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In 2009 all ECB publications feature a motif taken from the €200 banknote.

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CONTENTS

Abstract

Due to the emergence of global production networks, trade statistics have became less accurate in describing the dependence of emerging Asia on external demand. This paper analyses, using an update of the Asian International Input-Output (AIO) table, the interdependence of emerging Asian countries, the United States, the EU15, and Japan via trade and production linkages. According to the results, we do not find evidence of the decoupling of emerging Asia from the rest of the world. On the contrary, we find evidence on increasing trade integration, both globally and regionally. Nonetheless, our analysis indicates that emerging Asia's dependence on exports is only about one-third of its GDP, i.e. well below the 50% exposure suggested by trade data. This finding can be explained by the high import content of exports in these economies, which is a result of the increasing segmentation of production across the region.

Keywords: emerging Asia, Asian International Input-Output table, real linkages, decoupling, resilience

JEL classification: F14, C67, E23.

Non-technical summary

Related to the ongoing debate on "decoupling" of emerging markets, the paper analyses, using an update of the Asian International Input-Output (AIO) table, the dependence of emerging Asia[1] on demand from the region itself, from the advanced economies, in particular Japan, the United States, and the EU15 (the G3 countries henceforth), and from the rest of the world.

Due to the emergence of global production networks, trade data has became less accurate in describing the interdependences of the economies in emerging Asia. There are two main shortcomings of trade data. First, trade statistics are unable to capture the source of value-added (i.e. to quantify the contribution of each country to the total value added produced) in the production chain. Thus, trade statistics provide inaccurate information on the exposure of each country in the production chain. Second, because trade data are gross statistics they are prone to double-counting. The more the production is segmented across countries the higher the total volume of trade will be, and thus, the more trade data overestimate the openness of emerging Asia as a region.

These problems can be overcome by using an international input-output table to analyze the trade and production linkages between countries and sectors. The Asian International Input-Output table by the Institute of Developing Economies Japan External Trade Organization (IDE-JETRO) provides detailed information on trade and production linkages between 9 economies in the Asia-Pacific region: China, Indonesia, Malaysia, the Philippines, Singapore, South Korea, Taiwan (Republic of China), Thailand, and Japan, as well as the United States. The geographical breakdown for trade also includes Hong Kong S.A.R., the EU15 and the rest of the world. To date, the AIO tables have been compiled for the years 1985, 1990, 1995 and 2000. Given the rapid changes in production and trade structures, however, these data look inadequate to describe the current situation. For this reason, we calculate the country-level update of the AIO table for 2006.

The updated 2006 AIO table is used for two analyses. First, we calculate the linkages via imported inputs (the so-called "backward linkages" of production), which allows us to describe the inter-linkages of the emerging Asian countries *in the production process*. Second, as the main contribution of the paper, the reliance of each country's value added on *domestic demand, intra-regional and extra-regional demand* is computed. Comparing results from the 1995, 2000, and the updated 2006 AIO tables we also report the evolution of major trends in trade and production in the region.

[1] Emerging Asia in our analysis contains China, Hong Kong S.A.R., Indonesia, Malaysia, the Philippines, Singapore, South Korea, Taiwan (R.O.C.), and Thailand. Other countries of emerging Asia are not included due to data limitations.

The main findings of the paper are the following. First, only about one-third of the value added in emerging Asian countries is determined by external demand, significantly lower than the 50% exposure suggested by the aggregate trade data, while domestic demand contributes around two-thirds to the value added. Second, the dependence of emerging Asia's value added on export markets has steadily risen since 1995, a phenomenon in line with increasing global trade integration, and a clear evidence against the decoupling view. Third, although intra-regional and Chinese markets have both gained importance, they still account for only around 7% of the final demand. This share is also below the one suggested by trade data. As regards extra-regional markets, the G3 economies accounted for 16% of total final demand in 2006, with an increasing dependence of emerging Asia on the EU15, and a declining importance of US and Japanese markets. Moreover, demand from the rest of the world has recently grown substantially, accounting for 14% of total final demand in 2006 – a share equal to that of the G3 countries.

As it is evident from these results, the paper finds no support for the decoupling view. At the same time, however, it finds that, if the bias in trade data due to the segmentation of production is accounted for, the exposure of emerging Asia to external demand is significantly lower than suggested by trade statistics. In other words, on the one hand we find no evidence of decoupling, but on the other hand we calculate that emerging Asia is less "coupled" with the rest of the world than suggested by trade data.

When interpreting the results, one should note the caveat that the analysis with the AIO table can only capture the direct trade effects, i.e. neither any "second-round" effects of an export slowdown on domestic demand via lower employment, wages or investment, nor any financial market or policy related channels are accounted for.

Our findings on the production structure of the Asian hub and the role of China within it, also add some interesting insights to the literature. The "backward linkages" of production indicate a changing role of China in the Asian hub. Rather than being a last stage assembler, China increasingly takes over the role of Japan and supplies inputs for the production in other countries of the region. This finding is in line with the changing structure of global production networks and the downsizing of manufacturing activities in advanced economies.

1. INTRODUCTION

Since 1998, emerging Asia's[2] exports more than doubled in value, an increase well above the growth rate of overall world demand. As a result, the share of emerging Asia's exports in total world exports increased from 17% in 1998 to 22% in 2007. Moreover, by accounting for 14% of the world GDP[3] and contributing nearly half of world's GDP growth[4], emerging Asia has become a key to world's economic growth and dynamics.

The slowdown of the US economy since the second half of 2007 and the continued strength of growth in emerging Asia have set off, the so-called "decoupling" debate on whether emerging Asia has decoupled from the global business cycle. In general, decoupling can be defined as "*the emergence of a business cycle dynamic that is relatively independent of global demand trends and that is driven mainly by autonomous changes in internal demand*" (ADB (2007)). We use this definition of decoupling in the analysis of this paper.

At the early stages of the recent financial crisis, the shocks hitting the global economy seemed to be primarily US-based, emanating from the collapse of the US housing bubble. Since early 2008, however, a broader set of shocks has appeared, including a global banking and liquidity crisis with negative implications on financing costs, risk premia, and availability of credit, various commodity price shocks, and emergence of housing-related problems in several non-US economies. Thus, the relevant question today is more to what extent emerging Asia has decoupled not only from the United States, but from extra-regional demand in general. For this reason, our analysis focuses on the extra vs. intra-regional determinants of economic growth in emerging Asia.

The main arguments behind the decoupling theory are threefold. First, according to the trade statistics, trade linkages of emerging Asia with the G3 countries[5], and in particular with the United States, are less important today than in the past. Indeed, the steady slowdown of exports to the United States since 2006 has been compensated by dynamically expanding export markets to other emerging economies. Second, prolonged productivity and income

[2] In general, emerging Asia is defined in the paper as consisting of China, Hong Kong S.A.R., Indonesia, Korea, Malaysia, the Philippines, Singapore, Taiwan (R.O.C.), and Thailand. However, in the trade analysis using UN COMTRADE data (Chapter 2), Taiwan (R.O.C.) is not included due to missing data. In contrast, in the analyses with the Asian International Input-Output (AIO) tables, emerging Asia does not include Hong Kong due to the fact that this country is not included in the production matrix of the AIO table.

[3] Measure in USD 2007 values.

[4] Based on the IMF World Economic Outlook April 2008 projections for 2008 using PPP weights.

[5] By the G3 economies, we mean the United States, the euro area (EU15), and Japan.

growth, as well as rising purchasing power are increasing emerging Asia's own final demand. A major reason, why emerging Asia's business cycle may have decoupled, is China's emergence with a domestic market of 1.3 billion consumers. In the view of the supporters of the decoupling theory, China is an engine of growth in emerging Asia, i.e. it increasingly demands for goods produced in other countries of the region. Finally, unlike in the earlier episodes of a global slowdown, emerging Asian countries are now better able to weather adverse external conditions by active economic policies. This is because most countries now have current account surpluses, large foreign reserves and many even budget surpluses, leaving room for a fiscal stimulus.

The paper aims at analyzing the dependence of emerging Asia through trade linkages on the demand both from the region itself and on the advanced economies, especially the United States, the EU15 and Japan. There are three main questions that we intend to answer.

1. To what extent value added in emerging Asia is determined by domestic versus external demand? Has the dependence on external factors decreased over time? (In the latter question, "yes" supports the decoupling view).
2. How important is intra-regional trade in emerging Asia? Has the increasing purchasing power in China and other emerging Asian countries provided an expanding market for products from the region, helping to isolate emerging Asia from global business cycle fluctuations? ("yes" for the latter supports the decoupling view)
3. To what extent value added in emerging Asia depends on demand from US, Japan and the euro area and the rest of the world? Has the relative importance of these regions changed?

Due to the emergence of global production networks, it is less accurate to analyze economic dependences between countries by using only trade data. The main shortcoming of trade data lies with its inability to capture the source of value-added, i.e. to quantify the contribution of each country to the total value added produced in the production chain. This can be overcome by using an international input-output table to analyze the real linkages between countries and sectors.

One should note, however, there are some limitations to this approach. The analysis with the AIO table can only capture the "direct" trade effects, i.e. neither any "second-round" effects of an export slowdown on domestic demand via e.g. lower employment, wages or investment, nor any financial or policy related channels cannot be taken into account. Thus, the actual impacts of negative external demand shock may be underestimated by the numbers provided in the paper. The paper also lacks a sector level analysis. Although the 1995 and 2000 AIO tables provide information on sectors, the update of the AIO table at the sectoral level is currently not possible due to severe data limitations. However, an extensive literature

of sectoral studies is available (see e.g. Dieter (2007), Gangnes and Van Assche (2008), Nag et. al (2008), Luthje (2004)), which can be used to supplement the findings of this paper.

Compared to the study closest to our work, Mori and Sasaki (2007), this paper contains at least three improvements. First, as regards the updating procedure of the AIO table, the paper takes into account the compositional shift in the imports from final to intermediate goods, and also applies an adjustment for Hong Kong's entrepot trade. Second, the paper gives a picture of production linkages in the region using the Leontieff coefficients of the AIO table. Finally, the paper presents a broad set of descriptive results on income dependency, with specific attention paid to the reliance of emerging Asia's GDP on European markets.

