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# Labor Demand, Productivity, and Unit Labor Costs in Manufacturing

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# Summary

Sticky growth in manufacturing employment was still observed in the second half of the 2000s. Poor job creation performance was partly due to slow output growth and partly to low output-employment elasticities. The main exception was the “footloose” capital-intensive sector. Indonesia’s employment record in manufacturing was also disappointing from an international perspective, reflecting both slow growth and low elasticities for labor absorption. Wage-employment elasticities, however, were closer to international levels. From a policy standpoint, increased growth rates and policies that encourage employment-friendly growth are both high priorities.

There were significant differences in performance and costs among firms with different characteristics. Wages in large and foreign firms were higher than in small and domestic firms, and differences in productivity were even greater, so unit labor costs (ULCs) were low. Differences in relative unit labor costs among firms with different characteristics were especially big according the scale of firm (large firms had much lower ULCs than small firms), and industrial location (firms in industrial zones had higher ULCs). Productivity was highest among the footloose, which contributed to low ULCs. Differences in ULCs for all three groups of more capital-intensive industries were largely due to productivity variations.

While international comparison showed that manufacturing in Indonesia is still comparable to other countries, large differences between industries and among firms with different characteristics in Indonesia requires a careful and more targeted policy design.



# 1. Introduction

Indonesia's manufacturing sector has not fully recovered from the Asian financial crisis, when it went through a significant change, especially in labor absorption patterns. From 1990–1997 employment growth averaged 6.5 percent per year; from 1998–2006 employment did not grow at all although manufacturing sector output grew 5.5 per cent on average per year (AswicaHyono, et al 2011). Observers have attributed these developments to the slowdown in manufacturing exports in the labor-intensive sector, the decline in foreign direct investment in manufacturing since the Asian financial crisis, and stringent labor regulations (Manning and Purnagunawan 2012, AswicaHyono et al, 2011).

This policy brief examines the determination of unit labor cost (ULC) in Indonesia's manufacturing sector and how that cost affects competitiveness and employment. Specifically, we

- Identify determinants of employment growth in manufacturing in the second half of the 2000s, focusing on the labor-intensive and rapidly growing (footloose, capital-intensive) sectors.
- Examine the impact of labor-saving technology, especially where labor costs have been rising, and whether there has been a continuing compositional effect in manufacturing away from labor-intensive industries.
- Compare the results of our analysis with historical data and data from the 1990s, and compare labor absorption in manufacturing in Indonesia with absorption in other countries.
- Analyze ULC structure and variation across industries and over time, and from an international perspective, as an indicator of manufacturing competitiveness in the second half of the 2000s.

In Section 2 we analyze data from the large and medium manufacturing survey of 2006–2010. The section summarizes our theoretical approach, methodology and data, and then presents analytical results and historical and cross-country comparisons. In Section 3, we discuss differences in labor costs across industries and ULC determinants, with some international comparisons.



## 2. Labor Demand in the Manufacturing Sector, 2006-2010

To examine determinants of employment in manufacturing, we take the derived demand approach using the CES production function. The first order condition for profit maximization of the function with respect to labor (profit maximization) yields the following equation:

$$L = (\tau \cdot \alpha)^\sigma \cdot A^{\frac{\sigma-1}{\tau}} \cdot \left(\frac{P}{W}\right)^\sigma \cdot Q^{\frac{1-(1-\tau)\sigma}{\tau}} \quad (1)$$

Where:

L = Demand for labor

Q = Quantity of output

W = Wages

P = Price of output

A = Total Factor Productivity (TFP)

$\sigma$  = Elasticity of substitution between labor and capital

$\tau$  = Coefficient of return to scale

$\alpha$  = Labor coefficient (capital or labor intensive technology)

In logarithmic terms, equation 1 becomes:

$$\ln L = \sigma \cdot \ln(\tau \cdot \alpha) + \frac{\sigma-1}{\tau} \cdot \ln A + \sigma \cdot \ln P - \sigma \cdot \ln W + \frac{1-(1-\tau)\sigma}{\tau} \cdot \ln Q \quad (2)$$

From the above equation, therefore, in the short run (by imposing constant returns to scale,  $\tau=1$ ) we can see that:

1. An increase in TFP ( $A$ ) has an ambiguous effect on employment. If the elasticity of substitution between capital and labor is high, an increase in TFP will increase the demand for labor and vice versa. If the technology is Cobb Douglas ( $\sigma = 1$ ), TFP has no effect on labor demand.
2. An increase in price ( $P$ ) will increase the demand for labor.
3. An increase in wage ( $W$ ) will reduce the demand for labor.
4. An increase in output ( $Q$ ) will increase the demand for labor.

### METHODOLOGY AND DATA

In estimating the labor demand, we will estimate the following equation based on equation 3, as follows:

$$L\_Employ_{it} = \beta_0 + \beta_1 \ln lvcu_{it} + \beta_2 \ln labcost_{it} + \beta_3 \ln ltfp_{it} + \gamma_j Z_{it} + \alpha_i + \alpha_t + \varepsilon_{it} \quad (3)$$

Where

$L\_Employ$	=	log of total employment
$\ln lvcu$	=	log of real value added
$\ln labcost$	=	log of real labor cost
$\ln ltfp$	=	log of total factor productivity (TFP), proxied by total output/total cost of input
$Z$	=	vector of firm characteristics variables, which includes a foreign dummy (1=foreign owned), an export dummy (1=export), and a location dummy $\ln d\_area$ (=1 if establishment is located in a bonded zone)
$\alpha_i$	=	firm fixed effect
$\alpha_t$	=	time fixed effect
$\varepsilon$	=	error term

As in the first brief, we will use the large and medium survey data from Statistics Indonesia (BPS) and divide manufacturing into five groups related to factor intensity (following Aswicahyono, et al, 2010), in addition to the overall manufacturing sector.

1. Unskilled labor-intensive (ULI)
2. Resource based, labor-intensive (RLI)
3. Resource based, capital-intensive (RCI)
4. Electronics (ELEC)
5. Footloose capital-intensive (FCI)

## RESULTS

The data in Table 2-1 provide a summary of the main relationship between employment as the dependent variable and the key variables discussed above: value added, wages and the proxy for productivity/TFP, as well as variables of interest (extent of FDI and export engagement) and other control variables (industry group and year dummy variables). The main result is a quite sticky employment outcome, responding not strongly to the three main variables: value added, wages, and TFP. The year dummy variables were mostly negative and significant (compared with the reference year 2006).

