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Global Trading of Electronic Component in Indonesia Manufacturing Industry

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This paper deals with firm level data of Indonesian electrical and electronics industries in determining firm's production, especially among export intensity and component trade integration. In the full sample, the result demonstrates that component trade integration is a significant determinant on productivity while export intensity is not. In ordinary trader sub-sample, export intensity is a significant determinant of firm's production, whereas in global trader sub-sample export intensity is not. The policy implications of these results might not support totally for policies promoting export in Indonesian electrical and electronics industries. Export policies within the context of global trade and production value chains should be conducted with caution.

Key words: *export intensity, component trade integration, electrical and electronics industries.*

Introduction

It is a well-known fact that export expansion is an important feature for productivity gain, which is key determinant of economic growth. In this context, export expansion hinges on the trading of final goods and commonly measured by export over output, which is known as export component and it is considered to be an indicator of the competitiveness. However, the role of component trade integration, which is the use of imported inputs to produce goods that are afterwards exported, has yet to be fully recognized. It is only in very recent years that the empirical studies have started to focus on the role of component trade integration. It seems reasonable to expect the plant level productivity effects to differ depending on exporter characteristics. It can be distinguished by exporters from purely domestic plants and foreign

plants-owned by multinational national corporations (MNCs). This means that exporter from domestic plants export final goods using local inputs, while exporter from foreign plants owned by MNCs is allowed to unbundle their production process or outsource into other countries which usage inputs are cheap.

The cross-border dispersion of product component within global trade integration has become a growing phenomenon in the international trade. Athukorala (2005) discusses an international product component by using trade flows on parts and components as well as examines the implications of this phenomenon for global and regional trade patterns in East Asia countries. International component trade in East Asia has generally grown faster than total world trade in manufacturing. The global integrated production processes has made the East Asian growth dynamism increasingly reliant on extra-regional trade, strengthening the case for a global, rather than a regional. Khalifah (2013) also argues that trading of component goods across borders, as a result of global integrated production processes, has become a prominent feature in world trade. The cheap labor costs were just not enough of a reason for MNCs to locate their production in a developing country in the initial stage because the trade barriers and transaction costs were too high. The push factors, such as investment and trade liberalization, free trade zones as well as reducing tariffs, have made them more profitable to outsource specific product segments. Low production costs in certain part of goods in developing countries, decreasing transport and communication costs, all of which are further rein forced by technological advancements that also allow the production value chain to be unbundle.

Furthermore, a comprehensive policy for Indonesian electrical and electronic industry started in 1986. The main purpose of this policy was to promote the introduction of foreign capital. This policy represented a shift from restrictive government policies to more relaxed regulations on MNCs and the attendant production networks. As a result, Indonesia has fully utilized its comparative advantage and started to enjoy being a major recipient of foreign direct investment (FDI) and exporter of high-technology products. However, because high-quality components were not being produced locally, foreign firms imported the majority of their components and only assembled them domestically. The presence of FDI in Indonesia has raised a question whether being a host to MNCs and their attendant component trade, which includes high export intensity of firms in high-technology product is a still viable policy option under this circumstances. Indeed, global trade integration and FDI spillover effects on firm's production idea in the Indonesian electrical and electronics industry is an excellent example of firm level data study.

Therefore, the objective of this study will examine the export intensity and component trade integration in determining firm's production among other firm specific characteristic variables in the Indonesian electrical and electronics industry. Export intensity measure such as export over output can be misleading in determine firm's production. It is because the majority of their input components are imported and then afterwards their output exported. Therefore, a more

desirable measure of export expansion such as component trade integration will be implemented in the models of the study. Because of electrical and electronics industries enjoying a huge recipient of FDI, this study also wants to examine productivity gains from FDI spillover effects. Furthermore, some other firm specific characteristic variables such as foreign share, scale of production as well as market competition which may affect firm's production will be also included in the models.

The rest of the paper proceeds as follows: Section 2 reviews the literature of export expansion. Section 3 provides the dataset, variables and methodology. Section 4 presents the estimated results and then followed by an analysis of empirical results. The conclusions are given in the final section.