The paper has some interesting contributions to the decoupling debate. We find no evidence of decoupling of the emerging Asian region from the rest of the world. On the contrary, we find evidence on increasing trade integration, both globally and regionally. Our results indicate that emerging Asia's GDP is increasingly driven by exports, in line with the stronger economic integration of the world economy. Intra-regional markets, despite of gaining substantially in importance in the recent years, still account for only 7% of value added in the region. Nevertheless, the paper finds that domestic demand, with a share of around two thirds of the final demand, is still key to the economic growth in the region. Consequently, the share of external demand of around one third is, therefore, significantly lower than the 50% exposure suggested by aggregate trade data.

The paper is organized as follows. Section 2 briefly discusses the related literature. Section 3 introduces some stylized facts based on trade statistics and describes the limitations of these data. Section 4 presents the methodology used to update the AIO table, and Section 5 the main analysis. Finally, Section 6 concludes. Technical details on the structure of the AIO table, the updating procedure, and the derivation of measures used in the analysis are presented in the Appendix.

2. BRIEF REVIEW OF THE LITERATURE

The existing empirical evidence on the decoupling of emerging Asia is ambiguous. In support of the decoupling view, several recent studies suggest that global (common) factors play a relatively less important role in driving business cycles in emerging Asia than in other regions of the world (see e.g. IMF (2007), and Dees and Vansteenkiste (2007)). Moreover, the importance of common factors seems to have declined since the mid-eighties. In parallel, the studies indicate an increasing role of regional factors, in line with ongoing trade and financial integration in emerging Asia (see ADB (2008)).

In contrast, several studies indicate an increasing synchronization of business cycles of advanced and emerging Asian economies. According to calculation of IMF (2007) and ADB (2008), import demand from the United States, the euro area, and Japan is assumed to be now more important for the region than ever before. Indeed, estimations suggest that the co-movements between (non-oil) import demand from the aforementioned G3 economies and economic growth of emerging Asia became stronger in the last decade compared to earlier periods.[6]

Moreover, evidence based on existing trade data does not support the view that intra-regional demand for final goods is increasing, and that China is emerging as an engine of growth for the region. Although intra-regional exports are increasing fast, it is mostly due to trade in intermediate goods. In fact, there is no indication that exports of final goods from emerging Asia to China, or to other countries of the region would have risen strongly (ADB 2008).

One should note, however, that decoupling does not mean that a slowdown of the growth in the United States or the global economy would not have an impact on growth in emerging Asian economies. It means that the GDP growth in these countries will slow by much less than in previous recession episodes. Combining elasticities from panel estimates[7] and actual trade data, IMF (2007) calculates that the impact of a 1% slowdown in the US GDP growth has a -0.15 percentage point (pp) impact on growth in emerging Asia. The finding that a 1% slowdown in the euro area would have an impact closely similar in size implies that a broader slowdown within the G3 group can have an economically significant effect on emerging Asia's growth. However, these elasticities, given that they do not allow for spillovers between countries, are assumed to be underestimated. Indeed, VAR estimates that allow for inter-country dependencies estimate the impact of a 1% slowdown in the US GDP growth around -0.4 pp ((IMF 2007) and ADB (2008)). Moreover, Dees and Vansteenkiste (2007) using a global VAR model estimate the impact in the range of -0.16 to -0.30 pp[8]. Macro-model simulations that also take into account changes in relative prices and allow for a depreciation of the US dollar indicate impacts in the range of -0.5 to -1.5 pp (IMF (2007, ADB (2008)). Finally, when simulations take into account factors, such as cross-country inter-linkages in business and consumer confidences, integration of financial markets and synchronization of policy decisions, the elasticities may easily exceed those cited above.

[6] According to the IMF estimates, the rise in the openness of emerging Asia from 4.8% in 1981-85 to 7.1% in 2001-2005 (measured as merchandise exports to GDP) resulted in an increase of elasticity of growth to US growth by 0.2 percentage points.

[7] The sample contains 130 countries and data from 1970-2005. For more details see IMF (2007) p. 132.

[8] Including "echo effects" via trade links between third countries, the authors estimate an impact in the range of 0.2-0.4 percentage points.

In a study methodologically close to our paper, Mori and Sasaki (2007) use the updated version of the AIO table to quantify interdependences in the Asia-Pacific region. According to their results, interdependencies between the Asia-Pacific economies in terms of global production networks deepened further in 2000-2005, while China became the main production center in the region. The authors also find that the East Asian economies, rather being more autonomous, became more exposed to economic developments outside of the region.

3. EMERGING ASIA'S EXTERNAL DEPENDENCE BASED ON TRADE DATA

This section briefly summarizes the stylized facts on emerging Asia's external dependence based on trade statistics. The trade data we use is from UN COMTRADE, and it only contains data on traded goods for 1998-2006.

First we start the analysis with aggregated exports data. The main findings are the following (see Table 1):

- Exports (in goods) contributed 45% of GDP in 2006, which indicates a strong exposure of the region to external demand. Moreover, the exports to GDP ratio increased significantly from 34% in 1998 to 45% in 2006, giving no support to the decoupling theory. Using the more complete National Accounts statistics, which include trade in both goods and services, and serve as a benchmark for the final findings of the paper, exports of emerging Asia accounted for 53% of GDP in 2006. As for comparison, in 2006, the exports-to-GDP ratio in the United States was 11%, in the EU15 16%, and in Japan 16%.
- Intra-regional demand determines 17% of GDP. The role of intra-regional market has increased, mainly driven by a robust expansion of the Chinese market. The contribution of exports to China in the total value added increased from 6% to 12% in 1998-2006.
- As regards extra-regional demand, exports to the G3 countries accounts for 19% of GDP, slightly up from 16% in 1998. The US markets are the most important (8%), followed by the EU15 (7%), and Japan (4%). Demand from the rest of the world determined 10% of total value added in 2006.

Table 1. Exports by type of goods and by destination

	In million USD						in % of GDP					
	Total		Final		Intermediate		Total		Final		Intermediate	
	1998	2006	1998	2006	1998	2006	1998	2006	1998	2006	1998	2006
Exports to G3 countries	363.0	905.1	143.0	289.2	220.0	615.9	16.2	18.7	6.4	6.0	9.8	12.7
within that to US	164.5	378.6	70.8	138.8	93.7	239.8	7.3	7.8	3.2	2.9	4.2	4.9
to the EU	114.7	327.1	39.5	96.3	75.2	230.9	5.1	6.7	1.8	2.0	3.4	4.8
to Japan	83.9	199.4	32.8	54.2	51.0	145.2	3.7	4.1	1.5	1.1	2.3	3.0
Intra-regional exports	245.4	800.9	45.7	84.5	199.7	716.4	11.0	16.5	2.0	1.7	8.9	14.8
within that exports to China*	78.3	271.9	9.4	13.0	68.9	258.8	6.2	12.1	0.8	0.6	5.5	11.5
RoW	160.6	492.2	47.1	121.2	113.6	370.9	7.2	10.2	2.1	2.5	5.1	7.7
Exports of goods, total	**769.1**	**2198.2**	**235.8**	**495.0**	**533.2**	**1703.2**	**34.4**	**45.3**	**10.5**	**10.2**	**23.8**	**35.1**
Memo item												
Exports, goods and services	*958.9*	*2588.3*					*42.8*	*53.4*				

*Note: The numbers refer to exports of goods. * GDP ratio is based on non-China emerging Asia GDP.*
Source: UN COMTRADE database.

Aggregated (total) exports data indicate that emerging Asian countries are relatively open, are increasingly integrated in global trade networks and increasingly dependent on external markets. In a word, aggregated trade data reject the decoupling theory. Nevertheless, when a more detailed dataset is used and the analysis includes exports by types of goods, the picture becomes more ambiguous.

Intermediate goods exports accounted for 77% of total exports in 2006. Moreover, exports of intermediate goods have expanded more dynamically than exports of final goods, and have been the main contributor to increasing openness of emerging Asia in most country-relations. However, one may argue that trade of intermediate goods, being a result of production segmentation and prone to double-counting, should be excluded from the analysis. When calculating final demand dependence, it is exports of final goods that matter.

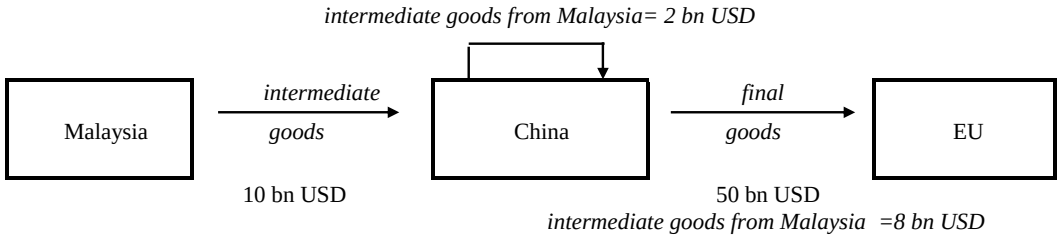
According to final goods exports, openness of emerging Asia is low and has not increased over the last decade (10.2% in 2006 vs. 10.5% in 1998). Extra-regional demand contributed to GDP by 8.5% in 2006, similarly to 1998. However, the importance of US and Japanese markets have declined, while the importance of EU and rest of the world has increased. *Unlike data on total exports, final goods trade statistics do not justify the high and increasing exposure of emerging Asia to external demand.*

Which data should we trust? Assuming that production networks aim at supplying export markets, and thus intermediate goods should partly be included in the analysis, we believe the actual exposure of emerging Asia should lie somewhere between the numbers suggested by total and final goods export data. However, trade statistics itself do not provide enough information to tell the exact exposure.

With the emergence of global production networks, trade data has became less accurate in describing the interdependences of the economies in emerging Asia. There are two main shortcomings of trade data. First, trade statistics are unable to capture the source of value-added (i.e. to quantify the contribution of each country to the total value added produced) in the production chain. Thus, trade statistics provide inaccurate information about the dependence of each country in the production chain on external demand. Second, because trade data are gross statistics they are prone to double-counting. The more the production is segmented across countries the higher the total volume of trade will be, and thus, the more trade data overestimate the openness of emerging Asia as a region. Let us illustrate these problems with a numerical example.

Assume that the production chain contains three countries: Malaysia supplies China with intermediate inputs, China uses these inputs for both producing final goods to its domestic market and to exports to EU markets. In order to calculate the impact of changes in demand from the EU on the value-added of Malaysia and China, one needs to know the share of inputs from Malaysia in the value of final goods produced by China to its domestic and export markets. This information, however, is not provided by the trade data.

