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Abstract

The paper is motivated by the current emphasis on the share of domestic value added in exports (SVEX) as a policy criterion for export development strategy in developing countries. Our hypothesis is that, the policy emphasis on SVAD, which harks back to the import substitution era, is not consistent with the objectives of achieving economic growth with employment generation in this era of economic globalisation. We test this hypothesis by examining relationship of SVEX with both export-induced employment and the total domestic value added (TVAD) or the contribution of exports to GDP by applying the standard input-output methodology to data from the Indonesian manufacturing. Our findings do not support the widely held view in policy circles that industries characterised by higher SVAD have the potential to make a greater contribution to employment generation and TVAD. The policy inference is that in this era of economic globalisation, in designing export development policy, policy makers should focus on the export potential of industries rather than on the share of domestic value added of exports

Key words: Indonesia, linkages, value added, global value chain, global production sharing

JEL classification: F13, F14, O19

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1. Introduction

Policy makers in Indonesia place emphasis on the share of domestic value added in exports (SVAD) when determining sectoral priorities in of export development. For instance, in November 2014, President Joko Widodo asked companies engaged in domestic oil palm industry to accelerate the 'downstreaming' of the industry in order to "increase the value [added] and the export volume of palm oil products".[1,2] Earlier, a ban on raw minerals export came into force in January 2014. There was a ban on exports of log and wood splinters during 1981-1986. This policy emphasis has also resulted in protectionist policies in an array of restrictions on intermediate goods imports. For instance, in 2012 the government imposed tariffs on imports of machinery and materials used in the assembly of automobiles. The regulation stipulates that "at least 30% of total value of machines used must have been locally produced".[3] Similar policies are found in other sectors such as power plants, footwear industry, food and beverages, etc. (Patunru and Rahardja 2015). In 2017, the Ministry of Industry introduced regulation requiring a minimum of 30% local content in the manufacturing of 4G hand phones.[4]

The policy emphasis on SVAD is not unique to Indonesia. In India, a key focus of the Modi government's grand vision of 'make-in-India' is to "incubate domestic industry rather than expose it to undue pressure of competition"[5] with a view to broadening and deepening the domestic procurement base of export-oriented industries. The past three years have seen introduction of selective tariff increases and financial incentives to promote domestic intermediate goods production to encourage export producers to turn to domestically produced inputs (Athukorala 2018, Sharma 2015). In South Africa, the National Industrial Policy Framework promotes the "beneficiation of raw materials in downstream sectors in a logical progression to complete various chains in the South African economy".[6] The PNG's Minister

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[1] As reported in *Kompas* daily, 28 November 2014.
[2] Downstreaming also goes by other names: beneficiation, linkage approach, and value-added approach. In Indonesia it is popularly known as 'hilirisasi' .
[3] Minister of Finance Regulation No. 76/2012.
[4] Minister of Industry Regulation No. 29/2017.
[5] See http://commerce.gov.in/PageContent.aspx?Id=64 (accessed on 17 June 2018).
[6] A policy brief released by South Africa's Department of Trade and Industry in 2006, cited by Hausmann et al. (2008).

of Trade and Industry reportedly announced that his government is "keen to promote downstream processing of raw materials to create value-added products for export and to generate employment".[7] There are many more examples, from Solomon Island (affecting its timber and fish industry), Ghana and Gabon (log), Zambia (copper), Botswana (diamond), and Australia (uranium). All of these policies aim to ban export of raw materials or intermediate goods in the expectation that they would instead be used as inputs in domestic export-oriented final goods industries.

The usual justification given by the proponents of these policies is that increase in domestic input usage as a percentage of gross output of exports (*per unit value added*[8]) would create more domestic employment, while increasing the contribution to overall growth of the economy (increase in GDP) in terms of *total* net export earnings (total value added of exports). What is overlooked in this reasoning is that under export-oriented industrialisation (as against the conventional import-substitution industrialisation) direct policy intervention to per unit domestic value added could in fact hinder growth and employment generation of domestic manufacturing, for three main reasons. First, production for competitive export markets requires the use of high-quality inputs procured at world market prices. Second, in a context where industrial production is becoming increasingly globalised driven by the on-going process of global production sharing (production fragmentation), naturally per unit value added in exports tends to *decline* everywhere. Therefore, increase in total net exports earnings (that is, total domestic value added of exports) of industries based on global production sharing depends increasingly on the expansion of export *volume*.[9] Third, intermediate goods production is typically more capital intensive compared to assembly of final goods that is more labour intensive. This means that shifting the domestic production structure towards final goods production and away from intermediate production would enhance the employment generation potential of domestic manufacturing in a labour-abundant country (that is, generate 'pro-poor ' growth) (Little 1989).

[7] As reported in *New York Times* in 2006 and cited by Hausmann et al. (2008).

[8] In the rest of the paper, for brevity, we use 'value added' to imply 'per unit value added', except when explicit distinction is needed.

[9] Therefore, it is important to distinguish between total values added and per unit valued (value added ratio) in analyzing gains from exports.: the latter may decline while the former goes up.

The emphasis on domestic value added as a policy criterion has received added impetus from a new wave of literature dealing with the measurement and patterns of manufacturing exports after converting gross (customs record-based) data into 'value-added' terms using input-output methodology.[10] This literature was originally motivated by a valid concern that the gross trade data tend to exaggerate the magnitudes of bilateral trade imbalances under the on-going process of global production sharing. This concern arose mainly because of widening trade deficit of the USA with China underpinned by China's rise as the 'assembly centre' within production networks (Athukorala & Yamashita 2009, Bergsten et al. 2006, Dedrik et al. 2010). It was for this reason that the former WTO Director General, Pascal Lamy initiated the WTO-OECD project on valued added trade (Lamy 2011). However, subsequently many researchers and policy advisors have begun to use the data generated by the WTO-OECD project (and other research projects subsequently emerged to generate value added trade data such as the Groningen's World Input-Output Database) for making inferences relating to developmental implications of export-oriented industrialisation and various other facets of global economic integration.[11]

The purpose of this paper is to assess the validity of using the share of domestic value added (value added -output ratio) as a performance criterion in designing policies for export-oriented growth. Our hypothesis is that in the context of the on-going process of internationalisation of production, industries characterised by high-import intensity (low per unit domestic value added) have the potential to make a greater contribution to employment generation and growth of national income compared to industries that are deeply rooted in the domestic economy. The import intensities of most of the dynamic product areas are largely determined by factors beyond the control of the individual exporting nations. The us of SVAD as a policy guide can therefore be both ineffective and counterproductive. We provide evidence in support of this hypothesis by examining the relationship of value added both with the employment intensity of Indonesian exports and with the contribution of exports to national income of the country by applying the standard input-output methodology to data for the years 1995, 2000, 2005 and 2010.

The rest of the paper is organised in four sections. Section 2 spells out the conceptual issues surrounding the use of domestic value added as a policy criterion, in order to provide the context for the ensuing analysis. Section 3 describes the input-output framework used for

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[10] See Johnson (2014) and Timmer et al. (2014) for surveys of this literature.
[11] See criticism to this approach in Patunru and Athukorala (2019).

estimating per unit value added, employment intensity and output (contribution to GDP). Section 4 presents and discusses the results. The final section summarises the key findings and offers some concluding remarks.

