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Exchange Rate and Employment in Indonesian Manufacturing Firms

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ABSTRACT

The objective of this study is to examine the effect of exchange rate movement on Indonesian manufacturing firm's employment. Using firm-level dataset for the period between 2008 and 2014, the GMM estimation results show that the exchange rate affects employment through revenue (i.e., export) and cost channels (i.e., imported inputs). An appreciation of the real effective exchange rates has a negative effect on employment through the revenue channel, but has a positive effect through the cost channel. However, the Wald Test indicates the net effect is not statistically different from zero, implying that any changes in the real effective exchange rate do not cause any changes in the firms' employment.

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INTRODUCTION

The standard input demand function for a profit-maximizing firm suggests that the optimal number of each input (i.e., capital, labor, and intermediate) is a function of the input and output prices. In an open economy, changes in the exchange rate will impact upon the imported input and output prices. Firms that either use imported inputs or export their output will experience changes in either the production cost or revenue from export, which may result in changes in their employment. A depreciation of the domestic currency will increase the production cost as the imported input becomes more expensive, and thus, reduces the demand for labor. However, depreciation of the domestic currency makes the exported output relatively cheaper, which results in an increased demand for labor due to an increase in the quantity demanded. Due to the different effects of exchange rate changes upon the input and output channels, the net effect of employment is ambiguous.

Empirical evidence on the effect of exchange rate movement is ample, yet the evidence is mixed. Some studies conclude that appreciation has a negative and significant effect on employment (e.g., Branson and Love, 1988; Hua, 2007; Revenga, 1992). Several other studies found different results (e.g., Campa and Goldberg, 2001; Gourinchas, 1999; Klein, Schuh, and Triest, 2003). Campa and Goldberg (2001) found that exchange rate movements have no significant impact on employment for the whole industry using 4-digit SIC manufacturing sector data in the United States between 1972 and 1995. The effect of appreciation is negative, but small and only significant in the lower market-power industrial sector. Gourinchas (1999) found that job creation is more responsive than job destruction using 2-digit manufacturing sector data in France. The increase in employment decreases when the exchange rate appreciates. Klein, Schuh, and Triest, (2003) conclude the opposite result using 4-digit level data of the manufacturing sector in the United States. They found that job destruction is more responsive to exchange rate appreciation, but the effect depends on the level of industry openness in international trade.

Several aspects may contribute to the mixed results such as different samples (i.e., U.S. vs France) as well as the methodology. However, the above-mentioned studies have two common aspects. First, the samples are from developed countries. Second, the employment changes are measured at an aggregate level instead of using firm-level data. Analysis of samples from developing countries at the firm-level data might provide valuable information on how exchange rate movements affect employment. In this study, we analyze the impact of the exchange rate on employment in a developing country (i.e., Indonesia) using firm-level data.

There are several reasons why the effects in developing countries can be different compared to those of developed countries. First, international trade in developing countries is usually conducted with dollars or other hard currency, instead of using domestic currency (Calvo and Reinhart, 2000). Hence, the level of the domestic exchange rate, relative to other countries' currencies, will greatly affect the trade. Second, developing countries tend to have a high trade openness, which causes the domestic inflation to be more sensitive to exchange rate fluctuation (Calvo and Reinhart, 2000). As a result, demand for labor will be more sensitive. However, market labor rigidity can also affect the sensitivity of the existing labor demand response (Burgess and Knetter, 1998). If the cost of hiring and firing is very expensive, there is the possibility of firms becoming less sensitive to changes in exchange rates. As a developing country, with a relatively rigid labor market, employment in Indonesia is an interesting case for further analysis.

Regarding the use of micro-level data, there are several reasons why this kind of analysis is more suitable for evaluating the exchange rates and employment relationship (Nucci and Pozzolo, 2010). Firstly, firms have a different level of export orientation and imported input content, which may affect the employment responsiveness to exchange rate changes. Second, the labor reallocation process that occurs between firms in the same industry sector is difficult to grasp using aggregate level data. This may result in an insignificant effect of exchange rate movements on employment (see, for instance, Campa and Goldberg, 2001). Third, the use of firm-level data can be more helpful in understanding the transmission mechanism, which is theoretically described using individual firm levels.