Figure 1: Sources of value added in the production chain, an illustrative example



	Malaysia to China	Malaysia to EU	China to EU
Actual exposure	2	8	42 (=50-8)
Trade data (total exports)	10	0	50
Trade data (final goods exports)	0	0	50

Assume that the value of inputs exported from Malaysia to China is USD 10 bn, and the value of final goods exports from China to the EU15 is USD 50 bn[9] (see Figure 1). Assuming that USD 2 bn of inputs from Malaysia ends up in products that are consumed in China, the products exported to the EU15 will contain USD 8 bn value-added from Malaysia and USD 42 bn value-added from China. Consequently, fall in the demand of EU15 by 50 bn US

[9] The illustrative numbers closely track actual export values in 2006, by both types of goods and country relations.

dollars would have an 8 bn impact on Malaysia and a 42 bn impact on China. Aggregate trade data (similar to trade data on final goods), however, would indicate a 50 bn USD impact on China and no impact on Malaysia.

The above example can also be used to illustrate the problem of double-counting. Malaysian inputs that end up in Chinese exports to the EU are counted twice: once when they are exported from Malaysia to China and once when they are exported from China to the EU. As a result, while the actual value-added that is exported from the region, is USD 50 bn, trade data would indicate an USD 60 bn of total exports of the region as a whole.

A possible way to compass these problems is to use input-output tables. Input-output tables are built on a broad set of disaggregated statistics and take into account not only trade flows, but also information on flows of inputs within the production process. In the following analysis, we will use the Asian International Input-Output tables to describe the dependence of emerging Asian countries on intra- and extra-regional demand.

4. METHODOLOGY

This Section describes the structure of the Asian International Input-Output (AIO), the updating methodology, as well as the sensitivity analysis applied.

The Asian International Input-Output (AIO) tables are compiled by the Institute of Developing Economies Japan External Trade Organization (IDE-JETRO), and can be used to analyze the structures of industry and trade linkages, as well as inter-temporal changes in the interdependences of the economies in the Asia-Pacific region.

The AIO tables provide detailed information on trade and production linkages between 9 economies in the Asia-Pacific region: China, Indonesia, Malaysia, the Philippines, Singapore, South Korea, Taiwan (R.O.C.), Thailand, and Japan as well as the United States. The geographical breakdown for trade also includes Hong Kong S.A.R., the EU, and the rest of the world. The AIO tables contain the input-output tables of these countries linked together using detailed trade matrices. Accordingly, the AIO tables have both a country and a sectoral dimension, which makes it possible to describe inter-linkages between various sectors of different countries.[10] A detailed description of the structure of the 2000 AIO table is given in Appendix A.1.

[10] For more technical details on the AIO tables, see Asian International Input-Output Table 2000, Volume 1. Explanatory Notes, JETRO, March 2006

To date, the AIO tables have been compiled for the years 1985, 1990, 1995 and 2000. Given the rapid changes in production and trade structures, however, these data look inadequate to describe the current situation. For this reason, we update the AIO table at the country level for 2006, and use it to analyze the research questions of the paper. The updating procedure is described in detail in Appendix A.2.

To test the validity of the updating procedure, we did the following two sensitivity analyses. First, we examined the residuals from the GDP identity. Input-output tables are closed systems, meaning that they are constructed so that total demand equals total supply. Given that we use imports data to update the trade linkages in the input-output table, any discrepancy between imports data reported by the importer and export data reported by the exporter (after the items of freight, insurance and import duties are controlled for) would cause a discrepancy between supply and demand in the updated table. For example, trade balances from the Chinese statistical sources do not necessarily match the trade balances reported by its trading partners.[11] Moreover, any assumption we use in the updating, such as the assumptions on services trade, on the share of freight, insurance and import duties in total imports, may all result in discrepancies.

Nevertheless, with the exceptions of Singapore and Taiwan (R.O.C.), the residuals calculated from the GDP identity are below 5% of the GDP. In the case of Singapore, the high residual may be explained by Singapore's relatively significant re-export trade that we could not correct for given data limitations. The discrepancies in the case of Taiwan (R.O.C.) may have to do with the fact that the COMTRADE database does not contain data for Taiwan (R.O.C.), and thus we had to make some assumptions on Taiwanese trade.[12] For transparency purposes, we report a residual line when presenting the contribution ratios of final demand to value-added. This residual line stands for a part of value-added, which remains unexplained.

A second way of checking the sensitivity of the updating procedure is to update the 1995 AIO Table to year 2000 values, derive the main indicators used in our analysis, and compare the results from this updated table with the "official" 2000 AIO Table by IDE-JETRO. To do this, we calculate two measures: the Leontieff coefficients and the so-called "Contribution ratios of final demand to value added". The Leontieff coefficients from the updated 1995 AIO table indicate less significant changes in the production network between 1995 and 2000, and a stronger concentration of suppliers of inputs than the "official" 2000 AIO. The results from the impact of final demand on value added analysis are not significantly different from the

[11] US Department of the Treasury (2007), Report to Congress on International Economic and Exchange Rate Policies, Appendix II China's Trade Data, June 2007.

[12] Although we tried alternative estimates for Taiwanese trade assuming similarities in the trade structure of Taiwan (R.O.C.) and China and other NIE3 countries, we could not lower the residuals.

findings of the "official" 2000 AIO table, the main difference being that the updated 1995 AIO table overestimates the dependence on domestic demand by 2 percentage points and underestimates the dependence on the rest of the world by the same extent.[13]

5. ANALYSIS USING THE AIO TABLES

We use the updated 2006 AIO table in two different analyses. First, we calculate the "backward linkages" of production, which helps us to describe the inter-linkages of the emerging Asian countries in the production process. Second, as the main contribution of our paper, the reliance of each country's value added on domestic demand, intra-regional and extra-regional demand is computed. Comparing results from the 1995, 2000, and the updated 2006 AIO tables we also report the evolution of major trends in emerging Asia's production and trade dynamics.

5.1. "Backward linkages" of production

The backward linkages of production are measured by the Leontieff coefficients of the 2006 AIO table. The Leontieff coefficients of the AIO table are calculated as follows:

Let $\alpha^{ij} = \frac{A^{ij}}{X^{j}}$, where i=(Indonesia, Malaysia …, US) is the supplier country, j =(Indonesia, Malaysia …, US) is the demand country, A^{ij} is input from supplier country i used in the demand country j's production, and X^j is total production of demand country j. Then the AIO table can be written in a matrix form as:

$$\begin{bmatrix} \alpha^{II} & \alpha^{IM} & . & \alpha^{IU} \\ \alpha^{MI} & \alpha^{MM} & . & \alpha^{MU} \\ . & . & . & . \\ \alpha^{UI} & \alpha^{UM} & . & \alpha^{UUI} \end{bmatrix} x \begin{bmatrix} X^{I} \\ X^{M} \\ . \\ X^{U} \end{bmatrix} + \begin{bmatrix} F^{II} \\ F^{MI} \\ . \\ F^{UI} \end{bmatrix} + \begin{bmatrix} F^{IM} \\ F^{MM} \\ . \\ F^{UM} \end{bmatrix} + ... + \begin{bmatrix} Q^{I} \\ Q^{M} \\ . \\ Q^{U} \end{bmatrix} = \begin{bmatrix} X^{I} \\ X^{M} \\ . \\ X^{U} \end{bmatrix},$$

where F^{ij} is vector of final demand (sum of consumption and investment), Q^js are export vectors to Hong Kong, the EU, and the rest of the world, respectively. For details see Appendix A.1.

The matrix notation can be written in short as: **AX+Y=X**

[13] For more details, see Appendix A.4.

To answer the question how much production is needed to meet one unit of demand, the system of equations should be solved to *X*:

$\mathbf{X=(I-A)^{-1}Y=BY}$, where *B* is called the Leontieff coefficient matrix.

The B^{ij} element of the matrix indicates the number of unit of production needed in country *i* (the supply country) to produce one unit of value added in country *j* (the demand country). The Leontieff coefficient matrix helps us to analyze production linkages across the countries in the region via trade of intermediate inputs.

The results of the analysis of backward linkages of production are summarized on Figure 2, which illustrates the Leontieff coefficients of the 1995, 2000 and updated 2006 AIO tables. The vertical axis of the Figure shows the supplier countries, and the horizontal axis represents the demand countries. For example, in the bottom-left corner, one can read the number of units of production needed in the United States to produce one unit of value added in Indonesia, or alternatively, the share of imports from the United States in Indonesian value added. The number of units is represented by the different colors in the Figure. According to Figure 2, in order to produce one unit of value added in Indonesia in 2006, approximately 0.03 units of production were needed in the United States. To put it differently, the import content of the Indonesian production from the United States was approximately 3%.

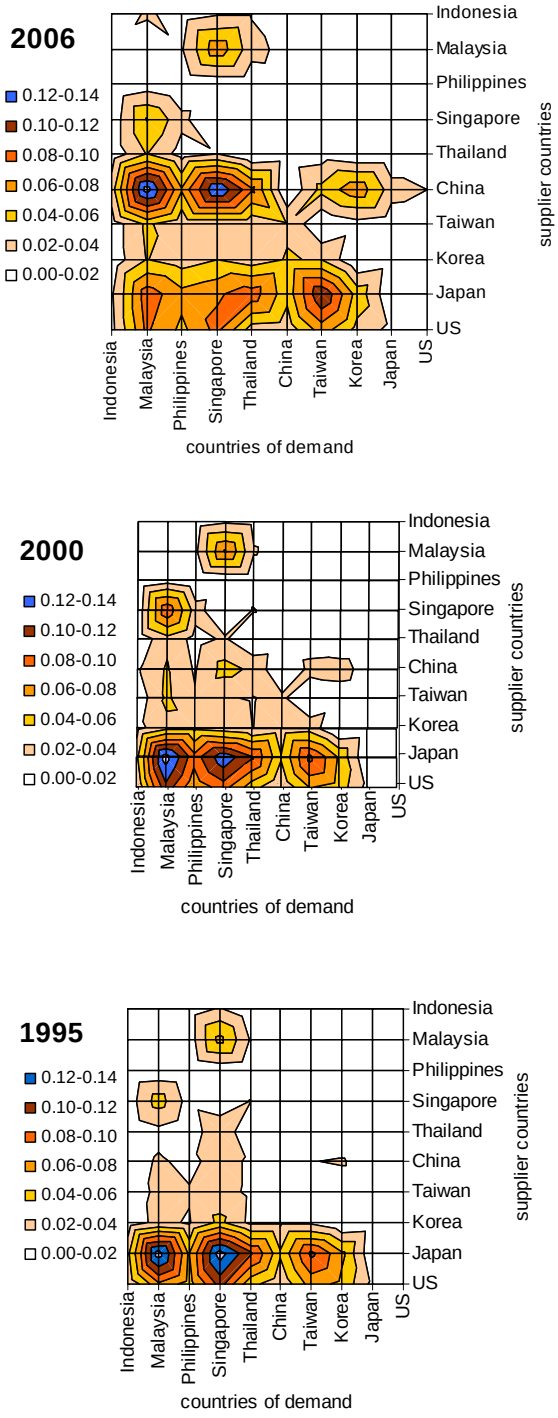
There are two main facts that stand out as results of the analysis. First, the dominance of horizontal formations in the Figure 2 indicates *that suppliers are highly concentrated in emerging Asia*, i.e. there are only a few countries that provide the bulk of inputs for production in the region. According to Figure 2, the main suppliers of inputs in the region are Japan, the United States, and most recently also China. As regards countries of demand, Malaysia, Singapore and Taiwan (R.O.C.) are the countries where imported inputs account for the highest share of value-added, while in the larger, less-open economies such as Korea and China, the import content of value-added is lower.

