# Impact of Firing Restrictions on Establishment Performance: Evidence from Indonesia

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October 31, 2013

**Abstract** This paper investigates the impact of an increase in the cost of firing employees on the performance of manufacturing establishments in Indonesia. This analysis uses semi-parametric difference-in-differences methods to measure the impact of the policy change on the output, employment, wages, and input mix of establishments. The new law applies to all formal sector manufacturing establishments in Indonesia, and increased both the size of severance payouts the establishments were required to pay and the number of occasions for which they were required to do so. In order to identify treatment and control groups, I argue the government is unable to enforce the law equally across all establishments. I use establishments that are most likely to comply with the new law as the treatment group, and establishments that are less likely to comply as the control group. This paper uses two complementary approaches to define the treatment and control groups, both based on the idea that establishments exposed to foreign markets are more likely to comply with labor laws. I find that establishments impacted by the new firing laws have decreased output, increased employment, pay lower wages, increase their capital/labor ratio, and decrease the percent of their workforce in production. These results suggest that establishments respond to the increased costs of firing workers by lowering wages, and switching to relatively less costly inputs, namely capital and non-production workers.

**Keywords:** Labor Laws; Firing Restrictions; Labor Markets; Indonesia.

**JEL Classification Numbers:** J32, J48, O12.

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# 1 Introduction

There is a long-standing debate about the right amount of regulation in labor markets. Good overviews of the debate are provided by Addison and Teixeira (2001), Blau and Kahn (2002), and Heckman and Pages (2004). Firing restrictions are one of the policies considered in the set of labor regulations, and usually take the form of a severance payment that firms are required to pay workers upon termination of their employment. These payments are especially important to workers in developing countries as they comprise the primary form of unemployment insurance in countries with few other safety nets.

This study adds to the literature analyzing the impact of labor regulations in three ways. First, this paper analyzes the impact of a specific policy change in Indonesia, as compared to many studies that have more abstract measures of rigidity, such as a strictness ranking or the number of laws that were passed for or against more flexible labor markets. Second, this study focuses on the impact of firing restrictions on establishments, whereas most studies have used household or individual level data. While it is important to study the impact of the firing restrictions on workers, the impact of firing restrictions on establishments has been relatively understudied. Finally, this study uses micro-data from the manufacturing sector of Indonesia. Heckman and Pages (2004) note the importance of using micro-data when studying this issue as opposed to the cross-country analyses that has been common.

This research is important as many developing countries have recently adopted firing restriction legislation or have had debates about doing so. Indonesia has had significant debates about reforming the law that was implemented in 2003, as many companies contest that the law is too restrictive. Reforms that would have weakened the regulations were almost passed in 2006, but popular support amongst the working class prevented revisions from passing. This study will help inform the debate as it provides information about the impact of a specific labor regulation on the performance of establishments using micro-data.

The primary theoretical contributions regarding the impact of firing restrictions on the labor market come from Bertola (1990) and Bentolila and Bertola (1990). They develop

dynamic partial-equilibrium models which predict that firms will reduce turnover, both hiring and firing, in the face of increased firing restrictions. However, the impact on the level of employment, and thus unemployment, depends on whether hiring or firing is reduced more. Other predictions come from standard producer theory. The increased firing restrictions are an increased cost, which induces the firm to use relatively less of that input, and reduces their overall output.

Many studies have looked at the impact of firing restrictions on labor markets. The three main outcomes studies have analyzed are labor turnover, employment levels, and the unemployment rates of local labor markets. Both Heckman and Pages (2004) and Addison and Teixeira (2001) provide good summaries of studies that find both a negative relationship between job security provisions and employment, and also those that find no evidence of such a relationship. Similarly, studies have found mixed results regarding the relationship between job security provisions and unemployment.

Most of the studies characterized in these reviews use aggregate data from developed countries, predominantly the OECD countries (Lazear 1990, Nickell 1997, Bertola 1990, Garibaldi et al 1997). Blau and Kahn (2002) provide a thorough analysis of the US labor market and how it compares with other OECD countries.

A prominent study using data from a developing country is Besley and Burgess (2004). They looked at changes in labor laws in India by state, and how the different labor regimes impacted aggregate output, employment, investment, productivity and poverty. They used counts of laws for or against a more flexible labor force and found that more pro-firm laws helped firms and reduced poverty, while more laws protecting workers increased poverty.

Heckman and Pages highlight the need for using micro data from single countries as it eliminates biases associated with unobserved heterogeneity often found in cross-country studies. While it is not necessary for these data to come from developing countries, developing countries often are good contexts to study as there are large changes in job security provisions either over time or across regions, providing the necessary identifying variation.

Four such studies are Kugler (2004), Adhvaryu, Chari, and Sharma (2010), Mondino and Montoya (2004), and Saavedra and Torero (2004).

Kugler uses micro data on households in Columbia. She uses a difference-in-differences technique, and also estimates an exponential duration model. She finds that job security provisions decrease turnover and increase unemployment.

Adhvaryu et al build on the Besley and Burgess study by investigating whether firms in Indian states that have more restrictive firing laws are able to adjust their labor more or less in response to demand shocks. Using rainfall shocks as their exogenous variation, they find that firms in less restrictive states are more able to adjust their employment levels. This finding is consistent with the standard theoretical prediction.

The other two studies, Mondino and Montoya, and Saavedra and Torero, use similar methodologies on disaggregated firm level data from Argentina and Peru, respectively[1]. They estimate labor demand equations in which a direct measure of the costs of job security is used as a control variable. This measure is constructed based on the labor taxes firms are required to pay, and the structure of the severance payment schedule. Both studies find a negative relationship between job security and employment. One weakness of these studies, which the authors admit, are the aggregate instruments used to identify the impact of job security at the firm level.

My research continues the recent trend of using establishment level data, though it builds on the literature by analyzing a specific policy change. This will provide more focused insight regarding how a specific job security provision impacts establishment behavior. The next section describes the context for the labor law change, and the empirical methods used in the analysis. Section three describes the data and section four presents the main results. Section five tests the validity of the main results using various robustness checks. The last section concludes and provides some policy implications.

[1]The data used by Saavedra and Torero is at the establishment level.

# 2 Background and Empirical Approach

The change to the labor law in Indonesia was a large piece of legislation (Manpower Law 13/2003) that contained many provisions. The three most controversial areas dealt with severance pay, the use of contract workers, and the setting of minimum wages (Manning and Roesad 2007). Manning and Roesad state that the provisions on severance pay were the most criticized aspects of the law[2]. Severance pay is especially important in the context of Indonesia as it is the primary source of unemployment benefits for most wage workers (Manning and Roesad 2007). The severance payouts are based on the workers' wages, so any changes to minimum wages would also carry through and affect the severance payout. Most employers responded to the increased severance payouts by increasing their use of contract workers, but the legislation made it more difficult to do so by limiting the types of activities contract workers were permitted to do and by limiting the length of their contract (to a total of three years, after all possible renewals and extensions). Increases in the minimum wage would have a similar predicted impact on firms as the increases in severance payments, as both policies increase the cost of labor.

