many other types of costs which are either bilateral or country specific will be ignored. In fact, inclusion of certain variables to account for location advantages or service link costs in a standard gravity equation will only cover some of the factors that influencing the trade flows of parts and components. As a consequence, the results obtained are likely subject to omitted variable bias. The gravity specification that we use is a fixed effect model. The time-varying country dummies capture much wider aspects (if not all) of location advantages and service link costs, be it observable or otherwise. [5] More significantly, this specification also account for multilateral resistance terms, an aspect which is more important in components trade compared to trade in final goods.

[5] At level, time invariant country-pair effects are include in our gravity specification. Accordingly, these account for even larger set of factors that reflecting country differences in location advantages and service link costs. When we use first differencing estimator, these dummies will be dropped from the specification as they do not vary annually.

The disadvantage of our methodology is that we cannot derive the overall magnitude of the effects of Chinese trade (level effect) on exports by other Asian economies exports, but only whether a country is more or less affected than another (relative effect). Be that as it may, this approach enables us to account for potential endogeneity of China's exports variable and more significantly, it allows us to capture the multilateral resistance terms, an aspect that has not been considered by the existing empirical studies examining the China's impact on export performance.

## 4. Empirical Specification and Data

We adopt the theoretically consistent specification proposed by Baldwin and Taglioni (2006) for the estimation of the impact of Chinese export expansion. In this regression (Equation (1)), exports from country *i* (one of Japan, South Korea, Singapore, Malaysia, Indonesia, Thailand, Philippines) to country *j* at time *t* is a function of a series of bilateral (*ij)* fixed effects, *i-time* and *j-time* dummies.:

$$ln\ EXP_{ijt}=\beta_0 + \beta_1 ln\ ChEXP_{jt} \times int_i + \beta_{i,t}\ I_t + \beta_{j,t} J_t + \beta_{ij} P + \epsilon_{ij,t} \quad (1)$$

where

| | |
|---|---|
| $EXP_{ijt}$ | Real export of country *i* to country *j* at time *t* |
| $ChEXP_{jt}$ | China's real exports to country *j* at time *t* |
| $I$ | Exporter fixed effect |
| $J$ | Importer fixed effect |
| $P$ | Country-pair fixed effect |
| $int$ | A characteristic of exporting country |

Following Baier and Bergstrand (2007), the first-difference Equation (1) yield:

$$\Delta ln\ EXP_{ijt} = \beta_0 + \beta_1 \Delta(ln\ ChEXP_{jt} \times int) + \beta_{i,t-(t-1)}\ I_{t-(t-1)} + \beta_{j,t-(t-1)} J_{t-(t-1)} + \upsilon_{ij,t-(t-1)} \quad (2)$$

where $\upsilon_{ij,t-(t-1)} = \epsilon_{ijt} - \epsilon_{ij.t-1}$.

The structure of Equation (2) adopts the first-differencing approach differences-in-differences model. Here we interact the variable of $ln\ ChEXP_{jt}$ with certain exporter characteristics (i). The advantage of using this approach is that we can include the time-varying importer dummies in the model as suggested by theory. Nevertheless, the China impact will now need to be interpreted in light of the exporter characteristic. In other words, the findings show relative effect, not level effect.

The trade data are annual trade data for the period 1994-2008 based on the Standard International Trade Classification (SITC) Revision 3 taken from the UN Comtrade online database. We use exports which are valued in f.o.b (free on board). The trade data are in current US dollars. Our study focuses on manufacturing trade, which comprises products in SITC 5, 6, 7 and 8 excluding SITC 68 (non-ferrous metals). In total we have 2399 products in our sample. we adopt the classification approach used by Athukorala (2003) in dividing these product into parts and components and final goods. Basically, this approach treats products termed as parts and accessories under SITC 7 and 8 as parts and components. We have identified a total of 224 components, of which the complete list is shown in Table A2.

It is common that trade data contain zero-value observations. This is due to several reasons: trade does not take place between country pairs; the volume of trade is so small that they are rounded to zero; and the values in the trade data are missing. We adopt the conventional method of dropping country pairs with zero trade (Greenaway et al., 2008; Head et al.,2010; Linders and de Groot, 2006). A consequence of this is that we are unable to generalise our results as describing an effect of Chinese exports on all bilateral trade flows from East Asian countries. After dropping missing values in some of the variables, our sample consists of 186 importing countries (excluding China) as listed in Table A1.

In this study, we consider two main exporter characteristics and the ratio of these characteristics to that of China:

i. $Sec_i$ : Average years of secondary schooling in the exporting country (country i), age 25+ (1990)
ii. $Sec_i/Sec_c$: Ratio of country i to China's average years of secondary schooling, age 25+ (1990)
iii. $Caplab_i$: Exporting country's capital-labour ratio at 1990 (4% depreciation rate)
iv. $\frac{Caplab_i}{Caplab_c}$ : Ratio of country_i to China's capital-labour ratio at 1990 (4% depreciation rate).

We use average years of secondary schooling as proxy for human capital. These data are extracted from the World Bank Education Statistics that are originally constructed by Barro and Lee (1993; 1996; 2000). Since the schooling data are only available at five-year intervals, data for 1990 - the latest year prior to our sample year 1994-2008, is selected and we keep this exporter's characteristic constant across the sample period.

For the capital-labour ratio, the physical capital stock is constructed using the perpetual inventory method. Basically, this measures the stock of physical capital as the accumulation of the past investments minus depreciation:

$$PCS_{it} = (1-\delta)PCS_{i,t-1} + PS_{i,t-1} \quad (3)$$

$$PCS_{i,0} = \frac{PS_{i,1}}{g^{PS}+\delta} \quad (4)$$

| | |
|---|---|
| $PCS$ | Physical capital stock |
| $PS$ | Physical capital formation |
| $g^{PS}$ | Average growth rate of physical capital stock |
| $\delta$ | The rate of depreciation |

The data for gross fixed capital formation (constant at year 2000 US dollar) is extracted from the World Bank World Development Indicators. Following Nehru and Dhareshwar (1993), we set the rate of depreciation at 4%. For the purpose of comparison with the

results that using human capital stock, we take the 1990 data and we keep this constant across the sample period.

Table 5 depicts the human capital stock and capital-labour ratio of the Asian countries covered in our study. Japan and Korea are at the top of the list that with highest average years of secondary schooling. The average schooling years of these countries are three times higher than that of China. Among the exporters examined in this paper, only Thailand and Indonesia are below China. In terms of physical capital stock, among the exporters examined here, Japan is the richest country followed by China. However, after taking into account the size of labour force, China is the exporter with lowest capital-labour ratio.

**Table 5**
Human Capital and Capital-labour Ratio of Exporting Countries in 1990

| **Exporter** | **Average years of secondary schooling, age 25+** | **Ratio of Country_i to China's average years of secondary schooling, age 25+** | **Exporter's capital-labour ratio at 1990** | **Ratio of country_i to China's capital-labour ratio at 1990** |
|---|---|---|---|---|
| China | 1.030 | 1.000 | 1729.986 | 1.000 |
| Indonesia | 0.874 | 0.848 | 2814.380 | 1.627 |
| Japan | 3.497 | 3.395 | 204048.400 | 117.948 |
| Malaysia | 2.159 | 2.095 | 14476.260 | 8.368 |
| Philippines | 1.600 | 1.553 | 7261.347 | 4.197 |
| Rep. of Korea | 3.184 | 3.091 | 33070.660 | 19.116 |
| Singapore | 1.382 | 1.341 | 82640.480 | 47.769 |
| Thailand | 0.628 | 0.610 | 7125.309 | 4.119 |

Source: World Bank Education Statistics and World Development Indicators.

In previous work on this topic a point of debate has been whether to include Hong Kong exports with those for China. This is justified on the ground that many Hong Kong's exports use Chinese labour and Hong Kong management and distribution skills. In other words, Hong Kong is the main conduit of China's exports to third markets. Our interest in the relative effect from Chinese exports means we do not take this approach in this paper for the practical reason of the difficulty of combining data on human capital and physical capital of these two countries. We have tested the robustness of our results to this point and find that it has no bearing on the conclusions that we draw.

Table 6 lists the top six major destinations of Chinese exports in 1994, 1999, 2004 and 2008 respectively. There are only few changes throughout these years. Netherlands replaced the United Kingdom as one of the top six China main export destinations and USA emerged as the most important export market since 1999. For the top three export destinations since 1999: USA, Hong Kong and Japan, shares of total Chinese manufacturing exports to these markets have dropped over time. This shows that Chinese export destinations are becoming more diverse and less dependent on few countries as before. This is possible as there have been significant change in the China's export bundle. In recent years, parts and components instead of apparel exports have been the main mover of Chinese export expansion. This is consistent with the view that East Asia is becoming a hub for fragmentation of the production process as reported by Kimura, et al. (2007).

