Chapter 3

Revisiting How Globalization Affects Wage Skill Premium in Indonesian Manufacturing

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Revisiting How Globalization Affects Wage Skill Premium in Indonesian Manufacturing

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This paper addresses the topic of globalization and skill premium (i.e. the gap in wage and the extent of skilled workers hired by a firm) using the plant-level data of Indonesia manufacturing. It asks the question of how the greater trade and investment openness, as a result of trade and investment liberalization in the 1990s and early 2000s, affect the skill premium and intensity within firms, the mechanisms at work, and which theories can explain the relationship between the liberalizations and skill premium. The descriptive analysis shows a declining pattern in the relative wages while there is a slightly increasing trend in relative employment. As a result, there is rather declining trend in the share of skilled workers in wage bills. The descriptive also find that the trend in relative wage and demand for skilled workers are different between fore-gin-owned and local plants and that relative wages for skilled workers in foreign-owned plants, which were much higher, has been declined faster than that for local plants. The econometric results confirms the input tariff cut leads to lower skill intensity (i.e., lower share of skill workers in total wages bill) as suggested by Amiti & Cameron (2012). However, the impacts are concentrated in foreign-owned plants. On the other hand, the results also suggest that the input tariff cut leads to higher skill intensity in local plants in the Indonesian manufacturing.

***Keywords*:** wage skill premium, trade liberalization, investment liberalization, Indonesian manufacturing

1. Introduction

The impact of trade and/or investment liberalization on inequality always attract the attention of policy makers, for the reason that it may determine the extent of public support for the engagement of a country in more globalized economic activities. Research on this topic, unfortunately, has so far not been able to provide a clear idea on the direction, mechanics, or even the extent of the impact, leaving ample of room for more public debate which may not be effective in deciding a general policy direction of a country. This paper attempts to provide more insight into this topic, by addressing the inequality in the form of skill premium and intensity *within a firm (plant)* (i.e., the gap in wage and the extent of skilled workers hired by a firm) in Indonesian manufacturing. The availability of data for this study allows it to address the topic at plant level.

The motivation of this study is threefold. First, little is known about the extent and pattern of skill premium and intensity over the time and across industries. Amiti & Cameron (2012), which also examined this topic in the same industry (i.e. the Indonesian manufacturing), has provided us with some information on the extent of the skill premium, but not so much on the pattern of it, either between industries or over the time. The long-span of time coverage covered by this study allows us to have a good observation for overtime pattern.[1] This study, in this sense, enriches our knowledge by making contribution to the literature on the basic facts skill premium and intensity in developing countries. Second, this study explores the possibility whether other factors other than trade liberalization determine the extent of within-plant skill premium in the Indonesian manufacturing. This is in regard, the recent study done by Amiti & Cameron (2012) indeed finds some evidence that trade

[1] The time period of the data covered by this midterm report is still limited to the period 2000-08; the 1990s period is yet to covered by the report because the authors have not yet been able to acquire the detail input-output table for the 1990s period. The authors however will include the 1990s period in for the final report; the 1990s input-output table is currently still being processed by the statistical agency/BPS.

liberalization, through the liberalization of input tariff, reduced the extent of the gap in wage between skilled and unskilled workers in Indonesian manufacturing in the 1990s.

What motivates this paper lead to some specific questions on the topic for the Indonesian manufacturing, that is: how does the greater trade and investment openness in Indonesia, as a result of trade and investment liberalization in the 1990s and early 2000s, affect the skill premium and intensity within firms (plants)? What are the mechanisms at work? Can the liberalization of foreign investment also explain the within-plant skill premium and intensity? Are other theories, such as the 'outsourcing'/'production sharing theory of Feenstra & Hanson (1996, 1997) and/or the 'skill biased technical change' (SBTC) theory, able to explain the within-plant variation in the skill premium and intensity? These are the key questions that this paper attempts answer.

The rest of this paper is organized as follows. The next section presents a review of literature, consisting description of policies affecting industrial development in Indonesia since the 1990s and a brief description of the literature surrounding the topic of skill premium. Section 3 presents some descriptive analysis on the measures the measures of labor-market outcome between skilled and unskilled workers. Section 4 explains our estimation method and describes the data and variables and presents our econometric results and Section 5 presents our conclusion.

2. Literature Review

2.1. Evolution of Trade and Investment Policy in Indonesia[2]

Indonesia provides a good case study to examine the impact of trade or investment liberalization, and obviously labor market policy, on relative demand for skilled labor (relative to the demand of unskilled labor). The country saw episodes of trade and investment liberalization as well as a dramatic change in labor market policy over the span of the last twenty years or so.

[2] See Pangestu (1996), Hill (1996), and Aswicahyono, *et al*. (2010) for more detail description about the evolution of the policy.

The first episode happened between the end of 1980s to right before the 1997/98 Asian financial crisis. During this period, especially in the beginning of the 1990s, the government undertook a rather massive policy reform with the aim to switch the country's industrial approach from import substitution to export oriented. Trade and investment regime were radically liberalized along with major reforms in banking sectors. All these were taken to reduce export bias, that is, reducing the cost for exporting, increasing the flow of investment, and establishing stronger banking-sector intermediary function. In practice, incentive system such as duty drawback system was introduced for the first time, tariffs were substantially reduced, and many non-tariff barriers (NTBs) were eliminated. As for investment reform, among other, the maximum share of foreign share for a joint venture was relaxed, minimum capital requirement for foreign investment was reduced by about 75 percent, and the government opened more sectors, which mostly are services sectors, to foreign investors.

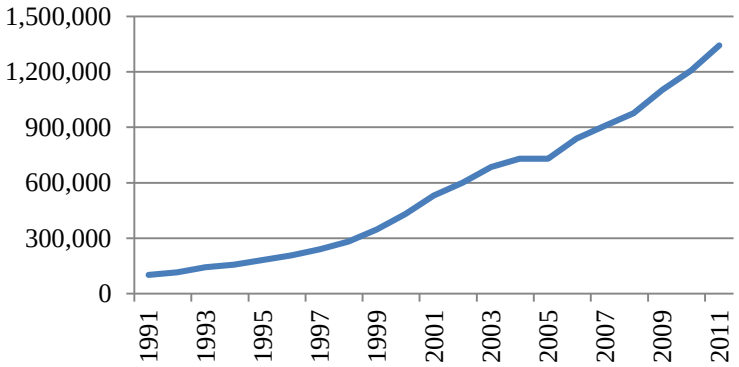
The second episode fall within short period of during the 1997/98 Asian financial crisis. Further trade liberalization was undertaken over the 1998-99 period as a part of the agreement between the government and the International Monetary Fund (IMF) under the Fund's crisis support program. Tariffs were further reduced and more NTBs were eliminated. All in all, as a result of trade reforms in the mid-1990s and the acceleration of the reforms per the IMF agreements, simple average tariff rates were reduced from 20% in 1994 to 9.5% in 1998 and 7.5% in 2002 (WTO 1998, 2003).