The changes to severance payouts is also the most proximate change for the empirical analysis. The law regarding severance payouts took effect immediately in 2003 when the law was passed. However, the impact of the changes to minimum wages and to the regulations for contract workers may have been more delayed. The labor law made two changes to the minimum wage, decentralizing the setting of the minimum wage to the districts and changing the criteria upon which the minimum wage is set. Thus, the law did not change the minimum wage itself, just the process for how the minimum wage was set. Also, the law did immediately change the regulations for contract workers, but the three year limit for using a specific contract worker would delay the impact on establishment behavior. So, the delayed impact of components of the law, and the controls for the local minimum wage

[2]Informal conversations with human resources personnel confirmed that the severance pay component of the law was very burdensome to the way they conducted their operations.

together help me parse out the impact of the increased severance payment on establishments.

The theoretical predictions for how increased severance payouts will impact establishment performance follows the literature. The increased payouts are an increase in worker costs, encouraging establishments to substitute towards other inputs, and reducing their overall output. As Bertola (1990) showed, the regulation on worker separation could either increase or decrease overall employment, depending on whether the reduction in separations or hirings is greater.

To examine the impact of the increased firing restrictions contained in Manpower Law 13/2003, this analysis will use a difference in differences technique around the implementation year of 2003. I will use establishments that were more likely to comply with the law as the treatment group and establishments that were not as likely to comply as the control group. Since the control group will be exposed to the treatment to some extent, the measured impact of the policy change will be combined with the difference in exposure to the law. This combined measurement will be an underestimate of the overall impact of the policy.

There is some research documenting the likelihood of compliance amongst Indonesian establishments. Harrison and Scorse document that manufacturing establishments exposed to foreign interests are more likely to comply with minimum wage laws (2004 and 2010). They measure foreign influence separately through foreign ownership and the amount a establishment exports. Manning and Roesad also argue that large firms and foreign-owned firms in Indonesia are more likely to be held in compliance to labor laws (2007). Following these papers, I use two complementary approaches to identify the treatment and control groups. The first treatment group consists of foreign establishments, and the associated control group being domestically owned establishments. Establishments are assigned to the treatment group if the average foreign ownership before the law change was at least 10%. The second treatment group consists of establishments that export at least 20% of their output, and the associated control group consisting of non-exporting establishments.

The difference in differences methodology can be represented in the following manner.

$$Y_{it} = Treat_{it} + Post_{it} + \alpha Treat * Post_{it} + X_{it}\beta + \epsilon_{it} \quad (1)$$

Where $Y_{it}$ is the outcome variable for establishment $i$ in year $t$. $Treat$ is a dummy variable equal to 1 if the establishment is a member of the treatment group, and zero otherwise. $Post$ is a dummy variable equal to 1 if the observation is after the program has been implemented. Then $Treat * Post$ is the interaction of the two dummy variables, which will only be equal to 1 for establishments in the treatment group after the policy has been implemented. $X_{it}$ is a vector of $k$ control variables, with $\beta$ being a vector of $k$ coefficients. The last term, $\epsilon_{it}$ represents the error term. In this setup, $\alpha$ captures the impact of the policy change. The analysis below will present results from a base specification with only year, region, and industry dummies, and then an additional specification which also includes additional controls, such as establishment output, employment, establishment growth, and the local minimum wage.

The identifying assumption in this approach is that, conditional on a set of control variables, the only change between before 2003 and afterwards for these two groups is the change in the labor laws. The main threat to identification in difference-in-differences analysis is that the treatment and control groups are experiencing different trends leading up to the policy change. If the groups experience different pre-treatment trends, the control group's behavior after the policy change is no longer a valid counterfactual for treatment group. To check for this issue, the analysis below displays the trends for the variables of interest over the study period.

The common trends assumption is restrictive, and doesn't apply in many settings. However, a recent extension of the traditional difference-in-differences analysis enables the application of the technique in more settings (Abadie 2005, Athey and Imbens 2006, Blundell and Costa-Dias 2000). The semi-parametric difference-in-differences estimator modifies to

the control group so that the pre-treatment trend more closely matches the treatment group. The modification of the control group is based on the propensity for any observation to be included in the treatment group. In this context, I estimate a probit model for the likelihood that an establishment is foreign owned (or exporting). The predictions from this model are then used to reweight each observation, making the control group look more like treatment group. The semi-parametric extension to the difference-in-differences technique modifies the common trend assumption, arguing establishments that are more similar in their observable characteristics (as measured by the propensity score), are also more likely to be similar in their unobservable characteristics.

Establishments are allocated into treatment and control groups based on their average values for the pre-treatment period (2000-2002). Also, the observations from 2003 are not used in the analysis to provide a more clear distinction between the before and after environments. The law became effective in March of 2003 which means I might miss some of the short term responses of establishments, but I am more interested in the long term responses of establishments. This is partly because my data is not granular enough to study the short term effects, but also because the longer term responses provide evidence of the structural changes that have occurred in the labor market.

Bertrand, Duflo, and Mullianathan (2004) also discuss an issue with using difference-in-differences techniques. They show that many effects may be erroneously shown to be statistically significant because of serial correlation in the analyzed variables. However, their Monte-Carlo simulations shows that this issue becomes less significant as the number of years used in the analysis shrinks. With only six years of data used in my analysis, this issue does not pose too much of a threat.

Another concern arises about drawing inference from difference-in-differences analysis based on ordinary least squares regressions. Donald and Lang (2007) demonstrate that the standard asymptotics are not valid when the number of groups is small. There are only two groups in this analysis, the treatment group and the control group. They propose

a two-step procedure that provides unbiased estimates for the variances of the coefficient estimates. However, they also state that if there are large numbers of observations within each group, which is the case here, that feasible GLS estimation will produce unbiased estimates. Therefore, I use feasible GLS estimation in each of the specifications reported below.

# 3 Data

The data I use for this analysis is Indonesia's Annual Manufacturing Survey, *Survei Tahunan Perusahaan Industri Pengolahan* (SI). It is a census of all the manufacturing establishments in Indonesia with at least 20 employees. The establishments are required to fill out the survey each year, and I have data covering years 2000-2006. This panel dataset includes many variables, but importantly for this study, it has data on output (revenue), inputs, capital, wages, number of employees, ownership, location, industry, etc.