Literature of Export Expansion

They are some explanations of the effect of export on plant's production. The exporting firms are expected to be more productive than non-exporting firms. This is because the exporting plants might receive technology spillovers through their exporting experience. They might come into contact with foreign technology through their exporting activity. It is likely that they get more access to technology. This raises the firm technological capacity, which in turn increases the firm productivity (Keller, 2009). It also argues that only more productive firms self-select into export markets (Yasar & Paul, 2007; Pham et al., 2013). In this case, only exporter firms which are better to deal with sunk cost and world market complexities. They have ability to penetrate the international market. There are sunk entry costs that associated with doing export expansion, such as distribution and marketing costs, transportation costs, personnel with skills to manage foreign networks, or production costs in modifying current domestic products for foreign consumption. In order to pay these costs, exporting firms need to be more productive. On the other hand, non-exporting firms may be protected by their government and more profitable, but they are not as productive as exporting firms. As a result, firms with lower productivity may only choose domestic market and not entry the global market. Therefore, only those firms that are more productive are likely to join and stay in the global market.

Another explanation why exporters may be more productive is based on the core competence. According to the comparative advantage principle, it emphasizes that exporting firms optimize their product scope by specializing in their core competence (Carsten & Neary, 2010; Pham et al., 2013). Indeed, competitive pressures in the global market would like to induce firms to become more concentration on what they do best. According to this theory, the reallocation of activity within-firm, and not across-firm, as reflected by concentration and specialization after exporting, causes productivity growth. The exporter could have a higher productivity than non-exporter because of learning-by-exporting effects. Exporters do benefit from interacting with foreign customers. They impose higher product quality standards than domestic customers,

while at the same time providing information on how to meet the higher standards. There is abundant evidence that exporters are on average more productive than non- exporters (De Loecker, 2007; Wagner, 2007). Exporting firms raise their productivity by participating in world market. Exporting firms learn from foreign customers, who require specific product and process standards and get ideas from them whereby they provide information about among others. Thus, productivity gains associated with this learning by exporting process helps firms continue to produce for export markets.

In the global trade integration framework, international fragmentation might also increase plant level productivity. Assume that goods are produced in a multistage production process, which for each good involve different stages from basic upstream production to the eventual completion of the final good in the downstream stages. International product fragmentation allows companies to do multi-stages of production so that each stage can be placed in countries which used inputs are cheap. The nature of factor intensity of the given parts and the relative prices of factors in comparison with their productivity jointly determine which country produces what components. There is a fact that companies which outsourced their intermediates inputs can reach higher profits than those that did not. Additionally, relocating their stages of production can be pointed out as a way of achieving cost reductions and accessing technical expertise which not available in a home country (Athukorala, 2005).

Görg, et al. (2008) argue that a multistage production process of goods is if the goods are produced in different stages from basic upstream production to the eventual completion of the final good in the downstream stages. In this set up, one may expect a number of different possible effects. In the short run, the plant that involving in international outsourcing has access to internationally traded inputs, which may be available at higher quality than those available domestically. Hence, increasing use of internationally traded inputs may result in a direct boost in productivity for the plant, shifting its production function upward. This may be particularly important for plants that are operating far away from the international technological frontier in their industry. Furthermore, if a plant engages with multiple production stages in home country it may be beneficial to relocate those part of goods in which it is relatively inefficient or less productive to aboard where it can be carried out at lower cost. Home production could then focus on those activities that it does more efficient or more productive, and import the intermediate goods which produced abroad. Hence, it would be able to reallocate resources to the more efficient production stage, expand output and push its production function outward, thus creating higher firm productivity.

The Data, Variables and Methodology

The data are obtained from an annual survey of medium and large manufacturing establishments conducted by the Indonesian Central Board of Statistics (BPS) covering selected period from 2003 to 2009. The series data are designed to survey all manufacturing

establishments employing at least 20 workers in every year. Large establishment is an establishment engaging with more than 99 employees, while medium establishment is an establishment engaging with 20 to 99 employees[1]. Another supplementary data are wholesale price index published by BPS, which are used to deflate the values output and all inputs into real values or constant price of 2005.