**Table 6**
Major Destinations of Chinese Manufacturing Exports 1994 - 2008

| Year | Destinations | | Share (%) |
|---|---|---|---|
| 1994 | 1. | China, Hong Kong SAR | 29.66 |
| | 2. | USA | 21.27 |
| | 3. | Japan | 15.37 |
| | 4. | Germany | 4.49 |
| | 5. | Rep. of Korea | 2.84 |
| | 6. | United Kingdom | 2.31 |
| 1999 | 1. | USA | 24.27 |
| | 2. | Hong Kong | 19.96 |
| | 3. | Japan | 15.35 |
| | 4. | Germany | 4.38 |
| | 5. | Rep. of Korea | 3.24 |
| | 6. | Netherlands | 2.80 |
| 2004 | 1. | USA | 23.00 |
| | 2. | Hong Kong | 17.98 |
| | 3. | Japan | 11.55 |
| | 4. | Germany | 4.37 |
| | 5. | Rep. of Korea | 3.97 |
| | 6. | Netherlands | 3.26 |
| 2008 | 1. | USA | 19.51 |
| | 2. | Hong Kong | 12.80 |
| | 3. | Japan | 8.07 |
| | 4. | Germany | 4.67 |
| | 5. | Rep. of Korea | 4.63 |
| | 6. | Netherlands | 3.23 |

Note: Data are at the 5-digit level.
Source: Computed from UN Comtrade database.

## 5. Results

Before presenting the results using our preferred gravity specification, we first report the results that adopting the methodology used in the existing relevant literature.

### 5.1. Replication of Previous Findings

In Table 7 we demonstrate that we can replicate the main results from Eichengreen et al. (2007), Greenaway et al. (2008) and Athukorala (2009). In these regressions we include a standard set of gravity variables, including the GDP and the distance between the origin and destination countries, and various combinations of year, exporter, importer and export-importer fixed effects.[6] Regression (a) includes no dummy variables, regression (b) adds year dummies, in regression (c) we add exporter and importer fixed effects alongside the year dummies and regression (d) includes country-pair fixed effects alongside the year dummies. The standard control variables behave as expected. The exports from East Asian countries to destination countries are increasing in the economic mass of the importer and exporter ( $GDP_{it}$, $GDP_{jt}$), their economic wealth ( $CAP_{it}$, $CAP_{jt}$), if they share a border ($Contig_{ij}$) and had the same colonizer ($ComCol_{ij}$). Export values are lower the greater is the distance between countries ($Distw_{ij}$), to island economies ( $Island_{ij}$ ), landlocked ( $Landl_{ij}$ ) and geographically large countries ( $Areap_{ij}$). Similar evidence for these variables can be found in Greenaway et al. (2008).

In all cases the coefficient on Chinese exports is positive and statistically significant, although the magnitude falls across the various regressions as we add more control variables. At its largest the regressions suggest that for every 1% increase in exports from China, exports from other East Asian economies grow by 0.49% (regression (b)), while at its smallest the effect is 0.17% (regression (c)). These suggest that

[6] In these regressions, we follow Greenaway et al. (2008) and Eichengreen et al. (2007) by deflating the trade data using the US CPI for all urban consumers (1982-1984=100) collected from http://www.bls.gov/ to generate a constant dollar series. A summary on the data sources and the number of countries covered by each source is shown in Table A3. Descriptive statistics are reported in Table A4.

complementarities from Chinese exports on the exports of other East Asian countries to the same destination.

**Table 7**
The Impact of China's Export on Asian Countries' Exports to the Third Markets

| **Dependent variable: $ln\ EXP_{ijt}$** | | | | |
|---|---|---|---|---|
| **Explanatory variables** | **(a) OLS** | **(b) Specification (i)** | **(c) Specification (ii)** | **(d) Specification (iii)** |
| $ln\ ChEXP_{jt}$ | 0.319*** | 0.488*** | 0.171*** | 0.187*** |
| | (0.026) | (0.035) | (0.027) | (0.028) |
| $ln\ GDP_{it}$ | 0.749*** | 0.786*** | 1.512*** | 1.896*** |
| | (0.051) | (0.050) | (0.414) | (0.420) |
| $ln\ CAP_{it}$ | 0.314*** | 0.300*** | -1.531*** | -2.052*** |
| | (0.056) | (0.054) | (0.548) | (0.558) |
| $ln\ GDP_{jt}$ | 0.629*** | 0.459*** | -0.629** | -0.467 |
| | (0.041) | (0.047) | (0.302) | (0.297) |
| $ln\ CAP_{jt}$ | 0.112*** | 0.158*** | 1.675*** | 1.632*** |
| | (0.038) | (0.037) | (0.303) | (0.302) |
| $ln\ Distw_{ij}$ | -1.150*** | -1.064*** | -1.864*** | - |
| | (0.071) | (0.072) | (0.193) | |
| $ln\ Areap_{ij}$ | -0.108*** | -0.111*** | -0.298** | - |
| | (0.024) | (0.023) | (0.129) | |
| $Landl_{ij}$ | -1.051*** | -0.922*** | 11.729*** | - |
| | (0.101) | (0.100) | (1.678) | |
| $Island_{ij}$ | -0.769 | -0.792*** | 3.936*** | - |
| | (0.080) | (0.078) | (1.268) | |
| $Contig_{ij}$ | 1.019*** | 1.045*** | -0.199 | - |
| | (0.307) | (0.312) | (0.432) | |
| $ComLang_{ij}$ | 0.170 | 0.178 | 0.194 | - |
| | (0.173) | (0.172) | (0.136) | |
| $ComCol_{ij}$ | 0.387*** | 0.401*** | 0.118 | - |
| | (0.145) | (0.145) | (0.117) | |
| $Colony_{ij}$ | 0.156 | 0.156 | -0.246 | - |
| | (0.413) | (0.406) | (0.510) | |
| Constant | -14.024 | -14.429*** | -3.367 | -21.517** |
| | (1.167) | (1.159) | (7.921) | (8.982) |
| Year fixed effects | No | Yes | Yes | Yes |
| Exporter and importer fixed effects | No | No | Yes | No |
| Country pair fixed effects | No | No | No | Yes |
| No. of observations | 16916 | 16916 | 16916 | 16916 |
| R-squared | 0.771 | 0.785 | 0.869 | 0.938 |

Notes: Significance level is denoted as ***1%, **5%, and *10% respectively. Figures in parentheses are robust standard errors (clustered by country-pairs).

In Table 8 we compare whether the effect differs according to whether the East Asian exporter is considered by the World Bank to be a high (Japan, South Korea and Singapore) or middle income countries (Indonesia, Malaysia, Philippines, Thailand). There is some evidence from these regressions that the effects are slightly stronger for the middle income group. For this group the evidence of complementarities from Chinese trade are strongest. In that regard our results support those found in Athukorala (2009).

**Table 8**
The Impact of China's Export on Asian Countries' Exports to the Third Markets

| **Dependent variable: $ln\ EXP_{ijt}$** | | | | |
|---|---|---|---|---|
| **Explanatory variables** | **(a) OLS** | **(b) Specification (i)** | **(c) Specification (ii)** | **(d) Specification (iii)** |
| $HI_i \times ln\ ChEXP_{jt}$ | 0.315*** | 0.476*** | 0.149*** | 0.118*** |
| | (0.029) | (0.037) | (0.029) | (0.034) |
| $MI_i \times ln\ ChEXP_{jt}$ | 0.343 | 0.499 | 0.190** | 0.241*** |
| | (0.023) | (0.023) | (0.019) | (0.030) |
| Year fixed effects | No | Yes | Yes | Yes |
| Exporter and importer fixed effects | No | No | Yes | No |
| Country pair fixed effects | No | No | No | Yes |
| No. of observations | 16916 | 16916 | 16916 | 16916 |
| R-squared | 0.773 | 0.782 | 0.867 | 0.939 |

Notes: Significance level is denoted as ***1%, **5%, and *10% respectively. Figures in parentheses are robust standard errors (clustered by country-pairs).

Finally in Table 9 we consider the instrumental variable approach used by Eichengreen et al. (2007), Greenaway et al. (2008) and Athukorala (2009). An issue raised by these studies is the possibility that there exists some omitted time varying characteristics of country *j*, for example some difficult to measure aspect of trade costs, that have caused exports from country *i* as well as those from China to rise over time.

One method of dealing with this problem would of course to be include importer-year dummies in the regression, but with the cost that the effect of the variable of interest could no longer be identified. Eichengreen et al. (2007), Greenaway et al. (2008) and Athukorala (2009) use an instrumental variable approach as an alternative. The common instrument used across the three studies is the distance between China and the importer country, to which Eichengreen et al. (2007), Greenaway et al. (2008) add China's real GDP and Athukorala (2009) a measure of common language and MNE presence in Chinese exports.

We require that the selected instruments fulfil two requirements: (i) it or they must be correlated with the endogeneous variable (instrument relevance), and (ii) it or they must uncorrelated with the error term (instrument exogeneity or instrument orthogonality). The first requirement can be formerly tested using the first-stage t-test of an instrument or F-test of the joint significance of the instruments. In a case in which the error process does not satisfy the homoskedasticity assumption, the Hanson J-Statistic

can be utilised to test for instruments orthogonality of overidentified models. A rejection of null hypothesis means the overidentifying restriction is invalid and therefore OLS will be preferred. The 2SLS estimator is only suitable when errors are homoskedastic. The IV based GMM estimator will be more appropriate when errors are heteroskedastic. Accordingly, check for the presence of heteroskesdacity is necessary by conducting the Pagan-Hall test.[7]Heteroskedasticity is present when the null hypothesis is rejected.