There was no major trade and investment liberalization occurred in the period after the 1997/98 crisis, which can defined as the third episode in the policy making related to industrialization in Indonesia. The openness in trade regime stayed relatively the same as right after the crisis. As for investment policy, there was a rather significant change when a new investment law was introduced in 2007. This is in the effort to revive the declining trend of investment, both foreign and local, in the country.

What makes the third episode special is a change in labor market policy in early 2000s that marks a change in the labor market regime since until present day. The labor market regime before the crisis was more or less accorded with "East Asian norms". Trade unions existed but were heavily managed, and minimum wages were prescribed but they were generally below market levels in the formal sector, and were

not enforced systematically. During the crisis, real wages fell sharply, but unemployment rose only modestly. After the crisis, powerful pro-labor pressures emerged, and the constraints on trade unions were largely removed. Under successive ministers of manpower, the government strongly supported worker entitlements and wage claims. Two of the most controversial outcomes were the significant increase in the regulated minimum wage (see Figure 1) and there were incidences that point to rigidities into hiring processes; firms from taking on additional labor (Manning & Roesad, 2006).

Figure 1: Average Monthly Minimum Wage 1991-2011



2.2. Impact of Globalizations on Labor Market

As pointed out by Goldberg and Pavcnik (2007), there seems to be an agreement that shift in demand for skilled workers is the main reason driving the widening gap in the wage between skilled and unskilled workers (or, as noted, 'skill premium'). This means that wages for skilled workers and skilled employment move in the same direction. While the demand-shift mechanism is clear, there is however not much agreement on how the demand curve is shifted. In other words, there are questions with clear answers on which factors driving the demand shift and how these factors do so.

The neoclassical Heckscher-Ohlin (H-O) theory is not always able to explain the trend and pattern of the skill premium, especially those in developing countries. The theory, as in Stolper-Samuelson model, predicts the distributional changes in developing countries, which usually are endowed with unskilled workers, should favor unskilled workers more than the skilled ones should there is liberalization in their trade

regime. In other words, this theory predicts a lower gap in the wages between skilled and unskilled workers.

A recent study done by Amiti & Cameron (2012) provide some support for the H-O model (or, trade theory) in explaining skill premium in developing countries, by examining the effects of tariff reduction on wage skill premium in Indonesian manufacturing. Amiti & Cameron examined the effects of output and input tariffs separately, and found that reducing input tariffs reduced the wage skill premium within firms that import their intermediate inputs. The intuition of the result is that relative demand for skilled labor was decreased because domestic production of relatively skill-intensive intermediate inputs was replaced by imports.

The results of Amiti and Cameron, along with the main prediction of trade theory, however is contrary to findings emerged from other studies of other developing countries. There is indeed evidence from these studies that globalization increases wage skill premium in not only developed countries but also developing countries (Goldberg & Pavcnik, 2007).

Two alternative explanations are put forward in the literature to date. The first is the 'outsourcing' or 'product sharing' theory of Feenstra & Hanson (1996, 1997). The theoretical model developed by Feenstra and Hanson expects that foreign direct investment (FDI) increases relative demand for skilled labor and thus wage skill premium. The model emphasizes the growing importance of trade in intermediate inputs. The implication derived from the model is that the relative demand for skilled labor is increased because production of relatively skill-intensive intermediate inputs is shifted to developing countries. While the shifted products are characterized as less skill-intensive from a developed country's perspective, they are likely skill-intensive from the perspective of developing country.

The second explanation is the one often termed as skill-biased technological change (SBTC). SBTC argues that the new technology embodied in imported capital goods – through channels such as a more open trade regime or an increase in FDI as a result of investment liberalization – increases the demand for skilled workers (in host countries). In other words, the technical changes induced by trade and FDI liberalizations have some effect (i.e., the 'bias') to increase the demand for skilled workers. The argument that the technology is brought by trade or FDI means that the

technology itself is endogenous to openness; this is how globalization is responsible for the skilled-bias (Goldberg & Pavcnik, 2007).

Wood (1995) is among the first who take this endogeneity in model of firms. He introduced the term 'defensive innovation' to describes the response of firms to trade openness, in which hypothesize that an intensified competition from import may induce firms to engage in R&D activities that they have little incentive to adopt before trade liberalization (Goldberg & Pavcnik 2007). Giving support for this, Attanasio, *et al*. (2004) document that the increase in skill labor demand in Columbia was the largest in the sectors that experienced the largest cuts in tariff. Another model of endogenous technology is suggested by Acemoglu (2003), who argues that technological change in developing countries may take the form of increased in imports of machinery and other capital goods that are complimentary to skilled workers. In his model, trade liberalization reduces the price of the machinery and capital goods and therefore increases the imports of these goods; demand for skilled workers is induced by the increase in the supply of these imported goods.

To this end, it is useful to make some comment on the different view between traditional trade theory and the suggested by Feenstra & Hanson (1996, 1997). The main difference comes from the different expectation how globalization changes the production of skill-intensive inputs. The former expects a decrease in the production because many of the intermediate inputs are replace by the imported ones. Feenstra & Hanson's theory, meanwhile, predicts that the production is increased, because now many of intermediate inputs are produced locally by the 'outsourced' firms. All these indicate that the magnitude and direction of the impact of globalization on wage skill premium depend on the changes in production of relatively skill-intensive intermediate inputs. In this respect, one of the most important factors determining the impact is therefore 'quality upgrading', which can induce an increase in relative demand for skilled labor.

3. Descriptive Analysis

3.1. Trend and Pattern of Trade and Investment

Before presenting the descriptive of the outcome variables on relative wages and demand for skill labors, it is useful to present some statistics to describe how the trade and investment liberalization affect the general trade and investment performance.

First, trade liberalization of the 1990s has evidently increased the extent of international trade regime for manufacturing goods. As it is shown in Table 1A, which reports the nominal tariff rates across two-digit industries (based on ISIC Revision 2) over the period 1990-2007, there is a declining trend in the tariff rates over the period 1990-2007. Moreover, it is important to note that much of this decline happened within the period 1990-2000; the tariff rates – at least for the MFN ones – then flattened for the rest of the period. The reduction within the 1990s is also significant; and to show this, the whole-industry average tariff rate in 2000 was recorded to about half of the rate in 1990. This reflects the fact the intensive trade liberalization undertaken by the government in the 1990s and during the 1997/98 crisis.

Looking at the cross section variation of the tariff rates (Table 1A), it is clear the only sector that did not undergo tariff cut is food and beverage; the tariff rate practically did not change within the whole period. It is observed that the lowest tariff rates are recorded for paper products, non-metallic chemical, basic metal, and machinery-and-transport equipment sectors.