This study uses a unique balanced panel data and only for electrical and electronics industries. The electrical and electronics industries include industries in international standard industrial classification (ISIC) 30-32 at the 2-digit level, encompassing 15 categories at the 5-digit level. A balanced panel dataset is constructed for the selected period by matching firms based on the specific identification code (PSID). Some observations are dropped when making consistency between industrial codes with ISIC in every year. Furthermore, the dataset are cleaned to minimize noise from non-reporting, misreporting and obvious typing mistakes in inputs. The adjustment process of cleaning data set follows a methodology similar with Sari et al. (2016). After the adjustment process for constructing a balance panel data, the numbers of observations are removed to 285 firms in every year, therefore the total number of observation will be 1995 firms.

The basic variables for each plant are complied output, fixed assets, value added, import of raw materials, export, foreign share and labor. The output variable is proxy by gross output. The gross output refers to total value of output produced by a firm in a given year. Capital stock is measured by the replacement value of fixed assets. The capital assets can be distinguished to the land and buildings, machinery and other capital goods as well as vehicles. Value added is taken to be the difference between the value of gross output and the cost of inputs. The labor input are measured by the number of employees. This is because of due to lack of data on man hours. All the data in the monetary values have been deflated into real values or constant price of 2005, using the wholesale price index.

The firm scale of production ($Scale_{it}$) variable is measured by value added of the firm i is divided by value added of the industry j. A plant with larger scale of production can be expected to gain from research and development, has better access to foreign technology and has higher risk-bearing aptitude compared to a plant with smaller scale. To be bigger plants, the plants must be productive in the past by having low-cost structures, which enable them to reduce prices and expand their scale. The Herfindahl–Hirschman Index (HHI) is used as a measure of the degree of market competition. Higher values of HHI indicate greater concentration of sales among producers and thus less competition. Higher concentration is an inverse measure of static competition that can protect less productive firms. However, higher concentration can also be the result of dynamic competition among firms of differential efficiency that removes

[1] Large companies are companies that employ more than 99 employees, while medium-sized companies are companies that employ 20 to 99 employees.

less productive firms from the industry as argued by Demsetz (1973) and Peltzman (1977). The first argument suggests that HHI is associated with lower productivity, while the latter argument suggests that HHI is associated with greater productivity. Therefore, the HHI_{jt} for a measure of market concentration of industry$j$ at time t, which is calculated as follows:

$$HHI_{jt} = \sum_{i \in j} s_{it}^2, \quad \text{where} i \in j \tag{1}$$

For s_i^2 is market share of each firms.

The $FShare$ is a variable that representing the share of firm total equity owned by foreign investors. Foreign equity ownership of a firm provides control over key aspects of a firm's operations, thus allowing for the exploitation of firm-specific assets of the foreign partner. Horizontal spillovers are defined as externalities derived from foreign firm presence, which benefits other firms through improvement of their productivity. The presence of foreign firms generates productivity gain to other firms in the same industry. As in Javorcik (2004), the $HorSpill$ variable is calculated as follows:

$$HorSpill_{jt} = \frac{\sum_{i \in j} ForShare_{it} * Y_{it}}{\sum_{i \in j} Y_{it}} \tag{2}$$

where $HorSpill$ denotes the horizontal spillover effects, $ForShare$ measures the share of firm total equity owned by foreign investors and$Y$expressesgross output.

The export expansion variables used as determinants of firm productivity contain export intensity and component trade integration. Export intensity(XI_{it}) is measured by ratio export to gross output.To measure component trade integration at the firm level, it will implement the overlap of exports and imported inputs to output. This measurement follows Khalifah (2013). The component trade integration or international fragmentation (CTQ_{it}) and defined as follows:

$$CTQ_{it} = \frac{2\,min\ (X_{it}, M_{it})}{Y_{it}} \tag{3}$$

where X_{it} and $M_{it}$are respectively exports and imported inputs and Y refers to gross output. A two-way trade dummy $(TWTD)$ takes on the value 1 for component traders and 0 for otherwise. The summary statistics of the panel data set for all variables discussed above is presented in Table 1.