Second, *the role of major supplier is changing*. In 1995, emerging Asia used inputs mostly from Japan and from the United States in its production process. (The EU is not in the production matrix of the AIO table, i.e. it is not included in this exercise.) The pattern of production segmentation in the region was determined by the offshoring activities from these economies. By 2000, Japan and the United States still being dominant, the NIE3s and China seem to have emerged as suppliers of input material. A major change occurred by 2006, when for most countries in the region, China became a more important source of inputs than Japan and the United States.

This trend can be explained by the increasing delocalization of manufacturing production from advanced economies. For example, Toyota has created a global operating platform in

recent years that operates without major Japanese inputs (Dieter (2006)). Nevertheless, the phenomenon does not come down to auto industry exclusively, but also present in other sectors, as documented by a wide range of literature (see e.g. Dieter (2006), Gauliner et al. (2005), Gangnes and Van Assche (2008) or Luthje (2004)).

Figure 2 Backward linkages of production (Leontieff coefficients)



Note: The figure depicts the Leontieff coefficients of the AIO matrices.
Sources: AIO tables 1995, 2000, and authors' calculations.

Figure 2 shows no evidence of clear specialization on final stage assembling in any of the countries. Final stage assembling would show up as a vertical formation in the Figure, indicating that several suppliers provide inputs for the assembler country. Although, the supply of inputs is increasingly diversified across the region due to intensifying production segmentation, no clear vertical pattern has emerged. This finding is striking in the case of China in particular, a country that has become the major export platform in the region supposedly via specializing in final stage assembling.

However, when interpreting the results one has to keep in mind that Figure 2 hides a significant heterogeneity in the data. Production linkages can differ by firms and sectors. Haddad (2007) describes various production networks within the machinery sector. In the road vehicles industry, all economies in East Asia including China, export a significant share of parts to Japan, and China also exports a large share of parts to the EU and the US. The electrical machinery sector, on the other hand, provides examples of final stage assembling. In electronics, inputs come from Japan and the NIEs and assembling and exports of final goods is done by several East Asian economies (China, Indonesia, Malaysia, and the Philippines) independently. In the electrical appliances and the computer industry East Asian economies export a high share of parts to China for final assembling and China exports the final products to the EU and the US.[14]

Due to data limitations, however, we are unable to update the 2000 AIO Table at the sectoral level and thus our analysis can not take into account the data heterogeneity across sectors.

5.2. Contribution ratios of final demand to value added

In the previous exercise we described production linkages via flows of intermediate inputs. Leontieff coefficients measured the production needed in the supply countries in order to produce one unit of value added in the demand country. Now, we extend the analysis further. First, we do not only take into account inputs needed for production, but also direct imports needed to meet final demand (consumption, investments and exports) in the demand country. Thus, rather than focusing on intermediate goods only, we also include flows of final goods in the analysis. Moreover, rather than gross production, the analysis focuses on value added implied in the supply country.

These changes make it possible, in the first step, to calculate the impact of final demand from demand countries on the value added of supply countries. In the next step, we can split up the

[14] According to the 2000 AIO table China's role as final assembler also prevails in the textile industry.

value added of the supply countries by final demand components: by domestic demand and by final demand from other countries, i.e. exports to different destinations.[15] By doing so we are able to measure the dependence of the supply countries' value added on domestic, intra-regional and extra-regional demand.

The calculations are made in two steps.

The impact of final demand on value added (*IFv*). The impact of final demand (from demand country *j*) on the value added of supply countries is calculated according to the following formula:

$$IFv^{j} = \hat{v} * B * f^{j},$$

where *v* is a diagonal matrix consisting the elements of $v^j=V^j / X^j$ (the ratio of *V* value-added to total production *X* in the demand country), *B* is the Leontieff coefficient matrix, f^j is a column vector of final demand in the demand country *j*. [16]

Contribution ratios of final demand to value added. The contribution ratio (*CR*) of final demand from demand country *j* to the value added of supply country *i* is given by the formula:

$$CR_i^{j} = IFv_i^{j} / \sum_j IFv_i^{j},$$

where IFv_i^j stands for the *i*th row of matrix IFv^j, representing the impact of final demand from country *i* on the value-added of supply country *j*.

The main findings of the analysis of the contribution ratios are summarized in the Tables 2-4.

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[15] Intuitively the split up of the value-added is based on the supply-demand identity: the value-added produced in the supply country is either consumed domestically, or exported to other countries.

[16] For interpretation purposes, let's assume the case of a one unit increase in final demand of Indonesia (f^I). The impact of Indonesian final demand on production of countries in the matrix (IFv^I) is the following:

$$IFv^{I} = \begin{matrix} v^I B^{II} f^{II} + v^I B^{IM} f^{MI} + ... + v^I B^{IU} f^{UI} \\ v^M B^{MI} f^{II} + v^M B^{MM} f^{MI} + ... + v^M B^{MM} f^{UI} \\ ... \\ v^U B^{UI} f^{II} + v^U B^{UM} f^{MI} + ... + v^U B^{UU} f^{UI} \end{matrix}$$

where the first row of the matrix indicates the impact of a one unit increase in Indonesian final demand on Indonesian value-added, the second row the impact on Malaysian value-added, etc. Interpreting the elements in the first row (from left to right), the Indonesian value-added is stimulated by Indonesian domestic demand to the extent that Indonesian domestic demand consumes products from domestic supply ($B^{II}*f^{II}$), plus the production of Indonesian inputs needed to produce the final goods imported from Malaysia ($B^{IM}*f^{MI}$), from the Philippines ($B^{IP}*f^{PI}$) etc.

Table 2. The impact of final demand on value added, emerging Asia

	1995	2000*	2000	2006
Domestic demand	72.3%	70.3%	68.9%	64.3%
Intra-regional trade	5.3%	5.8%	5.8%	6.8%
G3	11.4%	13.8%	16.1%	15.7%
within that EU	2.1%	2.4%	4.7%	5.8%
Japan	3.9%	4.1%	4.1%	3.2%
US	5.3%	7.3%	7.3%	6.6%
RoW	11.2%	10.1%	10.1%	14.2%
residual				-1.3%

Table 3. The impact of final demand on value added, China

	1995	2000*	2000	2006
Domestic demand	79.7%	79.3%	79.4%	69.7%
Intra-regional trade	2.0%	1.8%	1.8%	2.4%
G3	10.7%	12.5%	13.9%	16.6%
within that EU	2.1%	2.3%	3.8%	6.4%
Japan	4.1%	3.6%	3.6%	3.0%
US	4.5%	6.6%	6.6%	7.1%
RoW	8.0%	6.5%	6.5%	13.2%
residual				-2.4%

Table 4. The impact of final demand on value added, NIE3 and ASEAN4

	1995	2000*	2000	2006
Domestic demand	68.4%	63.0%	60.3%	57.9%
Intra-regional trade	7.0%	9.0%	9.0%	11.9%
within that China	2.1%	3.8%	3.8%	7.2%
G3	11.7%	14.9%	17.8%	14.6%
within that EU	2.1%	2.5%	5.4%	5.1%
Japan	3.9%	4.5%	4.5%	3.5%
US	5.8%	8.0%	8.0%	6.0%
RoW	12.9%	13.1%	13.1%	15.3%
residual				0.0%

Sources: AIO tables 1995, 2000, and authors' calculations.

Note: 2000 refers to EU3 under the EU line, and is directly comparable with 1995 results.*

Emerging Asia consists of China, the NIE3 (Korea, Singapore and Taiwan (R.O.C.)), and the ASEAN4 (Indonesia, Malaysia, the Philippines and Thailand).

Adjusted for Hong Kong's trade, the original (not re-exported) imports of Hong Kong is taken as intra-regional demand.

The residual indicates the non-statistical discrepancy in the GDP identity of the updated 2006 AIO table (for details see Section 4.)

The Tables 2-4 present the contribution ratios of four major final demand aggregates: domestic demand, intra-regional demand (the sum of exports to emerging Asian countries),

the G3 demand (exports to United States, EU15 and Japan) and exports to the rest of the world. The contribution ratios are presented separately for the following supply countries: emerging Asia (Table 2), China (Table 3), and non-China emerging Asia (Table 4).

The tables contain two columns for 2000, which refer to different country composition of the EU. The column marked with asterisks refers to EU3 (Germany, France and the United Kingdom) data, and is thus comparable with 1995 numbers in the first column, while the other column with no asterisks refers to EU15 and comparable with 2006 data in the last column.

The following results stand out from the analysis of emerging Asia as a whole (Table 2). Approximately two-thirds of the value added of emerging Asian countries is determined by domestic demand, while the share of external demand is around one-third.[17] More precisely, external factors accounted for 36.7% of the value added in 2006, implying *a significantly lower dependency of emerging Asia on exports than suggested by total trade data* (53%[18]). In addition, 6.8% of emerging Asia's value added was due to intra-regional demand, lowering the reliance of value added on extra-regional markets to below 30%. In 2006, the G3 countries accounted for slightly more than half of the extra-regional demand (15.7% of the value added) with the United States (6.6% of the value added) being the most important market, followed by the EU15 (5.8%) and Japan (3.2%).

The changes in the impact of the final demand components give some interesting insights. Since 1995, there is a trend increase in export dependence, indicating no sign of "decoupling", but more an increasing integration of emerging Asian countries to global trade. Dependence on intra-regional trade has also increased, in line with the strengthening of economic integration in emerging Asia. Despite its rising importance however, intra-regional trade has not compensated for the falling share of domestic demand in value added. Consequently, *the exposure of emerging Asia to extra-regional markets has increased*.