### All Manufacturing

The coefficient for value added in the main equation (the last column in Table 2-1) implies employment elasticity of close to 0.14 in relation to value added over the four-year period. This coefficient is comparable to the employment elasticity reported in Aswicahyono et al. (2010) for the early 2000s. It was much lower than the elasticities reported for the last decade of the New Order period. There are not yet any signs of a return to the pattern of employment-friendly growth in manufacturing of the second half of the 2000s.

The labor cost coefficient is negative as expected. It is significant and close to 0.14. Employment has responded as anticipated to rises in labor costs, although elasticity is also lower than we had presumed. Suryahadi et al. (2003) found higher wage-employment elasticities of a similar magnitude for the economy as a whole (and they reported much higher elasticities for youth, less educated persons, and females) in the 1990s through to 2000. The

result makes sense, however, bearing in mind that much of the growth in output over this period has been in more capital- and resource-intensive firms in manufacturing. Those industries were growing at 4.4 percent per annum, while the labor-intensive industry was shrinking. Wage growth played a role but not a very significant one in employment outcomes in the 2006-2010 period.

Table 2-1  
*Determinants of Employment in Indonesia, 2006-2010 by Main Industry Group*

	Labor-intensive		Capital-Intensive			All Industry
	Unskilled	Resource-based	Resource-based	Electronics	Footloose	
Labor cost	-0.194*** (0.007)	-0.133*** (0.007)	-0.111*** (0.007)	-0.108*** (0.021)	-0.115*** (0.013)	-0.138*** (0.004)
Output	0.184*** (0.006)	0.136*** (0.005)	0.110*** (0.006)	0.093*** (0.014)	0.105*** (0.010)	0.137*** (0.003)
Proxy-TFP	-0.005 (0.003)	-0.035*** (0.007)	-0.036*** (0.008)	-0.004 (0.011)	-0.029*** (0.009)	-0.020*** (0.003)
Foreign ownership	0.087*** (0.029)	0.155*** (0.042)	0.012 (0.031)	-0.013 (0.109)	0.113* (0.062)	0.086*** (0.018)
Bonded zone	0.035*** (0.006)	0.005 (0.006)	-0.000 (0.006)	0.074*** (0.023)	0.016 (0.010)	0.006** (0.003)
Exporting?	0.064*** (0.009)	0.059*** (0.012)	0.052*** (0.013)	0.001 (0.030)	0.066*** (0.024)	0.060*** (0.006)
d2007	-0.043*** (0.003)	-0.056*** (0.004)	-0.032*** (0.005)	0.008 (0.014)	-0.014* (0.007)	-0.042*** (0.002)
d2008	-0.044*** (0.004)	-0.069*** (0.005)	-0.021*** (0.005)	0.002 (0.016)	0.014 (0.009)	-0.042*** (0.003)
d2009	-0.058*** (0.005)	-0.080*** (0.006)	-0.030*** (0.006)	-0.014 (0.021)	0.008 (0.010)	-0.054*** (0.003)
d2010	-0.080*** (0.006)	-0.093*** (0.007)	-0.022*** (0.007)	0.022 (0.023)	0.017 (0.011)	-0.058*** (0.004)
<b>Dummies for Industrial group</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>No</b>	<b>Yes</b>
Constant	3.269*** (0.069)	3.329*** (0.070)	3.663*** (0.097)	4.644*** (0.271)	3.834*** (0.124)	3.450*** (0.041)
N	43,506	40,431	26,004	2,650	9,605	122,196
r2_w	0.171	0.117	0.088	0.096	0.105	0.118
r2_b	0.866	0.748	0.774	0.815	0.755	0.800
r2_o	0.807	0.684	0.699	0.728	0.690	0.731

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Number in parentheses are robust standard error

SOURCE: Statistics Indonesia, Large and Medium Manufacturing Survey, 2006-2010

The third variable of interest, our proxy for TFP, was negative and significant in relation to employment for the sample as a whole. The negative relationship with employment was a little surprising, although not totally unexpected. Insofar as TFP has affected employment, new technology and organization appears to have been labor-saving in this period.<sup>1</sup>

FDI and exports were positively associated with employment. The export relationship is in accord with the expectation that firms that export are likely to employ more workers, building on Indonesia's comparative advantage in a relatively abundant supply of unskilled labor. The reasons for a significant coefficient for FDI are less obvious, especially given the concentration of recent investment in resource-intensive industries (Aswicahyono et. al, 2010). But on balance, foreign investment seems to have had a positive impact on employment, perhaps because foreign firms seek to take advantage of an abundant labor supply.

Possibly associated both with FDI and exports, the coefficient of our dummy variable for bonded warehouses (*ind\_area*), was significant at 5 percent, although the coefficient was small. It seems that firms that locate in bonded warehouses are likely to employ more workers than those that do not.

The dummy variables for years and industry groups were interesting. The negative and significant coefficients for 2007-2010 compared with 2006 suggests that job creation has become more difficult in more recent years (although there is not a clear pattern in the size of the coefficients). In regard to industry groups, we were surprised to find that none of the dummy variables were significant compared with the labor-intensive group (group 1, mainly the textile, clothing and footwear or TCF industries). Indeed, one of the signs was positive, suggesting that the TCF industries were creating fewer jobs than the other labor-intensive but resource-based group, mostly food processing industries (Group 2). The 2006-2010 period was clearly similar to the earlier part of the 2000s when the TCF industries played a minor role in job creation, in stark contrast to stellar performance in the last decade of the New Order.

## Industry Groups

As noted, we estimated separate regressions for each industry group. We expected that employment would be more responsive to output and wages in the labor-intensive industries (industries 1 and 2), but we were uncertain about the relationship to our proxy for TFP, and the other variables. We were not certain, but believed that exporting would also be more important for employment in the TCF industries, where profit margins are very slender and output growth likely to translate quickly into more jobs.