Whilst each of the studies provides evidence of the power of their chosen instruments it is difficult to provide convincing evidence that Chinese GDP, or FDI affects exports to destination *j* only through its effects on exports from China. We choose not to use either as an instrument. Distance is more plausibly exogenous, but has the disadvantage of being time invariant. With reference back to the idea that trade costs for country *j* have fallen over time we interact distance between China and destination *j* with time dummies. The instruments pass the standard validity tests both when using IV or GMM. Moreover the time varying distance instruments behave sensibly as the coefficient on distance falls from 0.76 in 1994 to -0.49 in 2008 in a reasonably smooth fashion. This confirms the idea that trade costs have fallen over time. However, they do not pass the test of orthogonality with the error term, the overidentification test. Distance is a valid instrument in this context if the changes in trade costs that it captures are caused by reductions in trade costs within China. If they instead also capture, in part, changes in trade costs in the destination country *j*, or a world-wide reduction in trade costs, they are likely to be highly correlated with Chinese exports in the first stage regression, but fail the overidentification test. Jacks et al. (2011) report evidence of world-wide declines in trade costs up to the year 2000, where these declines are particularly strong in the Asian region.

When we continue to instrument Chinese exports there is also an interesting effect on the China export variable from employing the IV approach. The second-stage results, in both the simple IV and IV based GMM estimations, show that the coefficient for the

[7]Baum et al. (2003).

log of Chinese exports is negative and statistically significant. Chinese exports now appear to crowd out exports by other Asian countries.

**Table 9**
The Impact of China's Export on Asian Countries' Exports to the Third Markets – IV approach
: **variable:** $\boldsymbol{ln\ EXP_{ijt}}$

| | **IV** | | **IV/GMM** | |
|---|---|---|---|---|
| | **1st stage** | **2nd stage** | **1st stage** | **2nd stage** |
| $ln\ ChEXP_{jt}$ | - | -0.126*** (0.021) | - | -0.037* (0.019) |
| $ln\ ChDistw_j \times year\ 1994$ | -0.763*** (0.156) | - | -0.763*** (0.156) | - |
| $ln\ ChDistw_j \times year\ 1995$ | -0.744*** (0.156) | - | -0.744*** (0.156) | - |
| $ln\ ChDistw_j \times year\ 1996$ | -0.754*** (0.156) | - | -0.754*** (0.156) | - |
| $ln\ ChDistw_j \times year\ 1997$ | -0.746*** (0.156) | - | -0.746*** (0.156) | - |
| $ln\ ChDistw_j \times year\ 1998$ | -0.730*** (0.156) | - | -0.730*** (0.156) | - |
| $ln\ ChDistw_j \times year\ 1999$ | -0.727*** (0.156) | - | -0.727*** (0.156) | - |
| $ln\ ChDistw_j \times year\ 2000$ | -0.700*** (0.156) | - | -0.700*** (0.156) | - |
| $ln\ ChDistw_j \times year\ 2001$ | -0.689*** (0.156) | - | -0.689*** (0.156) | - |
| $ln\ ChDistw_j \times year\ 2002$ | -0.670*** (0.156) | - | -0.670*** (0.156) | - |
| $ln\ ChDistw_j \times year\ 2003$ | -0.638*** (0.156) | - | -0.638*** (0.156) | - |
| $ln\ ChDistw_j \times year\ 2004$ | -0.597*** (0.156) | - | -0.597*** (0.156) | - |
| $ln\ ChDistw_j \times year\ 2005$ | -0.571*** (0.155) | - | -0.571*** (0.155) | - |
| $ln\ ChDistw_j \times year\ 2006$ | -0.542*** (0.155) | - | -0.542*** (0.155) | - |
| $ln\ ChDistw_j \times year\ 2007$ | -0.515*** (0.155) | - | -0.515*** (0.155) | - |
| $ln\ ChDistw_j \times year\ 2008$ | -0.487*** (0.155) | - | -0.487*** (0.155) | - |
| No. of observations | 16916 | 16916 | 16916 | 16916 |
| R-squared | 0.820 | 0.732 | 0.820 | 0.746 |
| First stage F stat [p-value]: | 350.990 [0.000] | | | |
| Endogeneity test [p-value]: | 302.354 [0.000] | | | |
| Heteroskesdacity test [p-value]: | 816.753 [0.000] | | | |
| Hansen J-Statistic [p-value]: | 214.221 [0.000] | | | |

Notes: Significance level is denoted as ***1%, **5%, and *10% respectively. Figures in parentheses are robust standard errors (clustered by country-pairs).

In Table 10, we report the results from separating Asian countries into high and middle income groups. Whilst none pass the Hansen-J tests for orthogonality, the second stage results suggest some interesting differences according to the level of income. We consistently find evidence that high income Asian countries (Japan, South Korea and Singapore) are not affected to the same extent as the middle income countries, Indonesia, Malaysia, Philippines, Thailand. However there is disagreement as to whether the level effect is positive for this group as compared to negative for the middle income countries when using GMM (Panel A and B) or zero versus negative for the high and middle income countries respectively when using IV (Panel A and B).

**Table 10**
The Impact of China's Export on High and Middle-income Asian Countries' Exports to the Third Markets – IV approach

| **variable: $ln\ EXP_{ijt}$** | | | | |
|---|---|---|---|---|
| | **IV** | | **IV/GMM** | |
| | **1st stage** | **2nd stage** | **1st stage** | **2nd stage** |
| *A. High Income Exporters* | | | | |
| $ln\ ChEXP_{jt}$ | - | -0.043 (0.043) | - | 0.120*** (0.029) |
| $ln\ ChDistw_j \times year\ 1994$ | -0.855*** (0.245) | - | -0.855*** (0.245) | - |
| $ln\ ChDistw_j \times year\ 1995$ | -0.836*** (0.245) | - | -0.836*** (0.245) | - |
| $ln\ ChDistw_j \times year\ 1996$ | -0.846*** (0.245) | - | -0.846*** (0.245) | - |
| $ln\ ChDistw_j \times year\ 1997$ | -0.836*** (0.245) | - | -0.836*** (0.245) | - |
| $ln\ ChDistw_j \times year\ 1998$ | -0.818*** (0.244) | - | -0.818*** (0.244) | - |
| $ln\ ChDistw_j \times year\ 1999$ | -0.819*** (0.245) | - | -0.819*** (0.245) | - |
| $ln\ ChDistw_j \times year\ 2000$ | -0.793*** (0.245) | - | -0.793*** (0.245) | - |
| $ln\ ChDistw_j \times year\ 2001$ | -0.783*** (0.245) | - | -0.783*** (0.245) | - |
| $ln\ ChDistw_j \times year\ 2002$ | -0.763*** (0.245) | - | -0.763*** (0.245) | - |
| $ln\ ChDistw_j \times year\ 2003$ | -0.728*** (0.245) | - | -0.728*** (0.245) | - |
| $ln\ ChDistw_j \times year\ 2004$ | -0.687*** (0.245) | - | -0.687*** (0.245) | - |
| $ln\ ChDistw_j \times year\ 2005$ | -0.663*** (0.245) | - | -0.663*** (0.245) | - |
| $ln\ ChDistw_j \times year\ 2006$ | -0.635*** (0.245) | - | -0.635*** (0.245) | - |
| $ln\ ChDistw_j \times year\ 2007$ | -0.608** (0.245) | - | -0.608** (0.245) | - |
| $ln\ ChDistw_j \times year\ 2008$ | -0.581** (0.245) | - | -0.581** (0.245) | - |
| No. of observations | 7229 | 7229 | 7229 | 7229 |
| R-squared | 0.821 | 0.735 | 0.821 | 0.744 |
| First stage F stat [p-value]: | 94.220 [0.000] | | | |
| Endogeneity test [p-value]: | 108.849 [0.000] | | | |
| Heteroskesdacity test [p-value]: | 475.137 [0.000] | | | |
| Hansen J-Statistic [p-value]: | 152.216 [0.000] | | | |
| *B. Middle Income Exporters* | | | | |
| $ln\ ChEXP_{jt}$ | - | -0.671*** (0.076) | - | -0.292*** (0.050) |
| $ln\ ChDistw_j \times year\ 1994$ | -0.681*** (0.200) | - | -0.681*** (0.200) | - |
| $ln\ ChDistw_j \times year\ 1995$ | -0.66*** (0.200) | - | -0.66*** (0.200) | - |
| $ln\ ChDistw_j \times year\ 1996$ | -0.673*** (0.200) | - | -0.673*** (0.200) | - |
| $ln\ ChDistw_j \times year\ 1997$ | -0.665*** (0.199) | - | -0.665*** (0.199) | - |
| $ln\ ChDistw_j \times year\ 1998$ | -0.651*** (0.199) | - | -0.651*** (0.199) | - |
| $ln\ ChDistw_j \times year\ 1999$ | -0.645*** (0.199) | - | -0.645*** (0.199) | - |
| $ln\ ChDistw_j \times year\ 2000$ | -0.619*** (0.199) | - | -0.619*** (0.199) | - |
| $ln\ ChDistw_j \times year\ 2001$ | -0.607*** (0.199) | - | -0.607*** (0.199) | - |
| $ln\ ChDistw_j \times year\ 2002$ | -0.587*** (0.199) | - | -0.587*** (0.199) | - |
| $ln\ ChDistw_j \times year\ 2003$ | -0.558*** (0.199) | - | -0.558*** (0.199) | - |
| $ln\ ChDistw_j \times year\ 2004$ | -0.517*** (0.199) | - | -0.517*** (0.199) | - |
| $ln\ ChDistw_j \times year\ 2005$ | -0.488** (0.199) | - | -0.488** (0.199) | - |
| $ln\ ChDistw_j \times year\ 2006$ | -0.458** (0.199) | - | -0.458** (0.199) | - |
| $ln\ ChDistw_j \times year\ 2007$ | -0.430** (0.199) | - | -0.430** (0.199) | - |
| $ln\ ChDistw_j \times year\ 2008$ | -0.401** (0.199) | - | -0.401** (0.199) | - |
| No. of observations | 9687 | 9687 | 9687 | 9687 |
| R-squared | 0.819 | 0.605 | 0.819 | 0.694 |
| First stage F stat [p-value]: | 65.740 [0.000] | | | |
| Endogeneity test [p-value]: | 319.540 [0.000] | | | |
| Heteroskesdacity test [p-value]: | 405.378 [0.000] | | | |
| Hansen J-Statistic [p-value]: | 137.311 [0.000] | | | |