Since prices are different for consumers than they are for industries, I deflate wages using Indonesia's consumer price index to constant year 2000 Rupiah and I deflate all other monetary values using industry specific wholesale price indices to constant year 2000 Rupiah. The exchange rate in the year 2000 was about 8,400 Rupiah to 1USD. The question in the survey on establishment ownership asks how much of the establishment's capital is owned by the local government, central government, foreign interests, or private interests. I follow the standard practice of considering an establishment to be foreign-owned if at least 10% of its capital is foreign owned.

I performed some basic data cleaning procedures following other studies that have used the Indonesian SI data (Blalock and Gertler 2004, Hallward-Driemeier and Rijkers 2010). This included correcting for invalid values, missing values, and outliers. Observations were considered invalid if they were percentage variables with values outside the range 0-100, for example an establishment with 320 percent of its output exported. Missing values were

cleaned if they were surrounded by actual values in both the previous and following years. Observations were considered to be outliers if they were significantly different from both the previous and following values. I followed the Hallward-Driemeier and Rijkers thresholds for determining when observations were significantly different. In each of these cases, observations were replaced with the mean of the corresponding values from the previous and following years. When an observation was on a boundary, only the previous or following year was used for cleaning purposes. If suitable neighbors were not found, the missing or invalid data was left in the sample.

I have data on the number of production workers and non-production workers. Production workers are those working in the production activities of the establishment, and non-production workers comprise everyone else, such as management and administrative staff. Since over 80% of workers are production workers, I focus the analysis on them. The data also contains information on total salary and benefits paid to workers. I add these together to construct the total labor costs to the establishment, and then divide by the number of workers to yield the average wage paid by the establishment to each of its workers.

Summary statistics for the data can be found in Table 1. Each observation is an establishment-year. The first two columns show summary statistics for foreign and domestic establishments respectively. The third and fourth columns then show summary statistics for exporting and non-exporting establishments. The first row shows the continuous version of the foreign ownership variable, and suggests a bi-modal distribution for foreign ownership. If establishments have at least 10% foreign ownership, then they tend to have a lot more. Also, establishments that are classified as not being foreign owned may still have a small bit of foreign influence, though it appears to be minor. There are large differences in the averages reported across each treatment and control group, which suggests that while there may be different levels of compliance between establishments, there are many other differences which may preclude a clean analysis of the treatment effect. The semi-parametric reweighing of each observation based on its propensity score will help narrow the gaps in observables

between the two groups.

# 4 Results

This analysis focuses on five outcome variables which measure the activities of the establishment, total revenue, wages, employment, capital/labor ratio, and the percent of the workforce in production. For the measures of wages and employment, I focus on the production workers (as compared to the non-production workers).

As discussed above, when using difference in differences analysis, it is important to compare the trends of the groups before the policy change. In order for the analysis to work, the pre-treatment trends facing the treatment and control groups need to be similar. These trends are displayed in Figures 1-5 for each of the five outcome variables. In each figure, the panel on the left displays the trends for the foreign treatment group and domestic control groups. The panel on the right displays the trend for the exporting treatment group, and the non-exporting control group.

Overall, the trends for the treatment and control groups assigned according to their foreign ownership levels have more similar pre-treatment trends than do the groups assigned by their exporting status. One exception to this observation is the pre-treatment trends for the percent of the workforce in production, where the exporting group has pre-treatment trends relatively similar to its control group. The cases where the pre-treatment trends do not support the use of difference-in-differences are the capital/labor ratio using the exporting status, and the percent of the workforce in production using foreign ownership for identification.

The simplest way to conduct difference-in-differences analysis is to compare the means for the treatment and control groups both before and after the policy change. However, these results do not account for any differences in the distribution of establishments across industry or region, nor do they control for any establishment specific variables that may be directly impacting the outcome. To condition for these other variables, equation 1 is

estimated via ordinary least squares. The results of these regressions are reported separately by outcome variable in Tables 3-**??**. In each table, the odd numbered columns report the results using only year, industry, and region dummies as controls in the regression[3], whereas the even numbered columns include additional establishment-specific controls. The first four columns of each table show the results using the foreign ownership treatment, whereas the last four columns show the results using the export treatment. Finally, columns 1, 2, 5, and 6 show the standard difference-in-differences results, whereas columns 3, 4, 7, and 8 show the results using the semi-parametric difference-in-differences technique, where each observation is weighted by its propensity to be assigned to the treatment group.

The estimation results for the propensity score models are shown in Table 2. These models are estimated using data from years 2000-2002, so the effects of the policy change do not affect propensity of establishments to be in the treatment group. There is a small correlation between the two treatment schemes, with foreign owned establishments being more likely to also be exporting, and vice versa. Establishments located in the same district as the provincial capital are less likely to be foreign owned and exporting. Larger establishments, both by revenue and employment, are more likely to be foreign owned and exporting. However, establishments that are growing their output more are less likely to be foreign or exporting. Employment growth has mixed results, increasing the propensity to be foreign owned, but not exporting. Finally, being in a province with high minimum wages is not correlated with being foreign owned or exporting. The preferred specifications are columns 4 and 8, as they control for establishment characteristics that may be affecting the outcome variable, and also use the semi-parametric difference-in-differences technique.

Table 3 displays the results for establishment output (gross revenue). The theoretical prediction is that the increased severance payments would reduce establishment output as establishments need to adjust to the increased labor costs. The impact of the policy is captured by the coefficient on the interaction term, $Post - 2003 * Treated$. Column 1

[3]There are 32 regions and 20 two-digit industries.

reports a positive coefficient, however, that result switches to a negative coefficient once the additional establishment characteristics are included. The positive coefficient also turns statistically insignificant if the sample is reweighted by the propensity score. All of the even numbered columns report a statistically significant negative coefficient, indicating the increased firing restrictions reduced establishment output.

I next examine the impact of the increased severance payments on the number of production workers employed at each establishment. These results are reported in Table 4. In all 8 regressions, the treatment effect is positive, and is statistically significant in 7 of the specifications. The theoretical prediction for the impact of job security provisions on employment is ambiguous, but these results show that for establishments in the manufacturing sector in Indonesia, the overall impact of the policy on employment is positive. A common explanation for this result is that it's due to establishments decreasing their firing more than they decreased their hiring. The magnitude of these coefficients suggest that the policy increased employment of production workers about 7 or 8% (focusing on the semi-parametric results including additional controls).

The third outcome variable is the average wage each establishment pays their production workers. These results are reported in Table 5. In all 8 specifications, the treatment effect is negative, which is counter to the predicted impact. The result is only significant in one of the preferred specifications, using the foreign treatment. The law change mandates an increase in the benefits establishments are required to pay their workers, though establishments could offset the increased benefits by reducing the rate wages are increased. While the coefficient is negative, it does not mean that wages fell for workers in foreign owned establishments, just that wages were lower than would they would have been had the treatment not occurred. Indeed, by looking at Figure 6, wages for both foreign owned and domestic establishments increased over the years. The size of the coefficient suggests that wages in foreign owned establishments would have been 6% higher without the increased firing restrictions.