There have been differing trends in the sources of extra-regional demand in 1995-2006. The share of US demand increased between 1995 and 2000 from 5.3% to 7.3%, with a relatively stable share of the EU3 and Japan (close to 2% and 4%, respectively). After 2000, however, both the US and Japanese shares started to decline, in parallel with a significant increase in the share of EU15 from 4.7% to 5.8%. As a result, the *dependence of emerging Asia's value added on demand from the G3 economies declined slightly between 2000 and 2006.* However,

[17] The share of domestic demand of total value added in emerging Asia is significantly lower than in the advanced economies. Based on the AIO, the share of domestic demand of value added in 2006 was 91% in the United States, and in Japan 86%. Given that EU15 is not included in the production matrix of the AIO, comparable statistic is not available. See table A.6. for more details.

[18] Calculated as exports per GDP after aggregating National Accounts data at country level from the CEIC database.

the higher exposure of emerging Asia to extra-regional markets after 2000 was due to *stronger trade linkages with the rest of the world*, with its share in emerging Asia's value added increasing from 10.1% to 14.2% between 2000 and 2006.[19]

China, partly due to its size, is still less dependent on external markets than other countries in the region (Table 3). However, between 2000 and 2006, the share of external demand in the value-added of China increased substantially from 20% to 30%.

The comparison of China with the NIE3 and ASEAN4 countries by the sources of demand reveal an interesting pattern of division of labour within the region. Since 2000, China "outcrowded" the NIE3 and ASEAN4 countries from the G3 trade, and albeit its lower degree of openness, China had a higher exposure to the G3 markets in 2006 than the non-China block (16.6% vs. 14.6%, respectively). This finding is in line with the previous remark on the emergence of China as a major export platform in the region. As regards their exposure to demand from the rest of the world, China, the NIE3 and ASEAN4 countries were all more dependent on these markets in 2006 than in 2000. However, the increase in China's dependence was substantially stronger than that of the non-China block.

Finally, Table 4 also provides some information on the importance of China as a source of final demand within the region. *The dependency of the NIE3 and ASEAN4 countries' value added on Chinese markets was relatively low, at 7.2% in 2006*. The main channel of this impact, as shown by the import content analysis before, is via imported inputs to local production rather than direct imports of final goods. Albeit still at low level, *the exposure to demand from China increased substantially in recent years and almost doubled since 2000*. Moreover, by 2006 China became more important market for the NIE3 and ASEAN4 countries than the United States. More detailed country by country results are shown in Appendix A.6.

6. CONCLUSIONS

The paper contributed to the "decoupling debate" – i.e. whether the business cycle dynamics in emerging Asia have recently become less sensitive to the global demand trends - using a novel method based on an update of the Asian International Input-Output (AIO) table. In particular, the study analyzed the dependence of emerging Asia's value added through trade and production linkages on intra-regional demand, and on demand from the advanced economies, especially the United States, the EU15 and Japan. The updated 2006 AIO table

[19] The reasons behind China's opening up to the rest of the world are still to be investigated. One possible explanation being that China increased its manufacturing trade surplus against the rest of the world in order to compensate its growing trade deficit in oil and raw materials in this relation.

was used in two ways. First, we calculated the "backward linkages" of production, which allowed us to describe the inter-linkages of the emerging Asian countries in the production process. Second, as the main contribution of our paper, the dependency of each country's value added on domestic demand, intra-regional and extra-regional demand was computed.

The main findings of the paper are the following. First, only about one-third of the value added in emerging Asian countries is determined by external demand, significantly lower than the 50% exposure suggested by the aggregate trade data, while domestic demand contributes around two-thirds to the value added. Second, the dependence of emerging Asia's value added on export markets has steadily risen since 1995, a phenomenon in line with increasing global trade integration, and a clear evidence against the decoupling view. Third, although intra-regional and Chinese markets have both gained importance, they still account for only around 7% of the final demand. This share is also below the one suggested by trade data.

As it is evident from these results, the paper finds no support for the decoupling view. At the same time, however, it finds that, if the bias in trade data due to the segmentation of production is accounted for, the exposure of emerging Asia is significantly lower than suggested by trade statistics. In other words, on the one hand we find no evidence of decoupling, but on the other hand we calculate that emerging Asia is less "coupled" with the rest of the world than trade data suggests.

When interpreting the results, one should note the caveat that the analysis of the real linkages with the AIO table can only capture the direct trade effects, i.e. neither any "second-round" effects of an export slowdown on domestic demand via lower employment, wages or investment, nor any financial market or policy related channels are accounted for.

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Appendix A.1. The structure of the AIO table

The structure of the 2000 AIO table is shown in the Figure A.1 below. The scheme is simplified as it does not show the sectoral dimension of the table.[20] The way of reading the AIO table is very similar to the way of reading a standard input-output table. The three main blocks are intermediate demand (A), final demand (F) and exports (L). The first column of the production (or intermediate demand) block contains the supplier countries and the first row the use countries. As an example, A^{II} stands for the value of domestic inputs for production in Indonesia, and A^{IM} is the value of inputs from Indonesia used in the Malaysian production (Malaysian imports of intermediate goods from Indonesia) etc.

The row sums are the total outputs (X^i). The elements of the rows describe the purpose the output of each country is used for. For example, the first row describes what amount of Indonesia's total output is used as input for domestic production (A^{II}), as input for production in other countries of the production matrix (A^{IM} to A^{IU}), consumed / invested domestically (F^{II}), consumed / invested by other countries of the production matrix (F^{IM} to F^{IU}), and finally exported to Hong Kong (L^{IH}), the EU15 (L^{IO}) and the rest of the world (L^{IW}).

The column sums of the production block are the total inputs, which by definition equal the total outputs (X^is). The first column reads as follows: A^{II} indicates the domestic input content of Indonesian production, A^{MI} to A^{UI} are the input contents of Indonesian production from each country of the production matrix, A^{HI}, A^{OI} and A^{WI} are inputs from Hong Kong, the EU15 and the rest of the world, BA^I and DA^I are freight and insurance and import duties and taxes. The difference of total output and total intermediate inputs is the value-added (V^I).

[20] The main reason being that due to data limitations the update of the AIO matrix was possible only at a country level and thus we will focus on the aggregate / country level throughout the analysis. The numbers in the matrix are sectoral aggregates.

Figure A.1. The schematic layout of the 2000 Asian international Input-Output Table

The schematic image of the 2000 Asian international input-output table

		Intermediate Demand (A)										Final Demand (F)										Export (L)				
	code	Indonesia (AI)	Malaysia (AM)	Philippines (AP)	Singapore (AS)	Thailand (AT)	China (AC)	Taiwan (AN)	Korea (AK)	Japan (AJ)	U.S.A. (AU)	Indonesia (FI)	Malaysia (FM)	Philippines (FP)	Singapore (FS)	Thailand (FT)	China (FC)	Taiwan (FN)	Korea (FK)	Japan (FJ)	U.S.A. (FU)	Export to Hong (LH)	Export to EU (LO)	Export to R.O.W. (LW)	Statistical Discrepan (QX)	Total Outputs (XX)
Indonesia	(AI)	A^{II}	A^{IM}	A^{IP}	A^{IS}	A^{IT}	A^{IC}	A^{IN}	A^{IK}	A^{IJ}	A^{IU}	F^{II}	F^{IM}	F^{IP}	F^{IS}	F^{IT}	F^{IC}	F^{IN}	F^{IK}	F^{IJ}	F^{IU}	L^{IH}	L^{IO}	L^{IW}	Q^{I}	X^{I}
Malaysia	(AM)	A^{MI}	A^{MM}	A^{MP}	A^{MS}	A^{MT}	A^{MC}	A^{MN}	A^{MK}	A^{MJ}	A^{MU}	F^{MI}	F^{MM}	F^{MP}	F^{MS}	F^{MT}	F^{MC}	F^{MN}	F^{MK}	F^{MJ}	F^{MU}	L^{MH}	L^{MO}	L^{MW}	Q^{M}	X^{M}
Philippines	(AP)	A^{PI}	A^{PM}	A^{PP}	A^{PS}	A^{PT}	A^{PC}	A^{PN}	A^{PK}	A^{PJ}	A^{PU}	F^{PI}	F^{PM}	F^{PP}	F^{PS}	F^{PT}	F^{PC}	F^{PN}	F^{PK}	F^{PJ}	F^{PU}	L^{PH}	L^{PO}	L^{PW}	Q^{P}	X^{P}
Singapore	(AS)	A^{SI}	A^{SM}	A^{SP}	A^{SS}	A^{ST}	A^{SC}	A^{SN}	A^{SK}	A^{SJ}	A^{SU}	F^{SI}	F^{SM}	F^{SP}	F^{SS}	F^{ST}	F^{SC}	F^{SN}	F^{SK}	F^{SJ}	F^{SU}	L^{SH}	L^{SO}	L^{SW}	Q^{S}	X^{S}
Thailand	(AT)	A^{TI}	A^{TM}	A^{TP}	A^{TS}	A^{TT}	A^{TC}	A^{TN}	A^{TK}	A^{TJ}	A^{TU}	F^{TI}	F^{TM}	F^{TP}	F^{TS}	F^{TT}	F^{TC}	F^{TN}	F^{TK}	F^{TJ}	F^{TU}	L^{TH}	L^{TO}	L^{TW}	Q^{T}	X^{T}
China	(AC)	A^{CI}	A^{CM}	A^{CP}	A^{CS}	A^{CT}	A^{CC}	A^{CN}	A^{CK}	A^{CJ}	A^{CU}	F^{CI}	F^{CM}	F^{CP}	F^{CS}	F^{CT}	F^{CC}	F^{CN}	F^{CK}	F^{CJ}	F^{CU}	L^{CH}	L^{CO}	L^{CW}	Q^{C}	X^{C}
Taiwan	(AN)	A^{NI}	A^{NM}	A^{NP}	A^{NS}	A^{NT}	A^{NC}	A^{NN}	A^{NK}	A^{NJ}	A^{NU}	F^{NI}	F^{NM}	F^{NP}	F^{NS}	F^{NT}	F^{NC}	F^{NN}	F^{NK}	F^{NJ}	F^{NU}	L^{NH}	L^{NO}	L^{NW}	Q^{N}	X^{N}
Korea	(AK)	A^{KI}	A^{KM}	A^{KP}	A^{KS}	A^{KT}	A^{KC}	A^{KN}	A^{KK}	A^{KJ}	A^{KU}	F^{KI}	F^{KM}	F^{KP}	F^{KS}	F^{KT}	F^{KC}	F^{KN}	F^{KK}	F^{KJ}	F^{KU}	L^{KH}	L^{KO}	L^{KW}	Q^{K}	X^{K}
Japan	(AJ)	A^{JI}	A^{JM}	A^{JP}	A^{JS}	A^{JT}	A^{JC}	A^{JN}	A^{JK}	A^{JJ}	A^{JU}	F^{JI}	F^{JM}	F^{JP}	F^{JS}	F^{JT}	F^{JC}	F^{JN}	F^{JK}	F^{JJ}	F^{JU}	L^{JH}	L^{JO}	L^{JW}	Q^{J}	X^{J}
U.S.A.	(AU)	A^{UI}	A^{UM}	A^{UP}	A^{US}	A^{UT}	A^{UC}	A^{UN}	A^{UK}	A^{UJ}	A^{UU}	F^{UI}	F^{UM}	F^{UP}	F^{US}	F^{UT}	F^{UC}	F^{UN}	F^{UK}	F^{UJ}	F^{UU}	L^{UH}	L^{UO}	L^{UW}	Q^{U}	X^{U}
Freight and Insurance	(BF)	BA^{I}	BA^{M}	BA^{P}	BA^{S}	BA^{T}	BA^{C}	BA^{N}	BA^{K}	BA^{J}	BA^{U}	BF^{I}	BF^{M}	BF^{P}	BF^{S}	BF^{T}	BF^{C}	BF^{N}	BF^{K}	BF^{J}	BF^{U}					
Import from Hong Kong	(CH)	A^{HI}	A^{HM}	A^{HP}	A^{HS}	A^{HT}	A^{HC}	A^{HN}	A^{HK}	A^{HJ}	A^{HU}	F^{HI}	F^{HM}	F^{HP}	F^{HS}	F^{HT}	F^{HC}	F^{HN}	F^{HK}	F^{HJ}	F^{HU}					
Import from EU	(CO)	A^{OI}	A^{OM}	A^{OP}	A^{OS}	A^{OT}	A^{OC}	A^{ON}	A^{OK}	A^{OJ}	A^{OU}	F^{OI}	F^{OM}	F^{OP}	F^{OS}	F^{OT}	F^{OC}	F^{ON}	F^{OK}	F^{OJ}	F^{OU}					
Import from the R.O.W.	(CW)	A^{WI}	A^{WM}	A^{WP}	A^{WS}	A^{WT}	A^{WC}	A^{WN}	A^{WK}	A^{WJ}	A^{WU}	F^{WI}	F^{WM}	F^{WP}	F^{WS}	F^{WT}	F^{WC}	F^{WN}	F^{WK}	F^{WJ}	F^{WU}					
Duties and Import Commodity Taxes	(DT)	DA^{I}	DA^{M}	DA^{P}	DA^{S}	DA^{T}	DA^{C}	DA^{N}	DA^{K}	DA^{J}	DA^{U}	DF^{I}	DF^{M}	DF^{P}	DF^{S}	DF^{T}	DF^{C}	DF^{N}	DF^{K}	DF^{J}	DF^{U}					
Value Added	(VV)	V^{I}	V^{M}	V^{P}	V^{S}	V^{T}	V^{C}	V^{N}	V^{K}	V^{J}	V^{U}															
Total Inputs	(XX)	X^{I}	X^{M}	X^{P}	X^{S}	X^{T}	X^{C}	X^{N}	X^{K}	X^{J}	X^{U}															