Using firm-level data from the Indonesian Medium and Large Manufacturing survey between 2008 and 2014, the empirical results using GMM estimation show that exchange rate appreciation reduces employment through the revenue channel (i.e., export orientation). However, exchange rate appreciation increases employment through the cost channel (i.e., imported input). Although exchange rate changes have a different effect on the revenue and cost channel, we fail to reject the null hypothesis that the net effect is statistically

different from zero. This suggests that the exchange rate does not have a significant effect on manufacturing firms' employment.

The next sections of the paper are organized as follows: in section two we will briefly discuss the conceptual framework used in this study (i.e., Nucci and Pozzolo, 2010), followed by the empirical strategy in section three. Section four will discuss the analysis of the empirical results and is then followed by a conclusion in section five.

CONCEPTUAL FRAMEWORK

Theoretically, exchange rate depreciation can have both positive and negative effects on a firm's employment, especially firms with high international exposure, either as an exporter or an importer. For exporting firms, the effect may come from the revenue channel (i.e., revenue from exported products) and cost channel (i.e., imported input). A positive effect occurs because depreciation increases the competitiveness of the firm's exports. Firms will seek to increase their exports by increasing the amount of output, so the effect on employment is positive. On the other hand, depreciation can also have a negative effect because the price of imported inputs used in production becomes more expensive. Firms must incur greater costs to obtain imported inputs, which could lead to lower profits and could negatively impact upon employment.

Another factor that may affect the sensitivity of employment is market power (Campa and Goldberg, 2001; Nucci and Pozzolo, 2010). Campa and Goldberg argue that a firm's ability to gain maximum profit can be affected by exchange rate movements, especially in industries where the firms do not have enough power to set prices. The weaker the market power, the employment response will be more sensitive to exchange rate changes (Campa and Goldberg, 2001; Nucci and Pozzolo, 2010).

In this study, we use the conceptual framework developed by Nucci and Pozzolo (2010). In their model, a profit-maximizing firm is assumed to operate in an imperfect market and sell their products in two markets: domestic and foreign markets. The firm is also assumed to have a constant return to scale production function. The exchange rate is exogenous and affects the firm's profit function through both revenue and cost channels. Faced with exchange rate fluctuation, a firm makes decisions regarding the amount of output to produce, and the optimum allocation of product to be sold in the domestic and foreign markets, to maximize its profit. After determining the optimal output, the firm chooses the optimal number of labor input, as well as domestic non-labor input and imported non-labor input.

With such a setting, Nucci and Pozzolo (2010) describe the elasticity of employment equilibrium ($\widetilde{N}$) to exchange rate (e) as follows:

$$\frac{\Delta\widetilde{N}}{\Delta e}\frac{e}{\widetilde{N}} = \frac{1}{\bar{\mu}\beta}\left[(1-\chi)\eta_{p,e} - \chi\left(1-\eta_{p^*,e}\right) + \alpha\left(1-\eta_{s^*,e}\right)\right]\frac{a_1}{1+a_1} \qquad (1)$$

$\chi \in [0,1]$ is the export revenue portion of the total firm's revenue. $\alpha \in [0,1]$ is the imported input costs portion of the firm's total costs. $\bar{\mu}$ is the average value of the markup in the export and home markets. β is a parameter that reflects a firm's labor costs per firm's total revenue. $\eta_{p,e} \in [-1,0]$ and $\eta_{p^*,e} \in [0,1]$ are the elasticity of domestic and export prices with respect to the exchange rate. $\eta_{s^*,e} \in [0,1]$ is the elasticity of foreign input prices with respect to the exchange rate. a_1 is a parameter that represents the wage elasticity of the labor supply.