The next outcome variable considered is the capital-labor ratio; these results are reported

in Table 6. The treatment effect is positive and statistically significant in all specifications using the foreign ownership treatment, however it is not significant using the exporting treatment. The insignificant result is not important, since the pre-treatment trends for the capital/labor ratio did not support the use of difference-in-differences analysis. The positive impact reported using the foreign treatment does conform with expectations, indicating establishments are shifting towards a relatively cheaper input as labor becomes more expensive. While the previous table reported wages to be falling, the relevant factor here is the total labor cost. Total labor costs could rise even while wages fell if employment levels increased more than wages fell. Table 4 reported that employment did increase.

Finally, Table 7 reports the results for the impact of increased firing restrictions on the percent of the workforce in production. The treatment coefficient is negative in all specifications, though its statistically insignificant using the foreign treatment. But again, the pre-treatment trends for the foreign treatment did not support the use of difference-in-differences for this outcome variable. The results here are similar to those for the capital/labor ratio, establishments are switching away from the relatively more expensive input (production workers), towards the relatively cheaper input (non-production workers). This result is consistent with the predictions.

# 5 Robustness Checks

This section performs some variations on the above analysis to check the robustness of the results. These results are reported in Table 8. The table only reports the coefficient for the treatment effect (the interaction term), for models that include all of the additional establishment-level controls. The first panel repeats the main results from above.

The second panel tests the timing of the treatment by checking if the same treatment and control groups report a treatment effect in a random year. For this, I chose the treatment year 1994, and the 3 years prior and post to comprise the sample. If the treatment coefficient

reports significant results based on a placebo treatment in 1994, that would suggest the main results are not due to the change in labor laws that occurred in 2003. Insignificant results for the placebo treatment in 1994 do not prove the validity of the main treatment in 2003, but significant results for the placebo would diminish our confidence in the main results. Since results are reported for 20 regressions, I would expect to see at least one significant result at the 20% level. However, the consistently significant results for the impact of the placebo treatment on the percent of the workforce in production is worrying. The coefficient for the level of production jobs being always insignificant suggests that there was a significant reduction in the level of non-production workers around 1994.

The third panel in Table 8 tests the validity of the identification assumptions by randomly assigning establishments to treatment and control groups. The treatment effect year is still 2003, but establishments are assigned to the treatment and control groups randomly. The relative size of the treatment and controls groups stays the same as above. The insignificant results reported here are expected, and do not detract from the validity of the main results above.

The next two panels test different cut off values for when an establishment is considered to be foreign owned or an exporter. The main analysis above followed the literature by using the cutoff of 10% for foreign ownership and 20% for exporting. The results reported here use 20% for foreign ownership and 10% for exporting. The results are broadly similar to the main results, with only small changes in magnitude of the coefficients.

The last panel repeats the main analysis using the raw data, without any steps being made to clean the data. The data is noisier without the cleaning, and the results reported in Table 8 reflect that. A few coefficients are no longer significant, though they all retain the same sign, and some are close to being significant. This suggests the raw data is noisier, and the treatment effects are not strong enough to overcome the noise.

# 6 Conclusion

This paper has used semi-parametric difference-in-differences analysis to study the impact of a package of labor laws implemented in Indonesia in 2003. The most significant changes in the law increased firing restrictions for establishments, decentralized minimum wage setting, and placed restrictions on how contract workers could be used. I used data from Indonesia's census of manufacturing establishments from 2000 to 2006 to analyze the impact of the law on the behavior of establishments and the labor market. To establish treatment and control groups for the analysis, I argued that some of the establishments were more likely to comply with the law than others, whether through their own volition or through government enforcement.

I considered two dimensions along which compliance may differ, foreign ownership and export status. The first approach assumes foreign-owned establishments were more likely to comply with the new law, whereas domestically owned establishments did not. The second approach assumes exporting establishments are more likely to comply with the new labor law than do non-exporting establishments. If either of the control groups do respond to the new labor law, the results estimated here report the impact of the relative difference in compliance, and are underestimates of the overall impact of the policy.

The results showed the change in policy had a negative impact on establishment output. Employment was shown to have increased, indicating that establishments decreased their rate of firing workers less than their rate of hiring workers. The results also showed a decrease in wages, relative to the counterfactual. The last two tables showed establishments respond to incentives, by using less of the more expensive production labor, and shifted towards using more capital and non-production workers.

This work provides relevant information to the policy discussion about the impact of job security provisions on both sides of the labor market. While wages did not grow as quickly for production workers, the number of workers employed increased. Also, there is a negative impact on the output of establishments, which may disappear in the long run

as establishments adjust their input mix. More work needs to be done to quantify the magnitudes of these various effects.

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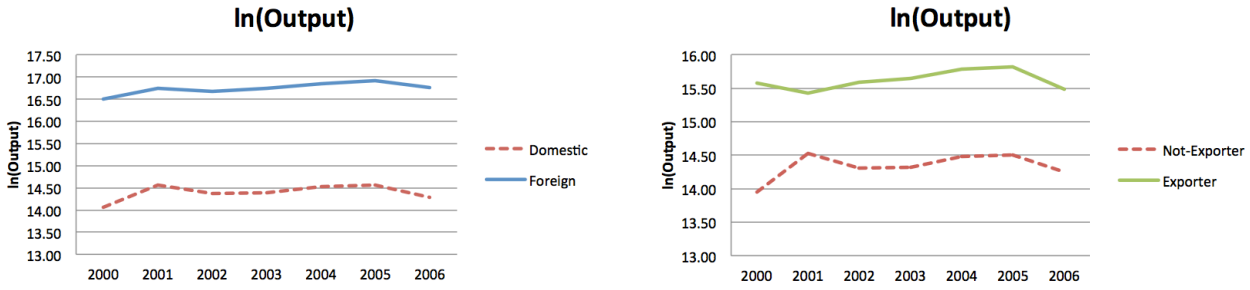