Notes: Significance level is denoted as ***1%, **5%, and *10% respectively. Figures in parentheses are robust standard errors (clustered by country-pairs).

The results reported thus far show that what specification to be employed to analyse the effect of Chinese export expansion does matter. Although the coefficient for Chinese exports is positive and is significant for regressions (a) to (d), the magnitude varies significantly from one to another. Using the IV approach, the negative coefficient for the variable of interest however suggests the existing of crowding out effect. These inconsistent evidence highlight the need to consider the most appropriate gravity specification to be used, particularly the one that is line with the established theoretical theories.

## 5.2 Theoretically Derived Gravity Model Regressions

Table 11 reports the results for the first-differenced theoretically consistent gravity regressions where we include country *i*-time and country *j*-time dummies (Equation (2)). In Panel A of Table 11, we use the exporter's human capital ($Sec_i$) and in Panel B the ratio of exporter's to China's human capital ($\frac{Sec_i}{Sec_c}$) to identify the effect of Chinese exports to country *j*. In Panels C and D, we focus on capital-labour ($ln\ Caplab_i$) and the ratio of exporter's capital-labour to that of China ($\frac{ln\ Caplab_i}{ln\ Caplab_c}$) respectively. Panels E and F shows the conditional relationship between the interaction terms with human capital and that with capital-labour ratio.

In all the regressions (Panels A to D) for the whole manufacturing sector in Table 11, we find that Chinese exports interacted with human capital and capital-labour respectively have a positive coefficient on the exports of other Asian countries. The effect of Chinese exports on other Asian country exports to the same destination is increasing in the human capital and capital-labour ratio of the Asian country. Given the diverse nature of the commodity exports, we recognise that very unlikely all products follow the same trade patterns. Also, when all the manufacturing trade data are aggregated, we are unable to tell whether the trade patterns of final goods, and parts and components are consistent with the predictions of the Heckscher-Ohlin factor endowment model and the

fragmentation model respectively. Accordingly, we divide the manufacturing products into parts and components, and final goods with the results are shown in columns 3 and 4 of Table 11 respectively.

Our results at the disaggregate level are broadly consistent with our aggregate analysis. For both parts and components and final goods, we find a positive relation between Chinese exports to third markets and those by other Asian countries. This effect is increasing in the human capital of the Asian country. Similarly, exporters with higher (or relatively higher than China's) capital-labour ratio benefit more from the China's exports expansion in both parts and components and final goods. Accordingly, our results match the predictions of the Heckscher-Ohlin and fragmentation models.

Comparison made between parts and components and final goods reveals that both the magnitude and the significance level for the coefficient of the interaction variable is smaller for final goods than parts and components when the Chinese exports interact with human capital. In contrast, the magnitude and the significance level for the coefficient of the interaction variable is bigger for final goods when the Chinese exports interact with capital-labour ratio. The possible explanation to this finding is that parts and components are relatively more sophisticated and skill-intensive. Human capital therefore plays a more important role as physical capital stock also requires the management of human capital. This is evident by the findings shown in third column in Panels E and F of Table 11. When we add the interaction term with capital-labour ratio, we find that the interaction with endowments of human capital is significant whereas the interaction with capital-labour ratio is insignificant. Similar results are however not found for final goods. Most of the parts and components that China specialises are mass-produced standard components and can be cross-product applied. Accordingly, these components are unskilled intensive. China's rapid growth of components exports stem from its costs advantage of labour used to assembly imported inputs to the manufacturing of high-tech intermediate goods. This is supported by the facts that China imports more parts and components than it exports, and the share of parts and components remains high in the

manufacturing exports of advanced countries such as Japan and Korea. It follows that country with larger human capital stock will benefit from the increased components trade.

**Table 11**
The Impact of China's Export on Asian Countries' Exports to the Third Markets - First-differencing DID Approach

| **Dependent variable: $ln\ EXP_{ijt}$** | | | |
|---|---|---|---|
| | Manufacturing Sector | Parts and Components | Final Good |
| *A* | | | |
| $\Delta(ln\ ChEXP_{jt} \times Sec_i)$ | 0.046** (0.022) | 0.050*** (0.016) | 0.045* (0.024) |
| Exporter-time fixed effects | Yes | Yes | Yes |
| Importer-time fixed effects | Yes | Yes | Yes |
| No. of observations | 15459 | 13336 | 15376 |
| R-squared | 0.227 | 0.241 | 0.225 |
| Adj. R-squared | 0.075 | 0.073 | 0.072 |
| *B* | | | |
| $\Delta(ln\ ChEXP_{jt} \times Sec_i/Sec_c)$ | 0.047** (0.023) | 0.052*** (0.016) | 0.047* (0.025) |
| Exporter-time fixed effects | Yes | Yes | Yes |
| Importer-time fixed effects | Yes | Yes | Yes |
| No. of observations | 15459 | 13336 | 15376 |
| R-squared | 0.227 | 0.241 | 0.225 |
| Adj. R-squared | 0.075 | 0.073 | 0.072 |
| C | | | |
| $\Delta(ln\ ChEXP_{jt} \times ln\ Caplab_i)$ | 0.036**(0.016) | 0.024* (0.014) | 0.043** (0.017) |
| Exporter-time fixed effects | Yes | Yes | Yes |
| Importer-time fixed effects | Yes | Yes | Yes |
| No. of observations | 15459 | 13336 | 15376 |
| R-squared | 0.227 | 0.240 | 0.225 |
| Adj. R-squared | 0.076 | 0.072 | 0.073 |
| D | | | |
| $\Delta(ln\ ChEXP_{jt} \times ln\ Caplab_i/ln\ Caplab_c)$ | 0.266** (0.116) | 0.177* (0.102) | 0.323** (0.130) |
| Exporter-time fixed effects | Yes | Yes | Yes |
| Importer-time fixed effects | Yes | Yes | Yes |
| No. of observations | 15459 | 13336 | 15376 |
| R-squared | 0.227 | 0.240 | 0.225 |
| Adj. R-squared | 0.076 | 0.072 | 0.073 |
| E | | | |
| $\Delta(ln\ ChEXP_{it} \times Sec_{\ i})$ | 0.026 (0.058) | 0.061***(0.022) | 0.005 (0.067) |
| $\Delta(ln\ ChEXP_{it} \times lcaplab_{\ i})$ | 0.020 (0.044) | -0.012 (0.019) | 0.041 (0.050) |
| Exporter-time fixed effects | Yes | Yes | Yes |
| Importer-time fixed effects | Yes | Yes | Yes |
| No. of observations | 15459 | 13336 | 15376 |
| R-squared | 0.227 | 0.241 | 0.225 |
| Adj. R-squared | 0.076 | 0.073 | 0.073 |
| F | | | |
| $\Delta(ln\ ChEXP_{it} \times Sec_i/Sec_c)$ | 0.026 (0.060) | 0.063***(0.022) | 0.005 (0.069) |
| $\Delta(ln\ ChEXP_{it} \times lcaplab_{\ i}/lcaplab_c)$ | 0.152 (0.325) | -0.087 (0.144) | 0.302 (0.374) |
| Exporter-time fixed effects | Yes | Yes | Yes |
| Importer-time fixed effects | Yes | Yes | Yes |
| No. of observations | 15459 | 13336 | 15376 |
| R-squared | 0.227 | 0.241 | 0.225 |
| Adj. R-squared | 0.076 | 0.073 | 0.073 |

Notes: $Sec_i$: average years of secondary schooling, age 25+ (1990) in exporter country. $Sec_c$: average years of secondary schooling, age 25+ (1990) in China. $Caplab_i$: capital-labour ratio in the exporter country. $Caplab_c$: capital-labour ratio in China Significance level is denoted as ***1%, **5%, and *10% respectively. Figures in parentheses are robust standard errors (clustered by country-pairs).