Equation 1 suggests that a firm's export and import orientation are important in shaping the size and direction of the future possible effects. The expression of $(1-\chi)\eta_{p,e} - \chi\left(1-\eta_{p^*,e}\right)$ is negative because$\chi \in [0,1]$, $\eta_{p,e} \in [-1,0]$, and $\eta_{p^*,e} \in [0,1]$. Hence, through the revenue channel, a decrease in *e* (depreciation) has a positive effect on employment. The effect of depreciation on an increase in employment will be greater for a firm with a higher χ (more export-oriented firm). On the contrary, the $\alpha\left(1-\eta_{s^*,e}\right)$ expression is positive because$\eta_{s^*,e} \in [0,1]$. Hence, the effect of depreciation on employment is negative through the cost channel. The higher the α (more dependence on imported materials or other imported non labor inputs), the greater the decrease in employment when a firm is facing an exchange rate depreciation. Another insight in equation 1 concerns the firm's market power, here measured using the markup index ($\bar{\mu}$). The firm's market power is positively correlated with the firm's employment, and the effect of exchange rate movement is magnified if they have low $\bar{\mu}$. Equation 1 is our basic framework to specify the empirical model.

METHOD AND DATA

Empirical Model

Departing from equation 1, our empirical specification is as the following:

$$\begin{aligned}\Delta labor_{i,t} = {} & \alpha_0 + \alpha_1 \Delta labor_{i,t-1} + \alpha_2 \Delta e_t * Export_{i,t-1} + \alpha_3 \Delta e_t * Import_{i,t-1} + \alpha_4 Export_{i,t-1} \\ & + \alpha_5 Import_{i,t-1} + \alpha_6 MKUP_{i,t-1} + \alpha_7 \Delta wage_{it} + \alpha_8 foreign_{it} + \alpha_9 \Delta sales_{i,t-1} \\ & + \alpha_{10} \Delta valueadded_{it} + Z_{it}\alpha_{11} + \varepsilon_t\end{aligned} \quad (2)$$

with i referring to firm and t referring to the year of observation. Following Nucci and Pozzolo (2010), we chose a specification in first difference, because the exchange rate variable is non-stationary.

Our dependent variable is $\Delta labor_{i,t}$ which refers to the change of (log) labor input. The use of the lag dependent variable as one of the independent variables is to account for the employment dynamics found in other studies (e.g., Campa and Goldberg, 2001; Hamermesh, 1993; Nucci and Pozzolo, 2010; Zmami and Ben-Salha, 2015). It measures the persistence and adjustment speed of labor demands by the firms.

To capture the exchange rate movement effects on a firm's employment, we use two interaction variables which are $\Delta e_t * Export_{i,t-1}$ and $\Delta e_t * Import_{i,t-1}$. We allow that estimated effects to vary across firms and over time, depending on these two foreign exposures (i.e. the share of export and import). e_t is the average expected real effective exchange rate at time t (we use lag 1 period of the exchange rate as the proxy). The future (conditional) expected value of the exchange rate is similar to today's realization if the exchange rate follows a random journey (Nucci and Pozzolo, 2010). We measure e_t as the foreign currency unit per unit of domestic currency. This means an increase in this variable refers to an appreciation. Hence, Δe_t is the changes of (log) average levels of the exchange rate. $Export_{i,t-1}$ is the portion of export in total firm sales. $Import_{i,t-1}$ is the portion of costs for imported inputs in total variable costs. We use lag one period for both of them to mitigate the possible correlation of the effect of exchange rate movement on a firm's international exposure.

$MKUP_{i,t-1}$ is a variable used as the measure for a firm's market power. Similar to Nucci and Pozzolo (2010), the market power is calculated using the approach suggested by Domowitz and Hubbard (1986). For Indonesian cases, this approach was also used by Setiawan and Effendi (2016).

$$MKUP_{it} = \left(\frac{sales + \Delta inventories - labor\ cost - inputs\ costs}{sales + \Delta inventories}\right) \quad (3)$$

In practice, data unavailability makes it difficult to distinguish inventories or labor costs and inputs costs used to produce goods in domestic and export markets. Similar to Nucci and Pozzolo (2010), we are aware of this limitation. However, it is safe to assume that exporters are usually more efficient in their operations. This can be reflected in their higher price-cost margin.