Figure 1: Trends in Output by Treatment Group

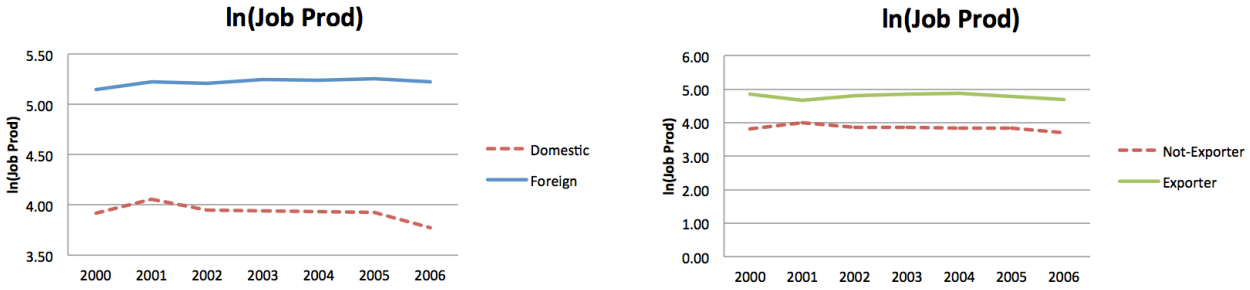


Figure 2: Trends in Production Jobs by Treatment Group

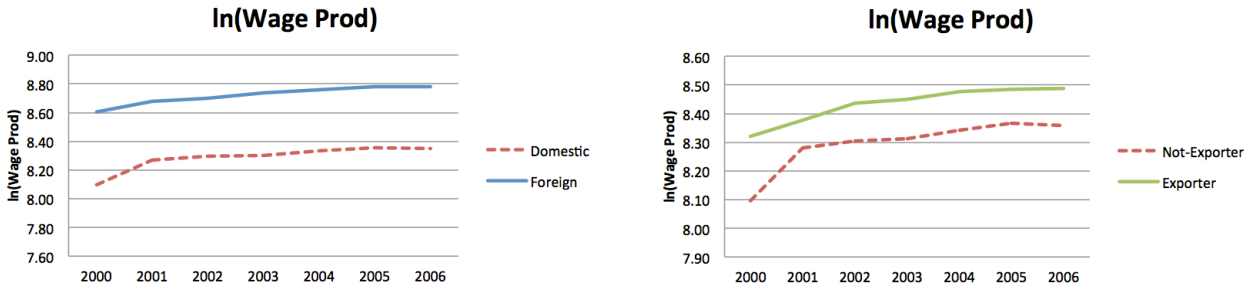


Figure 3: Trends in Production Wages by Treatment Group

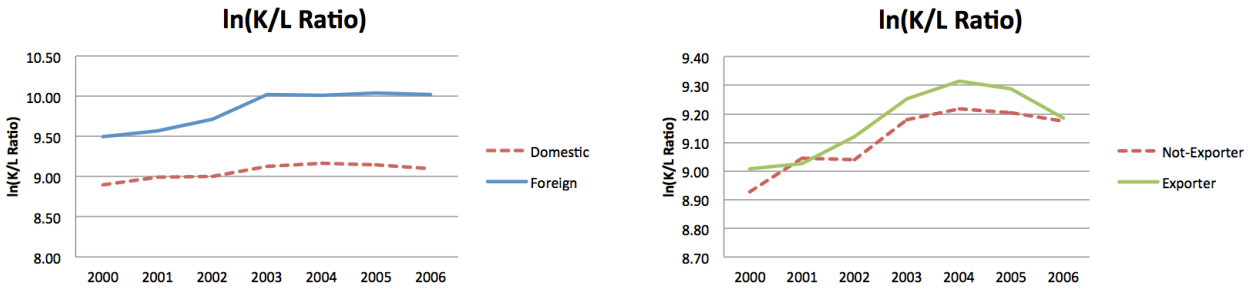


Figure 4: Trends in Capital/Labor Ratio by Treatment Group

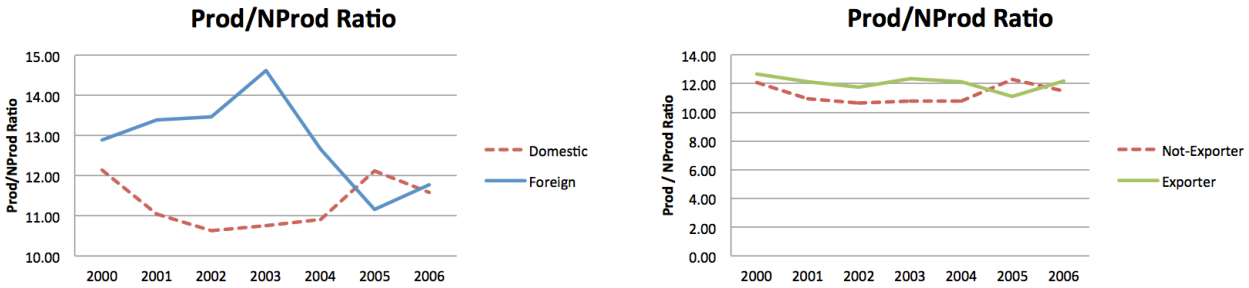


Figure 5: Trends in Percent of the Workforce in Production by Treatment Group

Table 1: Summary Statistics of Indonesian Manufacturing Establishments by Treatment Group

| | Foreign Establishments (1) | Domestic Establishments (2) | Exporter Establishments (3) | Not-Expo Establishm |
|---|---|---|---|---|
| % of Foreign Ownership | 64.4 | 0.2 | 14.4 | |
| | 36.4 | 2.5 | 32.2 | |
| % of Output Exported | 34.9 | 10.8 | 66.6 | |
| | 43.2 | 28.9 | 39.6 | |
| Output (Million Rupiah) | 94,220 | 17,873 | 45,841 | 18 |
| | 446,200 | 175,000 | 205,700 | 214 |
| Input (Mil Rph) | 56,501 | 11,484 | 29,512 | 11 |
| | 249,200 | 102,500 | 124,500 | 121 |
| Investment (Mil Rph) | 8,585 | 1,199 | 4,546 | 1 |
| | 281,800 | 46,230 | 190,200 | 41 |
| Capital (Mil Rph) | 81,805 | 7,723 | 38,670 | 7 |
| | 2,400,000 | 220,300 | 1,558,000 | 233 |
| R&D Expenditure (Mil Rph) | 23.8 | 3.2 | 13.1 | |
| | 227.4 | 90.8 | 197.1 | |
| Value Added per Employee (Mil Rph) | 72.9 | 26.1 | 36.2 | |
| | 263.5 | 179.7 | 177.0 | 1 |
| Establishment Age | 13.4 | 17.3 | 14.7 | |
| | 14.9 | 13.9 | 12.7 | |
| # Employees | 559.5 | 155.7 | 395.1 | 1 |
| | 1,327.6 | 556.7 | 961.8 | 5 |
| % of Workforce in Production | 82.9 | 84.7 | 85.4 | |
| | 15.2 | 14.0 | 13.4 | |
| Production Wages (Thous Rph) | 6,996 | 4,736 | 5,351 | 4 |
| | 3,534 | 2,839 | 3,013 | 2 |
| Non-Production Wages (Thous Rph) | 25,279 | 8,981 | 13,494 | 9 |
| | 63,833 | 14,293 | 28,263 | 22 |
| N | 11,855 | 129,022 | 29,107 | 111 |

Notes: All values are in constant 2000 Rupiah. Data covers years 2000 - 2006. The export data is available for years 2000, 2004, and 2006. The R&D expenditure information is available for a few establishments in years 2000 and 2006.