From our first policy brief in this series, we focused particularly on two industry groups: the labor-intensive TCF group (Group 1) and the footloose, capital-intensive group (Group 5). The former recorded poorly both on employment and labor productivity over the 2006-2010 period, while the latter showed results that were favorable on both scores in the same period. One question that arose is what distinguishes the very different performance of these two industry groups.

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<sup>1</sup> The result may be related partly to the weakness of the proxy variable (value added).

The coefficients on key variables for each industry suggested some interesting explanations. Both wage and output coefficients were larger for Group 1 compared with Group 5 (0.18-0.19 versus 0.10-11), which we might expect given its much greater labor intensity. A tentative conclusion is that the poor performance of these industries might be explained by negative wage effects outweighing any positive output effects on employment among Group I industries, whereas the opposite might have been the case in Group 5. TFP effects were very small and not significant in Group 1, the labor-intensive group, but of greater significance among the footloose industry group (though the coefficient was still small). New technology appears to have been labor saving, but the output effects clearly outweighed the negative impact of productivity and wage gains.

On all the other variables, there was little to distinguish the labor-intensive and footloose industries: the coefficients on exports, foreign ownership and year dummies were very similar. However, not surprisingly, perhaps, being part of a bonded zone matters more for jobs among the labor-intensive industries (Group 1); location in such places had more external effects on employment.

Also not entirely unanticipated were the negative coefficients for each year after 2006, and especially for 2010 (-0.8), compared with 2006 for Group 1.<sup>2</sup> These industries in particular might have felt the impact of the GFC in terms of employment more strongly than the more capital-intensive ones. In contrast, the coefficients for all the year dummies for footloose industries were positive, except for 2007. This is consistent with robust employment growth identified for this industry in our first policy brief.

Finally worthy of mention are the quite low coefficients on most of the variables tested for employment in the electronics industry (Group 4), the smallest of the industry groups in terms of the number of establishments. As with the footloose group, output, wage and TFP-proxy coefficients were small. But so were the coefficients for exporting and foreign ownership. Only the coefficient for being part of a bonded warehouse was positive and significant.

One explanation for the low coefficients for exporting and FDI among electronics firms is that these industries are heavily engaged in sales to the domestic market, including significant foreign ownership. Exporting is not a big part of the business of many firms in the industry, and this variable does not show up as contributing much to employment growth. Like the footloose, capital intensive, the dummy variable for 2010 was positive though not significant, suggesting that domestic market growth might have held up employment in the immediate aftermath of the global financial crisis.

## **HISTORICAL AND INTERNATIONAL COMPARISONS**

The above results suggest that the employment elasticities related to value-added were quite low (around 14 percent) in the manufacturing sector during 2006-2010. The elasticities were much lower than in the period before the Asian financial crisis (51 percent), as shown in Figure 2-1. It was really clear from the graph that the job absorption was quite responsive

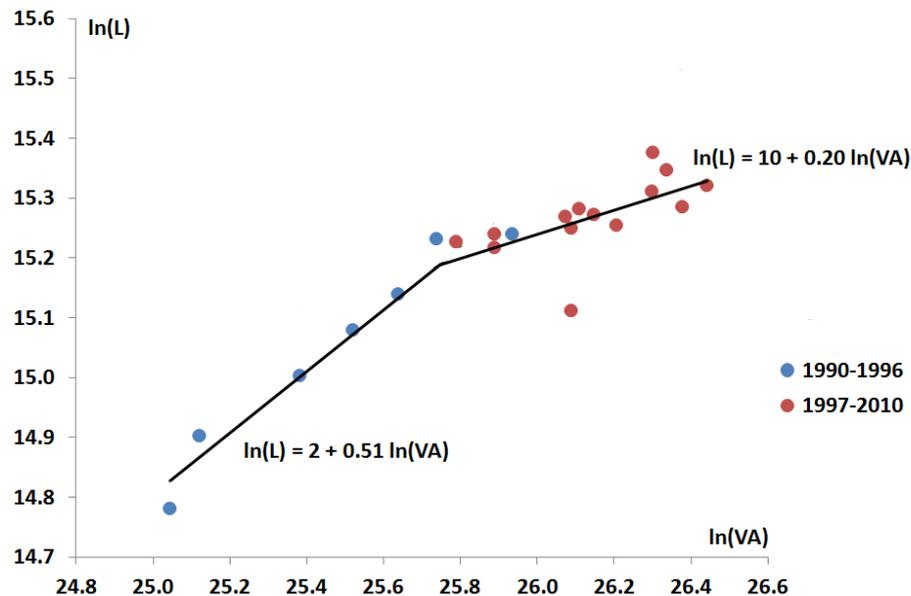
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<sup>2</sup> This was also true for the second labor-intensive group (Group 2), mostly food processing industries.

during 1990-1996, but since 1997 the growth of job creation was minimal although output still grew at around 5.5 percent per annum.

Figure 2-1

*Value Added and Employment in Manufacturing in Indonesia, 1990–2010*



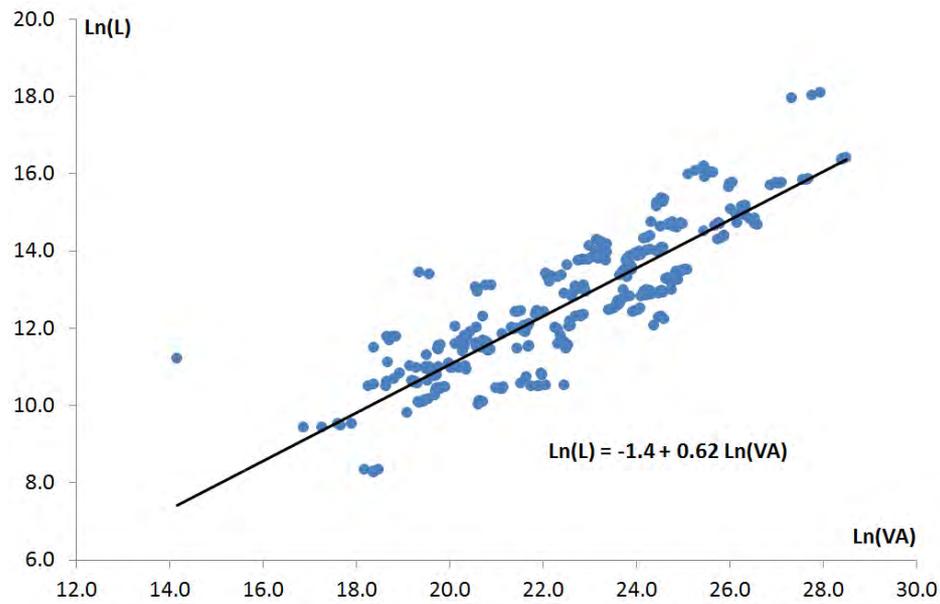
SOURCE: Statistics Indonesia, *Large and Medium Manufacturing Survey, 2006-2010*.