$wage_{it}$ refers to the average labor wage (in real terms) and is used to control change in the labor cost. The variable $foreign_{it}$ is the percentage of foreign ownership to control differences in the ownership of the firms. Variable $sales_{i,t-1}$ refers to the value of sales (in real terms) to account for changes in supply and demand conditions. $valueadded_{it}$ is a proxy of firm size. Kumar, Rajan, and Zingales (1999) convey that the complexity of an organization is closely related to the level of its contribution to the economy. Using value-added as a proxy for the firm's size is more appropriate than using the sales rate. Z_{it} is a set of dummy variables, including the firm's industry sector (2 digit ISIC), firm's location and time specific effect (year).

Estimation Method

Because we have the lagged dependent variable on the right-hand side, strict exogeneity assumption is violated, causing the standard fixed effect and random effect model to yield inconsistent results. Thus, we use the Generalized Method of Moment (GMM) estimation method developed by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). Moreover, there is also a possibility of a correlation between sales (in real terms) and market power with individual fixed effects (Nucci and Pozzolo, 2010). This causes measurements using other methods such as OLS, fixed effect, or GLS to be inconsistent (Demir, 2013). We chose the two-step GMM estimator, which is asymptotically more efficient than one-step. To solve the bias on standard errors, we used Windmeijer's (2005) procedure to correct the covariance matrix.

As suggested by Roodman (2006), for instruments with GMM-type, we select the lagged values of the dependent variable, of the markup, and of real sales on $t-2$ period and earlier. To test the robustness of the specification, we performed the Hansen test and the Arellano-Bond test. The Hansen test checks the over-identifying restrictions, while the Arellano-Bond test is used to check the second order serial correlation (Arellano and Bover, 1995).

Data and Descriptive Statistics

We use firm-level data from the annual large and medium manufacturing firms survey (IBS) from Statistics Indonesia (BPS) for the 2008-2014 period. This data covers all manufacturing firms using at least 20 workers. We limit our samples to firms that are exposed to international trade, either as the exporter, importer of inputs or both. Firms must be available for at least five consecutive years between 2008 and 2014.

Exchange rate data is obtained from the Bank of International Settlements (BIS) database. We use the Real Effective Exchange Rate (REER) which is the geometric weighted average of the bilateral exchange rate adjusted to the relative consumer price. In the REER weighted matrix of BIS, the Rupiah exchange rate is weighted against its 41 (forty-one) trading partner. The latest data from BIS uses 2010 as the base year of the exchange rate indicator. Effective exchange rate (EER) is a better indicator than a single bilateral exchange rate to be used in the analysis because BIS EER specifically uses trade flow data from the manufacturing sector.

Table 1 shows several statistics for the variables used in our empirical equation. During the sample period, the average rate of annual changes of the real effective exchange rate is -0.6%. The standard deviation is 5.8% with a minimum -6.6% and maximum 12.2%, suggesting adequate variability.

Table 1 Summary Statistics

Variable	Mean	Std.dev.	Median	Min	Max
$\Delta labor$	-0.006	0.222	0	-0.756	0.995
Δe	-0.006	0.058	-0.034	-0.066	0.122
$Export$	0.635	0.365	0.765	0.000	1.000
$Import$	0.189	0.308	0.000	0.000	0.999
$MKUP$	0.427	0.208	0.408	0.002	0.999
$\Delta wage$	0.063	1.196	0.036	-8.503	9.136
$foreign$	0.251	0.412	0.000	0.000	1.000
$\Delta sales$	0.059	0.839	0.025	-7.037	6.581
$\Delta valueadded$	0.097	0.937	0.060	-8.731	7.072

Source: Large and medium manufacturing firms survey (IBS) BPS 2008-2014, recalculated

The average of (log) changes in numbers of labor is -0.6%, with standard deviation at 22.2%, the minimum value is -75.6% and the maximum is 99.5%. The average share of export revenue in total firm's revenue, 63.5%, is more than triple that of import dependence. The average changes in wage is 6.3% with standard deviation at 119.6% suggesting high variability among the firms.