* Each cell of A** and F** represents a matrix of 76 x 76 and 76 x 4 dimension, respectively.

In a columnwise direction, each cell in the table shows the input compositions of industries of respective country. A for example shows the input compositions of Indonesian industries vis-à-vis domestically produced goods and services, i.e. domestic transactions of Indonesia. A^{MI} in contrast shows the input composition of Indonesian industries for the imported goods and services from Malaysia. The cells A^{PI}, A^{SI}, A^{TI}, A^{CI}, A^{NI}, A^{KI}, A^{JI}, A^{UI}, A^{HI}, A^{OI}, A^{WI} allow the same interpretation for the imports from other countries.
BA and DA give international freight & insurance and taxes on these import transactions.

Turning to the 11th column from the left side of the table, it shows the compositions of goods and services that have gone to final demand sectors of Indonesia. F^{II} and F^{MI}, for example, maps the the inflow into Indonesian final demand sectors, of goods and services domestically produced and of those imported from Malaysia, respectively. The rest of the column is read in the same manner as is done for the 1st column of the table.
L^{*H}, L^{*O}, L^{*W} are exports (vectors) to Hong Kong, EU and the Rest of the World, repectively.
Vs and Xs are value added and total input/output, as seen in the conventional national I-O table.

Appendix A.2. The updating procedure

The scheme of the updating procedure is shown in Figure A.2.1. The updating procedure and the data sources used are similar to Mori and Sasaki (2006), with two main improvements. First, the trade data used for the update differs by type of goods, and thus takes into account the shift in the composition of trade from final to intermediate goods. Second, the data are adjusted for Hong Kong's entrepot trade.[21]

The starting point of the updating procedure is the 2000 AIO table. In general, the 2006 value of a specific cell in the AIO table is calculated by multiplying the 2000 value of the cell by its nominal growth rate in 2000-2006. The steps of the procedure and the estimation of the 2006 / 2000 growth rates are as follows:

Intermediate demand block (A)

- Value added (V^{j}_{t+1}). The value added growth rates for each country are taken from National Account statistics (the datasource being the CEIC database).
- Total output (X^{j}_{t+1}). With the exception of the United States, direct information on total economy's output is not available. Thus, total (gross) output is estimated by applying the output / value added ratio in the manufacturing sector to the total economy's value added. Data on manufacturing value added is from national accounts sources, output data are from industrial statistics (datasource CEIC).
- Imported inputs (A^{ij}_{t+1}). The calculation of growth rates of imported inputs draws on two data sources. First, in order to keep consistency, we use the growth rate of imports from the National Accounts statistics. The advantage of using this statistics is that it includes trade of goods and services, while the disadvantage is that it does not provide information by the direction of trade. To get an estimate for changes in the direction of trade, we combined National Accounts import growth with the information from the COMTRADE. The COMTRADE database provides information on imports not only by direction, but also by type of good, i.e. it helps us to take into account the increasing share of intermediate inputs in total imports. (The classification of imports by type of goods I described in Appendix A.3.)

[21] In 2006, 95% of the Hong Kong's exports were re-exported. This re-exports are overwhelmingly originated from China and aimed at overseas markets. As Hong Kong is considered as part of the emerging Asian region, then if not corrected for, the Hong Kong re-exports may result in an overestimation of the intra-regional and underestimation of extra-regional demand. Given that Hong Kong is not included in the production matrix of the AIO table the adjustment has to be made as an additional exercise.

However, the COMTRADE only includes data on goods trade, thus we have to assume that changes in imports by direction and by type of good are similar for goods and services.[22]

The formula used to estimate the imported input growth rate is the following:

$$(\text{int}\, M_{t+1}^{*ij} / \text{int}\, M_t^{*ij}) = (M_{t+1}^{NA} / M_t^{NA}) * \frac{(\text{int}\, M_{t+1}^{COMij} / \text{int}\, M_t^{COMij})}{(M_{t+1}^{COM} / M_t^{COM})},$$

where the superscripts *NA* and *COM* stand for National Accounts and COMTRADE respectively and *intM* indicates imports of intermediate goods and *M* is for total imports.[23]

- Freight and insurance and import duties (BA^{j}_{t+1} , DA^{j}_{t+1}). The growth rates of items freights and insurance and import duties are chosen to be the same as the import growth rate from the National Accounts. This implies the assumption of unchanged share of these items in total imports from 2000 to 2006.
- Domestic input of production (A^{jj}_{t+1}). The domestic input content of production is calculated as a residual of the column, i.e. total inputs minus total imported inputs ($=X^{j}_{t+1}-V^{j}_{t+1}- BA^{j}_{t+1} - DA^{j}_{t+1} - \sum A^{ij}_{t+1}$)

The update of the *final demand block (F)* follows the same pattern. The final demand of each country is calculated by updating the components of consumption and investments separately.

- Total consumption and investments (C^{j}_{t+1}, I^{j}_{t+1}). The growth rates of consumption and investments are taken from the National Accounts statistics. Consumption is defined as the sum of private and government consumption, while investments equal gross capital formation (gross fixed capital formation plus inventories).
- Imported final goods (cF^{ij}_{t+1}) and imported capital goods (iF^{ij}_{t+1}). The growth rates are calculated according to the formula given for the imported inputs above, with the difference that the COMTRADE data on final and capital goods are used instead of the data on intermediate goods.

$$(cM_{t+1}^{*ij} / cM_t^{*ij}) = (M_{t+1}^{NA} / M_t^{NA}) * \frac{(cM_{t+1}^{COMij} / cM_t^{COMij})}{(M_{t+1}^{COM} / M_t^{COM})},$$

$$(capM_{t+1}^{*ij} / capM_t^{*ij}) = (M_{t+1}^{NA} / M_t^{NA}) * \frac{(capM_{t+1}^{COMij} / capM_t^{COMij})}{(M_{t+1}^{COM} / M_t^{COM})},$$

[22] COMTRADE data are not available for Taiwan. Import growth rate for Taiwan is taken from the National Accounts statistics, i.e. it lacks heterogeneity by countries of origin and types of goods.

[23] Note that, if the growth rate of total goods imports from COMTRADE (M^{COM}) would equal the growth rate of total goods and services imports from National Accounts (M^{NA}) then the growth rate would be simply the growth rate of intermediate goods imports.

where the superscripts *NA* and *COM* stands for National Accounts and the COMTRADE, respectively and *cM* and *capM* indicates imports of consumption and capital goods and *M* total imports.

- Freight and insurance, and import duties (cBF^{j}_{t+1} , iBF^{j}_{t+1}, cDF^{j}_{t+1} , iDF^{j}_{t+1}). Similar to the intermediate demand block.
- Domestically produced final and capital goods (cF^{ij}_{t+1}, iF^{ij}_{t+1}). Residual similar to the intermediate demand block.