As noted, the tariff rates were more or less flat after 2000. It is worth noting however there is further decline, albeit slightly, in the effective tariff rates (see Table 1B), and this is observed more clearly when one compares the effective with MFN rate in textile-and-garment, wood products, basic metals, and machinery-and-transport equipment. This pattern may be due trade liberalization coming from Indonesia's commitments in regional integration (e.g., ASEAN Free Trade Agreement, AFTA) or bilateral agreements (e.g., FTA with China or Japan).

Table 1A: Nominal Tariff Rates (%, MFN)

ISIC/Industry	1990	1995	2000	2005	2007
31 Food and beverage	24.9	20.0	30.8	30.7	28.8
32 Textile and garments	25.9	21.9	12.4	9.0	10.1
33 Wood products	27.8	23.1	11.1	8.5	8.0
34 Paper products	22.6	11.9	7.7	4.5	4.6
35 Chemical, rubber and plastics	13.5	13.0	8.9	7.0	7.0
36 Non-metallic mineral products	24.7	18.5	5.6	5.0	8.7
37 Basic metal industries	9.3	8.8	7.0	6.7	5.6
38 Machinery and transport equipment	19.7	16.4	7.9	6.7	6.3
39 Other manufacturing	31.6	24.7	14.0	10.4	10.5
Average	22.2	17.6	11.7	9.8	9.9

Source: WITS Database

Table 1B: Nominal Tariff Rates (%, Effective Rates)

ISIC/Industry	1990	1995	2000	2005	2007
31 Food and beverage	26.3	19.9	28.9	29.8	27.6
32 Textile and garments	24.8	20.9	12.0	7.3	7.9
33 Wood products	27.9	23.8	10.8	6.9	6.8
34 Paper products	23.4	11.8	8.2	4.9	5.0
35 Chemical, rubber and plastics	13.2	12.8	9.1	6.7	6.4
36 Non-metallic mineral products	21.3	15.7	5.3	4.4	7.0
37 Basic metal industries	10.1	9.7	7.2	5.9	5.0
38 Machinery and transport equipment	18.5	15.4	7.6	5.5	5.2
39 Other manufacturing	33.1	25.2	14.2	8.7	8.2
Average	22.1	17.2	11.5	8.9	8.8

Source: WITS Database

The impact of the trade liberalization in the 1990s on trade performance is immediately visible. As reported by Table 2, the growth of Indonesian manufacturing exports was phenomenal, that is, 29.5 percent over the period of 1990-93; this was the period immediately after many radical reforms done by the government in an attempt to reduce export bias. The growth however lessened in the next three years after the period (i.e., the period 1994-96) despite the fact it was still recorded at about at 10 percent. What is important to note is the export performance after the 1997/98 crisis. During this period (i.e., after 2000), the exports seem to have been sluggish, not being able to move back to the pre-crisis average. Disappointing performance – relative to pre-crisis performance – was recorded by exports of goods under the resource-based labor intensive and electronics products. The former is rather puzzling given a

commodity boom during the first half of 2000s. A potential explanation for the weak performance is it may have been affected by the more rigid labor market situation after the crisis and in particular this could have been caused by the jump in minimum wages in this period.[3]

Table 2: Trade and Foreign Direct Investment in the Indonesian Manufacturing

	1990-93	1994-96	1997-99	2000-02	2003-05	2006-08
Manufacturing export growth	29.5	9.6	0.8	9.9	7.9	
% of exporters in total mfg.	17.1	20.3	13.8	17.5	21.9	13.8
- Local plants	15.3	17.3	11.8	16.5	13.1	11.2
- Foreign-owned plants	45.8	56.7	33.0	45.6	39.9	36.5
% of importers in total mfg.	23.8	20.7	21.4	19.2	20.8	21.4
- Local plants	21.1	17.0	16.7	14.7	16.9	17.5
- Foreign-owned plants	69.9	66.4	66.0	61.1	56.3	55.5
Average share of imports to output	23.7	22.9	24.0	23.0	20.9	20.3
- Local plants	22.2	20.6	21.0	20.0	17.8	17.1
- Foreign-owned plants	30.9	30.3	31.3	29.7	29.4	29.1
% of foreign-owned plants	5.7	7.5	9.6	9.5	9.9	10.1
Foreign share of output	23.1	29.2	34.4	33.8	35.1	35.1

Note: Average share of imports to output was calculated using sample of importers only.

Reflecting the performance of aggregated manufacturing exports, the percentage of exporters in total manufacturing swing over time. The percentage increased from 17.1 percent during 1990-93 to 20.3 percent during 17.1 before declining to 13.8 percent during the economic crisis. The percentage of exporters in foreign-owned plants is far higher than that of local plants. More than the half of foreign-owned plants were exporting in 1994-96 but the percentage tended to have declined even after the economic crisis, reflecting that the number of non-exporting foreign-owned plants increased relative to exporting foreign-owned plants. On the other hand, the percentage of importers tended to have increased slightly in the 2000s. While the percentage in local plants was increasing, the percentage in foreign-owned plants was decreasing. The average share of imported material to output also tended to have declined mainly in local plants. The corresponding share of foreign-owned plants was higher than that of local plants, but was declining more slowly.

[3] See Section 2 on the evolution of policy affecting industrialization in the country after the 1997/98 crisis.

An increasing trend is observed for foreign direct investment, which reflects to large extent the impact of the investment liberalization that occurred in the 1990s, and to lesser extent the impact of the new investment law introduced in 2007. As shown in Table 2, the percentage of foreign-owned plants in total number of manufacturing plants and the share of the whole manufacturing output produced by firms with foreign equity share continuously increased over the long period 1990-2008. The increase was very significant within the first half of this period (*i.e.*, over the period 1990-2000). The pace of the increase has however has somewhat lessen after 2000.

It is important to observe how the increase in the output produced by foreign investment across the industries. That is, it is indicated that the increase was not observed only for sectors that mostly produced final goods; it was suggested that the increase also occur – in fact at much higher rate – in sectors/subsectors that produce intermediate inputs. To illustrate, the foreign-output share of sectors in which many machinery parts and components were classified under (*i.e.* sectors of ISIC 27 to 35) experience a rapid increase and the extent to which the output is produced by foreign investment in these sectors are mostly way above the whole-industry average. This indicate a large 'outsourcing'/'production sharing' activities done by foreigners and is likely reflect the behavior represented by the model of Feenstra & Hanson (1996, 1996).