Table 2 Wage and Employment

	Exporting Only	Importing Only	Export & Import	Exporting Only	Importing Only	Export & Import
			Wage (ln)			Number of labor
Mean	11.80	12.28	12.32	274.93	755.62	883.86
St. Dev.	1.02	0.73	0.87	659.70	1611.47	2031.87
Median	11.91	12.19	12.29	89	252	358
Minimum	2.90	8.98	3.68	20	20	20
Maximum	17.19	16.86	15.55	15399	15626	38343

Source: Large and medium manufacturing firms survey (IBS) BPS 2008-2014, recalculated

Table 2 shows us the descriptive statistics related to wage and employment in firms that conduct international trade activities (i.e. export, import, or both). On average, employment in firms that conduct both activities is higher (884 labor) than the two other (275 on exporting only, 755 on importing only firms). The firms that conduct both trading activities also show a slightly higher wage level (12.32). It is possible that they are bigger firms, which are possibly not too sensitive to exchange rate movements.

RESULTS AND DISCUSSION

Baseline Results and Discussion

Table 3 is the estimation results using our empirical model. In the first column, we exclude the market power or the markup term.

Table 3. The effect of Real Effective Exchange Rate Change on Employment

Variable	$\Delta labor_{it}$	
	(1)	(2)
$\Delta labor_{i,t-1}$	-0.167***	-0.163***
	(0.015)	(0.015)
$\Delta e_t * Export_{i,t-1}$	-0.235**	-0.223**
	(0.101)	(0.101)
$\Delta e_t * Import_{i,t-1}$	0.358***	0.353***
	(0.117)	(0.116)
$Export_{i,t-1}$	-0.024**	-0.022***
	(0.012)	(0.008)
$Import_{i,t-1}$	0.024*	0.013
	(0.013)	(0.009)
$MKUP_{i,t-1}$		0.054***
		(0.019)
$\Delta wage_{it}$	-0.004**	-0.004**
	(0.002)	(0.002)
$foreign_{it}$	0.043*	0.022*
	(0.023)	(0.013)
$\Delta sales_{i,t-1}$	0.012***	0.013***
	(0.003)	(0.003)
$\Delta valueadded_{it}$	0.034***	0.036***
	(0.003)	(0.003)
$Dummy\_isic2$	YES	YES
$Dummy\_prov$	YES	YES
$Dummy\_year$	YES	YES
$Constant$	0.769	1.325
	(1.027)	(0.975)
N	10,963	10,963
AR(2)	0.696	0.742
Hansen	0.150	0.178

Notes: (*) significant at level 10%, (**) significant at 5% level, (***) significant at 1% level. Estimates were performed using the two-step GMM method. The numbers in brackets indicate the standard error. Variables in lower-case letters denote their logarithmic transformation

The results show that the coefficient measuring the effect of exchange rate change on firm's employment through export orientation is always negative and significant at 5%. On the other hand, the effect upon imported input is always positive and also significant at 1%. Therefore, an exchange rate depreciation will increase employment through the revenue channel (export orientation), and decrease employment through the cost channel (imported input). This suggests that the effect of the exchange rate changes is different for each firm, depending on their export orientation and imports. From the second column of Table 2, we can express the effect as:

$$\frac{\partial\, \Delta labor_{it}}{\partial\, \Delta e_t} = -0.223\left(Export_{i,t-1}\right) + 0.353\left(Import_{i,t-1}\right) \qquad (4)$$

From the results, we can conclude two things. First, the higher the firm's export orientation, the greater negative effects from exchange rate appreciation upon the firm's employment. Second, the higher a firm's import orientation, the greater positive effects from exchange rate appreciation upon employment. These results are consistent with the theoretical prediction of Nucci and Pozzolo (2010) model and similar to their empirical evidence. As Nucci and Pozzolo puts it, the use of the specification on this first difference does not alter the interpretation of the results obtained.

As exchange rate changes affect each channel differently, we use the Wald test to examine whether or not the net effect on employment is different from zero. The null hypothesis is given by the following equation:

$$H_0 = \alpha_2 \Delta e_t * Export_{i,t-1} + \alpha_3 \Delta e_t * Import_{i,t-1} = 0 \qquad (10)$$

The Wald test yield a $p - value$ of 0.4091, implies that we fail to reject the null hypothesis. In other words, the sum of the effects of the interaction variables (-0.0749) is not statistically different from zero. On average, the net effect of exchange rate changes in both appreciation and depreciation during the study period did not significantly affect the employment in Indonesian manufacturing firms.