Table 1: A Statistical Summary of Variables

Variables	Units	Obs	Mean	SD	Min	Max
y	*In (thousand rupiah)*	1995	12.4907	1.9729	6.5300	18.4200
k	*In (thousand rupiah)*	1995	11.5301	1.5510	6.4000	16.8500
l	*In (workers)*	1995	5.1036	1.3009	3.0000	8.9300
Scale	*ratio*	1995	0.0526	0.1182	0.0000	0.9350
HHI	*ratio*	1995	0.1998	0.1571	0.0540	0.9910
ForS	*ratio*	1995	0.3939	0.4574	0.0000	1.0000
HorSpill	*ratio*	1995	0.5404	0.2464	0.0260	0.9980
XI	*ratio*	1995	0.4346	0.2122	0.0090	1.0000
VTQ	*ratio*	1995	0.0967	0.2534	0.0000	1.6000
TWDT	*binary dummy*	1995	0.2080	0.4060	0.0000	1.0000

Notes: Obs = Observation; Mean = arithmetical average; SD = standard deviation; Min = minimum; and Max = maximum

This study deals with firm level panel data, when using a panel data model with small T and large N, meaning few time periods and many individuals, there will be serious endogenity issues on the relationship between firm specific characteristic variables and firm's production. The generalized method of moments (GMM) estimators can alleviate endogenity biases. The model can be treated with some specific characteristic variables as endogenous or predetermine. This estimator optimally exploits all the linear moment restrictions that follow the assumption of no serial correlation in the error terms (Arellano &Bond, 1991; Blundell & Bond 1998). Our approach in this study is to rely on a short dynamic panel regression framework (Roodman, 2009; Windmeijer, 2005), such as system generalized method of moments (GMM) and can be defined as follows:

$$y_{it} = \beta_y y_{it-1} + \boldsymbol{\beta_i x_{it}} + u_{it}, \quad (4)$$

$$u_{it} = v_i + e_{it} \quad (5)$$

where y_{it} is dependent variable and y_{it-1} is its lag value. $\boldsymbol{x_{it}}$ is a column vector of $k$regressors.$\boldsymbol{\beta}'$ are vectors of parameters to be estimated and subscript i and t denote firm and time period. u_{it} is the error term, which consists of the unobserved individual specific effects (v_i) and the observation specific errors (e_{it}).

Empirical Results

We begin with identifying the effect of export expansion on plant level production. We specify the establishment level production function as follow:

$$y_{it} = \beta_0 + \beta_y y_{it-1} + \beta_k k_{it} + \beta_l l_{it} + \beta_S Scale_{it} + \beta_H HHi_{it} + \beta_F ForS_{it} + \beta_H HorSpill_{it} + \beta_X XI_{it} + \beta_V CTQ_{it} + u_{it} \quad (6)$$

where y_{it} is the logarithm of gross output, k_{it} is log of capital stock, l_{it} is log of labor, $Scale_{it}$ is scale of production, HHi_{it} is the degree of market concentration, $ForS_{it}$ is foreign share, $HorSpill_{it}$ is horizontal spillover within industry, XI_{it} is export intensity and CTQ_{it} is component trade. Subscript i and t stand for firm and time, $\beta's$ are parameters to be estimated

and $u_{it}$is the error term, which consists of the unobserved individual specific effects (v_i) and the observation specific errors (e_{it}).

We can estimate the coefficients of equation (6) using system GMM and the results reported in Table 2. The results from the autocorrelations, Hansen and difference in Hasen tests in all models support the models estimated with the system GMM procedure. In all models, the $Scale$ variable is significant and positively associated with firm's production in all estimated models. Higher market power or less market competition as measured by HHI is negatively and significantly associated with production. Higher values of HHI indicate higher degree of industry concentration and thus, less competition and henceforth complacency, so that a negative coefficient of HHI is expected. The positive and statistically significant for $ForS$ coefficient indicates the higher degree of foreign ownership of establishments achieving higher level of production. The coefficients on $HorSpill$ variables are negative in all models. None of our models provide any evidence of positive horizontal spillover effects, suggesting that there is no positive learning from direct foreign competitors. The positive FDI spillovers seem to be small compared to the negative impact of FDI on firm's production.