## 5.3. Conclusion

In this paper we use a theoretically consistent gravity model of Baldwin and Taglioni (2006) to investigate the impact brought by the China's export expansion on other Asian countries in third markets. The limitation of this approach is that we are not able to derive the overall magnitude of the effects of Chinese trade on exports by other Asian economies exports. Our estimations reveal only relative effect - whether a country is more or less affected than another. Notwithstanding, this approach allows us to account for potential endogeneity of China's exports variable and more significantly, it also enable us to capture the multilateral resistance terms, an aspect that has not been considered by the existing empirical studies examining the China impact on export performance. In addition, the gravity set-up we use here elicit directly whether a particular country characteristics is relevant in explaining the impact of Chinese exports surge or whether this characteristics contributes to the differences in China impact faced by the Asian exporters.

Overall, our results show that country characteristics, especially factor endowment, has an important role in determining whether and how a country will be affected by the growth of Chinese trade. This holds for trade in final goods as well as trade in parts and components. Although today's global trading environment and trade patterns are much sophisticated, our findings indicate that endowment-based trade models are still useful in explaining the current trend.

# Appendix A

**Table A1**
List of Importing Countries

| **Importing countries** | | | |
|---|---|---|---|
| **High-income** | Slovenia | Iraq | **Low-income** |
| Andorra | Spain | Jamaica | Tunisia |
| Antigua and Barbuda | Sweden | Jordan | Turkey |
| Aruba | Switzerland | Kazakhstan | Turkmenistan |
| Australia | Trinidad and Tobago | Kiribati | Ukraine |
| Austria | USA | Latvia | Uruguay |
| Bahamas | United Arab Emirates | Lebanon | Vanuatu |
| Bahrain | United Kingdom | Lesotho | Venezuela |
| Barbados | | Libya | Bangladesh |
| Belgium | **Middle-income** | Lithuania | Benin |
| Bermuda | Albania | Malaysia | Burkina Faso |
| Brunei Darussalam | Algeria | Maldives | Burundi |
| Canada | Angola | Marshall Islands | Cambodia |
| China, Hong Kong SAR | Argentina | Mauritius | Central African Rep. |
| Croatia | Armenia | Mexico | Chad |
| Cyprus | Azerbaijan | Mongolia | Comoros |
| Czech Rep. | Belarus | Morocco | Dem. Rep. of the Congo |
| Denmark | Belize | Namibia | Eritrea |
| Equatorial Guinea | Bhutan | Nicaragua | Ethiopia |
| Estonia | Bolivia | Nigeria | Gambia |
| Faeroe Islands | (Plurinational State of) | Pakistan | Ghana |
| Finland | Bosnia Herzegovina | Palau | Guinea |
| France | Botswana | Panama | Guinea-Bissau |
| French Polynesia | Brazil | Papua New Guinea | Haiti |
| Germany | Bulgaria | Paraguay | Kenya |
| Greece | Cameroon | Peru | Kyrgyzstan |
| Greenland | Cape Verde | Philippines | Lao People's Dem. Rep. |
| Hungary | Chile | Poland | Liberia |
| Iceland | Colombia | Rep. of Moldova | Madagascar |
| Ireland | Congo | Romania | Malawi |
| Israel | Costa Rica | Russian Federation | Mali |
| Italy | Côte d'Ivoire | Saint Kitts and Nevis | Mauritania |
| Japan | Djibouti | Saint Lucia | Mozambique |
| Kuwait | Dominica | Saint Vincent and the Grenadines | Nepal |
| Luxembourg | Dominican Rep. | | Niger |
| Malta | Ecuador | Samoa | Rwanda |
| Netherlands | Egypt | Seychelles | Senegal |
| New Caledonia | El Salvador | Solomon Islands | Sierra Leone |
| New Zealand | FS Micronesia | South Africa | Tajikistan |
| Norway | Fiji | Sri Lanka | Togo |
| Oman | Gabon | Sudan | Uganda |
| Portugal | Georgia | Suriname | United Rep. of Tanzania |
| Qatar | Grenada | Swaziland | Uzbekistan |
| Rep. of Korea | Guatemala | Syria | Viet Nam |
| San Marino | Guyana | TFYR of Macedonia | Yemen |
| Saudi Arabia | Iran | Thailand | Zambia |
| Singapore | Honduras | Timor-Leste | Zimbabwe |
| Slovakia | India | Tonga | |
| | Indonesia | | |

**Table A2**
List of Parts and Components Under the Standard International Trade Classification (Revision 3)

| Code | Description |
|---|---|
| **SITC 7** | **Machinery and Transport Equipment (Total: 167)** |
| 71191 | Parts for steam generating or other vapour generating boilers |
| 71192 | Parts for auxiliary plants used with boilers; parts of condensers for steamers and other vapour power units |
| 71280 | Parts for steam turbines and other vapour turbines |
| 71319 | Parts, n.e.s., of spark-ignition reciprocating or rotary combustion piston engines for aircraft |
| 71331 | Outboard motors |
| 71332 | Spark-ignition reciprocating or rotary marine propulsion engines, n.e.s. |
| 71391 | Parts, n.e.s, suitable for use solely or principally with spark-ignition internal combustion piston engines |
| 71392 | Parts, n.e.s., suitable for use solely or principally with compression-ignition internal combustion piston engines |
| 71491 | Parts for turbojets or turbo propellers |
| 71499 | Parts for gas turbines, n.e.s. |
| 71690 | Parts n.e.s. for use solely or principally with electric motors, electric generators, electric generating sets and rotary converters |
| 71819 | Parts, including regulators, of hydraulic turbines and water wheels |
| 71878 | Parts of nuclear reactors |
| 71899 | Parts of reaction engines (except turbojet), linear acting hydraulic and pneumatic power engines and motors, and parts of engines and motors n.e.s. |
| 72119 | Parts of agricultural, horticultural or forestry machinery for soil preparation or cultivation and lawn or sports ground rollers |
| 72129 | Parts of harvesting or threshing machines, mowers, and machines for cleaning, sorting and grading eggs, fruit or other agricultural produce |
| 72139 | Parts for milking machines and dairy machinery |
| 72198 | Parts of presses, crushers and similar machinery for the manufacture of wine, cider, fruit juices, etc. |
| 72199 | Parts of agricultural, horticultural, forestry and poultry-keeping or bee-keeping machinery, n.e.s. |
| 72392 | Bulldozer or angledozer blades |
| 72393 | Parts for boring or sinking machinery |
| 72399 | Parts n.e.s., of civil engineering etc. machinery, including mining and public works machinery parts (heading 723) and cranes etc. (heading 744.3) |
| 72439 | Sewing machine needles; sewing machine furniture, bases and covers and parts thereof; sewing machine parts |
| 72449 | Parts and accessories of textile machinery designed for use in the preparation and production of textile fibers and yarns |
| 72467 | Parts and accessories of weaving machines (looms) or their auxiliary machines |
| 72468 | Parts and accessories of knitting and stitch-bonding machines, tulle, lace, embroidery, net, etc. machines or their auxiliary machines |
| 72488 | Parts for leather machinery designed for preparing, tanning or working hides or leather or for making or repairing footwear or other leather articles |
| 72491 | Parts for household or laundry type washing machines |
| 72492 | Parts for textile machinery designed for washing, drying, bleaching, dyeing, etc. yarn, fabric or articles (not for household or laundry type washers) |
| 72591 | Parts of machines for making pulp of fibrous celluloid material or for making or finishing paper or paperboard |
| 72599 | Parts of machinery for making up paper pulp, paper or paperboard, n.e.s. |
| 72689 | Parts for bookbinding machinery |
| 72691 | Parts for typesetting and type-founding machinery, apparatus and equipment |
| 72699 | Parts for printing machinery and parts of machines for uses ancillary to printing |
| 72719 | Parts for machinery (other than farm type) used for grain milling or the working, cleaning, sorting etc. of cereals or dried leguminous vegetables |
| 72729 | Parts for the machinery, n.e.s. for the industrial preparation or manufacture of food or drink |
| 72819 | Parts and accessories suitable for use solely or principally with machine tools specialized for particular industries |
| 72839 | Parts of machinery for sorting, washing, crushing or mixing earth, stone, ores etc., and for shaping solid mineral fuels, ceramic pastes etc. |
| 72851 | Parts for machines assembling electric or electronic lamps, tubes, etc.; parts for machines manufacturing or hot working glass or glassware |
| 72852 | Parts of machinery for working rubber or plastics or manufacturing products made from rubber or plastics, n.e.s. |
| 72853 | Parts of machinery for preparing or making up tobacco, n.e.s. |