Export block (L)

- Exports to Hong Kong, EU15 and RoW (L^{iH}_{t+1}, L^{iO}_{t+1}, L^{iW}_{t+1}). Growth rates are calculated in a similar manner as before, i.e. as a combination of the National Accounts' export growth rates and the COMTRADE export growth rates by country of destination (HK, EU15, RoW).

$$(EX^{*ij}_{t+1} / EX^{*ij}_{t}) = (EX^{NA}_{t+1} / EX^{NA}_{t}) * \frac{(EX^{COMij}_{t+1} / EX^{COMij}_{t})}{(EX^{COM}_{t+1} / EX^{COM}_{t})}$$

- Statistical discrepancy (Q^{i}_{t+1}). To calculate the discrepancy, the data for 2006 data are taken from the National Accounts.

Adjusting for Hong Kong's entrepot trade

According to Hong Kong trade statistics, re-exports accounted for 95% of the country's exports in 2006. Re-exports consists of goods that pass through Hong Kong without having undergone "a manufacturing process which has changed permanently the shape and nature, form or utility of the product"[24]. Hong Kong's re-exports are overwhelmingly related to trade between China and the overseas markets. In total re-exports of Hong Kong, the share of China's exports to out-of-region markets was 39% in 2006, while the share of imports of China from out-of-region markets was 22% (Figure A.2.2). Thus, if not corrected for, the Hong Kong re-exports may result in an overestimation of the intra-regional and underestimation of extra-regional demand.

The Hong Kong trade statistics provides information on re-exports by country of origin, destination, and also by type of good and destination. Based on this information, we used the following formulas to adjust the imports of intermediate, consumer and capital goods respectively for the Hong Kong entrepot trade.

[24] US Department of the Treasury (2007), Report to Congress on International Economic and Exchange Rate Policies, Appendix II Chain's Trade Data, June 2007.

$$A^{ij}{}_{HK} = A^{ij} + \eta^{j}_{\text{int}} * \gamma^{ij} * LH^{i}$$

$$cF^{ij}{}_{HK} = cF^{ij} + \eta^{j}_{cons} * \gamma^{ij} * LH^{i}$$

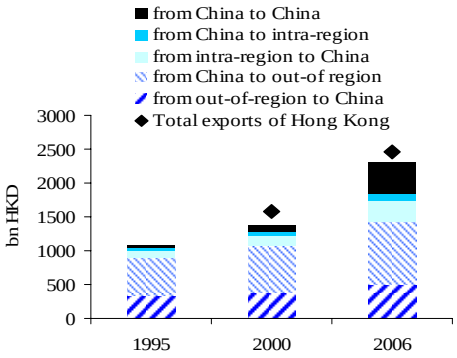
$$iF^{ij}{}_{HK} = iF^{ij} + \eta^{j}_{cap} * \gamma^{ij} * LH^{i}$$

where LH^{i} is exports from (origin) country *i* to Hong Kong,

$\gamma^{ij} = \frac{RX^{*ij}}{M^{*i}}$ is the share of re-exports (RX) from (origin) country *i* to (destination) country *j* in total imports of Hong Kong from (origin) country *i*, and

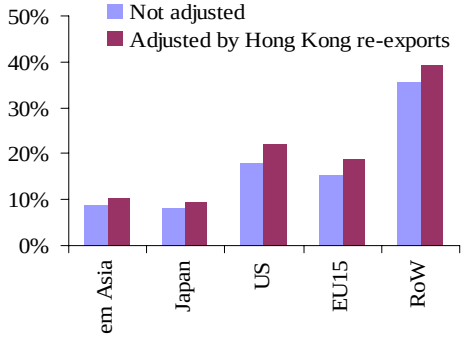
$\eta^{j}_{g} = \frac{RX^{*j}_{g}}{RX^{*j}}$, is the share of intermediate, capital and consumption goods (g={int, cons, cap} type of good) in re-exports to (destination) country *j*. [25]

Figure A.2.2: The value of China-related trade in the total exports of Hong Kong



Source: CEIC.

Figure A.2.3: China's adjusted and non-adjusted export weights



Source: AIO updated.

As a result of the adjustment, the new trade weights of China indicate a significantly higher share for the United States, the EU15 and rest of the world markets, while intra-regional markets and Japan gain relatively less in importance (Figure A.2.3). In fact, the share of the United States in China's total exports rises from 18% to 22% in 2006, the share of EU15 from 15% to 19% and the rest of the world from 36% to 39%, an almost 4 percentage point increase on average. The adjustment's impact on the shares of emerging Asia and Japan are lower, a 1.4 percentage point on average.

[25] Given that data on re-exports by type of good is only available in relation to destination countries, we apply the assumption that the distributions across the types of goods are similar regardless of the country of origin of re-exports.

Figure A.2.1 Schematic chart of the updating procedure

Updating the 2000 Asian international input-output table

		Intermediate Demand (A)										Final Demand (F)										Export (L)			Statistical Discrepancy	Total Outputs
	code	Indonesia (AI)	Malaysia (AM)	Philippines (AP)	Singapore (AS)	Thailand (AT)	China (AC)	Taiwan (AN)	Korea (AK)	Japan (AJ)	U.S.A. (AU)	Indonesia (FI)	Malaysia (FM)	Philippines (FP)	Singapore (FS)	Thailand (FT)	China (FC)	Taiwan (FN)	Korea (FK)	Japan (FJ)	U.S.A. (FU)	Export to Hong Kong (LH)	Export to EU (LO)	Export to R.O.W. (LW)	(QX)	(XX)
												C	I													
Indonesia	(AI)	A^{II}										cF^{II}	iF^{II}									L^{IH}			Q^{I}	X^{I}
Malaysia	(AM)	A^{MI}		$A^{jj}_{t+1}=X^{j}_{t+1}-V^{j}_{t+1}-DA^{j}_{t+1}-BA^{j}_{t+1}-\sum A^{ij}_{t+1}$								cF^{MI}	iF^{MI}		$cF^{jj}_{t+1}=C^{j}_{t+1}-cDA^{j}_{t+1}-cBA^{j}_{t+1}-\sum cF^{ij}_{t+1}$								L^{MH}			Q^{M}	X^{M}
Philippines	(AP)	A^{PI}										cF^{PI}	iF^{PI}		$iF^{jj}_{t+1}=I^{j}_{t+1}-iDA^{j}_{t+1}-iBA^{j}_{t+1}-\sum iF^{ij}_{t+1}$							L^{PH}			Q^{P}	X^{P}
Singapore	(AS)	A^{SI}										cF^{SI}	iF^{SI}									L^{SH}			Q^{S}	X^{S}
Thailand	(AT)	A^{TI}										cF^{TI}	iF^{TI}									L^{TH}			Q^{T}	X^{T}
China	(AC)	A^{CI}										cF^{CI}	iF^{CI}									L^{CH}			Q^{C}	X^{C}
Taiwan	(AN)	A^{NI}	}	$A^{ij}_{t+1} = A^{ij}_{t} * (intM^{*ij}_{t+1} / intM^{*ij}_{t})$								cF^{NI}	iF^{NI}	}	$cF^{ij}_{t+1} = cF^{ij}_{t} * (cM^{*ij}_{t+1} / cM^{*ij}_{t})$							L^{NH}			Q^{N}	X^{N}
Korea	(AK)	A^{KI}										cF^{KI}	iF^{KI}		$iF^{ij}_{t+1} = iF^{ij}_{t} * (capM^{*ij}_{t+1} / capM^{*ij}_{t})$							L^{KH}			Q^{K}	X^{K}
Japan	(AJ)	A^{JI}										cF^{JI}	iF^{JI}									L^{JH}			Q^{J}	X^{J}
U.S.A.	(AU)	A^{UI}										cF^{UI}	iF^{UI}									L^{UH}			Q^{U}	X^{U}
Freight and Insurance	(BF)	BA^{I}		$BA^{j}_{t+1} = BA^{j}_{t} * (intM^{*j}_{t+1} / intM^{*j}_{t})$								cBF^{I}	iBF^{I}		$cBF^{j}_{t+1} = cBF^{j}_{t} * (consM^{*j}_{t+1} / consM^{*j}_{t})$											
Import from Hong Kong	(CH)	A^{HI}										cF^{HI}	iF^{HI}		$cF^{ij}_{t+1} = cF^{ij}_{t} * (consM^{*ij}_{t+1} / consM^{*ij}_{t})$							$L^{ij}_{t+1} = L^{ij}_{t} * (EX^{*ij}_{t+1} / EX^{*ij}_{t})$				
Import from EU	(CO)	A^{OI}	}	$A^{ij}_{t+1} = A^{ij}_{t} * (intM^{*ij}_{t+1} / intM^{*ij}_{t})$								cF^{OI}	iF^{OI}	}	$iF^{ij}_{t+1} = iF^{ij}_{t} * (capM^{*ij}_{t+1} / capM^{*ij}_{t})$							$Q^{ij}_{t+1} = Q^{ij}_{t} * (Q^{*ij}_{t+1} / Q^{*ij}_{t})$				
Import from the R.O.W	(CW)	A^{WI}										cF^{WI}	iF^{WI}													
Duties and Import Commodity Taxes	(DT)	DA^{I}		$DA^{j}_{t+1} = DAjt * (intM^{*j}_{t+1} / intM^{*j}_{t})$								cDF^{I}	iDF^{I}	}	$cDF^{j}_{t+1} = cDF^{j}_{t} * (consM^{*j}_{t+1} / consM^{*j}_{t})$ $iDF^{j}_{t+1} = iDF^{j}_{t} * (capM^{*j}_{t+1} / capM^{*j}_{t})$											
Value Added	(VV)	V^{I}		$V^{j}_{t+1} = V^{j}_{t} * (V^{*j}_{t+1} / V^{*j}_{t})$								C^{I}	I^{I}		$C^{j}_{t+1} = C^{j}_{t} * (C^{*j}_{t+1} / C^{*j}_{t})$, $I^{j}_{t+1} = I^{j}_{t} * (I^{*j}_{t+1} / I^{*j}_{t})$											
Total Inputs	(XX)	X^{I}		$X^{j}_{t+1} = X^{j}_{t} * (X^{*j}_{t+1} / X^{*j}_{t})$																						

X^{*j}_{t} = Gross production of country j (National Accounts data) or industrial gross output

V^{*j}_{t} = GDP of country j (National Accounts)
C^{*ij}_{t} = total consumption of country j (National Accounts)
I^{*ij}_{t} = capital accumulation of country j (National Accounts)
EX^{*ij}_{t} = exports of country j to country i (COMTRADE+National Accounts)