2. The Issue

The emphasis on domestic value added (alternatively known as 'domestic content' and 'domestic retained value') was central to the policy debate on industrialisation in the first three decades of the Post-War era when import-substitution (IS) held sway as the basic tenet of development strategy. It provided the justification for imposing local content requirement for foreign-invested firms in domestic manufacturing and selectivity in tax concession and other incentives for firms to encourage them to use domestic inputs in the production process. Estimating and analysing the determinants of domestic value added or import intensity of exports, and identifying 'key industries' (that is, industries with strong domestic supply base in terms of forward- and backward input linkages) were a key focus of the empirical development economic during this period.[12]

The basic policy thrust of IS strategy was to turn inward and seek the key to industrial development in greater interaction between domestic industries, while ignoring 'efficiency' (or 'factor proportions') considerations of resource allocations advocated by mainstream economists (Hirschman 1958). Therefore, the empirical development literature at the time mainly intended to help policy makers to find "*an alternative* … to linking the economy to the rest of the world on the basis of comparative advantage" (Findlay 1984, p. 23) (emphasis added).

The emphasis on domestic value added as a policy criterion dissipated from the development literature from about the late 1970s because of the important paradigm shift in development thinking away from import-substitution and toward export-oriented industrialisation. This is because, in a labour abundant economy, attempts to 'create' domestic value added through direct policy intervention could stifle the evolution of the export structure of a given country in line with its comparative advantage in internationalisation of production.

[12] See Hazari (1970), Acharya and Hazari (1971), Bulmer-Thomas (1978) and the literature cited therein. Surprisingly these papers are missing in the reference lists of the recent works on value-added trade even through there is no real novelty in the methodology used compered to this early literature.

This in turn will frustrate the achievement of employment and income growth objectives. There are two key relevant considerations here.

First, in an open economy, the factor intensity of production depends not only upon the technology in the final and intermediate stages of domestic production, but also upon the structure of foreign trade. This is because participation in international trade provides the economy with the opportunity to specialise in products in which it has comparative advantage (i.e. labour-intensive products in the case of a surplus labour economy), while relying on world trade for the procurement of intermediate inputs. Intermediate goods production is typically more capital intensive compared to final assembly of products (Riedel 1975 and 1976). The importation of intermediate inputs for export production, therefore, involves an implicit substitution of labour for relatively capital-intensive intermediate products in the production process. For instance, when an economy imports capital-intensive inputs such as machinery, synthetic fibre, and industrial chemicals with foreign exchange earned by exporting labour intensive products such as garments, footwear and toys, it is implicitly substituting labour intensive goods for capital-intensive goods in the production structure. This would enhance the labour intensity of the overall production process. Thus, resource allocation considerations make a strong case for the development of footloose (loosely linked) export industries in a labour-abundant economy.

Second, emphasis on achieving greater domestic content in exports can run counter to the objective of increasing the income level through rapid penetration in world trade. In contrast to the closed-economy approach of import-substitution industrialisation, the key to success under export-oriented industrialisation lies in a country's ability to produce what the international buyers demand. For a surplus-labour country, light consumer goods (clothing, footwear, sport goods etc.) and component production and assembly in vertically integrated global industries are the most promising areas in the early stage of export-led industrialisation. In the production of these light consumer goods, using imported input is essential in order to maintain high quality standards (and thus international competitiveness) in the final products. In component production and final assembly within vertically integrated global industries, import content is naturally high and, in many cases, there is virtually no possibility of local substitution of intermediate inputs. Thus, per unit value added is generally lower than in import-substitution production and even the traditional export-oriented manufacturing production. Nevertheless, given the vast market potential, total value added, and hence the contribution to GDP and employment generation, could be much higher.

There is a vast case-study based literature, covering the industrialisation experiences of both the Newly Industrialised Countries (NICs) in East Asia and the second-tier NICs that cast doubt on the use of value added as a policy criteria in the context of export-led industrialisation (Chow and Papanek 1981, Little 1999, and Ranis 1973 & 1995). One of the strongest inferences worth quoting here is that by Little (1999, p. 234):

> Some critics have used the pejorative term 'shallow' to describe the development [in the 1960s and 1970s] of Korea and Taiwan, by which it is meant that there are relatively little backward linkages from exports. In that case, development in depth must be declared the enemy of employment and equity. All labour-intensive sectors have their *K/L* ratios raised by backward linkages [that is increase in domestic content], because all the intermediaries – petrochemical, artificial fibre, steel, non-ferrous metals, etc. – are highly capital intensive. *These intermediaries are the curse of developing countries*.' (emphasis added)

The above arguments by no means imply that a labour-surplus country has to remain locked-in in 'footloose' manufacturing activities forever. On the contrary, the important message is that attempts to 'create value added' through direct intervention could run counter to the objectives of growth and employment generation under the export-oriented development strategy. With the gradual depletion of excess supply of labour and adjustment in response to competition emanating from greater international specialisation, the industrial structure will gradually shift over to more capital- and skill-intensive industries, depending, of course, the required preconditions, including human capital development, are met. With further global integration of the manufacturing sector, the quality of intermediate goods produced in the country would also improve through increased international exposure, although global production sharing naturally set a limit to the substitution of locally produced parts and components to those exchanged within cross-border production networks.

3. Methodology

Our methodology draws on the standard input-output framework developed by Leontief (1936).[13] We calculate domestic value added, employment intensity of exports (export-related

[13] For an excellent textbook treatment of the I-O analysis with the latest developments in the subject area, see Miller and Blair (2009).

employment), and net export earnings (contribution of exports to domestic value added, GDP) based on the Leontief inverse matrix. Export-related employment captures both direct employment in export production and employment indirectly generated by export production through backward linkages with other industries. Likewise, net export earnings (total domestic value added of exports) is defined as gross exports minus direct and indirect imported input embodied in exports

Let $\boldsymbol{X}$ be an n x 1 vector of gross output and $\boldsymbol{M}$ be an n x 1 vector of imports. Furthermore, $\boldsymbol{Y}^D$ and $\boldsymbol{E}$ are n x 1 vectors of domestic demands (including usage in consumption and investment) and export demand for domestically produced outputs, respectively, and $\boldsymbol{Y}^M$ is an n x 1 vector of final demands for imported products (for both consumption and investment). We then have:

$$\boldsymbol{X} = \boldsymbol{A}^D\boldsymbol{X} + \boldsymbol{Y}^D + \boldsymbol{E} \quad (1)$$

$$\boldsymbol{A}^M\boldsymbol{X} + \boldsymbol{Y}^M = \boldsymbol{M} \quad (2)$$

where $\boldsymbol{A}^D = \left[a_{ij}^D\right]$ is an n x n matrix of direct input coefficients of domestic products and $\boldsymbol{A}^M = \left[a_{ij}^M\right]$ is an n x n matrix of direct imported input coefficients. That is,

$$a_{ij}^D = z_{ij}^D / X_j \quad (3)$$

$$a_{ij}^M = z_{ij}^M / X_j \quad (4)$$

where z_{ij}^D and z_{ij}^M are elements of n x n matrices $\boldsymbol{Z}^D$ and $\boldsymbol{Z}^M$- the domestic transaction table and the imported intermediate inputs transaction table, respectively, summation of which is the n x n total transaction matrix $\boldsymbol{Z}$.