| | |
|---|---|
| 72855 | Parts, n.e.s., of machinery for public works etc., preparing animal or fixed vegetable fats and oils, and specialized for particular industries n.e.s. |
| 73591 | Parts, n.e.s., and accessories suitable solely or principally for use with metalworking machine tools working by removing metal or other material |
| 73595 | Parts, n.e.s., and accessories suitable solely or principally for use with metalworking machine tools working without removing metal or other material |
| 73719 | Parts of metalworking converters, ladles, ingot moulds and casting machines |
| 73729 | Rolls and other parts for metal-rolling mills |
| 73739 | Parts for electric laser, other light or photon beam, ultrasonic etc. soldering, brazing or welding machines and apparatus for hot metal etc. spraying |
| 73749 | Parts for machinery and apparatus for soldering, brazing or welding, n.e.s. and parts for gas-operated surface tempering machines |
| 74128 | Parts for furnace burners, mechanical stokers, grates, ash dischargers and similar mechanical appliances for furnaces |
| 74135 | Parts for electric industrial or laboratory furnaces and ovens, etc. |
| 74139 | Parts for nonelectrical industrial or laboratory furnaces and ovens |
| 74149 | Parts of refrigerators, freezers and other refrigerating or freezing equipment (electric or other) |
| 74159 | Parts for the air conditioning machines (having a motor-driven fan and elements for changing the temperature and humidity) of heading 741.5 |
| 74172 | Parts for producer gas or water gas generators; parts for acetylene gas generators and similar water process gas generators |
| 74190 | Parts, n.e.s. for temperature changing industrial and laboratory machinery and equipment |
| 74291 | Parts of pumps for liquids |
| 74295 | Parts of liquid elevators |
| 74380 | Parts for air or vacuum pumps, air or other gas compressors and fans; parts of ventilating, recycling or cooker hoods incorporating a fan |
| 74391 | Parts of centrifuges (including centrifugal dryers) |
| 74395 | Parts of filtering or purifying machinery and apparatus |
| 74419 | Parts of self-propelled works trucks (electrically operated or not), not fitted with lifting etc. equipment and railway station platform tractors |
| 74491 | Parts of pulley tackle, hoists, winches, capstans and jacks |
| 74492 | Parts of lifting and handling machinery |
| 74493 | Parts of lifts, skip hoists or escalators |
| 74494 | Parts of lifting, handling, loading or unloading machinery, n.e.s. |
| 74519 | Parts of tools for working in the hand, pneumatic or with self-contained nonelectric motor |
| 74529 | Parts of dish washing machines (including household type), machinery for cleaning, filling, sealing, labelling, etc. containers and aerating beverages |
| 74539 | Weighing machine weights; parts of weighing machinery (excluding balances of a sensitivity of 5 ca or better), weight-operated counting machines, etc. |
| 74568 | Parts of mechanical appliances for projecting, dispersing or spraying liquids or powders, fire extinguishers, steam or sand blasting machines, etc. |
| 74591 | Calendaring or other rolling machines (other than for metal or glass) |
| 74593 | Parts (cylinders etc.) for calendaring or other rolling machines (other than for metals or glass) |
| 74595 | Automatic goods-vending machines (postage stamp, cigarette, food, beverage etc.), including money-changing machines |
| 74597 | Parts for automatic goods-vending machines (postage stamp, cigarette, food etc.) |
| 74699 | Parts of ball and roller bearings, n.e.s. |
| 74790 | Parts for taps, cocks, valves and similar appliances for pipes, boiler shells, tanks, etc. |
| 74839 | Parts of articulated link chain |
| 74890 | Parts, n.e.s., for transmission shafts and cranks, bearing housings, gears, gearing, ball screws, gear boxes, flywheels and pulleys, clutches, etc. |
| 74991 | Ships' or boats' propellers and blades therefore |
| 74999 | Machinery parts, not containing electrical connectors, insulators, coils, contacts or other electrical features, n.e.s. |
| 75910 | Parts and accessories of photocopying and thermo-copying apparatus |
| 75991 | Parts of typewriters and word processing machines |
| 75993 | Parts of office machines, n.e.s. |
| 75995 | Parts of calculating machines, accounting machines, cash registers. postage-franking machines and similar machines incorporating a calculating device |

| | |
|---|---|
| 75997 | Parts of automatic data processing machines and units thereof, magnetic or optical readers, and machines for transcribing and processing data n.e.s. |
| 76491 | Parts of electrical apparatus for line telephony or line telegraphy (including apparatus for carrier-current line systems) |
| 76492 | Parts of microphones, loudspeakers, headphones, earphones and combined microphone/speaker sets; audio-frequency electric amplifiers; etc. |
| 76493 | Parts of television receivers, radiobroadcast receivers, transmission apparatus for radio telephony, telegraphy, broadcasting or television etc. |
| 76499 | Parts of the apparatus for sound recorders or reproducers and parts of television image and sound recorders or reproducers |
| 77129 | Parts of electric power machinery (other than rotating electric power generating machinery and equipment), and parts thereof |
| 77220 | Printed circuits |
| 77231 | Fixed carbon electrical resistors, composition or film types |
| 77232 | Fixed electrical resistors, n.e.s |
| 77233 | Wirewound electrical variable resistors (including rheostats and potentiometers) |
| 77235 | Variable electrical resistors (including reostats and potentiometers), n.e.s. |
| 77238 | Parts for the electrical resistors (including rheostats and potentiometers), other than heating resistors; and parts thereof |
| 77241 | Fuses for electrical apparatus used with circuits exceeding 1,000 volts |
| 77242 | Automatic circuit breakers for a voltage of less than 72.5 kv |
| 77243 | Automatic circuit breakers for a voltage of 72.5 kv or greater |
| 77244 | Electrical isolating switches and make-and-break switches for a voltage exceeding 1,000 volts |
| 77245 | Lightning arresters, voltage limiters and surge suppressors for a voltage exceeding 1,000 volts |
| 77249 | Electrical apparatus for switching or protecting electrical circuits, or making connections to or in electrical circuits n.e.s., exceeding 1,000 volts |
| 77251 | Fuses for electrical apparatus used with circuits not exceeding 1,000 volts |
| 77252 | Automatic circuit breakers for a voltage not exceeding 1,000 volts |
| 77253 | Apparatus for protecting electrical circuits, n.e.s., not exceeding 1,000 volts |
| 77254 | Relays for electrical apparatus used with electrical circuits not exceeding 1,000 volts |
| 77255 | Switches for electrical apparatus, n.e.s., for voltages not exceeding 1,000 volts |
| 77257 | Electric lamp holders, for voltages not exceeding 1,000 volts |
| 77258 | Electric plugs and sockets, for voltages not exceeding 1,000 volts |
| 77259 | Electrical apparatus for switching or protecting electrical circuits or making connections to or in electrical circuits, n.e.s., not exceeding 1,000 v |
| 77261 | Boards, panels, consoles and other bases, for electric control or distribution of electricity, for a voltage not exceeding 1,000 volts |
| 77262 | Boards, panels, consoles and other bases, for electric control or distribution of electricity, for a voltage exceeding 1,000 volts |
| 77281 | Boards, panels, consoles, desk, cabinets and other bases not equipped with their electrical apparatus |
| 77282 | Parts of electrical apparatus for switching or protecting electrical circuits for making connections to or in electrical circuits, n.e.s. |
| 77429 | Electro-diagnostic apparatus for medical, surgical, dental or veterinary sciences and radiological apparatus, n.e.s., including parts and accessories |
| 77549 | Parts of shavers and hair clippers with self-contained electric motor (excluding blades and cutter heads) |
| 77579 | Parts of electromechanical domestic appliances with self-contained electric motors |
| 77589 | Parts of electrochemical appliances n.e.s. |
| 77611 | Television picture tubes, colour |
| 77612 | Television picture tubes, black and white or other monochrome |
| 77621 | Television camera tubes; image converters and intensifiers; other photo cathode tubes |
| 77623 | Cathode ray-tubes, n.e.s. |
| 77625 | Microwave tubes (excluding grid-controlled tubes) |
| 77627 | Electronic valves and tubes, n.e.s. |
| 77629 | Parts of television picture tubes and other electronic valves and tubes |
| 77631 | Diodes, not photosensitive nor light emitting diodes |
| 77632 | Transistors (excluding photosensitive transistors) with a dissipation rate of less than 1 watt |
| 77633 | Transistors (excluding photosensitive transistors) with a dissipation rate of 1 watt or more |
| 77635 | Thyristors, diacs and triacs (excluding photosensitive devices) |
| 77637 | Photosensitive semiconductor devices; light emitting diodes |
| 77639 | Semiconductor devices, n.e.s. |