3.2. Relative Wages and Demand for Skilled Workers

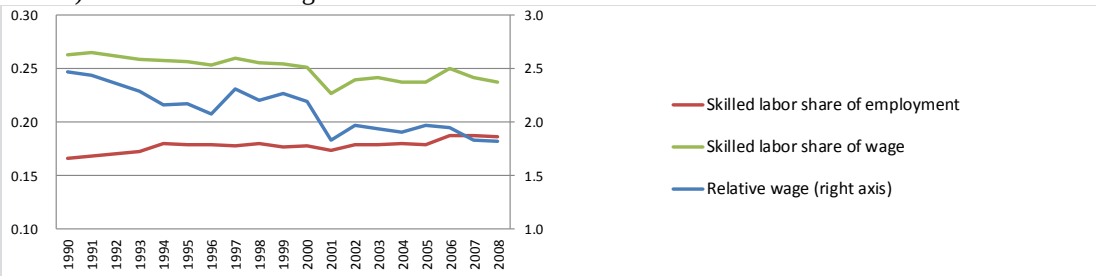
Figure 2 present the statistics of the main interest of this paper, that is, relative wages, relative employment, and the skilled-labor share of total in wages. As in Feenstra & Hanson (1997), the latter measures the relative labor demand that incorporates the former first two. The statistics of all the three variables computed as the plant-average for each two-digit ISIC industries are shown in Appendix Tables 1-3.

It is observed that the average relative wage is declining for the whole manufacturing during last decades. In the 2000s, it is more or less flat up until 2005 with a tendency of a decline toward the end of the period (2008). Looking at the pattern across the more disaggregated industries, it is revealed that some of these industries exhibit a rather fluctuating pattern, especially within the first ten year of the

period (i.e., from 1990 to 2002). There are also industries that actually show an increasing trend up until 2002 (*i.e.*, machinery and equipment, and motor vehicles and trailers). It is however almost a regular pattern that the industries (almost all of them) experience a decline in the relative wage at the latter part of the period (between 2002 and 2008). As for the cross-section pattern, it is observed that the relative wages recorded for the following industries is consistently above the whole manufacturing average: tobacco products, chemical products, basic metals, fabricated metal products, office, accounting and computing machinery, electrical machinery and apparatus, and radio, television and communication equipment and apparatus.

Figure 2: Relative Wage, Employment and Wage Share of Skilled Workers

Panel a) Total manufacturing



Looking at the skilled worker share in total employment, a general trend that emerges is a moderately increasing one. For the whole manufacturing, the average share of skilled workers at each plant increased from 11.9 percent in 1990-93 to 18.4 percent in 2006-08. This indicates that the relative demand of skilled workers was increased over the period. On the other hand, as mentioned above, the relative wage of skilled workers was reduced during the period. These suggest that the relative wages were also affected by supply-side factors. There is not much of variation to this general pattern across industries. As for cross-section pattern, some labor-intensive industries (i.e., textiles, apparel, and leather and footwear; tobacco and wood products) exhibit a relative employment figures below the average for the whole manufacturing. The other industries record either above or about the average of the whole manufacturing.

The patterns of plant-average skilled-labor share of total wages more or less 'summarize' the pattern observed from the previous two figures because, as noted, the

share incorporates both relative wages and relative employment. Indeed, this seems to be the case. The share tended to have moderately declined over the period reflecting the faster decline in relative wages compared to the increase in relative employment. Cross-sectional pattern also persists, where some industries are observed to record the skilled-labor share above the average for the whole manufacturing, and many of these industries are the subset of the industries that record the above-average relative employment. It is worth to underline that, for Indonesian manufacturing, the share of skill-labor in total wages is about 20 percent in Indonesian manufacturing. This may be considered low for developing country standard. The skilled share in Mexican manufacturing, for example, is about 30 percent (Feenstra & Hanson 1997).

What then can we learn from the descriptive statistics presented by the previous three tables? First, there is a tendency of a declining pattern in the relative wages while there is a slightly increasing trend in relative employment. As a result, there is rather declining trend in the share of skilled workers in wages. Second, this overtime pattern is consistent with the findings and conclusion of Amiti & Cameron (2012). The descriptive presented in Figure 2 and Appendix Tables, however, is not yet been able to confirm whether or not the declining trend is due to cut in tariff rates as Amiti and Cameron tested. This is especially for the later part of the period (*i.e.*, the period after 2000), for the reason of rapid overtime increase in minimum wage in Indonesia. Third, with respect to the minimum wage, one may speculate that the sharp increase in the minimum wage may have affected the decision of firms in hiring workers and this, in turn, may explain why there is a tendency of declining trend in the demand for skilled workers in 2000s. Fourth, the fact that cross-section variation (across industries) also exists leads one to speculate that there should be other factors that may explain this variation other than trade liberalization (or tariff cut) as proposed by Amiti and Cameron. The observations that many of the sectors/industries with above-average statistics are capital-intensive and consist of many parts and components industries more support for the importance of 'outsourcing'/'production-sharing' theory of Feenstra & Hanson (1996, 1997) in explaining the cross-sectional variation.

3.3. Comparisons of Globalized Plants and Others

As explained in subsection 3.1, export and import status and ownership have been changing during last decades. This subsection compares relative wages, skilled workers' share in total employment and wages between globalized plants and other. There is evidence that exporters employ a higher share of white-collar workers than non-exporting plants in developing countries (e.g., Harrison & Hanson 1999), which indicates that firms in developing countries are required to employ a relatively large number of skilled workers to meet a demand for higher quality from developed countries. Furthermore, a related study by Amiti & Davis (2011), which examined the effect of tariff reduction on wages in Indonesian manufacturing, suggests that the wage consequence of a tariff change depends on the mode of globalization of the firm at which a worker is employed.

Top two panels of Figure 3 make a comparison between non-exporting and exporting plants. One of the clear differences between them is that exporters pay higher relative wages for skilled workers compared to non-exporters, while the employment share of skilled worker is almost same. As a result, skill intensity, which is measured as the share of skilled workers in total wage, is higher for exporters than for non-exporters. The difference between globalized plants and others is more apparent when we compare non-importing and importing plants (middle panels) and local and foreign-owned plants (bottom panels). Importing or foreign-owned plants pay higher relative wages for skilled workers but the relative wages are decreasing over the period. In addition, importing or foreign-owned plants employ a relatively large number of skilled workers compared to not only non-importing or local plants but also exporters. These suggest that importing and/or foreign ownership is more important determinants of relative wage and employment at a plant-level. Another difference of importers and foreign-owned plants from other groups is that the employment share of skilled workers does not seem to increase over the period, while the corresponding shares for other groups are slightly increasing. As a result, the average wage share of skilled workers or skill intensity in foreign-owned plants (and importing plants) decreased relatively faster compared to others.