For the international comparison, we plot value added and employment for different countries for the 2005–2009 period, allowing us to compare the output elasticity of employment in Indonesia with the rest of the world. During the 2000-2009 period, the output elasticity of employment from the international panel data was 0.62 but only 0.20 in Indonesia.

While informative, the two figures ignore the employment effect of a wage increase and are estimated for different time periods. It is therefore necessary to estimate the output and wage elasticities during comparable periods. The regression results presented in Table 2-2 show that output elasticity of employment in Indonesia's manufacturing sectors (0.14) was significantly lower than the world average (0.83), while the wage elasticity in Indonesia (-0.14) was only slightly below the international level (-0.2) over comparable time periods.

These comparisons can help explain the low labor absorption in Indonesia's manufacturing sector. First, for the same rate of output growth the sector absorbs significantly less employment compared to the international average. Increases in labor costs during the period also contributed to low employment creation in Indonesia. A combination of slow growth in manufacturing, unresponsive output growth, and sensitivity of employment to wage increases contributed to these gloomy employment conditions in manufacturing. More research is needed to understand why Indonesia is an outlier in this regard, and what policies might be adopted to encourage more employment in manufacturing.

Figure 2-2  
*Value added and Employment in Manufacturing Across Countries, 2000–2009*



SOURCE: UN Industry Statistics.

Table 2-2  
*Wage-Employment and Output-Employment Elasticities, Indonesian 2006-2010 and International 2006-2009*

	Indonesia	International
Labor cost	-0.138***	-0.198***
	(0.004)	(0.016)
Output	0.137***	0.826***
	(0.003)	(0.000)
Proxy-TFP	-0.020***	
	(0.003)	
Foreign ownership	0.086***	
	(0.018)	
Bonded zone	0.006**	
	(0.003)	
Exporting?	0.060***	
	(0.006)	

SOURCE: See Figures 1 and 2.



# 3. Unit Labor Costs and Productivity

Indonesia's poor employment performance in manufacturing is likely to be related to factors that influence labor demand. One factor not often discussed in Indonesia is unit labor cost, or the level of wages relative to labor productivity. In this section we examine ULC determinants and their pattern in Indonesia.

ULC is defined as compensation per unit of real output, and is a measure of labor cost relative to real labor productivity.<sup>3</sup> ULCs are a measure of international competitiveness, cross-sectional and over time (Turner and Golub 1997). They are also used to gauge the competitiveness of industries in a particular economy.

Wage costs and productivity should be closely related in a competitive economic environment. In practice, however, ULC may differ significantly across industries and over time. One puzzle of economic trends in Indonesia is slow growth in real wages, given improvements in economic performance as the economy consolidated from the mid-2000s (World Bank 2010). This is reflected in trends in nominal and real labor costs. The former grew quite slowly relative to productivity, and the latter has declined (Figure 3-1). As a result, real output per worker has risen, although gradually.

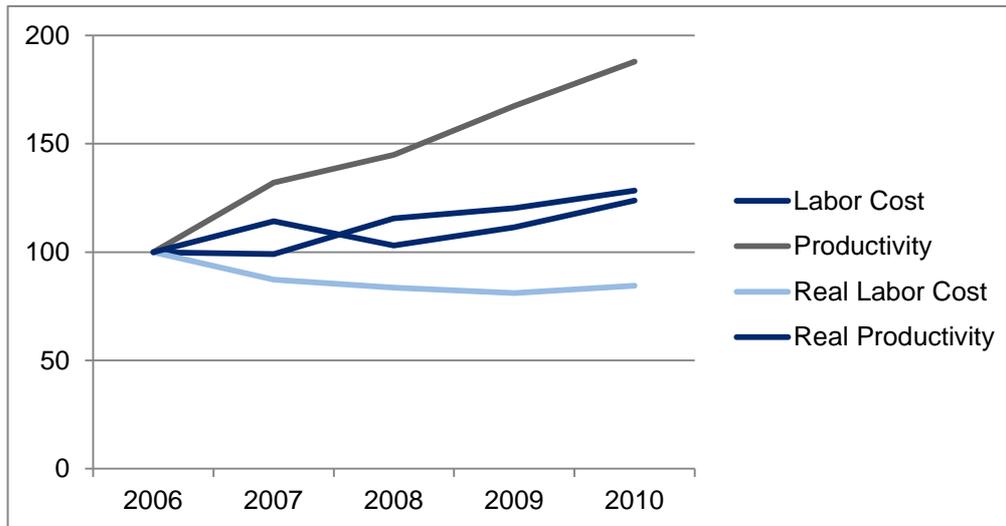
The issues raised in the public domain. First, unions question why wages are not higher and have not risen more quickly at a time when investors are attracted to Indonesia and middle incomes are rising rapidly. This interpretation seems to conflict with employers' reports that wage costs are too high, especially as result of high rates of severance pay. How can these very different interpretations of the labor market be reconciled?

Second, are labor-intensive industries becoming less competitive because of high or rising ULCs, and should policy focus less on them in the future?. This issue is significant particularly because the textiles, clothing and footwear (TCF) group still provides a high share of employment, even though it has recorded slower growth in productivity and employment in recent years, compared with other industry groups (see Policy Brief I in this series).

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<sup>3</sup> Thus unit labor costs can be defined as:  $ULC = \frac{wL}{VA}$  or  $ULC = \frac{w}{VA/L}$  where ULC=Unit labor costs, w is average labor costs or wages, VA is value added in real terms and L is employment. See OECD (2007).