| | |
|---|---|
| 77641 | Digital monolithic integrated units |
| 77643 | Nondigital monolithic integrated units |
| 77645 | Hybrid integrated circuits |
| 77649 | Electronic integrated circuits and micro assemblies, n.e.s. |
| 77681 | Piezoelectric crystals, mounted |
| 77688 | Parts of diodes, transistors and similar semiconductor devices (including photosensitive), light emitting diodes and mounted piezoelectric crystals |
| 77689 | Parts of electronic integrated circuits and micro assembles |
| 77811 | Primary cells and primary batteries |
| 77812 | Electric accumulators (storage batteries) |
| 77817 | Parts of primary cells and primary batteries |
| 77819 | Parts of electric accumulators |
| 77829 | Parts of electric filament or discharge lamps (including parts of sealed beam lamp units and ultraviolet or infrared lamps) and arc lamps |
| 77833 | Parts of electrical ignition or starting equipment for internal combustion engines; parts of generators and cut outs used with those engines |
| 77835 | Parts of electrical lighting and signalling equipment (excluding filament, discharge or arc lamps); parts of windshield wipers, defrosters or demisters |
| 77848 | Parts of electromechanical tools for working in the hand, with self-contained electric motor |
| 77869 | Parts of electrical capacitors |
| 77883 | Parts of electrical signalling, safety or traffic control equipment for railways, tramways, roads, waterways, parking facilities, etc. |
| 77885 | Parts of electric sound or visual signalling apparatus, n.e.s. (including parts of indicator panels, burglar and fire alarms) |
| 77889 | Electrical parts of machinery or apparatus, n.e.s. |
| 78421 | Bodies (including cabs), for motor cars and motor vehicles designed for the transport of persons (other than public-transport type vehicles) |
| 78425 | Bodies (including cabs) for tractors, trucks and special purpose motor vehicles and road motor vehicles n.e.s. |
| 78431 | Bumpers and parts thereof, for tractors, motor cars and other motor vehicles, etc. |
| 78432 | Other parts and accessories of motor vehicle bodies of headings 8701 to 8705 (including cabs) |
| 78433 | Brakes and servo-brakes and parts thereof for tractors, motor cars and other motor vehicles, etc. |
| 78434 | Gear boxes |
| 78435 | Drive axles with differential, whether or not provided with other transmission components, for tractors, motor cars and other motor vehicles, etc. |
| 78436 | Non-driving axles and parts thereof for tractors, motor cars and other motor vehicles, etc. |
| 78439 | Parts and accessories n.e.s. for tractors, motor cars and other motor vehicles, trucks, public-transport vehicles and road motor vehicles, n.e.s. |
| 78535 | Parts and accessories for motorcycles (including mopeds) |
| 78536 | Parts and accessories for invalid carriages |
| 78537 | Parts and accessories for bicycles and other cycles (except motorcycles and mopeds), n.e.s. |
| 78689 | Parts of trailers and semi-trailers, for housing or camping, transport of goods, trailers, n.e.s. and vehicles not mechanically propelled, n.e.s. |
| 79199 | Parts of railway or tramway locomotives or rolling stock railway vehicles; parts of railway or tramway coaches, vans, trucks, service vehicles, etc. |
| 79291 | Propellers and rotors and parts thereof for aircraft |
| 79293 | Undercarriages and parts thereof for aircraft |
| 79295 | Parts of airplanes or helicopters, n.e.s. |
| 79297 | Parts of aircraft and associated equipment, spacecraft (including satellites) and spacecraft launch vehicles, n.e.s. |
| **SITC 8** | **Miscellaneous Manufacturing (Total: 57)** |
| 81211 | Radiators and parts thereof, of iron or steel |
| 81219 | Parts of central heating boilers, n.e.s., of iron or steel |
| 81380 | Parts of portable electric lamps designed to function on their own energy sources (batteries etc.), other than for motor vehicles, etc. |
| 81391 | Parts n.e.s., of lamps and lighting fittings, n.e.s., and parts of illuminated signs and nameplates, etc., of glass |
| 81392 | Parts n.e.s., of lamps and lighting fittings, n.e.s., and parts of illuminated signs and nameplates, etc., of plastics |
| 81399 | Parts n.e.s., of lamps and lighting fittings, n.e.s., and parts of illuminated signs and nameplates, etc., of materials other than glass or plastics |
| 82119 | Parts of seats, n.e.s. |
| 82180 | Parts of furniture, n.e.s., of metal, wood and other materials |

| | |
|---|---|
| 84699 | Clothing accessories, n.e.s., knitted or crocheted; parts of garments or of clothing accessories, knitted or crocheted |
| 84848 | Headbands, linings, covers, hat foundations, hat frames, peaks (visors) and chinstraps, for headgear |
| 85190 | Parts of footwear; removable in-soles, heel cushions and similar articles; gaiters, leggings and similar articles, and parts thereof |
| 87119 | Parts and accessories (including mountings) of binoculars, monoculars, other optical telescopes, and astronomical instruments, n.e.s. |
| 87149 | Parts and accessories of compound optical microscopes |
| 87240 | Medical, dental, surgical or veterinary furniture (operating and examining tables, mechanical hospital beds and dentists or similar chairs) and parts |
| 87319 | Parts and accessories of gas, liquid or electricity meters |
| 87329 | Parts and accessories of revolution and production counters, odometers, pedometers, speedometers, tachometers, stroboscopes, etc. |
| 87412 | Parts and accessories of navigational instruments and appliances |
| 87414 | Parts and accessories for surveying, hydrographic, oceanographic, hydrological, meteorological, etc. instruments and appliances, and rangefinders |
| 87424 | Parts and accessories for drafting tables, etc., marking out and mathematical calculating instruments, and instruments for measuring length by hand |
| 87426 | Parts and accessories for measuring or checking instruments, appliances and machines, n.e.s. and profile projectors |
| 87439 | Parts and accessories for instruments and apparatus for measuring or checking the flow, level, pressure or other variables of liquids or gases, n.e.s. |
| 87449 | Microtones; parts and accessories of instruments for physical or chemical analysis, measuring or checking viscosity, etc. or heat, sound or light |
| 87454 | Parts and accessories for the machines and appliances for testing the mechanical properties of materials |
| 87456 | Parts and accessories for hydrometers and similar floating instruments, thermometers, pyrometers, pyrometers, barometers, hygrhydrometers and similar floating instruments |
| 87469 | Parts and accessories for automatic regulating or controlling instruments and apparatus |
| 87479 | Parts and accessories for instruments and apparatus (except meters) measuring etc. electrical quanities and devices measuring etc. ionized radiations |
| 87490 | Parts and accessories for machines, appliances, instruments and apparatus, n.e.s., measuring, checking, analyzing or controlling, n.e.s. |
| 88114 | Parts and accessories for photographic (other than cinematographic) cameras |
| 88115 | Parts and accessories for photographic flashlight apparatus |
| 88123 | Parts and accessories for cinematographic cameras |
| 88124 | Parts and accessories for cinematographic projectors |
| 88134 | Parts and accessories for microform readers, image projectors, n.e.s. and photographic (except cinematographic) enlargers and reducers |
| 88136 | Parts and accessories for photographic (including cinematographic) laboratory apparatus and equipment, n.e.s., negascopes and projection screens |
| 88422 | Parts for frames and mountings of spectacles, goggles and the like |
| 88431 | Objective lenses for camera, projectors or photographic enlargers or reducers |
| 88432 | Objective lenses, n.e.s., mounted |
| 88433 | Filters (optical elements), mounted |
| 88439 | Mounted optical elements, n.e.s. |
| 88591 | Watch cases and parts of watch cases |
| 88592 | Watch straps, watch bands and watch bracelets, and parts thereof, of mrtal |
| 88593 | Watch straps, watch bands and watch bracelets and parts thereof, of material other than metal |
| 88597 | Clock cases and cases of a similar type for other clock mechanisms (time registers and/or recorders, time stamps, time meters, etc.) and parts thereof |
| 88599 | Clock or watch parts, n.e.s. |
| 89124 | Cartridges and parts thereof, n.e.s. |
| 89129 | Munitions of war and parts thereof, n.e.s. |
| 89191 | Parts and accessories of revolvers or pistols designed to fire live ammunition |
| 89195 | Parts of shotguns and rifles for sports, hunting, etc. n.e.s. |
| 89199 | Parts and accessories, n.e.s. of military weapons (other than revolvers and pistols) and non-military arms (other than firearms and side arms) |
| 89410 | Baby carriages, and parts thereof, n.e.s. |
| 89935 | Parts and accessories of lighters, n.e.s., other than flints or wicks |
| 89937 | Smoking pipes (including pipe bowls) and cigar or cigarette holders, and parts thereof |

| | |
|---|---|
| 89949 | Parts, trimmings and accessories of umbrellas, walking-sticks, seat-sticks, whips, riding-crops and the like |
| 89966 | Artificial parts of the body |
| 89984 | Button moulds and other parts of buttons; button blanks |
| 89986 | Parts of slide fasteners |
| 89996 | Parachutes (including dirigible parachutes) and rotochutes: parts thereof and accessories thereto |
| 89997 | Vacuum flasks and other vacuum vessels, complete with cases; parts thereof (other than glass inners) |

Source: Athukorala (2003), pp.57-67, UN Comtrade database.