This insignificant effect might not be a surprise for Indonesian cases. Although manufacturing firms in developing countries may have a higher sensitivity to exchange rate movements, there is a major possibility that the rigidity of the labor market could diminish the effect. According to a survey in 2009, Indonesia was ranked number 157 of 181 countries in the world with rigid labor regulations. Indonesia also ranks 23 out of 24 countries in the Pacific and East Asia region with high firing costs (The World Bank, 2010). Among the existing employment regulations, the provisions deemed to be the biggest barriers are severance pay, minimum wage, and lay-off procedure.

The firm's export orientation is negatively correlated with changes in the firm's labor input. Meanwhile, the coefficient of import orientation is no longer significant, after we use the firm's market power as an additional control variable. Firms with higher export orientation tend to have a smaller change in the labor input. This may reflect an increase in productivity, capital density, or the use of higher technology in very export-oriented firms. A study by Sjoholm (1999) supports this possibility, in which he found that exporters in Indonesia are more productive than non-exporters. Besides being more productive, exporters are usually larger with more labor (Bernard and Jensen, 1999), which can lead to lower employment growth.

The other coefficients are also significant. The change in the wage of labor has a negative sign and is statistically significant at 5%. This shows that the higher wage growth can decrease employment growth in Indonesian manufacturing firms. The level of profit margin ($MKUP$) as a measure of market power has a positive and statistically significant effect on change in employment. Similarly, the change in a firm's total sales, the percentage of foreign ownership, and the change in value added also shows positive signs and are statistically significant. The coefficient of lagged dependent variable is negative and significant at 1%. It suggests that the firms with high positive employment changes (growth) on the previous period have a smaller growth in the current period.

The value of the Hansen statistic confirms the validity of our specification. The Arellano-Bond (AR) test result indicates the absence of second-order serial correlation of residuals.

Firm's Market Power

As we have mentioned before, the firm's market power might affect the firm's employment sensitivity to the exchange rate movements. To account for this possibility, we use an additional interaction variable between the firm's market power (measured as profit-cost margin) and the exchange rate change. The results are presented in Table 3. We found that the $MKUP_{i,t-1}$ variable remains positive and significant at 1%. All other variables also consistent with the previous specification.

Table 4 Exchange Rate and Employment: The Role of Market Power

Variable	$\Delta labor_{i,t}$
$\Delta labor_{i,t-1}$	-0.163***
	(0.015)
$\Delta e_t * export_{i,t-1}$	-0.224**
	(0.101)
$\Delta e_t * import_{i,t-1}$	0.349***
	(0.116)
$export_{i,t-1}$	-0.023)***
	(0.008
$import_{i,t-1}$	0.013
	(0.009)
$MKUP_{i,t-1}$	0.055***
	(0.019)
$MKUP_{i,t-1} * \Delta e_t$	-0.096
	(0.181)
$\Delta wage_{it}$	-0.004**
	(0.002)
$foreign_{it}$	0.023*
	(0.014)
$\Delta sales_{i,t-1}$	0.013***
	(0.003)
$\Delta valueadded_{it}$	0.036***
	(0.003)
$Dummy\_isic2$	YES
$Dummy\_prov$	YES
$Dummy\_year$	YES
$Constant$	1.241
	(0.918)
N	10,963
AR(2)	0.742
Hansen	0.183

Notes: (*) significant at level 10%, (**) significant at 5% level, (***) significant at 1% level. Estimation was performed using the two-step GMM method. Variables in lower-case letters denote their logarithmic transformation. The numbers in brackets indicate the standard error.

The coefficient of the interaction variable between market power and change in the exchange rate ($MKUP_{i,t-1} * \Delta e_t$) is not statistically significant. The possible explanation of this result is that Indonesian manufacturing firms engaged in international trade are price takers. In the international market, these firms certainly have more (and possibly) larger competitors. This causes the firms' ability to determine its profit margin as not significant enough to reduce the effect of exchange rate changes on the employment. In addition to the possibility of being a price taker in the international market, another thing to be considered is the importance of profit margins as a factor for these firms. The total revenue from product sales might be more important for them than the profit margin per unit.