Figure 3-1  
Trends in Nominal and Real Labor Costs and Productivity, Manufacturing 2006–2010



## DETERMINANTS OF UNIT LABOR COSTS

To estimate the effect of firms' characteristics on unit labor cost (ULC), we use the following:

$$ULC_i = \beta_0 + \beta_1 L\_Employ_i + \delta_j Z_i + \gamma_j X_i + \varepsilon_i \quad (4)$$

Where:

- ULC = unit labor cost calculated by dividing labor cost per worker/ productivity (or total labor cost / total value added)
- L\_employ = log of employment as a measure of firm size
- Z = vector of firm characteristics variables, which includes: *foreign* dummy (1=foreign owned), *export* dummy (1=export), *ind\_area* (1 if establishment is located in a bonded zone)
- X = vector of industry group dummies, which includes: *RLI* (1=resource based, labor-intensive firm), *RCI* (1=resource-based, capital-intensive firm), *ELEC* (1=electronic firm), *footloose* (1=footloose, capital-intensive firm). The base category is unskilled labor-intensive firms

For purposes of comparison, we also estimate the specification for each industrial group (and drop Xs, the vector of industry group dummies).

To estimate the model, we use the latest (2010) data on medium and large manufacturing.<sup>4</sup> As can be seen in Table 3-1, firms in the electronics industry employed many more workers on average than any other industry, even the labor-intensive ones. They also had a larger proportion of foreign and export-oriented companies and firms in industrial zones when compared with other industrial groups. This suggests that the electronics industry in Indonesia

<sup>4</sup> We also estimated the model using the 2009 data and had a consistent and robust results.

is quite labor-intensive, in contrast to the capital-intensive electronics industry of Malaysia or Thailand ; however, it is also much more focused on the world market compared with other industries.

Table 3-1  
*Firm Characteristics by Industrial Groups, 2010*

Industry Group	Average Employment	Proportion of		
		Foreign Firms	Exporting Firms	Firms in Industrial Area
Unskilled labor-intensive	169.5	6.0	13.9	10.0
Resource based, labor-intensive	147.4	3.7	10.0	13.0
Resource based, capital-intensive	156.8	9.7	9.6	12.3
Electronics	432.2	43.6	18.5	20.4
Footloose capital-intensive	171.7	18.2	8.0	12.6
Total	165.4	7.8	11.3	11.9

SOURCE: BPS, author calculation

The main results are reported in Table 3-2. In the main model (column 1), the most important finding relates to ULC by firm size and ownership. The results show that employment (as a measure of firm size) and ownership both had a negative and statistically significant effect on ULC. This appears to confirm our expectation that larger and foreign firms have higher labor productivity. The former are more likely to exploit economies scale and economies of scope, while the latter may take advantage of imported and more recent technology, as well as cheaper sources of capital.

If we estimate the impact separately for each sector, the impact for scale effects is especially large for the electronics (for scale effects, column 5), and in the resource based, labor-intensive and footloose capital-intensive groups (for ownership, columns 3 and 6). The coefficients, though significant, were smallest in the pure labor-intensive group (column 2) in both cases.

However, the opposite was true in relation to whether the firm was an exporter or not, or whether it was in an industrial zone. Surprisingly, ULCs were positively associated with exporting; that is, exporting firms tended to pay higher wages relative to productivity than non-exporters. This ran counter to our expectation that exporting firms might be expected to be more competitive and have lower ULCs. One explanation is just that productivity of labor is a lot lower in export-oriented firms because of higher labor intensity. Estimation results for separate industry categories suggest this might be the case. It shows that the relationship between ULC and exporting is strongly positive in the two labor-intensive groups but not in several of the more capital-intensive groups (resource-based and electronics). The situation

might also be due to weak export performance of manufacturing firms in these labor-intensive firms after the financial crises.<sup>5</sup>

Table 3-2  
*Estimation Results Based on Medium and Large Manufacturing Firms Survey 2010*

	All			Industry Categories		
		Unskilled Labor Intensive	Resource based labor- intensive	Resource based capital intensive	Electronics	Footloose capital intensive
	(1)	(2)	(3)	(4)	(5)	(6)
Log employment	-0.013*** (0.002)	-0.009*** (0.003)	-0.011*** (0.003)	-0.013*** (0.005)	-0.054*** (0.014)	-0.018*** (0.006)
Dummy Foreign	-0.050*** (0.007)	-0.025** (0.012)	-0.064*** (0.015)	-0.038** (0.017)	-0.040 (0.036)	-0.071*** (0.017)
Dummy Industrial Area	0.194*** (0.004)	0.204*** (0.006)	0.196*** (0.006)	0.186*** (0.008)	0.144*** (0.054)	0.179*** (0.017)
Dummy Ekspor	0.076*** (0.007)	0.087*** (0.009)	0.111*** (0.013)	-0.001 (0.016)	0.018 (0.035)	0.104*** (0.025)
Dummy Resource-Based Labor-Intensive	-0.081*** (0.004)					
Dummy Resource Based Capital Intensive	-0.003 (0.005)					
Dummy Electronics	-0.019 (0.015)					
Dummy Footloose Capital Intensive	-0.039*** (0.007)					
Constant	0.447*** (0.009)	0.428*** (0.012)	0.357*** (0.014)	0.453*** (0.021)	0.647*** (0.064)	0.434*** (0.026)
N	21,898	7,364	7,278	4,799	517	1,864
Adjusted R2	0.142	0.166	0.145	0.095	0.081	0.090
F	483.259	373.601	316.913	164.138	15.283	52.630

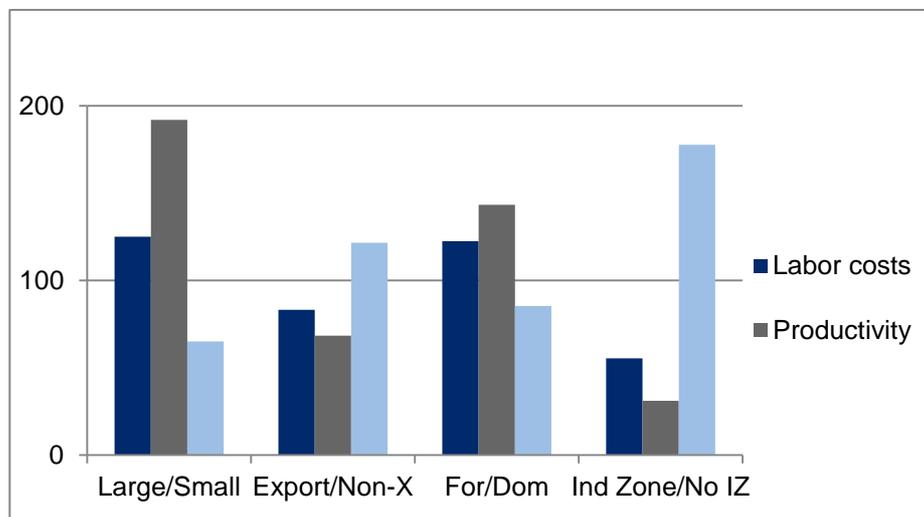
Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Number in parentheses are standard errors.