Solving (1) for $\boldsymbol{X}$ gives

$$\boldsymbol{X} = (\boldsymbol{I} - \boldsymbol{A}^D)^{-1}(\boldsymbol{Y}^D + \boldsymbol{E}) \quad (5)$$

where the first term in the right-hand side is the Leontief domestic inverse matrix with $\boldsymbol{I}$ being the identity matrix. The element of this matrix, $\tilde{a}_{ij}^D$, is the output required of the ith sector to sustain one unit of the output of jth sector.

To measure the net export earnings, import intensity of domestic production needs to be subtracted from gross exports. Import intensity is calculated as,

$$\boldsymbol{M} = \boldsymbol{R}(\boldsymbol{I} - \boldsymbol{A}^{D})^{-1} \quad (6)$$

where, $\boldsymbol{M}$ is the import inverse matrix and $\boldsymbol{R}$ is the diagonal matrix of imported input coefficients (i.e. the share of imported inputs in the total output of the given sectors). An element of $\boldsymbol{M}$, m_{ij}, represents both direct and indirect import required to produce one unit of product j domestically. Thus, the increase of the imported inputs in sector j when the final demand of sector j increases by one unit is given by

$$M_{tj} = \sum_{i=1}^{n} m_{ij} \text{ for } j = 1,2,\ldots,n \quad (7)$$

The total imports embodied in sector j's total exports (denoted e_j) ('foreign content of exports', NRC 2006) is

$$m_{tj}^{e} = e_j M_{tj} \quad (8)$$

Accordingly, we can derive the 'domestic content of export' or 'net export earnings' of sector j as:

$$e_j^{n} = e_j\left(1 - M_{tj}\right) = e_j - m_{tj}^{e} \quad (9)$$

Finally, the share of domestic value added in exports (or more precisely, per-unit domestic content of exports) is given by the ratio of net exports and gross exports:

$$SVAD = e_j^{n}/e_j \quad (10)$$

Export-related employment is measured by similar approach. That is:

$$\boldsymbol{L} = \boldsymbol{G}(\boldsymbol{I} - \boldsymbol{A}^{D})^{-1} \quad (11)$$

where $\boldsymbol{L}$ is the employment inverse matrix and $\boldsymbol{G}$ is the diagonal matrix of labour input coefficients. An element of $\boldsymbol{L}$, l_{ij}, represents both direct and indirect employment required to produce one unit of product j domestically. Thus, the increase of employment in sector j when the final demand of that sector increases by one unit is given by

$$L_{tj} = \sum_{i=1}^{n} l_{ij} \text{ for } j = 1,2,\ldots,n \quad (12)$$

Finally, l_{tj}^{e} is export-related employment (MPEX) in sector j:

$$MPEX = l_{tj}^{e} = e_j L_{tj} \quad (13)$$

The dataset for the empirical analysis is constructed by bringing together the input-output tables of Indonesia for 1995, 2000, 2005, and 2010 and employment data from the annual labour force survey for the same years from the Indonesian Office of Statistics (BPS). Indonesia is one of the few developing countries that produces ‘complementary import type’ input-output tables[14] every five year for a period spanning over three decades[15]. The number of sectors in each table varies between 172 to 185. We synchronised the tables to 163 sectors (including 83 manufacturing sectors[16]) to allow for sector-by-sector intertemporal comparison. Employment data from the labour force survey are classified by the same sectors in order to calculate export-related employments.

It is worth noting that input-output tables for most countries (including the USA, China, India and Vietnam) are of the competitive import type. For these countries, calculation of import intensity and net export earning requires separating the intra-industry metric into domestic and imported-input matrices by employing the stringent ‘import similarity assumption’: within the product categories of the input-output table, the mixes of imports and

[14] Input-output tables are of two forms: ‘complementary import’ type and ‘competitive import’ type. In the former, there are two intra-industry matrices, one for domestic inputs and another for imported inputs. (That is, the import content of each inter-industry transaction is separately identified and allocated to a separate import matrix) In the latter, imported inputs and domestically procured inputs are lumped together in a single intra-industry transaction table.

[15] The 2015 input-output table is presently under construction.

[16] According to the BPS commodity classification, ‘animal and vegetable oil (I-O sector 55), petroleum processing (99) and smoked and crumb rubber (100) are treated as ‘manufacturing’. We excluded these three sectors from our manufacturing classification because standard (unprocessed or semi-proceed) primary products account for over 90% of production of these sectors sector.

domestically made goods are the same.[17] The use of this assumption can lead to significant biases in estimated domestic contents of exports if the exports are heavily concentrated in some manufacturing sectors, which are heavily dependent on imported inputs (such as electronics, electrical goods and automobiles) (Patunru and Athukorala 2019). The presence of duty drawback schemes and other government initiatives that facilitate duty-free access for intermediate inputs used in export production could compound such biases. Fortunately, our analysis does not suffer from this limitation because the Indonesian input-output tables, as noted, are of complementary import type with separate domestic and imported input matrices. Both tables are constructed using input-structure data collected from the annual industry survey.

It is pertinent to mention that our estimation procedure may lead to an underestimation of import intensity of export, for two reasons. First, that import content of production of exports in each industry is identical with the average import intensity of total production of the industry (the assumption on which Equation (3) is based). The assumption is not entirely consistent with the reality. The usual pattern is that even when industries are finely classified, import content in an industry's production for export is higher than in its production for the home market. Second, the estimates, as they are based on the inter-industry transaction table, incorporate only direct import requirements of export production. These estimates do not capture import intensity of domestic investment (capital formation) in export producing industries.

4. Results

We computed domestic contents of exports (net export earnings), export-related employment and backward- and forward linkages using the Indonesian input-output tables for 1995, 2000, 2005 and 2010. The estimates for the 83 manufacturing industries and the supporting statistical tables are given in the Appendix. Tables 1 and 2 provide the summary indicators derived from these tables.

Export-weighted average of value added share of manufacturing has remained within the narrow margin of 0.77% to 0.82% without showing any clear trend (Table 1). As we hypothesised, both total net exports earnings (net addition to GDP) and export-related

[17] For instance, if 30% the gross output of agriculture is used in food processing industry, then 30% of agricultural imports are also used in food processing. Similarly if 40% of the gross output of the mineral sector goes to the iron and steel industry, so does 40% of the mineral imports.

employment exhibit quite distinct patterns. Net export earnings in 2010 stood at Rp 611 trillion, compared to compared Rp 281 trillion in 1995. Total export-related employment increased from 5493 thousand to 8029 thousand between these two years. Both total net exports and export-related employment were slightly higher in 2000 compared to both 2005 and 2010. This seems to reflect slowing down of manufacturing exports in the first decade of the new millennium presumably due to the 'Dutch disease' effect of the resource boom and some policy backsliding that eroded incentives for export-oriented production (Patunru and Rahardja 2015).

Table 1: Domestic value added, net exports and export-induced employment in Indonesian manufacturing: Summary data

	1995	2000	2005	2010
Domestic value added share (%)[1]	0.82	0.77	0.77	0.79
Total net export earnings (US$ million, at 2010 prices)	23658	52818	47658	49247
Total export-related employment	5,152	11,343	8,739	7,383

Note: (1) Export-weighted average
Source: Based on Appendix Tables

In Table 2, we summarise our estimates for the industries, which are closely associated with global production networks (GPNs), together with the overall industry averages (last row) for comparison. The classification system used for delineating GPN products and further distinguishing between 'producer driven' and 'buyer-driven' GPNs is discussed in Athukorala (2019). It is important to note that this classification as applied to the industries at the I-O classification (which is the two-digit level of the International Standard Industry Classification) does not permit precise delineation of the characteristics of GPN products. This is because output of a 'GPN industry' identified at the two-digit level is a combination of production based on global production sharing (vertical specialisation) and the traditional production for the domestic market (horizontal specialisation). Normally, import content of the former tends to be higher than in the latter (Brumm et al. 2019, Koopman et al. 2014).