Table 2: Probit Results for Estimation of Probability of Being in Treatment Group

| | p(Foreign) | p(Exporter) |
|---|---|---|
| | (1) | (2) |
| Exporter | 0.080*** | |
| | (0.003) | |
| % Foreign Ownership | | 0.002*** |
| | | (0.000) |
| In Same District as Capital | 0.000 | -0.022*** |
| | (0.002) | (0.005) |
| ln(Prod Jobs) | 0.000 | 0.054*** |
| | (0.001) | (0.002) |
| ln(Output) | 0.000 | 0.032*** |
| | (0.001) | (0.001) |
| Prod Job Growth | 0.000 | -0.075*** |
| | (0.007) | (0.015) |
| Output Growth | 0.000 | -0.302*** |
| | (0.013) | (0.027) |
| ln(Min Wage) | 0.000 | 0.007 |
| | (0.009) | (0.017) |
| Pseudo-$R^2$ | 0.284 | 0.250 |
| N | 54,387 | 55,001 |

Notes: Marginal effects are reported for each coefficient, and standard errors are in parentheses. The sample consists of all establishments for the years 2000-2002. Both models include year, region, and industry effects.

Table 3: Difference in Differences Results for Establishment Output

| | Foreign Treatment | | | | Export Treatment | | | |
|---|---|---|---|---|---|---|---|---|
| | Plain | | Reweighted | | Plain | | Reweighted | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Post-2003 | 0.150*** | 0.086*** | 0.169*** | 0.091*** | 0.164*** | 0.106*** | 0.185*** | 0.100*** |
| | (0.019) | (0.015) | (0.039) | (0.031) | (0.020) | (0.015) | (0.034) | (0.021) |
| Treated | 2.083*** | 0.606*** | 1.107*** | 0.452*** | 1.370*** | 0.295*** | 1.029*** | 0.238*** |
| | (0.027) | (0.020) | (0.034) | (0.023) | (0.019) | (0.013) | (0.025) | (0.015) |
| Post-2003*Treated | 0.084** | -0.070*** | 0.044 | -0.078** | 0.004 | -0.157*** | -0.076** | -0.119*** |
| | (0.038) | (0.027) | (0.049) | (0.032) | (0.027) | (0.017) | (0.036) | (0.019) |
| Exporter | | 0.209*** | | 0.039** | | 0.007*** | | 0.005*** |
| | | (0.010) | | (0.016) | | (0.000) | | 0.000 |
| Provincial Capital | | 0.198*** | | 0.058*** | | 0.195*** | | 0.225*** |
| | | (0.010) | | (0.021) | | (0.010) | | (0.014) |
| ln(Prod Jobs) | | 1.191*** | | 1.034*** | | 1.197*** | | 1.109*** |
| | | (0.003) | | (0.006) | | (0.003) | | (0.004) |
| Prod Jobs Growth | | -1.936*** | | -1.897*** | | -1.952*** | | -2.049*** |
| | | (0.046) | | (0.092) | | (0.046) | | (0.059) |
| Output Growth | | 6.498*** | | 7.192*** | | 6.474*** | | 6.873*** |
| | | (0.072) | | (0.133) | | (0.072) | | (0.100) |
| Minimum Wage | | -0.074* | | -0.052 | | -0.069 | | 0.015 |
| | | (0.044) | | (0.085) | | (0.044) | | (0.000) |
| Constant | 14.585*** | 11.558*** | 16.530*** | 12.819*** | 14.640*** | 11.479*** | 16.215*** | 11.265*** |
| | (0.095) | (0.567) | (0.159) | (1.101) | (0.104) | (0.567) | (0.192) | (0.785) |
| Adjusted $R^2$ | 0.162 | 0.709 | 0.117 | 0.676 | 0.150 | 0.709 | 0.185 | 0.762 |
| N | 121,635 | 104,913 | 103,572 | 103,572 | 121,635 | 104,913 | 104,849 | 104,849 |

Notes: Standard errors are in parentheses. The sample consists of all treated and control establishments for the years 2000-2002 and 2004-2006. All models include year, region, and industry effects.

Table 4: Difference in Differences Results for Production Employment

| | Foreign Treatment | | | | Export Treatment | | | |
|---|---|---|---|---|---|---|---|---|
| | Plain | | Reweighted | | Plain | | Reweighted | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Post-2003 | -0.025** | -0.062*** | -0.026 | -0.084*** | -0.026** | -0.076*** | -0.014 | -0.072*** |
| | (0.012) | (0.009) | (0.028) | (0.025) | (0.012) | (0.009) | (0.023) | (0.015) |
| Treated | 1.125*** | 0.039*** | 0.646*** | -0.019 | 0.951*** | 0.268*** | 0.866*** | 0.221*** |
| | (0.019) | (0.014) | (0.027) | (0.018) | (0.013) | (0.009) | (0.017) | (0.011) |
| Post-2003*Treated | 0.144*** | 0.066*** | 0.086** | 0.067*** | 0.112*** | 0.104*** | 0.027 | 0.081*** |
| | (0.028) | (0.019) | (0.039) | (0.025) | (0.018) | (0.012) | (0.025) | (0.014) |
| Exporter | | 0.314*** | | 0.246*** | | 0.001*** | | -0.000*** |
| | | (0.007) | | (0.012) | | (0.000) | | (0.000) |
| Provincial Capital | | -0.079*** | | 0.006 | | -0.079*** | | -0.092*** |
| | | (0.006) | | (0.016) | | (0.006) | | (0.010) |
| ln(Output) | | 0.476*** | | 0.545*** | | 0.477*** | | -0.010 |
| | | (0.002) | | (0.003) | | (0.002) | | (0.044) |
| Prod Jobs Growth | | 1.737*** | | 1.629*** | | 1.736*** | | 1.853*** |
| | | (0.031) | | (0.072) | | (0.031) | | (0.042) |
| Output Growth | | -3.223*** | | -4.013*** | | -3.231*** | | -3.870*** |
| | | (0.044) | | (0.097) | | (0.044) | | (0.074) |
| Minimum Wage | | 0.050* | | 0.011 | | 0.044 | | -0.010 |
| | | (0.027) | | (0.059) | | (0.027) | | (0.044) |
| Constant | 3.610*** | -4.204*** | 4.365*** | -4.939*** | 3.628*** | -4.133*** | 4.574*** | -4.496*** |
| | (0.048) | (0.349) | (0.106) | (0.763) | (0.053) | (0.349) | (0.160) | (0.574) |
| Adjusted $R^2$ | 0.119 | 0.682 | 0.078 | 0.666 | 0.155 | 0.682 | 0.174 | 0.730 |
| N | 121,626 | 104,913 | 103,572 | 103,572 | 121,626 | 104,913 | 104,849 | 104,849 |

Notes: Standard errors are in parentheses. The sample consists of all treated and control establishments for the years 2000-2002 and 2004-2006. All models include year, region, and industry effects.