$intM^{*j}_{t}$ = intermediate goods imports of country j (COMTRADE+National Accounts)

$intM^{*ij}_{t}$ = intermediate goods imports of country j from country i (COMTRADE+National Accounts)
$consM^{*j}_{t}$ = consumption goods imports of country j (COMTRADE+National Accounts)
$consM^{*ij}_{t}$ = consumption goods imports of country j from country i (COMTRADE+National Accounts)
$capM^{*j}_{t}$ = capital goods imports of country j (COMTRADE+National Accounts)
$capM^{*ij}_{t}$ = capital goods imports of country j from country i (COMTRADE+National Accounts)

Appendix A.3. Classification of goods by Broad Economic Categories (BEC)

1 Capital goods
Sum of categories:

41	Capital goods (except transport equipment)
521	Transport equipment, industrial

2 Intermediate goods
Sum of categories:

111	Food and beverages, primary, mainly for industry
121	Food and beverages, processed, mainly for industry
21	Industrial supplies not elsewhere specified, primary
22	Industrial supplies not elsewhere specified, processed
31	Fuels and lubricants, primary
322	Fuels and lubricants, processed (other than motor spirit)
42	Parts and accessories of capital goods (except transport equipment)
53	Parts and accessories of transport equipment

3 Consumption goods
Sum of categories:

112	Food and beverages, primary, mainly for household consumption
122	Food and beverages, processed, mainly for household consumption
522	Transport equipment, non-industrial
61	Consumer goods not elsewhere specified, durable
62	Consumer goods not elsewhere specified, semi-durable
63	Consumer goods not elsewhere specified, non-durable

4 Other goods
Sum of categories:

21	Motor spirit
51	Passenger motor cars
7	Goods not elsewhere specified

Note: When the breakdown of goods to capital, intermediate and consumption goods is used in the paper, the three first categories are used. However, in the cases where total trade is used, then the data also includes the fourth category of Other goods.

Appendix A.4. Sensitivity analysis - results from the updated 1995 AIO table

As a sensitivity check of the updating procedure we also updated the 1995 AIO table to year 2000 and compared the results from this updated table with that from the "official" 2000 AIO table.

The updating procedure was similar to the one used in the paper: we took the 1995 AIO Table as a starting point and updated each cell according to the steps described in section A.2. Data limitations were somewhat more severe than in the original exercise. First, as no COMTRADE import data was reported by the Philippines for 1995, we used the export data reported by partner countries adjusted for the freight and insurance and import duties component. Second, Indonesian producer prices were proxied by the average producer price inflation in Malaysia, the Philippines and Thailand. Similar to the original exercise we lack COMTRADE trade data for Taiwan, applying the output / value added ratio in the manufacturing sector to the total economy's value added and assume changes in imports by direction and by type are similar for goods and services.

To test the sensitivity of our findings to the updating procedure, we calculated the Leontieff coefficients and the impacts of final demand on value added from the updated 1995 table and compared the results with the ones from the "official" 2000 AIO table.

The Leontieff coefficients from the updated 1995 AIO table indicate less significant changes in the production network between 1995 and 2000, and a stronger concentration of suppliers of inputs than the "official" 2000 AIO.

Figure A4.1 Leontieff coefficients from the updated 1995 AIO table

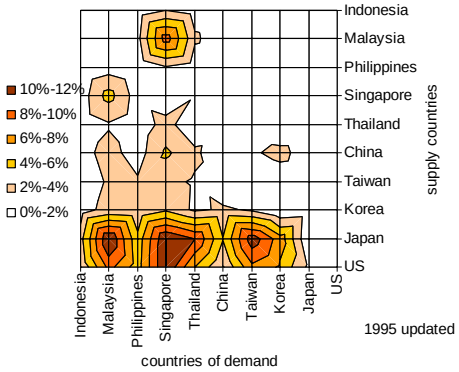
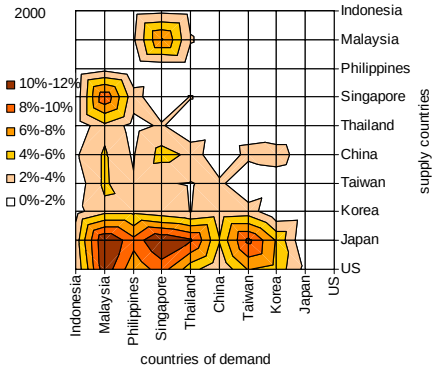


Figure A4.2 Leontieff coefficients from the "official" 2000 AIO table



However, the results from the impact of final demand on value added analysis with the updated 1995 AIO table are not significantly different from the findings of the "official" 2000 AIO table, the main difference being that the updated 1995 AIO table overestimates the dependence on domestic demand by 2 percentage points and underestimates the dependence on the rest of the world by the same amount.

Table A4.1. The impact of final demand on value added, not adjusted for Hong Kong trade

	updated 1995 AIO Table	official 2000 AIO Table	difference in pps
Domestic demand	70%	68%	2%
Intra-regional trade	8%	7%	0%
G3	13%	13%	0%
within that EU3	2%	2%	0%
Japan	4%	4%	0%
US	7%	7%	0%
RoW	10%	12%	-2%
residual	0%	-1%	1%

Appendix A.5. The derivation and interpretation of the main indicators used in the analysis

Backward linkages (Leontieff coefficients)

Let $\alpha^{ij} = \frac{A^{ij}}{X^{j}}$,

where index *i*=(I, M …, U) depicts the supplier country and *j* =(I, M …, U) is the country of demand. X is total production, A is intermediate inputs from the supplier country used in the production of the country of demand.

Then the AIO Table can be written as:

$$\begin{aligned}
\alpha^{II}X^{I} + \alpha^{IM}X^{M} + ... + \alpha^{IU}X^{U} + F^{II} + F^{IM} + ... + Q^{I} = X^{I} \\
\alpha^{MI}X^{I} + \alpha^{MM}X^{M} + ... + \alpha^{MU}X^{U} + F^{MI} + F^{MM} + ... + Q^{M} = X^{M} \\
... \\
\alpha^{UI}X^{I} + \alpha^{UM}X^{M} + ... + \alpha^{UU}X^{U} + F^{UI} + F^{UM} + ... + Q^{U} = X^{U}
\end{aligned}$$

or in a matrix form:

$$\begin{bmatrix} \alpha^{II} & \alpha^{IM} & . & \alpha^{IU} \\ \alpha^{MI} & \alpha^{MM} & . & \alpha^{MU} \\ . & . & . & . \\ \alpha^{UI} & \alpha^{UM} & . & \alpha^{UUI} \end{bmatrix} x \begin{bmatrix} X^{I} \\ X^{M} \\ . \\ X^{U} \end{bmatrix} + \begin{bmatrix} F^{II} \\ F^{MI} \\ . \\ F^{UI} \end{bmatrix} + \begin{bmatrix} F^{IM} \\ F^{MM} \\ . \\ F^{UM} \end{bmatrix} + ... + \begin{bmatrix} Q^{I} \\ Q^{M} \\ . \\ Q^{U} \end{bmatrix} = \begin{bmatrix} X^{I} \\ X^{M} \\ . \\ X^{U} \end{bmatrix}$$

in short: **AX+Y=X**

To answer the question how much production is needed to meet 1 unit of demand the system of equation should be solved to X:

$X=(I-A)^{-1}Y=BY$,

where *B* is called the *Leontieff coefficient matrix.*

The B^{ij} element of the matrix indicates the number of unit of production needed in country i to produce 1 unit of value added in country j.

The impact of final demand on value-added

The formula used is

$$IFv^j = \hat{\upsilon} * B * f^j,$$

where B is the Leontieff coefficient, f^j is final demand of country j and v is a diagonal matrix constructed from the elements of $v^j=V^j / X^j$ and f^j is the demand vector of country j.

For interpretation purposes let's assume the case of a one unit increase in final demand of Indonesia (f^I). The impact of Indonesian final demand on production of countries in the matrix (IF^I) is the following:

$$IF^I = \begin{matrix} B^{II} f^{II} + B^{IM} f^{MI} + ... + B^{IU} f^{UI} \\ B^{MI} f^{II} + B^{MM} f^{MI} + ... + B^{MM} f^{UI} \\ ... \\ B^{UI} f^{II} + B^{UM} f^{MI} + ... + B^{UU} f^{UI} \end{matrix},$$

where the first row of the matrix indicates the impact on Indonesian production, the second row the impact on the Malaysian production etc.

Interpreting the elements of the formula in the first row, the Indonesian production is stimulated by Indonesian domestic demand to the extent that Indonesian domestic demand consumes products from domestic supply ($B^{II}*f^{II}$), plus the production of Indonesian inputs needed to produce the final goods imported from Malaysia ($B^{IM}*f^{MI}$), the Philippines ($B^{IP}*f^{PI}$) etc.

Multiplying the IF^i matrix with the v diagonal matrix, the formula gives the level of induced value added rather than that of the induced production.

Appendix A.6. Detailed results from the impact of final demand on value added exercise.

Year 2006 with adjustment for Hong Kong entrepot trade

	Demand countries												
	Indonesia	Malaysia	Phillippines	Singapore	Thailand	China	Taiwan	Korea	Japan	US	HK	EU15	RoW
Source countries													
Indonesia	**74%**	1%	0%	0%	1%	2%	1%	1%	4%	3%	0%	3%	9%
Malaysia	1%	**31%**	1%	2%	2%	9%	2%	2%	5%	12%	1%	9%	20%
Philippines	0%	1%	**55%**	0%	1%	8%	1%	1%	4%	6%	1%	6%	7%
Singapore	1%	2%	1%	**26%**	1%	6%	1%	2%	2%	8%	4%	8%	32%
Thailand	1%	1%	0%	1%	**54%**	5%	1%	1%	5%	7%	1%	5%	21%
China	0%	0%	0%	0%	0%	**70%**	0%	1%	3%	7%	0%	6%	13%
Taiwan	0%	1%	0%	0%	1%	16%	**49%**	1%	5%	12%	1%	8%	17%
Korea	0%	0%	0%	0%	0%	6%	1%	**65%**	2%	4%	1%	4%	14%
Japan	0%	0%	0%	0%	0%	2%	1%	1%	**84%**	3%	0%	2%	5%
US	0%	0%	0%	0%	0%	0%	0%	0%	0%	**91%**	0%	1%	6%

The percentages indicate the ratio of demand from each country to the total value-added produced in the source countries
The rows should sum up to 100%, the difference being the sum of the residual and the statistical discrepancy (not included in the table)

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