The regression also predicts that firms in industrial zones have higher ULCs than firms outside the zones. This might be because firms in industrial zones are more likely to comply with government regulations on wages and other labor costs. The results are consistent across industrial groups, which indicates that the effect is not group-specific. Furthermore, this is also confirms that firms in industrial areas are likely to be more concerned with the import and export of inputs and materials, other products, and parts and components than with labor costs.

<sup>5</sup> Of course, the dichotomous variable engaged in export or not engaged in export is a very crude measure of the relationship between exporting and ULCs. The L&M survey no longer collects data on the percentage of output exported.

The bi-variate relationships shown in Figure 3-2 illustrate the main relationships by the selected firm characteristics included in the regression equation: size (measured by number of employees), ownership, market orientation, and location. The figure helps us understand the regression results in two respects. First, the negative relationship with ULCs among large and foreign firms, in contrast to the positive one among exporting firms and those in industrial zones, appears to have been more heavily influenced by productivity rather than labor costs. For example, while wages were higher among large and foreign firms compared with small and domestic firms respectively, differences in productivity were even larger, and hence unit labor costs were low. The opposite was true for exporting firms and those in industrial zones, compared with nonexporters and those in industrial zones: differences in wages appear to have played a greater role in determining differences in ULCs across different kinds of firm.

Figure 3-2  
*Ratio of Labor Costs, Productivity, and ULCs by Selected Firm Characteristics, Indonesia 2010*

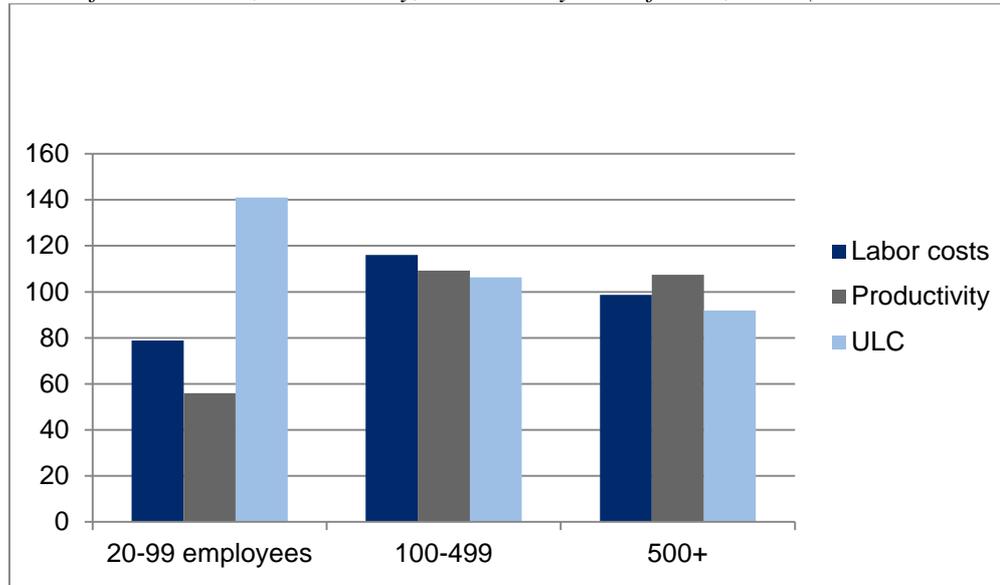


Note: Indices show the ratio of values for large (500 employees or more), foreign, exporting firms, and firms in industrial zones, relative to small (less than 100 employees), domestic owned and nonexporting firms, and firms outside industrial zones, respectively.

Second, differences in relative unit labor costs among firms with different characteristics were especially big according the scale of firm (large firms have much lower ULCs than small firms), and industrial location (firms in industrial zones have much higher ULCs). The main contrast was between small firms with less than 100 employees, on the one hand, which had quite high ULCs, and both medium and large firms in which ULCs were much lower (Figure 3-3). This is relevant to discussions of small firms' difficulties in adjusting to high levels of minimum wage increase. For small firms, the main issue was low productivity relative to wages, which were also quite low compared to other groups of firms. Higher wages would likely to make them even less competitive.

Figure 3-3

*Index of Labor Costs, Productivity, and ULC by Size of Firm, 2010 (All Firm Sizes=100)*