4. Effects of Tariff Reduction on Wage Skill Premium and Skill Intensity

4.1. Input and Output Tariffs and Other Variables

Indonesia's tariffs on imported manufacturing goods are taken from World Bank's World integrated Trade Solutions (WITS).[4] The dataset includes not only MFN applied rates but also effectively applied rates which take account for available preferential tariff rates. These rates can be classified at a 4-digit ISIC level, which are calculated as simple averages of corresponding tariffs at a 9 or 10-digit HS level. The tariffs at a 4-digit ISIC level are used as output tariffs in our analysis.[5]

To construct input tariffs, we basically follow the method used in Amiti & Konings (2007), in which input tariffs are calculated from output tariffs and cost shares of intermediate inputs. In our analysis, input tariffs on a good in industry *i* at a 4-digit ISIC level in year *t* are calculated as follows:

$$\text{input tariff}_{it} = \sum_{i} w_{ji} \times \text{output tariff}_{jt},$$

where w_{ji} is cost share of intermediate input from industry *j* in total intermediate inputs of industry *i*. The cost shares are calculated at an industry-level aggregating intermediate inputs of each plant in the manufacturing dataset in 2006.

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[4] In 2004, Indonesia adopted the ASEAN Harmonized Tariff Nomenclature (AHTN, 10 digit codes) for classifying imports and exports as part of its commitments under AFTA. Until then, the Harmonized Commodity Description and Coding System (HS, 9-digit codes) had been used.

[5] While Amiti & Konings (2007), Amiti & Davis (2011) and Amiti and Cameron (2012) used output tariffs at a 5-digit ISIC level (revision 2), we use output tariffs at a 4-digit ISIC level (revision 3) partially because tariffs at a 5-digit ISIC level are not available in the WITS and partially because a concordance between 9 or10-digit HS codes and 5-digit ISIC codes is not available.

Combining the tariff data, we examine a plant-level panel dataset which covers Indonesian manufacturing plants with 20 workers or more in 2000-2008. In the rich dataset, various kinds of variables are available. An advantage of the dataset is that it contains wage bills (R) as well as the number of workers (L) by type, non-production workers and production workers, which have been used as proxies for skilled and unskilled workers, respectively, in many previous studies. Therefore, we can used average wages (R/L) for non-production and production works as skilled wage and unskilled wage. It also contains plant's value added, physical capital, ownership and other variables which enable us to estimate relative wage equations and skilled worker share of total wage bill explained below.[6]

4.2. Wage Skill Premium Equation

To examine the effects of input and output tariff reduction on wage skill premium, Amiti & Cameron (2012) estimated a following relative wage equation (Eq.1) using data for 1990-2000:

$$\ln\left(\frac{w_s}{w_u}\right)_{f,i,t} = \alpha_f + \alpha_{l,t} + \beta_1 * \text{input tariffs}_{i,t} + \beta_2 * \text{input tariffs}_{i,t} * \text{impshare}_{f,i,t} + \beta_3 * \text{output tariffs}_{i,t} + \beta_4 * \text{output tariffs}_{i,t} * \text{expshare}_{f,i,t} + Z_{f,i,t}\Gamma + \varepsilon_{f,i,t},$$

where w_s and w_u are wage for skilled workers (non-production workers) and unskilled workers (production workers), respectively. The subscripts f, i, t and l denote firm (plant), industry, year and location, respectively. Therefore, α_f refers to firm-specific time-invariant effects, and $\alpha_{l,t}$ refers to location-year fixed effects. In addition to input

[6] Value added was deflated using wholesale price index at a two-digit level of ISIC, revision 3. Deflated physical capital was calculated as sum of building deflated by price index for building material, machinery deflated by price index for imported machinery, vehicle deflated by transport machinery, and others deflated by wholesale price index for manufacturing goods. The price indices were taken from BPS-Statistics, *Economic Indicators*.

and output tariffs, an interaction term between input tariffs and firm's share of imported material to output, as well as another interaction between output tariffs and firm's export share, are included on the right-hand side. The empirical results supported the hypothesis that reduction of input tariffs reduces wage skill premium for skilled workers and the effect is strongest for importers as indicated by the positively significant coefficients on both input tariffs and the interaction with the import share.

This paper re-estimated the model using more recent data for 2000-08. The results of estimation are shown in Table 3. In the first column, the relative wage of skilled workers is regressed on input and output tariffs.[7] The coefficient on input tariffs is significantly positive but the coefficient on output tariffs is not statistically significant. The magnitude of the former coefficient, 0.830 suggest that 10 percent input tariff reduction induces 8 percentage point reduction of wage skill premium. In column 2, the estimation included the interacting term between input tariff and import share as well as another interacting terms between (plant-level) export dummy variable and output tariffs. This is to follow the exercise done by Amiti and Cameron (2012).[8] The estimation only gives weakly significant estimate to the interaction between input tariff and import share, and the sign of this estimate is positive. This is a similar result with the one coming from Amiti and Cameron (2012), which suggest that reduction in input tariffs reduces relative wage in plants with relatively high import share of (intermediate) input. This is also consistent with an expectation of trade theory, which hypothesizes that relative wage of skilled workers decreases because production of skill-intensive inputs is replaced by imports within a firm in an unskilled-worker abundant economy. The result does not change after including dummy variable which takes one if the plant is foreign-owned (Column 3). However, when we include interaction terms of foreign ownership dummy with input tariffs and output tariffs (Column 4), the coefficients on input tariffs and the interaction of input tariffs and imported material share turns to be insignificant. Instead, the interaction of input

[7] Amiti & Cameron (2012) included the year-island effects (DKI Jakarta, Java, Sumatra, Kalimantan, Sulawesi, other islands). The main results does not change including the year-island effects instead of year dummies.

[8] Because of data constraint, we use export dummy instead of export shares.

tariffs and foreign ownership dummy is significantly positive. This result suggests that reduction of input tariffs reduces wage skill premium only in foreign-owned plants that has paid higher relative wages for skilled workers. The inclusion of other plant characteristic variables, plant size measured by total number of workers (ln L) and the employment share of skilled workers (S_{ls}), do not affect the result.

Table 3: Effects of tariff reduction on wage skill premium (dependent variable: ln (ws/wu))

	[1]	[2]	[3]	[4]	[5]	[6]
T^{input}	0.83	0.687	0.675	0.371	0.361	-0.087
	[0.343]**	[0.348]**	[0.348]*	[0.358]	[0.357]	[0.336]
$T^{input} \times S_{imp}$		2.942	3.003	1.303	1.502	2.42
		[1.625]*	[1.620]*	[1.669]	[1.671]	[1.580]
$T^{input} \times D_{fs}$				3.294	3.49	3.62
				[0.975]***	[0.974]***	[0.916]***
T^{output}	-0.035	-0.031	-0.031	0.004	0.004	-0.002
	[0.063]	[0.064]	[0.064]	[0.067]	[0.067]	[0.065]
$T^{output} \times D_{exp}$		-0.014	-0.013	-0.019	-0.018	0.035
		[0.117]	[0.117]	[0.116]	[0.117]	[0.111]
$T^{output} \times D_{fs}$				-0.307	-0.293	-0.1
				[0.227]	[0.227]	[0.212]
S_{imp}		-0.056	-0.059	0.032	0.013	-0.03
		[0.097]	[0.097]	[0.099]	[0.099]	[0.093]
D_{exp}		0.001	0	0	-0.004	-0.007
		[0.012]	[0.012]	[0.012]	[0.012]	[0.012]
D_{fs}			0.108	-0.038	-0.06	-0.083
			[0.056]*	[0.074]	[0.074]	[0.070]
In L					0.088	0.052
					[0.008]***	[0.008]***
S_{ls}						-1.906
						[0.033]***
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Plants	36,547	36,547	36,547	36,547	36,547	36,547
Observation	146,182	146,182	146,182	146,182	146,182	146,182
AR^2	0.007	0.007	0.007	0.007	0.01	0.103
F	68.169	49.683	46.612	41.473	45.692	222.145

Notes: "***", "**", "*" indicate statistically significant at 1 percent, 5 percent, or 10 percent level, respectively.