Distinguishing between producer-driven and buyer-driven GPNs is important for assessing a country's gains from export expansion through production sharing and formulating related policies. Buyer-driven networks are common in diffused-technology based consumer goods industries such as clothing, footwear, travel goods, toys and sport goods. In these networks, the 'lead firms' in the production networks are international buyers (large retailers such as Walmart, Mark & Spencer, H&M) or brand manufactures such as Victoria's Secret, Gap, Zara, Nike). Global production sharing in these networks takes place predominantly through arm's length relationships, with global sourcing companies (value chain intermediaries, such Hong Kong-based Li & Fung, Mast Industries Far East) playing a key role in linking producers and the lead firms. Therefore, there is room for local firms to directly engage in exporting through links established with foreign buyers and to substitute local inputs for imported inputs, depending of course on the ability of local suppliers to meet the required quality standards.

In a producer-centered production network the 'lead firm' is a multinational enterprise (MNE). Global production sharing takes place predominantly through the lead firms' global branch network. Producer-centered production networks are common in vertically integrated global industries such as electronic, electrical goods, automobiles, and scientific and medical devices. In these industries, production technology is normally specific to the lead firm and is closely protected to prevent imitations. Moreover, the production of final goods in these industries requires highly customized and specialized parts and components whose quality cannot be assured by a third party. Thus, opportunities for increasing domestic value added are limited compared to the specialisation within buyer-driven production networks.

The average (export-weighted) value added ratio of GPN industries (about 70%) is smaller compared to an overall industry average of about 80%. As expected among GPN products, value added is larger for industries in buyer-driven networks (78%) compared to their producer-driven counterparts (64%). Within producer-driven GPN products, value added is notably lower than the overall industry average for all products other than automobiles and motorbikes. Notwithstanding low domestic value added, both net export earnings and export-related employment in GPN industries have grown faster than total manufacturing between 1995 and 2010. During this period the net exports of GPN products increased at a compound annual rate of 6.6% compared to an industry average of 5.3%. The difference in terms of the rate of employment growth was even wider, 6.0% and 2.6% respectively. Within GPN products, net exports of producer-driven products have increased at a much faster rate (9.1%) compared to buyer- driven products (4.1%).

Table 2: **Domestic value added, net exports and export-induced employment in GPN products[1] Indonesian manufacturing:**

I-O Code	Product/product group	Value added share (%)		Net exports at 2010 prices (US$ million)		Export-related employment		Annual compound growth rate (%) (1995-2010)	
		1995	2010	1995	2010	1995	2010	Net exports	Export-related employment
	(a) Producer-driven GPN products	0.65	0.64	2,908.4	10,745.1	941.3	2241.8	9.1	6.0
114	Prime-mover engines	0.66	0.63	3.8	38.1	0.3	1.8	16.6	11.6
115	Machinery and parts	0.42	0.62	361.2	592.5	11.4	59.8	3.4	11.7
116	Electric generator and electric motor	0.75	0.57	50.0	174.2	5.4	9.2	8.7	3.6
117	Electrical machine and parts	0.74	0.68	96.3	875.7	14.4	38.3	15.9	6.8
118	Communication equipment and parts	0.67	0.56	1,274.7	3,817.2	85.9	321.2	7.6	9.2
119	Electronic household appliances	0.77	0.70	42.2	651.0	5.5	57.7	20.0	16.9
120	Other electrical appliances	0.67	0.49	131.7	777.1	20.4	36.9	12.6	4.0
121	Battery	0.75	0.61	180.6	392.7	13.2	27.1	5.3	4.9
122	Ships and ship repair services	0.77	0.64	246.1	538.0	40.6	73.1	5.4	4.0
124	Motor vehicles except motorbikes	0.75	0.85	101.4	1,753.6	3.3	95.9	20.9	25.2
125	Motorbikes	0.73	0.89	74.3	208.6	2.3	10	7.1	10.4
126	Other transport equipment	0.67	0.66	140.4	171.0	100.6	13.5	1.3	-12.5
127	Aircrafts and its repair services	0.43	0.64	40.3	82.6	26	7.1	4.9	-8.3
128	Measuring, photographic and optical equipment	0.75	0.59	165.3	672.7	24.8	40.2	9.8	3.3
	(b) Buyer-driven GPN products	0.79	0.78	3,943.9	7,238.1	587.2	1450.1	4.1	6.2
76	Apparel	0.77	0.78	2,311.8	5,110.3	187.5	1100.4	5.4	12.5
80	Footwear	0.83	0.79	1,595.6	1,878.8	366.6	328.7	1.1	-0.7
131	Toys and sport goods	0.79	0.86	36.5	249.0	33.2	21.0	13.7	-3.0
	(c) Total GPN products (a + b)	0.73	0.70	6,852.3	17,983.2	1528.5	3691.9	7.6	6.1
Memo item									
	Total manufacturing	0.80	0.81	30,949.5	67,191.6	5493.4	8029	5.3	2.6

Note: (1) I-O industries in which global production sharing related exports are concentrate, (2) Indonesian rupiah
Source: Based on Tables in the Appendix.

Automobiles (motor vehicles and motorbikes) stand out among GPN products for their higher domestic value added compared to the other GPN products. What explains this difference? Unlike most other GPN products (in particular, electronics and electrical goods), automobiles are bulky and ‘low-value-to-weight’ goods, and, hence, transport costs are a key determinant of market price. There is also a need to design the product to suit the taste and affordability of the consumer. Therefore, there is a natural tendency for assembly plants to be located in countries with large domestic markets. Once automakers set up assembly plants in a given country, parts and component producers follow them for two reasons.

First, most auto parts are also bulky and have low value-to-weight ratios, which makes it too costly to use air transport. This naturally create a formidable constraint on the timely delivery for the just-in-time production schedules of the final assembler. Second, there is an asymmetrical market power relationship between component makers and automakers within the global automobile industry; the products of many auto part manufacturers are used in the vehicles made by a handful of carmakers. This is different from electronics parts like integrated circuits and semiconductors that are used in many industries. Thus, there is incentive for the part makers to set up factories next to the assemblers to secure their position in the market (Kohpaiboon & Jongwanich 2013; Klier & Rubenstein, 2008).

Once a complete production base (involving both final assembly and component assembly/production) is established in a given (large) country, exporting to third countries becomes a viable option for automakers. Scale economies gained from domestic expansion makes exporting of both parts and components and assembled vehicles profitable as part of their global profit maximisation strategy. Adaptation of products to suit domestic demand conditions and lower transportation cost compared to exporting from the home base also become important drivers of exporting to regional markets from the new production base. Given that parts and component production base had evolved around the final assemblers, these exports tend to be characterised by higher domestic value added compared to other GPN exports. Part of the measured value added could, however, be ‘pseudo’ domestic value added given the dominant role played by foreign companies in the domestic parts and component supply base.