Firm Size and the Industrial Sector

We also want to discuss two other factors that we have already used for control variables in our baseline empirical equation, which are the firm size (instrumented using their value added) and the industrial sector. It is very likely that firms with different sizes and from different sectors will respond differently, when they are faced with exchange rate movements. Here on table 5, we found that the interaction variable between the change of exchange rate and change of value resulted with a positive value and significant at 1%. As predicted, bigger firms

are able to reduce the negative effect of appreciation, even more, on average they are able to employ more labor. Bigger firms are most likely have stronger internal financial support, which makes them less vulnerable to exchange rates movements.

Table 5 Exchange Rate and Employment: The Firm Size

Variable	$\Delta labor_{it}$
$\Delta labor_{i,t-1}$	-0.163***
	(0.015)
$\Delta e_t * Export_{i,t-1}$	-0.237**
	(0.101)
$\Delta e_t * Import_{i,t-1}$	0.363***
	(0.117)
$Export_{i,t-1}$	-0.026***
	(0.008)
$Import_{i,t-1}$	0.014
	(0.009)
$MKUP_{i,t-1}$	0.053***
	(0.019)
$\Delta wage_{it}$	-0.005**
	(0.002)
$foreign_{it}$	0.034***
	(0.013)
$\Delta sales_{i,t-1}$	0.014***
	(0.003)
$\Delta valueadded_{it}$	0.035***
	(0.003)
$\Delta e_t * \Delta valueadded_{it}$	0.237***
	(0.051)
$Dummy\_isic2$	YES
$Dummy\_prov$	YES
$Dummy\_year$	YES
$Constant$	1.847*
	(0.958)
N	10,963
AR(2)	0.765
Hansen	0.078

Notes: (*) significant at level 10%, (**) significant at 5% level, (***) significant at 1% level. Estimates were performed using the two-step GMM method. The numbers in brackets indicate the standard error. Variables in lower-case letters denote their logarithmic transformation

This study also tries to examine how the effect of exchange rate changes employment in all manufacturing industry sectors. The results on Table 6 show the different responses from various firms. There are at least four manufacturing sectors which showed a significant effect.

Table 6 Exchange Rate and Employment: Industrial Sector

$\Delta labor_{it}$	Food Products (10)	Wearing Apparel (14)	Electrical equipment (27)	Furniture (31)
$\Delta labor_{i,t-1}$	-0.151***	-0.148***	-0.109	-0.160***
	(4.19)	(3.25)	(1.08)	(4.36)
$\Delta e_t * Eksport_{i,t-1}$	0.125	-0.389	1.048*	-1.088**
	(0.41)	(1.13)	(1.89)	(2.57)
$\Delta e_t * Import_{i,t-1}$	0.827*	0.654**	-0.759	0.491
	(1.66)	(2.21)	(1.62)	(0.48)
$Eksport_{i,t-1}$	-0.034*	0.007	-0.013	-0.010
	(1.78)	(0.35)	(0.43)	(0.39)
$Import_{i,t-1}$	-0.015	0.032*	0.037	0.026
	(0.36)	(1.95)	(1.31)	(0.39)
$MKUP_{i,t-1}$	0.045	0.021	-0.063	0.194***
	(1.01)	(0.44)	(0.96)	(3.26)
$\Delta wage_{it}$	-0.007	0.001	-0.010	-0.007
	(1.63)	(0.10)	(0.69)	(1.60)
$foreign_{it}$	0.019	-0.025	0.022	-0.005
	(0.91)	(1.54)	(0.79)	(0.23)
$\Delta sales_{i,t-1}$	0.026***	0.007	-0.046**	0.029**
	(2.63)	(0.59)	(2.17)	(2.50)
$\Delta valueadded_{it}$	0.026***	0.042***	0.008	0.095***
	(3.24)	(3.47)	(0.57)	(9.04)
$Dummy\_prov$	YES	YES	YES	YES
$Dummy\_year$	YES	YES	YES	YES
$Constant$	0.007	-0.019	-0.027	-0.036
	(0.25)	(0.53)	(0.56)	(0.65)
N	1476	823	273	1665
AR(2)	0.277	0.246	0.287	0.796
Hansen	0.200	0.361	0.429	0.369