4.3. Skill Intensity

The results presented in previous subsection suggest that input tariff reduction reduces wage skill premium (especially in foreign-owned plants). This is consistent with the prediction of trade theory that the distributional changes in developing countries, which usually are endowed with unskilled workers, should favor unskilled workers more than the skilled ones. The mechanism underlying this prediction is that relative demand for skilled workers is decreased because domestic production of relatively skill-intensive intermediate inputs is replaced by imports and thus relative

demand for skilled workers decreases. However, as seen in previous section, relative demand for skilled workers tended to have slightly increased in the Indonesian manufacturing. To explore the mechanism, this subsection examines how plants respond to the tariff reductions in terms of skill intensity. The skill intensity has been used as a measure of skill upgrading (Bernard & Jensen, 1997) and the change in the variable incorporates the changes in relative wages and relative employment, as noted above.

The equation of skill worker share of total wages has been typically estimated in previous studies that examined firm-level datasets based on a theory of (trade-induced) skill-biased technological change (see Chennels & Van Reenen, 1999 for review). The equation is derived from a quasi-fixed translog cost function with two variable factors (skilled workers and unskilled workers) and two quasi-fixed factors (physical capital and technology). Given the restrictions that ensure that cost is homogeneous of degree one in prices and Shaphard's lemma, an equation of skilled workers share of total wage bill can be derived as follows:[9]

$$\left(\frac{R_s}{R}\right)_{f,i,t} = \alpha_s + \beta_s * \ln\left(\frac{w_s}{w_u}\right)_{f,i,t} + \beta_q \ln Q_{f,i,t} + \beta_k \ln K_{f,i,t} + \beta_\tau \ln \tau_{f,i,t},$$

where R_s is wage bill paid for skilled workers and R is total wage bill. Q, K and τ are value added, physical capital and technology, respectively. If that the cost share is independent of the levels of value added and the quasi-fixed factors (homotheticity of the structure of production: $\beta_q + \beta_k + \beta_\tau = 0$), a following estimated model with control variables Z is derived (Eq. 2):

$$\left(\frac{R_s}{R}\right)_{f,i,t} = \alpha_f + \alpha_t + \beta_s * \ln\left(\frac{w_s}{w_u}\right)_{f,i,t} + \beta_k \ln\left(\frac{K}{Q}\right)_{f,i,t} + \beta_\tau \ln\left(\frac{\tau}{Q}\right)_{f,i,t} + Z_{f,i,t}\Gamma + \varepsilon_{f,i,t},$$

[9] See Chennels & Van Reenen (1999) for the derivation in more detail.

A positive and significant coefficient β_τ indicates the skill biased technical change. The model that emphasizes the presence of traded intermediate inputs assumes that firms split apart their production process across countries (Feenstra, 2004, p. 100).

In our present analysis, input and output tariffs and the interactions introduced in the previous subsection are added to the equation 2. The estimation results are shown in Table 4. In these estimations, the relative wage variable on the right hand side is measured as an industry-average, assuming that plants are price takers. After accounting for the change in average relative wages at an industry-level, the result shown in column 1 suggests that the reduction of input tariffs increases skill intensity while the reduction of output tariffs does not affect significantly. The magnitude of the effect of input tariff reduction on skill intensity depends on the extent to which a plant imports intermediate material (Column 2 and 3). The positive coefficient on the interaction term of input tariffs and import share suggests that plants with lower import share increases skill intensity more responding to input tariff reduction, compared to plants with higher import share. The point estimate of coefficient on the input tariffs variable, -0.217 suggest that 10 percent input tariff reduction increases skill intensity by 2.17 percentage point for non-importing plants. On the other hand, the marginal effect of input tariff reduction calculated assuming the import share is 10 percent (average import share for importing local plants is about 20 percent) based on estimation results shown in Colum 3 was -0.103 and statistically insignificant. These results suggest that input tariff reduction have impacts on skill intensity for not-globalized plants.

Table 4: Skilled worker share of total wages, tariffs and industry/plant-specific factors.

Dependent variable	R_s/R (skilled worker share of total wages) .					
	[1]	[2]	[3]	[4]	[5]	[6]
$\ln(\overline{w_s/w_u})$	0.004	0.004	0.004	0.004	0.004	0.004
	[0.002]**	[0.002]**	[0.002]**	[0.002]**	[0.002]**	[0.002]**
T^{input}	-0.164	-0.216	-0.217	-0.281	-0.29	-0.29
	[0.082]**	[0.084]**	[0.084]***	[0.085]***	[0.085]***	[0.085]***
$T^{input} \times S_{imp}$		1.136	1.14	0.65	0.645	0.644
		[0.398]***	[0.397]***	[0.430]	[0.430]	[0.430]
$T^{input} \times D_{fs}$				0.834	0.834	0.834
				[0.266]***	[0.266]***	[0.266]***
T^{output}	-0.011	-0.012	-0.012	-0.011	-0.011	-0.011
	[0.017]	[0.018]	[0.018]	[0.018]	[0.018]	[0.018]
$T^{output} \times D_{exp}$		0.009	0.009	0.004	0.004	0.004
		[0.024]	[0.024]	[0.024]	[0.024]	[0.024]
$T^{output} \times D_{fs}$				0.01	0.012	0.012
				[0.080]	[0.080]	[0.080]
S_{imp}		-0.051	-0.051	-0.024	-0.024	-0.024
		[0.025]**	[0.025]**	[0.026]	[0.026]	[0.026]
D_{exp}		-0.002	-0.002	-0.002	-0.002	-0.002
		[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
D_{fs}			0.014	-0.031	-0.032	-0.032
			[0.014]	[0.017]*	[0.017]*	[0.017]*
In (K/Q)	0.003	0.003	0.003	0.003	0.003	0.003
	[0.001]***	[0.001]***	[0.001]***	[0.001]***	[0.001]***	[0.001]***
$S_{foreign\ capital}$					0.005	0.005
					[0.003]	[0.003]
$R_{machinery/total\ capital}$						0.001
						[0.004]
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Plants	25,667	25,667	25,667	25,667	25,667	25,667
Observation	95,828	95,828	95,828	95,828	95,828	95,828
AR^2	0.002	0.002	0.003	0.003	0.003	0.003
F	8.171	7.055	6.694	6.738	6.555	6.248

Notes: "***", "**", "*" indicate statistically significant at 1 percent, 5 percent, or 10 percent level, respectively. Column 6 presents the estimation result of between-effects model.