To supplement this broad-brush comparison, we estimated the following regression using a panel dataset constructed by putting together the data for the four years.

$$\left.\begin{matrix} TVEX_{it} \\ MPEX_{it} \end{matrix}\right\} = \alpha + \beta_1 SVEX_{it} + \beta_2 PROD_{it} + \beta_3 DGPN_i + \beta_4 DGPN_i * SVEX_{it} + \beta_5 DGPN_i * PROD_{it} + \delta_i + \gamma_t + \varepsilon_{it} \quad (14)$$

where i=1,2,...,N is the product category, t=1,2,...,T is the time unit in years, *TVEX* is total domestic valued added of export, *SVEX* is share of value added of exports, *MPEX* is export-related employment, *PROD* is productivity, and *DGPN is* a dummy variable that takes the value of 1 for GPN products and zero otherwise, δ_i is unobservable fixed characteristics of industries product specific effects, γ_t is unobservable time specific effects and ε_{it} is the disturbance term.

The main variable of interest is *SVEX*, which, according to the proponents of using value added share as a policy criterion, is postulated to have a positive effect on both *TVEX* and *MPEX*. *PROD* is included to capture efficiency of production. This variable is measured as real value added per worker or labour productivity. Labour productivity by construct captures both efficiency with factors of production used in the production process (total factor productivity) and with capital deepening, which is measured as change in capital per worker per worker.[18] Ideally, we need to include these as two separate variables, but unavailability of data at this level of industry disaggregation prevents us from doing so.

The intercept and slope dummies for *GPN* products are included to test whether the hypothesised relationships vary between these products and total manufacturing. All four variables, *TVEX*, *MPEX*, *SVEX*, and *PROD* are measured at constant (2010) prices, and *TVEX*, *MPEX*, and *PROD* are used in natural logarithms so that the coefficients of the latter two variables can be interpreted as elasticities. The expected sign of the coefficient of this variable is positive in the TVEX- and negative in the MPEX equation.

We estimated Equation 14 for the total value added and export-related employment using fixed effects and random effects estimators and compared the results using Wu-Hausmann test. The test decisively rejected the null hypothesis that unobserved explanatory variables (the unobserved effects) are not distributed independently of the explanatory variables, favouring the use of the *FE* estimator.

[18] For this reason value added per worker is also used alternatively as a measure of capital intensity: 'capital deepening tends to increase the relative output of a sector with a greater capital share' (Acemoglu and Guerrieri 2008).

The results are reported in Table 3. Summary statistics are given in Table 4 to facilitate interpretation of the results

Table 3: Value added share of exports, and total valued added and export-induced employment in Indonesian manufacturing[1]

Explanatory variable	Total value added (TVEX)		Export-related employment (MPEX)	
	Model 1	Model 2	Model 1	Model 2
Valued added share (*SVEX*)	0.85 (0.80)	1.09 (0.94)	0.08 (0.91)	0.12 (1.08)
Productivity (*PROD*)	0.15*** (0.05)	0.18*** (0.08)	-0.14** (0.06)	-0.12* (0.08)
*DGPN*SVEX*		-1.29 (1.64)		-0.35 (1.81)
*DGPN*PROD*		-0.10 (0.08)		-0.06 (0.11)
D2000[2]	1.07*** (0.16)	1.07*** (0.16)	0.87*** (0.18)	0.87*** (0.19)
D2005[2]	0.98*** (0.16)	0.98*** (0.16)	0.70*** (0.19)	0.71*** (0.19)
D2010[2]	0.86*** (0.22)	0.86*** (022)	0.48*** (0.22)	0.48*** (0.22)
Constant term	12.02*** (0.73)	11.96*** (0.74)	10.14*** (0.84)	10.13*** (0.86)
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	324	324	324	324
Number of sector	82	82	82	82
Memo item: results for GPN products[3]				
SVEX		-0.19 (1.35)		-0.23 (1.48)
PROD		0.08* (0.04)		-0.18** (0.08)

Notes:

(1) Heteroscedasticity-corrected (robust) standard errors in parentheses with statistical significance of the coefficients denoted as *** $p<0.01$, ** $p<0.05$, * $p<0.1$

(2) Time (year) dummy with the year 1995 as the base dummy.

(3) Derived from the overall regression. The coefficients are the linear combinations of the base coefficient and the coefficient of the GPN interaction dummy. The standards errors are derived from the covariance of the two coefficients.

Table 4: Summary statistics

					Correlation			
	Mean	Std. Dev.	Min	Max	*TVEX*	*MPEX*	*SVEX*	*PROD*
TVEX	13.40	2.85	2.64	19.02	1.00			
MPEX	9.54	2.73	-2.53	14.92	0.90	1.00		
SVEX	0.84	0.13	0.39	0.99	-0.24	-0.16	1.00	
PROD	4.27	1.83	-0.62	12.86	0.27	-0.12	-0.16	1.00

In each of the two panels in Table 3, Model 1 is the base model (without the *GNP* dummies). In Model 2, the GPN dummy interaction variables covers all 17 GPN products identified in Table 2. We estimated also an alternative specification of Model 2 after excluding automobiles (I-O 125) and motorbikes (I-O 126), but it is not reported here because there were no notable differences in coefficient estimates compared to Model 2. The fixed effects estimator automatically dropped the GPN intercept dummy. The results of *SVEX* and *PROD* for the GPN products derived from the overall regressions are reported as memo items in the table.

In both sets of equations, the coefficient of *SVEX* is not statistically significant even at the 20% level. Thus, clearly the results do not regret the null hypothesis that there is no statistically significant association between share of domestic value added in exports and both total contribution of exports to GDP (total value added) and employment generation. The results are remarkably insensitive to the inclusion of dummy interaction variables for GPN products.

The signs of the coefficient of *SVEX* for GPN products is negative in both TVEX and MPEX equations. This is consistent with what we observed in the simple comparison between total manufacturing and GPN products based on data in Table 2. However, the coefficients have failed to achieve statistical significance presumably because of the limitations involved in the identification of GPN products at this level of commodity disaggregation. The coefficient of *PROD* in both models of TVEX equation indicate strong positive association between productivity and total value added in exports (contribution of exports to GDP), as expected. There is however no statically significant difference between total manufacturing and GPN related industries as regards this relationship. The coefficient of *PROD* in the two models of MPEX equation is negative and statistically significant, suggesting a plausible trade-off between improvement in labour productivity and total employment. Interestingly, the magnitude of this trade-off seems greater for GPN products: the negative coefficient of PROD for GNP products is larger in magnitude (see memo item). However, this result needs to be taken with caution because, as noted, *PROD* is also a widely used proxy for capital intensity. From that point of view, the result permits the alternative interpretation that specialisation in global production sharing has greater employment potential compared to engagement in the traditional horizontal specialisation. It is not possible to distinguish between these two interpretations because of paucity of data.

5. Concluding remarks

We have examined the implications of using the share of domestic value added (per unit value added) as a criterion in designing national policy for export-oriented industrialisation in this era of economic globalisation. The key hypothesis is that, given the increased cross-border spread of production process within vertically integrated industries, policy emphasis on increasing the domestic value added ratio in exports, which harks back to the era of import-substitution industrialisation, runs counter to the national objectives of achieving economic growth and employment generation under economic globalisation. Production for competitive export markets requires the use of high-quality inputs procured at world market prices. Moreover, given the growing importance of global production sharing as the prime mover of manufacturing export expansion over the past few decades, naturally per unit value added in exports tends to *decline* everywhere and national gains from export expansion is fundamentally dependent on volume expansion rather than on the increase in the domestic content in a given country. Finally, given that intermediate goods production is typically more capital intensive compared to assembly of final goods, domestic value added is likely to correlate negatively, rather than positively, with employment creation (and hence poverty reduction) potential of export-oriented industrialisation at the early stage of industrialisation in developing countries.