Table 5: Difference in Differences Results for Wages of Production Workers

| | Foreign Treatment | | | | Export Treatment | | | |
|---|---|---|---|---|---|---|---|---|
| | Plain | | Reweighted | | Plain | | Reweighted | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Post-2003 | 0.036*** | 0.004 | 0.095*** | 0.080*** | 0.038*** | 0.005 | 0.051*** | 0.029*** |
| | (0.006) | (0.007) | (0.009) | (0.014) | (0.007) | (0.007) | (0.008) | (0.010) |
| Treated | 0.349*** | 0.013 | 0.199*** | 0.053*** | 0.181*** | -0.012** | 0.110*** | -0.001 |
| | (0.008) | (0.008) | (0.010) | (0.009) | (0.006) | (0.005) | (0.007) | (0.006) |
| Post-2003*Treated | -0.012 | -0.013 | -0.085*** | -0.063*** | -0.009 | -0.014* | -0.023** | -0.010 |
| | (0.011) | (0.011) | (0.014) | (0.013) | (0.008) | (0.007) | (0.009) | (0.008) |
| Exporter | | -0.017*** | | -0.003 | | 0.000** | | 0.000*** |
| | | (0.004) | | (0.006) | | (0.000) | | (0.000) |
| Provincial Capital | | 0.124*** | | 0.060*** | | 0.125*** | | 0.073*** |
| | | (0.004) | | (0.008) | | (0.004) | | (0.006) |
| ln(Prod Jobs) | | -0.171*** | | -0.109*** | | -0.171*** | | -0.147*** |
| | | (0.002) | | (0.004) | | (0.002) | | (0.003) |
| ln(Output) | | 0.232*** | | 0.155*** | | 0.232*** | | -0.019 |
| | | (0.002) | | (0.003) | | (0.002) | | (0.028) |
| Prod Jobs Growth | | 0.026 | | 0.076** | | 0.026 | | 0.059*** |
| | | (0.016) | | (0.030) | | (0.016) | | (0.022) |
| Output Growth | | -0.521*** | | -0.566*** | | -0.519*** | | -0.608*** |
| | | (0.028) | | (0.051) | | (0.028) | | (0.040) |
| Minimum Wages | | 0.029 | | -0.028 | | 0.030 | | -0.019 |
| | | (0.019) | | (0.036) | | (0.019) | | (0.028) |
| Constant | 8.441*** | 5.133*** | 8.625*** | 6.804*** | 8.454*** | 5.127*** | 8.501*** | 6.032*** |
| | (0.032) | (0.243) | (0.065) | (0.470) | (0.032) | (0.243) | (0.054) | (0.370) |
| Adjusted $R^2$ | 0.167 | 0.472 | 0.119 | 0.302 | 0.157 | 0.472 | 0.163 | 0.388 |
| N | 121,635 | 104,913 | 103,572 | 103,572 | 121,635 | 104,913 | 104,849 | 104,849 |

Notes: Standard errors are in parentheses. The sample consists of all treated and control establishments for the years 2000-2002 and 2004-2006. All models include year, region, and industry effects.

Table 6: Difference in Differences Results for the Capital/Labor Ratio

| | Foreign Treatment | | | | Export Treatment | | | |
|---|---|---|---|---|---|---|---|---|
| | Plain | | Reweighted | | Plain | | Reweighted | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Post-2003 | 0.152*** | -0.097*** | 0.403*** | 0.160* | 0.162*** | -0.089*** | 0.281*** | -0.013 |
| | (0.019) | (0.034) | (0.043) | (0.094) | (0.019) | (0.034) | (0.033) | (0.096) |
| Treated | 0.485*** | 0.152*** | 0.306*** | 0.150*** | 0.054*** | -0.004 | 0.015 | 0.059** |
| | (0.033) | (0.032) | (0.047) | (0.044) | (0.018) | (0.020) | (0.025) | (0.025) |
| Post-2003*Treated | 0.289*** | 0.285*** | 0.196*** | 0.205*** | 0.050* | 0.065*** | -0.065* | -0.014 |
| | (0.047) | (0.044) | (0.065) | (0.059) | (0.027) | (0.025) | (0.035) | (0.032) |
| Exporter | | 0.022 | | 0.144*** | | 0.004*** | | 0.003*** |
| | | (0.016) | | (0.027) | | (0.000) | | (0.000) |
| Provincial Capital | | 0.006 | | -0.201*** | | 0.004 | | -0.029 |
| | | (0.016) | | (0.034) | | (0.016) | | (0.023) |
| ln(Prod Jobs) | | -0.596*** | | -0.545*** | | -0.596*** | | -0.610*** |
| | | (0.008) | | (0.015) | | (0.008) | | (0.011) |
| ln(Output) | | 0.458*** | | 0.431*** | | 0.459*** | | 0.471*** |
| | | (0.005) | | (0.011) | | (0.005) | | (0.008) |
| Prod Jobs Growth | | 0.164** | | 0.138 | | 0.156** | | 0.256** |
| | | (0.070) | | (0.149) | | (0.070) | | (0.108) |
| Output Growth | | -2.813*** | | -2.548*** | | -2.837*** | | -3.118*** |
| | | (0.107) | | (0.248) | | (0.107) | | (0.176) |
| Minimum Wage | | 0.294*** | | 0.196 | | 0.291*** | | 0.132 |
| | | (0.067) | | (0.147) | | (0.068) | | (0.109) |
| Constant | 8.892*** | 0.411 | 8.475*** | 1.297 | 8.937*** | 0.441 | 8.536*** | 1.928 |
| | (0.206) | (0.898) | (0.440) | (1.934) | (0.206) | (0.899) | (0.380) | (1.422) |
| Adjusted $R^2$ | 0.062 | 0.205 | 0.038 | 0.192 | 0.051 | 0.205 | 0.043 | 0.196 |
| N | 85,805 | 81,120 | 80,150 | 80,150 | 85,805 | 81,120 | 81,069 | 81,069 |

Notes: Standard errors are in parentheses. The sample consists of all treated and control establishments for the years 2000-2002 and 2004-2006. All models include year, region, and industry effects.