Table 2: The Effect of Export Expansion and FDI Horizontal Spillover on Productivity Using System GMM

Variables	Model 1.1		Model 1.2		Model 1.3		Model 1.4	
	Coeff	Sign	Coeff	Sign	Coeff	Sign	Coeff	Sign
$Constant$	2.093 *	0.000	2.076 *	0.000	2.080 *	0.000	2.145 *	0.000
y_{it-1}	0.261 *	0.000	0.268 *	0.000	0.267 *	0.000	0.264 *	0.000
k_{it}	0.419 *	0.000	0.414 *	0.000	0.409 *	0.000	0.413 *	0.000
l_{it}	0.482 *	0.000	0.476 *	0.000	0.487 *	0.000	0.469 *	0.000
$Scale_{it}$	1.780 *	0.000	1.817 *	0.000	1.824 *	0.000	1.819 *	0.000
HHI_{jt}	-0.318 **	0.027	-0.427 *	0.007	-0.422 *	0.008	-0.402 *	0.010
$ForS_{it}$	0.234 *	0.000	0.189 *	0.005	0.203 *	0.003	0.222 *	0.001
$HorSpill_{jt}$	-0.376 *	0.000	-0.318 *	0.006	-0.309 *	0.006	-0.332 *	0.004
XI_{it}	-0.070	0.548			-0.220	0.120	-0.264	0.143
VTQ_{it}			0.233 **	0.036	0.382 *	0.005		
$TWDT_{it}$							0.312 **	0.042
AR(1)		0.000		0.000		0.000		0.000
AR(2)		0.305		0.309		0.293		0.330
Hansen test of overid. restrictions		0.462		0.185		0.220		0.199
Difference in Hansen test (null H = exogenous)		0.493		0.582		0.664		0.436
N (Number of observation)		1710		1710		1710		1710

Notes: *, ** and *** indicate statistical significance at the 1%, 5% and 10% levels.

To assess the validity of the instruments, it will be appropriate to use a Hansen test. The export intensity (XI), component trade integration (VTQ) and two trade dummy ($TWTD$) are interesting determinants of firm productivity in Indonesian Electrical and electronics industries. We compare the relative performance of the export intensity, component trade

integration and two trade dummy as determinants of firm's production in all models. When we include XI and CTQ variable in all models, the results show that variable XI in all models is not significant, while variable CTQ has a positive and statistically significant effect on firm productivity. The rapid increase of component production networks as a result of assembly-type activities of these MNCs may have diminished the causal link between export and production at the plant level. This study shows that component trade integration is associated with production of establishments and not exports intensity. Moreover, when we include $TWTD$ variable in the model 1.4, it is also significant for determine firm's production. This describes that establishments who receive outsourcing contracts can produce higher output than establishments who do not receive outsourcing contracts.

To verify the robustness of our main results we can distinguish ordinary trading establishments from component trading establishments. The estimation results for the sub-samples of component trading and ordinary trading establishments are shown in Table 2. The results of A-B test for autocorrelations as well as Hansen and difference in Hansen tests supports the model estimated with the system GMM framework. The estimated coefficients for both ordinary and component traders show that there is higher labor intensity. The coefficients of capital for both ordinary and global trading establishments are lower than their coefficients of labor. In Indonesian electrical and electronics industries, international fragmentation manifests itself as firms providing outsourcing services in terms of relatively unskilled-labor intensive stages of the production process to MNCs which offering subcontracts in this multi-stage production process. Furthermore, the sum of the coefficients of capital and labor on ordinary traders is greater than the sum of the coefficients of capital and labor on global traders. This indicates that replacement capacity is not as forthcoming for the component traders compared to ordinary traders.

Table 3: The Effect of Export Intensity and FDI Horizontal Spillover on Productivity on Ordinary and Global Trader's Productivity Using System GMM

Variables	Model 2.1 Ordinary Trading		Model 2.2 Global Trading	
	Coeff	Sign	Coeff	Sign
$Constant$	3.251 *	0.000	2.904 **	0.015
y_{it-1}	0.176 *	0.000	0.288 *	0.004
k_{it}	0.456 *	0.000	0.361 *	0.007
l_{it}	0.470 *	0.000	0.424 **	0.021
$Scale_{it}$	2.103 *	0.000	0.597	0.643
HHI_{jt}	0.046	0.833	-0.051	0.901
$ForS_{it}$	1.413 *	0.000	-0.013	0.945
$HorSpill_{jt}$	-2.233 *	0.000	-0.162	0.650
XI_{it}	1.333 *	0.007	-0.160	0.247
AR(1)		0.000		0.015
AR(2)		0.779		0.196
Hansen test of overid. restrictions		0.098		0.331
Difference in Hansen test (null H = exogenous)		0.304		0.136

Variables	Model 2.1 Ordinary Trading		Model 2.2 Global Trading	
	Coeff	Sign	Coeff	Sign
N (Number of observation)		1284		286

Notes: *, ** and *** indicate statistical significance at the 1%, 5% and 10% levels.