We have provided evidence in support of this hypothesis by applying the standard input-output methodology to data for the Indonesian economy. The findings clearly show that export expansion and growth of export-related employment in the Indonesian economy during 1995 -2010 occurred in a context where domestic value added, as usually measured by the domestic content of exports as a percentage of gross exports, remained virtually unchanged. The findings become even more striking when we recall that they are based on an estimation procedure that perhaps could lead to an underestimation of the import intensity of export production.

The policy inference of our findings is that in this era of economic globalisation, policy makers should focus on the export potential of industries rather than on the share of domestic value added of exports in designing export development policy. Using value added ratio as a criterion in industrial approval and attempting to engineer value added through other direct policy interventions could run counter to the objectives of growth and employment generation under the export-oriented development strategy. With the gradual depletion of the domestic production base through global integration, the quality of intermediate goods produced in the country would improve, resulting in increase in domestic value added in exports. However, rapid expansion of global production sharing naturally set a limit to the substitution of locally produced parts and components to those exchanged within cross-border production networks. In this context, increase in domestic value added of exports (net export earnings) and employment expansion depends crucially on export volume expansion and ability of manufacturing firms to move towards high-value tasks/segments in the global manufacturing value chain.

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Appendix

Table A1. Per-unit domestic value added and export-related employment

I-O code	Sector	Domestic value added				Export-related employment			
		1995	2000	2005	2010	1995	2000	2005	2010
48	Meat, entrails of slaughtered animals	0.94	0.92	0.97	0.96	0.71	0.05	0.03	0.02
49	Processed and preserved meat	0.94	0.92	0.95	0.96	0.34	0.05	0.02	0.02
50	Dairy products	0.87	0.79	0.89	0.92	0.10	0.11	0.08	0.02
51	Canned and preserved fruits and vegetables	0.95	0.93	0.95	0.93	0.27	0.08	0.06	0.02
52	Salted fish and dried fish	0.98	0.95	0.96	0.98	0.05	0.05	0.02	0.01
53	Processed and preserved fish	0.95	0.92	0.94	0.97	0.07	0.05	0.02	0.02
54	Copra	0.97	0.95	0.96	.	0.17	0.08	0.04	0.02
56	Rice milling	0.96	0.97	0.96	0.97	0.44	0.19	0.11	0.05
57	Wheat flour	0.53	0.59	0.39	0.66	0.04	0.03	0.01	0.00
58	Other flour	0.86	0.80	0.95	0.96	0.57	0.07	0.05	0.03
59	Bakery products and similar products	0.88	0.78	0.79	0.87	0.12	0.05	0.03	0.02
60	Noodle, macaroni and similar products	0.82	0.80	0.70	0.83	0.12	0.04	0.02	0.01
61	Sugar	0.95	0.94	0.93	0.91	0.12	0.14	0.09	0.04
62	Chocolate and sugar confectionary	0.95	0.81	0.91	0.94	0.06	0.05	0.04	0.01
63	Milled and peeled coffee	0.96	0.95	0.95	0.95	0.26	0.07	0.03	0.04
64	Processed tea	0.98	0.93	0.94	0.96	0.26	0.14	0.09	0.03
65	Soybean products	0.97	0.73	0.77	.	0.16	0.04	0.03	0.03
66	Other food	0.91	0.86	0.88	0.92	0.21	0.09	0.06	0.03
67	Animal feed	0.86	0.87	0.91	0.93	0.62	0.08	0.05	0.03
68	Alcoholic beverages	0.93	0.80	0.91	0.85	0.19	0.06	0.05	0.02
69	Non-alcoholic beverages	0.92	0.80	0.88	0.91	0.09	0.05	0.04	0.01
70	Tobacco products	0.86	0.78	0.86	0.83	0.91	0.12	0.11	0.02
71	Cigarettes	0.90	0.86	0.88	0.89	0.13	0.04	0.02	0.02
72	Yarn and cleaned cotton bead	0.69	0.71	0.59	0.76	0.04	0.03	0.02	0.01
73	Textile	0.71	0.68	0.69	0.59	0.02	0.03	0.02	0.02
74	Processed textile except apparel	0.78	0.48	0.76	0.80	0.40	0.03	0.02	0.03
75	Knitted materials	0.61	0.64	0.77	0.81	0.23	0.03	0.02	0.04
76	Manufacture of ready-made garment	0.77	0.73	0.80	0.78	0.04	0.04	0.03	0.02
77	Manufacture of carpet, rope and other textiles	0.73	0.45	0.63	0.71	0.17	0.03	0.02	0.02
78	Tanned and processed leather	0.80	0.90	0.95	0.93	1.19	0.06	0.03	0.01
79	Leather products	0.85	0.78	0.89	0.94	0.30	0.05	0.03	0.04
80	Footwear	0.83	0.87	0.88	0.79	0.11	0.05	0.03	0.02
81	Sawmill and preserved wood	0.95	0.89	0.88	0.94	0.07	0.07	0.04	0.02
82	Manufacture of plywood and similar products	0.91	0.83	0.82	0.92	0.08	0.07	0.04	0.01
83	Wooden building materials	0.94	0.87	0.87	0.89	0.18	0.08	0.05	0.01
84	Manuf. of furniture and other products mainly of wood, bamboo, or rattan	0.94	0.86	0.88	0.87	0.32	0.12	0.06	0.09
85	Pulp	0.87	0.60	0.86	0.83	0.05	0.02	0.02	0.01
86	Paper and cardboard	0.71	0.58	0.73	0.77	0.02	0.02	0.01	0.00