Table 7: Difference in Differences Results for Percent of Workforce in Production

| | Foreign Treatment | | | | Export Treatment | | | |
|---|---|---|---|---|---|---|---|---|
| | Plain | | Reweighted | | Plain | | Reweighted | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Post-2003 | 0.033 | 1.302*** | 0.162 | 1.863*** | -0.005 | 1.332*** | -0.779*** | 0.849* |
| | (0.146) | (0.365) | (0.321) | (0.584) | (0.151) | (0.366) | (0.238) | (0.476) |
| Treated | -1.079*** | 0.152 | 1.566*** | 1.243*** | 1.295*** | 0.040 | 1.782*** | 0.215 |
| | (0.231) | (0.228) | (0.289) | (0.274) | (0.150) | (0.162) | (0.167) | (0.173) |
| Post-2003*Treated | -0.922*** | -1.358*** | -0.695* | -1.187*** | -0.107 | -0.814*** | 0.325 | -0.315 |
| | (0.325) | (0.303) | (0.408) | (0.354) | (0.204) | (0.203) | (0.235) | (0.219) |
| Exporter | | -0.340*** | | 0.181 | | -0.004* | | 0.009*** |
| | | (0.125) | | (0.184) | | (0.002) | | (0.002) |
| Provincial Capital | | -1.234*** | | -0.692*** | | -1.220*** | | -1.195*** |
| | | (0.130) | | (0.232) | | (0.130) | | (0.173) |
| ln(Prod Jobs) | | 6.373*** | | 5.532*** | | 6.373*** | | 5.142*** |
| | | (0.073) | | (0.114) | | (0.073) | | (0.083) |
| ln(Output) | | -3.961*** | | -3.189*** | | -3.973*** | | -3.332*** |
| | | (0.045) | | (0.085) | | (0.045) | | (0.060) |
| Prod Jobs Growth | | 6.331*** | | 6.436*** | | 6.353*** | | 6.794*** |
| | | (0.613) | | (0.891) | | (0.613) | | (0.757) |
| Output Growth | | 13.781*** | | 11.960*** | | 13.894*** | | 12.733*** |
| | | (0.807) | | (1.473) | | (0.808) | | (1.116) |
| Minimum Wage | | -1.570*** | | -0.675 | | -1.525*** | | -0.667 |
| | | (0.513) | | (0.984) | | (0.513) | | (0.674) |
| Constant | 81.194*** | 134.224*** | 79.803*** | 115.396*** | 80.980*** | 133.764*** | 81.550*** | 118.399*** |
| | (1.012) | (6.618) | (1.853) | (12.696) | (1.012) | (6.620) | (1.756) | (8.718) |
| Adjusted $R^2$ | 0.014 | 0.198 | 0.012 | 0.211 | 0.014 | 0.198 | 0.021 | 0.177 |
| N | 112,862 | 96,141 | 94,918 | 94,918 | 112,862 | 96,141 | 96,078 | 96,078 |

Notes: Standard errors are in parentheses. The sample consists of all treated and control establishments for the years 2000-2002 and 2004-2006. All models include year, region, and industry effects.

Table 8: Summary of Difference in Differences Results for Robustness Checks

| | Output (1) | Production Jobs (2) | Production Wages (3) | Capital/Labor Ratio (4) | Percent Production (5) |
|---|---|---|---|---|---|
| **Main Results** | | | | | |
| Foreign | -0.070*** | 0.066*** | -0.013 | 0.285*** | -1.358*** |
| | (0.027) | (0.019) | (0.011) | (0.044) | (0.303) |
| Foreign - Reweighted | -0.078** | 0.067*** | -0.063*** | 0.205*** | -1.187*** |
| | (0.032) | (0.025) | (0.013) | (0.059) | (0.354) |
| Export | -0.157*** | 0.104*** | -0.014* | 0.065*** | -0.814*** |
| | (0.017) | (0.012) | (0.007) | (0.025) | (0.203) |
| Export - Reweighted | -0.119*** | 0.081*** | -0.010 | -0.014 | -0.315 |
| | (0.019) | (0.014) | (0.008) | (0.032) | (0.219) |
| **1994 Treatment** | | | | | |
| Foreign | 0.006 | 0.020 | 0.001 | -0.032 | 1.932*** |
| | (0.038) | (0.027) | (0.016) | (0.053) | (0.456) |
| Foreign - Reweighted | 0.047 | 0.026 | -0.035* | -0.071 | 1.535*** |
| | (0.041) | (0.032) | (0.020) | (0.062) | (0.450) |
| Export | -0.023 | 0.006 | -0.009 | -0.029 | 0.841*** |
| | (0.019) | (0.014) | (0.008) | (0.027) | (0.228) |
| Export - Reweighted | 0.009 | 0.007 | -0.011 | -0.084*** | 0.420* |
| | (0.022) | (0.016) | (0.010) | (0.032) | (0.244) |
| **Random Assignment** | | | | | |
| Foreign - Reweighted | -0.003 | 0.003 | -0.005 | 0.003 | -0.111 |
| | (0.023) | (0.014) | (0.010) | (0.032) | (0.293) |
| Export - Reweighted | -0.014 | 0.006 | -0.008 | 0.019 | -0.061 |
| | (0.013) | (0.009) | (0.006) | (0.020) | (0.166) |
| **Foreign Ownership $\geq$ 20%** | | | | | |
| Base | -0.082*** | 0.065*** | -0.013 | 0.293*** | -1.295*** |
| | (0.027) | (0.020) | (0.011) | (0.046) | (0.312) |
| Reweighted | -0.082** | 0.058** | -0.062*** | 0.205*** | -1.082*** |
| | (0.033) | (0.026) | (0.014) | (0.062) | (0.369) |
| **Exporting $\geq$ 10%** | | | | | |
| Base | -0.143*** | 0.092*** | -0.017** | 0.049** | -0.969*** |
| | (0.016) | (0.011) | (0.007) | (0.024) | (0.196) |
| Reweighted | -0.109*** | 0.076*** | -0.015* | -0.032 | -0.529** |
| | (0.018) | (0.014) | (0.008) | (0.031) | (0.213) |
| **Raw Data** | | | | | |
| Foreign | -0.027 | 0.091*** | -0.041*** | 0.056 | -0.820*** |
| | (0.024) | (0.016) | (0.013) | (0.045) | (0.271) |
| Foreign - Reweighted | -0.045 | 0.087*** | -0.086*** | 0.090 | -0.896*** |
| | (0.028) | (0.021) | (0.016) | (0.057) | (0.316) |
| Export | -0.148*** | 0.144*** | -0.024** | 0.024 | -1.027*** |
| | (0.018) | (0.012) | (0.010) | (0.030) | (0.212) |
| Export - Reweighted | -0.110*** | 0.119*** | -0.020* | 0.040 | -0.444** |
| | (0.020) | (0.015) | (0.012) | (0.037) | (0.226) |

Notes: Standard errors are in parentheses. Only the coefficient on the treatment effect is reported for models which include all controls.