In model 2.1 (ordinary trader), a larger scale of production and higher foreign share are associated with production of ordinary trading establishments. However, the market power is not a significant determinant of firm's production and there is no positive horizontal spillover effect from MNCs to ordinary trading establishments. In model 2.2 (global trader), a scale of production, market power, foreign share and horizontal spill over are not significant determinant of firm's production on the component trading establishments.

Our finding in ordinary trader model shows that export intensity (XI) is a significant determinant of productivity for processing trade establishments, while in component trader model for the sub-sample of global trading establishments, XI is not a significant determinant of firm's production. These results support to the traditional view that exporting is positively associated with production of ordinary firms with almost complete production value chain in the exporting country. In the current international fragmentation context, most firms owned by MNCs are global traders. They produce incomplete production value chains and their exports are not necessarily associated with firm's production. This means that high export intensity establishments may be global traders with outsourcing already incorporated in global trading and thus outsourcing is not related to firm's production.

Higher degree of component integration is positively associated with production of establishments in Indonesian electrical and electronics industry pointing to the importance of net production relative to gross production. Global value chains and fragmentation of production in the global arena dictate the harsh reality of global competition in containing costs and promoting production of establishments in Indonesian electrical and electronics industries without export intensity being a significant determinant of production in the presence of global trade.

The policy implications of these results might not support totally for policies promoting export expansion in Indonesian electrical and electronics industries, especially in the context of component trade integration and global production value chain. Policy makers should consider whether the incoming MNCs carry out benefits to local firms. Furthermore, where there is potential lose gains from the FDI spillover; policy makers should at least, to ensure that the negative FDI spillovers on electrical and electronics industries do not overweight the overall benefits of the FDI. Institutional reforms such as government administration, building modern infrastructure, increasing and strengthening the institutions for accelerating and sustaining economic growth as well as trade policies are needed in order to develop a more competitive environment in the whole economy.

Conclusion

The empirical results show that component trade intensity is significant determinant on the firm's production while export intensity is not bigger scale of production and higher share equity of foreign ownership are positively and significantly related to firm productivity whereas higher market concentration is negatively and significantly associated with firm's production. There is a negative horizontal spillover effects from foreign firm to firm's production. Higher degree of component integration is positively associated with production of establishments in Indonesian electrical and electronics industry pointing to the importance of net production relative to gross production.

Only in the sub-sample of ordinary trading firms is export intensity associated with production. A larger scale of production and higher foreign equity ownership of establishments is related to production of establishments. However, the market power is not a significant determinant of firm's production and there is no positive horizontal spillover effect from MNCs to ordinary trading establishments. On the other hand, in the sub-sample of global trading firms, a scale of production, market power, foreign share and horizontal spill over are not significant determinant of firm productivity on the component trading establishments

Higher degree of component integration is positively associated with production of establishments in Indonesian electrical and electronics industry pointing to the importance of net production relative to gross production. The policy implications of these results might not support totally for policies promoting export in Indonesian electrical and electronics industries. An unqualified policy of export expansion within the context of component trade and global value chains in production should be conducted with caution. On the other hand, if there are negative spillover effects from FDI to Indonesian electrical and electronics industry, policy makers should consider whether the entering FDI carry out benefits to local firms. Policy makers should at least, to make sure that the negative FDI spillovers on electrical and electronics industries do not overweight the overall benefits of the FDI. Therefore, institutional reforms such as government administration, building modern infrastructure, increasing and strengthening the institutions for accelerating and sustaining economic growth as well as trade policies are needed in order to develop a more competitive environment in the whole economy.

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