Column 4-6 additionally includes interactions of input and output tariffs with foreign ownership dummy, and share of capital stock in foreign-owned plants at a 4-digit industry-level ($S_{foreign\ capital}$) and plant-level ratio of machinery to total capital

stock ($R_{machinery/total\ capital}$) as variable that capture technological changes. The coefficient on the interaction of input tariffs with the ownership dummy is significantly positive while the interaction with import share turns to be insignificant. The marginal effect of input tariffs evaluated for local plants was -0.255, while corresponding effect for foreign owned plants was evaluated as 0.578. These indicates that 10 percent input tariff reduction increases skill intensity for local firms by 2.5 percentage point and decreases for foreign-owned plants by 5.78 percentage point.

The estimation results in previous subsection suggest that the relative wages for skilled workers vary among plants. Table 5 shows the estimation results of equation 2 which includes the relative wages at a plant-level instead of an industry-average as in Table 4. The results of fixed-effect model (Columns 1 and 2) suggest similar results with Table 4, indicating that input tariff reduction increases skill intensity in local plants and decreases in foreign-owned plants. However, these estimates may suffer from endogeneity problem because the relative wage at a plant-level is apparently an endogenous variable in the skill-intensity equation. Columns 3 and 4 show the results of regression using GMM technique developed by Arellano & Bond (1991). In this estimation, the relative wage and K/Q were assumed to be endogenous and their 1^{st} differences were instrumented by the level of 3-year lags in the differenced equation. Even after accounting for the endogeneity, main results of previous estimation do not change.

To examine the impact of input tariff reduction on skill intensity in local plants, equation 2 was estimated excluding foreign-owned plants from estimation sample (Column 5). The estimation result was similar with Column 3 in Table 4.

Table 5: Skilled Worker Share of Total Wages, Tariffs and Industry/plant-Specific Factors.

Dependent variable	R_s/R (skilled worker share of total wages) .					
	[1]	[2]	[3]	[4]	[5]	[6]
R_s/R_{-1}						0.746
						[0.123]***
ln (w_s/w_u)	0.084	0.084	0.071	0.072	0.069	-0.016
	[0.001]***	[0.001]***	[0.009]***	[0.008]***	[0.008]***	[0.015]
T^{input}	-0.237	-0.307	-0.253	-0.303	-0.284	-0.146
	[0.078]***	[0.080]***	[0.084]***	[0.080]***	[0.081]***	[0.090]
$T^{input} \times S_{imp}$		0.463		0.507	0.898	0.91
		[0.374]		[0.380]	[0.514]*	[0.481]*
$T^{input} \times D_{fs}$		0.463		0.49		0.027
		[0.240]*		[0.246]**		[0.268]
T^{output}	-0.011	-0.016	0.003	-0.016	-0.02	0.006
	[0.015]	[0.015]	[0.018]	[0.016]	[0.015]	[0.018]
$T^{output} \times D_{exp}$		0.014		0.012	0.02	0.001
		[0.021]		[0.021]	[0.022]	[0.032]
$T^{output} \times D_{fs}$		0.057		0.043		-0.04
		[0.066]		[0.068]		[0.077]
S_{imp}		-0.018		-0.024	-0.047	-0.059
		[0.023]		[0.024]	[0.032]	[0.030]*
D_{exp}		-0.002		-0.002	-0.002	-0.001
		[0.002]		[0.002]	[0.003]	[0.003]
D_{fs}	0	-0.03	-0.007	-0.029		-0.007
	[0.013]	[0.016]*	[0.014]	[0.016]*		[0.020]
In (K/Q)	0.002	0.002	0.003	0.006	0.004	0.006
	[0.000]***	[0.000]***	[0.005]	[0.004]	[0.004]	[0.004]
$S_{foreign\ capital}$	0.005	0.006	0.005	0.006	0.005	0.006
	[0.003]**	[0.003]**	[0.003]	[0.003]**	[0.003]*	[0.003]*
$R_{machinery/total}$	-0.001	-0.001	0.299	-0.003	0	-0.009
	[0.003]	[0.003]	[0.181]*	[0.004]	[0.004]	[0.005]*
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Plants	25,667	25,667	25,667	25,667	23,480	19,542.00
Observation	95,828	95,828	95,828	95,828	87,124	67,897.00
AR^2			0	0	0	0
AR1			0	0	0	0
AR2			0	0	0	0
Hansen			0.376	0.597	0.703	0
Instruments			31	32	29	36

Notes: "***", "**", "*" indicate statistically significant at 1 percent, 5 percent, or 10 percent level, respectively.

5. Concluding Remarks

This paper addresses the topic of globalization and skill premium (i.e. the gap in wage and the extent of skilled workers hired by a firm) using the plant-level data of Indonesia manufacturing. It asks the question of how the greater trade and investment openness, as a result of trade and investment liberalization in the 1990s and early 2000s, affect the skill premium and intensity within firms, the mechanisms at work, and which theories can explain the relationship between the liberalizations and skill premium.

The descriptive analysis shows a declining pattern in the relative wages while there is a slightly increasing trend in relative employment. As a result, there is rather declining trend in the share of skilled workers in wages. In addition, the analysis suggests that the trend in relative wage and demand for skilled workers are different between foreign-owned plants and plants with higher importing share on one hand and other plants on the other hand. The relative wages for skilled workers in foreign-owned plants, which were much higher than other plants, have been declined faster than that for other plants. Furthermore, the patterns of relative demand for skilled workers in foreign-owned and importing plants are more or less flat while other plants increased slightly relative demand for skilled workers.

The econometric results point to several key points. First, they confirmed the earlier study by Amiti & Cameron (2012) that finds the impact of tariff cut on relative wage between skilled and unskilled workers. This is consistent with trade theory which suggests that trade liberalization decreases relative demand for skilled labor in a less-skilled worker abundant economy because domestic production of relatively skill-intensive intermediate inputs is replaced by imports. Second, the results, at the same time, also show that the input tariff cut leads to lower skill intensity (i.e., lower share of skill workers in total wages bill) in foreign-owned plants or plants with higher share of imported material to output. This is also consistent with the trade theory. Third, the results also suggests that the input tariff cut leads to higher skill intensity in local plants or non-importing plants or plants with lower share of imported material to output. One of the possible interpretations of this result is that local plants or not-importing plants responded to the increasing competitive pressure from foreign-owned or importing plants, which could improve efficiency by importing intermediate inputs,

by increasing employing a relatively large number of skilled workers. The decrease in the relative wages for skilled workers enabled the plants to respond so.