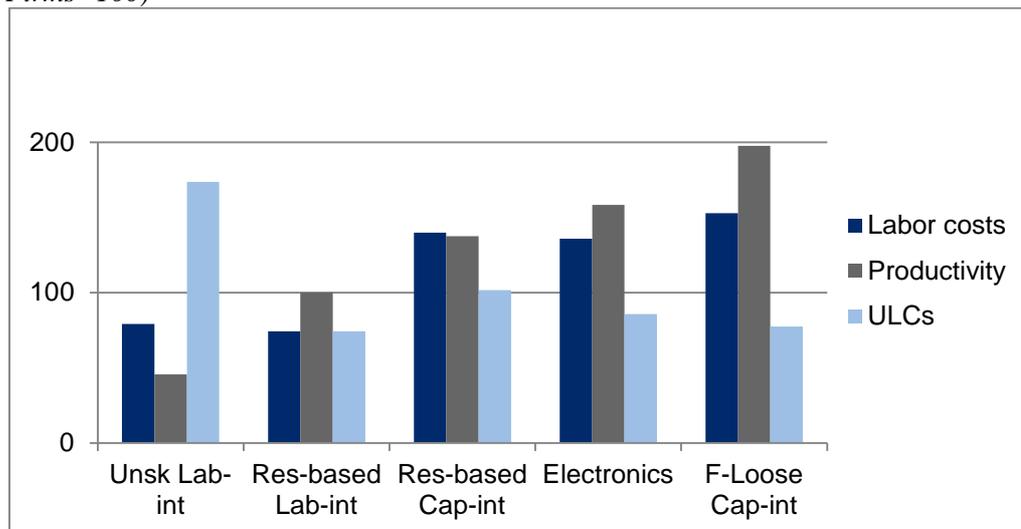
## FIRM CHARACTERISTICS AND DIFFERENCES IN ULCS ACROSS INDUSTRIES

The regression equation (column 1 in Table 3-2) predicts that ULCs in resource based labor-intensive and footloose capital-intensive firms are likely to be lower than the reference group, unskilled labor-intensive firms. But differences in ULCs in unskilled labor-intensive firms on the one hand and electronics and resource-based capital-intensive firms on the other were not significant.

What factors drive these differences and how might they be related to firm characteristics in industries or groups of industries? Figure 3-4 provides some of the answer. First, to differences between the first two labor-intensive groups in the figure, and differences between these two groups and the other groups of industries. The significant difference in ULCs between the two labor-intensive groups of firms appears to be due mainly to differences in productivity. Output per worker was by far the lowest in the unskilled labor-intensive group and this contributed to the much higher ULCs. However, labor costs were quite low and productivity also low, in *both* groups of labor-intensive firms compared with the more capital-intensive firms.

At the other extreme, productivity was highest among the footloose group of firms, and this contributed to low ULCs. Differences in ULCs for all the three groups of more capital-intensive industries were largely due to productivity variations. ULCs did not differ nearly as much as among firms in the groups of labor-intensive industries.

Figure 3-4  
*Index of Average Wages, Productivity and ULC by Industry Group, Indonesia 2010 (All Firms=100)*



What can we conclude from this cross-sectional survey of ULCs? Consistent with many other studies, larger and foreign owned firms tended to have lower ULCs mainly because of higher labor productivity. This was not true of export-oriented firms or firms in industrial zones.

ULCs were very much higher among the unskilled, labor-intensive group of industries relative to all other groups, which may help explain why output and employment have grown so slowly among this group. They were considerably lower in the capital-intensive firms, especially among firms in the footloose group of industries. This lends support to policies that seek to encourage growth of the latter. However, given the relatively small contribution to total employment in the capital-intensive group, a parallel set of policies might be directed to raising productivity in the unskilled and resource-based, labor-intensive industries.

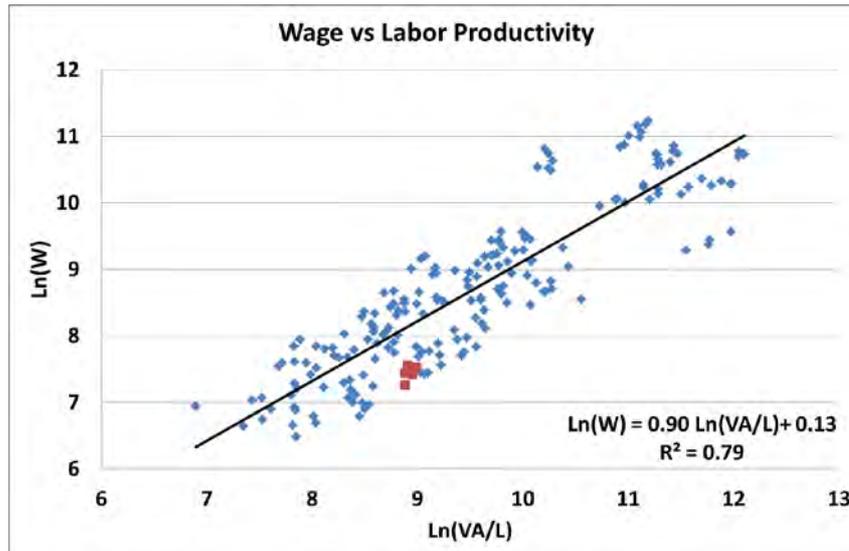
## INTERNATIONAL PATTERNS OF UNIT LABOR COSTS

The previous section compares ULCs and ULC determinants in Indonesia's industrial groups. How does Indonesia's manufacturing sector fare when compared to other countries? In this subsection, we examine international patterns of ULC and the position of Indonesia's manufacturing sector relative to neighboring countries.

Using data from INDSTAT collected by United Nations Industrial Development Organization,<sup>6</sup> Figure 3-5 shows a positive relationship between productivity and nominal wages for the 2006-2009 period, as expected by theory. The graph reveals that on average the percentage increase in the wage was only slightly less than the increase in productivity. Indonesian manufacturing wages, in particular, were slightly below international average for the same level of productivity (as shown by the red square dot in the figure). This suggests that Indonesia was quite competitive during this period.

<sup>6</sup> Countries included in this graph are countries with complete data for employment, value added and total wage bill in INDSTAT for 2006-2009. Note that the data on changes over time are fragmentary and illustrative only.

Figure 3-5  
*Wage and Productivity of Manufacturing Sector Across Countries, 2006-2009*



SOURCE: INDSTAT, author calculation.  $\ln(W)$  is log of average wage which is calculated by dividing wages and salaries paid to employees (converted to current US\$) divided by number of employees.  $\ln(VA/L)$  is log labour productivity which is calculated by dividing value added (deflated by constant 2000 \$US, WDI) by number of employees.

The most recent data (2010<sup>7</sup>) in Figure 3-6 for 52 countries also show positive but slightly lower elasticities. This might be due to the fact that we used minimum wage instead of average wage and used the contribution of industry sector instead of just manufacturing. Nevertheless, Figure 3-6 still shows that Indonesia's manufacturing wage is comparable with other countries, if one takes into account productivity differences. But while ULCs in Indonesia in 2010 were comparable to those in China, Cambodia and the Philippines, they were much higher than in Thailand and India (Figure 3-7).