**Table A3**

Summary on the Data Sources and the Countries Coverage of Each Source

| Variable | Source | Coverage |
|---|---|---|
| $EXP_{ijt}$<br>$ChEXP_{jt}$ | UN Comtrade online database | 255 countries |
| $GDP_i$<br>$CAP_i$<br>$GDP_j$<br>$CAP_j$ | World Bank World Development Indicators | 190 countries |
| $Dist_{ij}$<br>$Areap_{ij}$<br>$Landl_{ij}$<br>$Contig_{ij}$<br>$ComLang_{ij}$<br>$ComCol_{ij}$<br>$Colony_{ij}$ | CEPII database | 217 countries |
| $Island_{ij}$ | Rose (2004) and CIA World Factbook | 194 countries |

**Table A4**

Descriptive Statistics

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| $ln\ EXP_{ijt}$ | 16916 | 15.935 | 3.242 | 2.243 | 25.097 |
| $ln\ ChEXP_{jt}$ | 16916 | 17.869 | 2.787 | 9.040 | 25.369 |
| $ln\ GDP_{it}$ | 16916 | 26.283 | 1.393 | 24.814 | 29.280 |
| $ln\ CAP_{it}$ | 16916 | 8.535 | 1.377 | 6.655 | 10.614 |
| $ln\ GDP_{jt}$ | 16916 | 23.255 | 2.355 | 17.735 | 30.075 |
| $lnCAP_{jt}$ | 16916 | 7.722 | 1.613 | 4.127 | 11.193 |
| $ln\ Distw_{ij}$ | 16916 | 9.081 | 0.563 | 6.226 | 9.886 |
| $ln\ Areap_{ij}$ | 16916 | 23.585 | 3.353 | 10.441 | 31.128 |
| $Landl_{ij}$ | 16916 | 0.178 | 0.383 | 0 | 1 |
| $Island_{ij}$ | 16916 | 0.612 | 0.635 | 0 | 2 |
| $Contig_{ij}$ | 16916 | 0.009 | 0.095 | 0 | 1 |
| $ComLang_{ij}$ | 16916 | 0.079 | 0.270 | 0 | 1 |
| $ComCol_{ij}$ | 16916 | 0.080 | 0.271 | 0 | 1 |
| $Colony_{ij}$ | 16916 | 0.008 | 0.090 | 0 | 1 |

**References**


Ahearne, A. G., Fernald, J. G., Loungani, P. & Schindler, J. W., (2003). 'China and Emerging Asia: Comrades or Competitors?' *Federal Reserve Bank of Chicago Working Paper*, 2003-27.

Anderson, J. E. & Wincoop, E. V., (2003). 'Gravity with Gravitas: A Solution to the Border Puzzle.' American Economic Review, 93(1), 170–192.

Athukorala, P. & Yamashita, N., (2006). 'Production Fragmentation and Trade Integration: East Asia in a Global Context.' *The North American Journal of Economics and Finance*, 17, 233-256.

Athukorala, P., (2009). 'The Rise of China and East Asian Export Performance: Is the Crowding-out Fear Warranted?' *The World Economy*, 32(2), 234–266.

Baier, S. L., & Bergstrand, J. H., (2007). 'Do Free Trade Agreements Actually Increase Members' International Trade?' *Journal of International Economics*, 71, 72–95.

Baldwin, R. & Taglioni, D., (2006). 'Gravity for Dummies and Dummies for Gravity Equations.' *NBER Working Paper*, 12516.

Baldwin, R. & Taglioni, D., (2011). 'Gravity Chains: Estimating Bilateral Trade Flows When Parts and Components is Important.' *European Central Bank Working Paper*, 1041.

Baum, C. F., Schaffer, M. E. & Stillman, S., (2003). 'Instrumental variables and GMM: Estimation and Testing.' *Boston College Department of Economics Working Paper*, 545.

Barro, R. J., & Lee, J. W., (1993). 'International Comparisons of Educational Attainment.' *Journal of Monetary Economics*, 32, 363–394.

Barro, R. J., & Lee, J. W., (1996). 'International Measures of Schooling Years and Schooling Quality.' *American Economic Review*, 86(2), 218–223.

Barro, R. J., & Lee, J. W., (2000). 'International Data on Educational Attainment: Updates and Implications.' *NBER Working Paper*, (42).

Bergstrand, J. & Egger P., (2010). 'A General Equilibrium Theory for Estimating Gravity Equations of Bilateral FDI, Final Goods Trade and Intermediate Goods Trade' in Brakman, S. & Van Bergeijk, P. ed., The Gravity Model in International Trade: Advances and Applications,. Cambridge: Cambridge University Press.

Berthelon, M. & Freund, C., (2008). 'On the Conservation of Distance in International Trade.' *Journal of International Economics*, 75(2), 310–320.

Brun, J., Carrre, C., Guillaumont, P. & de Melo, J., (2005). 'Has Distance Died? Evidence from a Panel Gravity Model.' *World Bank Economic Review*, 19(1), 99–120.

Egger, P. & Pfaffermayr, M., (2003). 'The Proper Panel Econometric Specification of the Gravity Equation: A Three-way Model with Bilateral Interaction Effects.' *Empirical Economics*, 28, 571–580.

Eichengreen, B., Rhee, Y. & Tong, H., (2007). 'China and the Exports of Other Asian Countries.' *Review of World Economics*, 143(2), 201–226.

Feenstra, R., (2003). Advanced International Trade. New Jersey: Princeton University Press.

Geda, A. & Meskel, A. G., (2008). 'China and India's Growth Surge: Is It a Curse or Blessing for Africa? The Case of Manufactured Exports.' *African Development Review*, 20(2), 247–272.

Giovannetti, G. & Sanfilippo, M., (2009). 'Do Chinese Exports Crow-out African Goods? An Econometric Analysis by Country and Sector.' *European Journal of Development Research*, 21(4), 506–530.

Greenaway, D., Mahabir, A. & Milner, C., (2008). 'Has China Displaced other Asian Countries Exports?' *China Economic Review*, 19, 152 –169.

Head, K., Mayer, T. & Ries, J., (2010). 'The Erosion of Colonial Trade Linkages After Independence.' *Journal of International Economics*, 81(1), 1–14.

Holst, D. R. & Weiss, J., (2004). 'Asean and China: Export Rivals or Partners in Regional Growth?' *The World Economy*, 27(8), 1255–1274.

Ianchovichina, E. & Martin, W., (2001). 'Trade Liberalization in China's Accession to the World Trade Organisation.' *World Bank Policy Research Working Paper*, 2623.

Ianchovichina, E. & Walmsley, T., (2005). 'Impact of Chinas WTO Accession on East Asia.' *Contemporary Economic Policy*, 23(2), 261–277.

Jacks, D. S., Meissner, C. M. & Novy, D., (2011). 'Trade Booms, Trade Busts and Trade Costs.' *Journal of International Economics*, 83(2), 185-201.

Jenkins, R., Peters, E. D. & Moreira, M. M., (2008). 'The Impact of China on Latin America and the Caribbean.' *World Development*, 36(2), 235– 253.

Jones, R., & Kierzkowski, H., (1990). 'The Role of Services in Production and International Trade: A Theoretical Framework,' in R. Jones & A. Krueger (eds.), *The Political Economy of International Trade: Essays in Honor of Robert E. Baldwin*. Oxford: Basil Blackwell.

Kimura, F., Takahashi, Y. & Hayakawa, K., (2007). 'Fragmentation and Parts and Components Trade: Comparison between East Asia and Europe.' *The North American Journal of Economics and Finance*, 18(1), 23-40.

Lall, S. & Albaladejo, M., (2004). 'Chinas Competitive Performance: A Threat to East Asian Manufactured Exports?' *World Development*, 32(9), 1441–1466.

Lall, S. & Weiss, J., (2005). 'China's Competitive Threat to Latin America: An Analysis for 1990-2002.' *Oxford Development Studies*, 33(2), 163–194.

Linders, G. M. & de Groot, H. L. F., (2006). 'Estimation of the Gravity Equation in the Presence of Zero Flow.' *Tinbergen Institute Discussion Paper TI*, 2006-072-3.

Matyas, L., (1997). 'Proper Econometric Specification of the Gravity Model.' *The World Economy*, 20(3), 363–368.

Moreira, M. M., (2007). 'Fear of China: Is there a Future for Manufacturing in Latin America?' *World Development*, 35(3), 355–376.

Nehru, V. & Dhareshwar, A., (1993). 'A New Database on Physical Capital Stock:Sources, Methodology and Results.' *Revista de Analysis Econmico*, 8(1), 37–59.

Rauch, J. (1999). 'Networks versus Markets in International Trade.' *Economica*, 48, 7–35.

Schott, P. K., (2008). 'The Relative Sophistication of Chinese Exports.' *Economic Policy*, 23(53), 5-49.

Shafaeddin, S. M., (2004). 'Is Chinas Accession to WTO Threatening Exports of Developing Countries? ' *China Economic Review*, 15, 109–144.

Subramanian, A. & Wei, S., (2007). 'The WTO Promotes Trade, Strongly but Unevenly.' *Journal of International Economics*, 72, 151–175.