All in all, this study (temporarily) concludes that globalization indeed create a pressure to narrow the gap in the wage difference between skilled and unskilled workers and the difference in wage skill premium among plants in Indonesian manufacturing.

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Appendix

Table A1. Relative wage of skilled workers to unskilled workers

		1990-93	1994-96	1997-99	2000-02	2003-05	2006-08
15	Food products and beverages	2.22	1.96	2.06	1.89	1.81	1.76
16	Tobacco	3.36	3.06	3.74	2.78	2.71	2.30
17	Textiles	2.47	2.18	2.23	1.99	1.97	1.77
18	Wearing apparel	2.36	2.23	2.16	1.86	1.77	1.69
19	Tanning and dressing of leather	2.80	2.44	2.39	2.12	2.00	1.74
20	Wood and products of wood	2.20	2.07	2.19	2.05	1.96	2.06
21	Paper and paper products	2.67	2.35	2.52	2.07	1.88	1.91
22	Publishing and printing	1.98	1.90	1.84	1.65	1.57	1.53
23	Coal/refined petroleum products	1.98	1.62	1.97	2.26	1.58	1.79
24	Chemicals and chemi. products	2.57	2.25	2.48	2.17	2.05	2.01
25	Rubber and plastics products	2.44	2.12	2.25	1.94	1.90	1.92
26	Non-metallic mineral products	2.16	1.91	2.03	1.95	2.05	1.91
27	Basic metals	2.69	2.30	2.68	2.47	2.31	2.08
28	Fabricated metal products	2.56	2.31	2.51	2.03	1.95	1.95
29	Machinery and equipment	2.06	1.89	2.06	1.97	2.08	2.02
30	Office/computing machinery	2.47	3.62	3.55	2.79	3.24	1.92
31	Electrical machinery	2.71	2.44	2.80	2.42	2.46	2.20
32	Radio/television/communication	3.08	2.85	3.10	2.82	2.66	2.47
33	Precision/optical instruments	2.30	2.50	2.46	1.95	2.03	1.92
34	Motor vehicles and trailers	2.25	2.24	2.73	2.34	2.34	2.24
35	Other transport equipment	1.98	1.85	2.00	1.92	1.70	1.72
36	Furniture	2.70	2.17	2.29	1.92	1.84	1.86
	Total manufacturing	2.39	2.13	2.26	1.99	1.93	1.86

Table A2.Share of skilled workers in total employment (percent)

		1990-93	1994-96	1997-99	2000-02	2003-05	2006-08
15	Food products and beverages	19.6	21.3	20.6	19.7	20.0	21.6
16	Tobacco	8.7	10.3	9.2	10.0	12.0	11.3
17	Textiles	12.4	13.1	13.6	14.1	13.8	14.0
18	Wearing apparel	10.7	11.5	11.4	11.5	12.1	12.6
19	Tanning and dressing of leather	12.0	12.8	13.4	14.5	15.5	14.9
20	Wood and products of wood	16.4	16.8	15.1	15.4	15.4	16.0
21	Paper and paper products	18.3	19.6	19.7	19.7	20.5	20.7
22	Publishing and printing	22.3	22.9	23.5	24.1	23.9	25.3
23	Coal/refined petroleum products	29.3	34.4	28.7	28.0	28.8	29.7
24	Chemicals and chemi. products	29.6	30.7	29.1	29.4	31.2	33.3
25	Rubber and plastics products	18.3	19.3	18.5	18.3	17.8	18.9
26	Non-metallic mineral products	13.9	16.3	17.1	16.0	15.6	16.1
27	Basic metals	24.0	24.6	23.7	22.6	23.5	23.7
28	Fabricated metal products	17.6	17.5	18.6	19.1	19.2	20.3
29	Machinery and equipment	18.3	18.6	21.3	22.4	23.0	23.0
30	Office/computing machinery	22.8	16.7	26.2	41.4	21.6	17.1
31	Electrical machinery	21.0	21.0	22.8	23.1	21.4	21.8
32	Radio/television/communication	17.3	15.7	18.3	17.7	15.1	16.2
33	Precision/optical instruments	18.9	16.7	18.5	24.0	20.3	19.3
34	Motor vehicles and trailers	20.6	20.8	21.7	21.6	20.8	20.0
35	Other transport equipment	18.6	18.6	19.8	19.4	19.9	20.3
36	Furniture	12.6	13.9	13.4	13.7	14.5	15.6
	Total manufacturing	16.9	17.9	17.8	17.6	17.9	18.7

Table A3. Share of skilled workers in total wage (percent)

		1990-93	1994-96	1997-99	2000-02	2003-05	2006-08
15	Food products and beverages	28.2	27.9	27.3	25.0	24.9	26.0
16	Tobacco	18.6	19.5	18.8	16.3	18.3	16.4
17	Textiles	21.6	20.7	21.2	20.4	19.9	18.8
18	Wearing apparel	18.7	18.4	17.6	16.0	16.1	16.1
19	Tanning and dressing of leather	23.4	21.4	21.5	21.5	21.9	19.8
20	Wood and products of wood	24.5	24.0	22.5	22.0	21.1	22.7
21	Paper and paper products	30.9	30.5	30.7	28.1	27.8	28.7
22	Publishing and printing	30.9	30.6	30.0	29.3	29.0	29.8
23	Coal/refined petroleum products	38.5	40.2	35.3	35.9	33.3	34.6
24	Chemicals and chemi. products	42.6	41.0	40.4	38.8	39.9	41.9
25	Rubber and plastics products	28.6	27.5	27.2	25.0	24.3	25.7
26	Non-metallic mineral products	21.0	21.3	23.1	21.3	20.7	21.1
27	Basic metals	37.1	35.4	36.5	33.8	32.7	32.9
28	Fabricated metal products	29.3	27.2	28.9	27.0	26.6	27.8
29	Machinery and equipment	26.5	25.6	29.0	30.0	31.0	31.3
30	Office/computing machinery	32.1	28.3	37.6	45.5	41.3	21.5
31	Electrical machinery	34.9	33.0	34.8	32.8	31.2	30.9
32	Radio/television/communication	31.0	26.9	31.1	28.8	25.1	25.7
33	Precision/optical instruments	30.5	26.3	27.9	31.2	27.6	26.2
34	Motor vehicles and trailers	30.6	30.9	33.4	31.5	30.9	29.7
35	Other transport equipment	25.6	24.4	26.7	25.9	25.4	25.2
36	Furniture	22.8	21.2	20.7	19.2	19.9	21.2
	Total manufacturing	26.2	25.6	25.6	23.9	23.8	24.3