87	Paper and cardboard products	0.83	0.70	0.78	0.76	0.04	0.02	0.01	0.01
88	Printing and publishing	0.84	0.75	0.71	0.73	0.05	0.02	0.01	0.04
89	Basic chemicals except fertilizer	0.64	0.73	0.63	0.59	0.02	0.01	0.00	0.00
90	Fertilizer	0.52	0.90	0.89	0.79	0.01	0.01	0.00	0.00
91	Pesticides	0.75	0.53	0.56	0.79	0.06	0.07	0.02	0.01
92	Synthetic resin, plastic, and fibre	0.61	0.75	0.70	0.69	0.02	0.01	0.00	0.00
93	Paints, varnishes and lacquers	0.75	0.60	0.61	0.83	0.03	0.02	0.01	0.01
94	Drug and medicine	0.72	0.70	0.67	0.81	0.04	0.02	0.01	0.01
95	Traditional herbal medicine	.	.	0.86	0.92	0.18	0.04	0.02	0.02
96	Soap and cleaning materials	0.62	0.68	0.62	0.87	0.07	0.03	0.01	0.02
97	Cosmetics	0.72	0.78	0.64	0.69	0.03	0.03	0.01	0.01
98	Other chemical products	0.69	0.54	0.58	0.79	0.03	0.01	0.01	0.00
99	Products of refined petroleum	0.86	0.86	0.78	0.86	0.01	0.00	0.00	0.00
100	Smoked and crumb rubber	0.92	0.94	0.94	0.92	0.14	0.05	0.03	0.03
101	Tire	0.77	0.64	0.67	0.89	0.10	0.02	0.01	0.03
102	Other rubber products	0.92	0.80	0.79	0.79	0.09	0.03	0.02	0.01
103	Plastic products	0.62	0.63	0.59	0.72	0.02	0.01	0.01	0.01
104	Ceramics and products of clay	0.91	0.83	0.86	0.85	0.30	0.04	0.03	0.02
105	Glass and products of glass	0.88	0.78	0.79	0.85	0.26	0.04	0.03	0.00
106	Cement	0.91	0.91	0.89	0.85	0.11	0.04	0.02	0.00
107	Other non-ferrous products	0.89	0.88	0.84	0.88	0.20	0.03	0.02	0.01
108	Basic iron and steel and their products	0.79	0.70	0.65	0.84	0.02	0.02	0.01	0.00
109	Non-ferrous basic metal	0.92	1.00	0.93	0.77	0.02	0.01	0.01	0.00
110	Products of non-ferrous basic metal	0.56	0.55	0.73	0.71	0.05	0.02	0.01	0.01
111	Products of metal moulding	0.74	0.72	0.81	0.72	0.13	0.02	0.01	0.03
112	Metal-based building materials	0.61	0.58	0.71	0.85	0.03	0.02	0.01	0.01
113	Other metal products	0.71	0.68	0.67	0.72	0.03	0.02	0.01	0.01
114	Prime-mover engines	0.66	0.44	0.66	0.63	0.03	0.01	0.01	0.00
115	Machinery and parts	0.42	0.42	0.42	0.62	0.01	0.01	0.01	0.01
116	Electric generator and electric motor	0.74	0.66	0.81	0.57	0.05	0.02	0.01	0.00
117	Electrical machine and parts	0.74	0.64	0.75	0.68	0.06	0.02	0.01	0.00
118	Communication equipment and parts	0.67	0.69	0.66	0.56	0.03	0.02	0.01	0.01
119	Electronic household appliances	0.77	0.74	0.74	0.70	0.06	0.02	0.01	0.01
120	Other electrical appliances	0.67	0.69	0.71	0.49	0.06	0.02	0.01	0.00
121	Battery	0.75	0.62	0.64	0.61	0.03	0.02	0.01	0.00
122	Ship and its repair services	0.77	0.59	0.63	0.64	0.07	0.02	0.01	0.01
123	Train and its repair services	0.73	0.70	0.60	0.73	1.03	0.02	0.01	0.01
124	Motorized vehicles except motorbikes	0.75	0.65	0.60	0.85	0.01	0.02	0.01	0.01
125	Motorbikes	0.73	0.77	0.77	0.89	0.01	0.02	0.01	0.00
126	Other transport equipment	0.67	0.68	0.71	0.66	0.27	0.02	0.01	0.01
127	Aircrafts and its repair services	0.43	0.41	0.42	0.64	0.16	0.01	0.01	0.01
128	Measuring equipment, photographic and optical equipment, watches	0.75	0.73	0.72	0.59	0.06	0.08	0.04	0.00
129	Jewellery	0.70	0.48	0.54	0.82	0.05	0.04	0.03	0.03
130	Musical instruments	0.88	0.78	0.74	0.82	0.89	0.07	0.04	0.01

131	Toys and sporting goods	0.79	0.89	0.85	0.86	0.41	0.10	0.09	0.01
132	Other manufacturing goods	0.83	0.78	0.76	0.84	0.15	0.17	0.05	0.01

Note: --- Data not available

Source: Computed from Indonesian Input-Output Tables

Table A2. Net exports (US$ million), 2010 prices

IO	Sector	1995	2000	2005	2010
48	Meat, entrails of slaughtered animals	1.0	6.0	2.3	2.2
49	Processed and preserved meat	8.0	2.8	4.5	18.9
50	Dairy products	9.9	69.1	103.9	65.5
51	Canned and preserved fruits and vegetables	108.8	188.5	245.4	209.9
52	Salted fish and dried fish	60.3	72.6	91.0	35.9
53	Processed and preserved fish	1017.5	1729.9	2339.4	1679.6
54	Copra	0.0	55.8	24.9	#VALUE!
56	Rice milling	1.9	0.8	16.3	0.5
57	Wheat flour	0.0	0.7	7.2	9.2
58	Other flour	124.1	78.6	117.7	153.3
59	Bakery products and similar products	16.6	27.6	91.5	144.8
60	Noodle, macaroni and similar products	8.5	27.7	43.1	7.0
61	Sugar	36.4	14.2	41.9	69.4
62	Peeled grains, chocolate and sugar confectionary	67.4	284.1	350.2	425.4
63	Milled and peeled coffee	469.0	499.1	42.9	165.7
64	Processed tea	94.7	208.1	147.2	150.0
65	Soybean products	6.3	4.0	5.5	#VALUE!
66	Other food	48.0	29.9	185.8	439.1
67	Animal feed	25.8	26.4	11.8	11.4
68	Alcoholic beverages	5.6	20.7	28.5	28.1
69	Non-alcoholic beverages	11.9	11.2	4.1	26.2
70	Tobacco products	1.2	96.8	131.0	107.8
71	Cigarettes	140.5	252.6	232.0	398.1
72	Yarn and cleaned cotton bead	676.9	1727.3	1341.0	1077.4
73	Textile	1211.4	1996.7	1263.2	1002.8
74	Processed textile except apparel	118.8	131.1	155.4	430.9
75	Knitted materials	596.6	2143.6	2287.0	67.4
76	Manufacture of ready-made garment	2311.8	4451.9	3723.5	5110.2
77	Manufacture of carpet, rope and other textiles	207.4	355.5	302.2	0.0
78	Tanned and processed leather	40.8	173.2	138.8	108.0
79	Leather products	87.1	249.0	98.1	141.2
80	Footwear	1595.6	1814.9	1613.7	1878.8
81	Sawmill and preserved wood	318.6	190.7	16.6	361.3
82	Manufacture of plywood and similar products	3484.1	3529.9	1669.5	1252.7
83	Wooden building materials	673.5	1361.7	1259.1	226.5