Notes: (*) significant at level 10%, (**) significant at 5% level, (***) significant at 1% level. Estimates were performed using the two-step GMM method. The numbers in brackets indicate the standard error. Variables in lower-case letters denote their logarithmic transformation

Employment in the manufacturing of food products (ISIC 10) and clothing industry (ISIC 14) was most affected by their import orientation. It can be concluded from the parameters of the interaction variable between import orientation and the exchange rate change which are significant at 10% and 5%. The two other employment sectors, electrical equipment industry (ISIC 27) and furniture industry (ISIC 31), are through the export orientation channel. The coefficient of interaction variable between export orientation and exchange rate change is also significant at 10% and 5%.

To find the net effect, we ran the Wald Test on those four sectors. The Wald test for wearing apparel industry yielded a *p-value* of 0.463, the electrical equipment industry has a *p-value* of 0.724, and the furniture industry has a *p-value* of 0.641, implying that we fail to reject the null hypothesis. In other words, the sum of the effects of the interaction variables for those three sectors is not statistically different from zero. Different from the other three, we found that on average, a firm's employment in the food products industry sector is affected by the exchange rate movements during the sample period. The Wald test for food industry yields a *p-value* of 0.051, which shows that the sum of the effects of the interaction variables is statistically different from zero.

According to Ministry of Industry data compiled from Statistic Indonesia, during 2008 – 2014, and even until late 2017, the manufacturing of food products sector still has a high dependency on imported raw materials. It is because the local agricultural outputs are more focused to fulfill direct food needs, while the demand for raw material from the food products industry has not been able to be fulfilled by the domestic market. Some factors might be causing that, such as the domestic supply does not meet the standard, specification, or economies of scale. In addition, high demand materials such as industrial salt, sugar, and wheat were more than 80% from import. Especially for refined sugar and wheat, whereby until 2011 the import was around 100%. This high

import dependence is risky from large swings of exchange rates, and for some movement levels is able to affect the employment.

CONCLUSION

This research examines the effect of exchange rate movement on manufacturing firm's employment in Indonesia. The effects of exchange rate are different for each firm, and it depends primarily on their degree of international exposure (export orientation and import). Firms with higher export orientation suffer larger negative effects from exchange rate appreciation on their employment. On the other hand, the higher the firm's imported input in the production cost, the larger positive effects from exchange rate appreciation on their employment. However, the Wald Test result suggests that on average, the net effect of changes in exchange rates, for both appreciation and depreciation during the study period, did not have a significant effect on the Indonesian manufacturing firm's employment. We do not find any statistical evidence to support the notion that the exchange rate changes affect employment differently based on the firm's market power.

The exchange rate movements alone do not seem sufficient enough to explain the decline in the manufacturing employment contribution to the total Indonesian employment during 2008 - 2014. In the period between 2010 and 2014, there was a decline in GDP growth with four consecutive years of deceleration, caused by the decline in government consumption, net export, and fixed investment. There were also hikes on inflation and the Bank Indonesia rate, which some or maybe all, contributed to affecting manufacturing employment.

Some suggestions regarding the manufacture of the food products sector are: first, the government need to strengthen the national upstream industry by utilizing the domestic natural resources. Strengthening the national upstream is needed to decrease the import dependence and create a standardized and good quality intermediate material to catch up the economy of scale. To achieve that, there are a lot of things that need to be done, for example solving the limited agricultural land problem. Efforts to meet the needs of raw materials of sugar and salt for the industry are still often constrained by limited agricultural land. It is hard for investors to build the sugar industry if there is no more land for sugarcane. According to the Indonesian Plantation Statistics of Cane Commodities, in Indonesia, there was only 478.108 Ha area of sugar cane in Indonesia in 2014 and an estimated 482.239 Ha in 2016. That amount is only able produce around 2.5-2.7 million ton, with productivity around 5.41 - 5.46 Ton/Ha. Second, the government also needs to enrich the agricultural industry downstream. Enriching the agricultural industry downstream not only gives more value-added and strengthens the industrial structure, but also might be useful to absorb more labor in the industry.

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