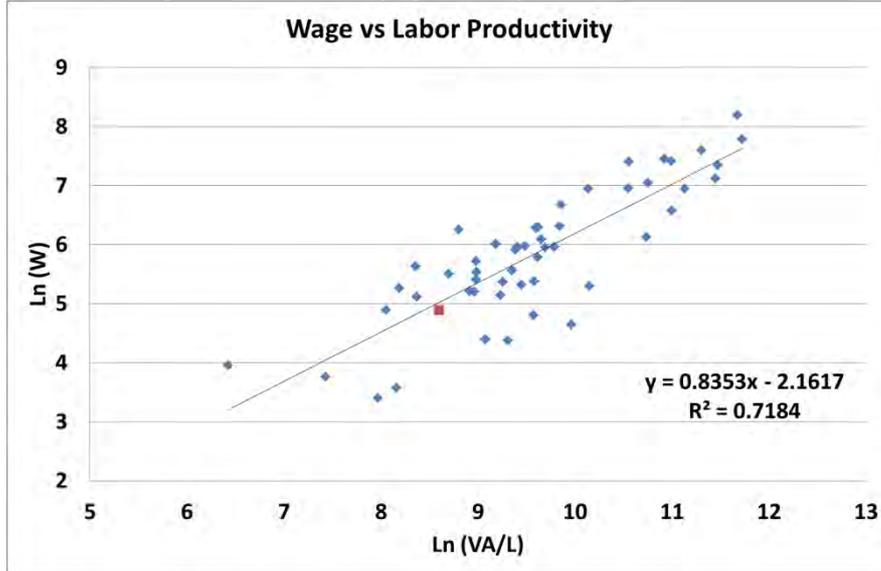
ULCs were high and increasing in 2000–2005 (Aswicahyono, et al, 2010) as a result of the large increase in minimum wage after decentralization, but they seem to have plateaued from 2005-2009/10, as the economic situation stabilized.

Indonesia seems to be quite comparable with other East Asian countries until 2010, but there are concerns regarding the large minimum wage rise in 2012 and even bigger rise in several of the main industrial areas in 2013. A minimum wage increase of 40 percent or more surely will raise the ULC significantly in comparison to neighboring countries. Whether Indonesia can still compete with any other countries will partly depend on whether the increase in the minimum wage can be matched by an increase in labor productivity.<sup>8</sup> The minimum wage increase may be tolerable for capital-intensive firms, but there are doubts about unskilled labour-intensive ones.

<sup>7</sup> The 2010 data are from Jobs database (minimum wage) and WDI (industry value added) from the World Bank and from KILM database, ILO (employment in industry).

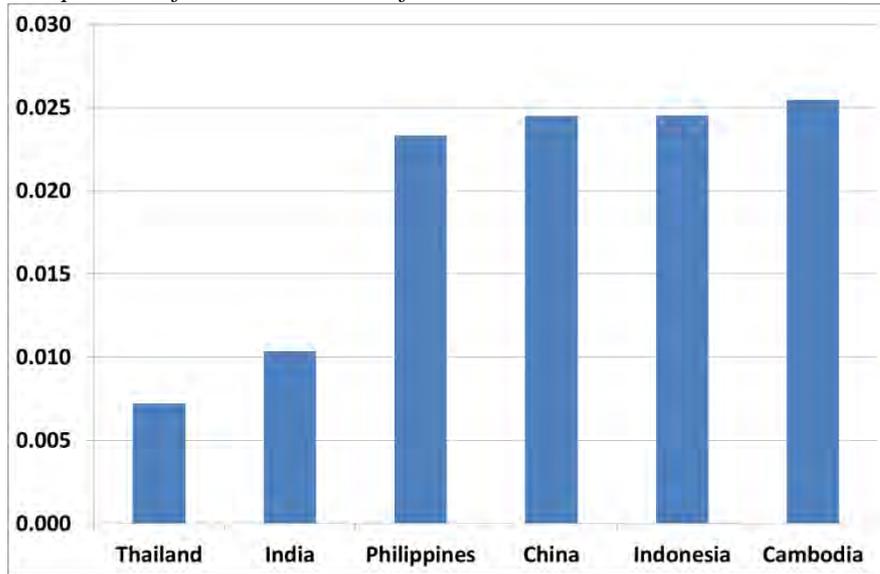
<sup>8</sup> Normally, the relationship between wage increases and productivity is stronger if negotiated at the plant or industry level because it allows for changes in work practices to support wage rises.

Figure 3-6  
 Minimum Wage and Productivity of Industry Sector Across Countries, 2010



SOURCE: Author calculation from World Bank and ILO database. Ln (W) is log of minimum wage which is calculated by dividing wages and salaries paid to employees (converted to current US\$) divided by number of employees. Ln(VA/L) is log labour productivity which is calculated by dividing value added (deflated by constant 2000 \$US, WDI) by number of employees.

Figure 3-7  
 Comparison of Unit Labor Costs for Selected Countries in 2010



SOURCE: World Bank and ILO databases, author calculation.



## 4. Conclusion

Employment in Indonesia's manufacturing sector grew slowly in the second half 2000s. One of the main reasons for this are employment elasticities related to output, which are very low compared with the international average even for unskilled labor-intensive firms.

Contributing to gloomy employment conditions in manufacturing are slow growth in manufacturing industries, unresponsive output growth, and sensitivity of employment to wage increases.

We found that ULCs are lower in larger and foreign firms, mainly because of higher labor productivity rather than lower wages. Surprisingly, ULC were higher in exporting firms, especially related to high levels of labor absorption per unit of output, hence lower labor productivity, in labor-intensive firms.

Over time, ULCs have risen, but with some important differences among industries. Nevertheless internationally, ULCs have not been rising much faster in Indonesia than in other countries at a similar stage of development until 2010. The very large increase in the minimum wage in 2012—and even bigger increases in several industrial areas in 2013—is cause for worry. Wage increases may be tolerable for capital-intensive firms, but may have negative effects on employment in labor-intensive firms.

The main issue for Indonesia is to raise productivity in order to become more competitive and gain international market share while also creating jobs. In addition to the well-known reforms needed to achieve this (i.e., improve infrastructure and the business environment), we suggest that the government attend to the structure and level of labor costs.



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