84	Manuf. of furniture and other products mainly of wood, bamboo, or rattan	1130.6	2807.9	2636.3	211.6
85	Pulp	385.5	825.1	971.7	947.1
86	Paper and cardboard	536.1	1896.8	1482.8	2292.3
87	Paper and cardboard products	171.1	287.0	445.3	313.2
88	Printing and publishing	111.3	657.5	152.3	3.2
89	Basic chemicals except fertilizer	467.2	2243.7	2140.6	2257.3
90	Fertilizer	179.1	361.0	296.6	339.8
91	Pesticides	15.0	70.2	42.7	135.7
92	Synthetic resin, plastic, and fibre	219.5	1105.5	839.9	1007.6
93	Paints, varnishes and lacquers	4.1	10.4	22.3	61.9
94	Drug and medicine	35.9	116.8	204.1	205.0
95	Traditional herbal medicine	---	---	6.6	68.7
96	Soap and cleaning materials	80.1	216.7	234.3	400.3
97	Cosmetics	27.5	33.2	62.1	171.5
98	Other chemical products	257.7	89.8	129.3	575.0
101	Tire	166.0	400.6	615.4	1323.8
102	Other rubber products	485.1	822.1	209.6	394.4
103	Plastic products	202.6	709.8	850.1	874.7
104	Ceramics and products of clay	67.2	164.8	142.3	281.1
105	Glass and products of glass	194.4	519.6	346.7	249.7
106	Cement	6.9	229.6	120.9	65.6
107	Other non-ferrous products	79.6	348.2	231.1	98.8
108	Basic iron and steel and their products	290.5	520.0	548.7	1228.8
109	Non-ferrous basic metal	1088.9	2332.8	3946.3	5659.2
110	Products of non-ferrous basic metal	20.7	86.1	153.4	129.1
111	Products of metal moulding	190.2	481.3	252.2	55.9
112	Metal-based building materials	54.9	194.2	139.8	228.3
113	Other metal products	168.1	443.6	935.1	464.3
114	Prime-mover engines	3.8	46.5	6.9	38.1
115	Machinery and parts	361.2	1877.3	1341.6	592.5
116	Electric generator and electric motor	50.0	415.3	264.9	174.2
117	Electrical machine and parts	96.3	686.1	705.4	875.7
118	Communication equipment and parts	1274.7	6859.6	4947.8	3817.2
119	Electronic household appliances	42.2	122.9	145.3	651.0
120	Other electrical appliances	131.7	616.6	699.3	777.1
121	Battery	180.6	329.3	445.9	392.7
122	Ship and its repair services	246.1	162.6	345.6	538.0
123	Train and its repair services	0.3	10.3	4.4	3.2
124	Motorized vehicles except motorbikes	101.4	326.9	885.2	1753.6
125	Motorbikes	74.3	131.4	248.6	208.6
126	Other transport equipment	140.4	145.8	113.8	171.0
127	Aircrafts and its repair services	40.3	56.5	140.4	82.6
128	Measuring equipment, photographic and optical equipment, watches	165.3	297.4	298.8	672.7
129	Jewellery	158.0	80.9	80.2	160.7

130	Musical instruments	45.5	219.3	278.2	331.7
131	Toys and sporting goods	36.5	69.6	24.0	249.0
132	Other manufacturing goods	287.7	556.4	387.2	1907.9
	Total	23658.1	52817.7	47658.2	49246.6

Note: --- Data not availableSource: Computed from Indonesian Input-Output Tables

Table A3. Export-related employments (number of workers)

I-O code	Sector	1995	2000	2005	2010
48	Meat, entrails of slaughtered animals	1299	1248	413	378
49	Processed and preserved meat	5057	601	728	2932
50	Dairy products	1967	38831	54626	10390
51	Canned and preserved fruits and vegetables	55177	67308	98405	38031
52	Salted fish and dried fish	5418	13940	11542	3430
53	Processed and preserved fish	127707	354867	322140	266555
54	Copra	13	18495	6310	---
56	Rice milling	1528	577	11869	203
57	Wheat flour	---	139	773	564
58	Other flour	145682	27738	41017	50973
59	Bakery products and similar products	4119	6695	23882	33784
60	Noodle, macaroni and similar products	2138	5735	6993	914
61	Sugar	8212	8335	24860	25625
62	Chocolate and sugar confectionary	7190	69040	87808	56623
63	Milled and peeled coffee	223108	156481	7848	57321
64	Processed tea	43830	121420	91776	38044
65	Soybean products	1814	975	1311	---
66	Other food	19804	11956	72475	136007
67	Animal feed	32870	9102	4154	3546
68	Alcoholic beverages	2021	5691	9717	4848
69	Non-alcoholic beverages	2124	2696	1143	3504
70	Tobacco products	2226	60908	108826	22335
71	Cigarettes	36634	41060	31910	72592
72	Yarn and cleaned cotton bead	72355	256979	257460	117547
73	Textile	70409	398379	234048	359035
74	Processed textile except apparel	108599	36298	31589	141440
75	Knitted materials	399079	432634	453679	31787
76	Manufacture of ready-made garment	187461	1032143	742984	1100366
77	Manufacture of carpet, rope and other textiles	82857	93518	63731	2
78	Tanned and processed leather	107047	43187	29526	12304

79	Leather products	53587	60430	20464	51448
80	Footwear	366551	424023	320376	358725
81	Sawmill and preserved wood	42493	63156	5019	67181
82	Manufacture of plywood and similar products	518473	1196909	537197	157477
83	Wooden building materials	232907	509834	409608	28353
84	Manuf. of furniture and other products mainly of wood, bamboo, or rattan	684058	1523299	1184907	203458
85	Pulp	35112	130835	132438	67289
86	Paper and cardboard	29868	234866	177515	130947
87	Paper and cardboard products	13512	32739	52048	20311
88	Printing and publishing	10952	69152	18474	1566
89	Basic chemicals except fertilizer	23161	70549	97173	66923
90	Fertilizer	7801	8895	5916	15450
91	Pesticides	2064	36035	10573	11916
92	Synthetic resin, plastic, and fibre	11240	43061	32261	40152
93	Paints, varnishes and lacquers	267	1140	1633	5392
94	Drug and medicine	3420	13541	25598	19502
95	Traditional herbal medicine	---	---	1139	16255
96	Soap and cleaning materials	15840	37204	31843	79769
97	Cosmetics	2021	4394	7859	26059
98	Other chemical products	19350	9191	9815	30633
99	Products of refined petroleum	83280	62090	66602	106786
100	Smoked and crumb rubber	554034	321723	605324	1745992
101	Tire	38608	51208	62105	340364
102	Other rubber products	81587	113876	27064	62631
103	Plastic products	10957	61461	73392	129485
104	Ceramics and products of clay	39399	35302	26524	57366
105	Glass and products of glass	101481	114045	72150	12630
106	Cement	1436	43233	17441	3130
107	Other non-ferrous products	31470	53616	35450	5378
108	Basic iron and steel and their products	14383	48815	31950	58150
109	Non-ferrous basic metal	46678	64581	155866	243093
110	Products of non-ferrous basic metal	3039	9720	10327	11458
111	Products of metal moulding	60777	66038	23690	21408
112	Metal-based building materials	5294	23402	11277	12589
113	Other metal products	12035	57122	79501	34320
114	Prime-mover engines	345	4308	558	1781
115	Machinery and parts	11429	178058	111779	59789
116	Electric generator and electric motor	5432	59794	20278	9183
117	Electrical machine and parts	14360	83079	50993	38348
118	Communication equipment and parts	85911	941278	377501	321188
119	Electronic household appliances	5521	15562	10874	57677
120	Other electrical appliances	20388	54211	52664	36878
121	Battery	13200	38321	27238	27115
122	Ship and its repair services	40569	22598	31600	73050

123	Train and its repair services	687	1094	377	278
124	Motorized vehicles except motorbikes	3285	38454	65246	95880
125	Motorbikes	2269	16763	17399	9987
126	Other transport equipment	100591	18220	9801	13515
127	Aircrafts and its repair services	26029	6181	11543	7136
128	Measuring equipment, photographic and optical equipment, watches	24808	125956	116028	40197
129	Jewellery	20666	29776	26774	58836
130	Musical instruments	81404	75343	92197	33947
131	Toys and sporting goods	33168	30258	15949	20987
132	Other manufacturing goods	88468	488567	157022	288607
	Total manufacturing	5152309	11343066	8739026	7383910

Note: --- Data not available.
Source: Computed from Indonesian Input-Output Tables