Poverty and Monopsony: Evidence from the Indonesian Labor Market

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May 13, 2013

Abstract Industrialization is often seen as an engine of growth that will help lift people out of poverty. This process is occurring in Indonesia, as its GDP per capita has increased five-fold in the last 40 years, and its poverty rate has declined by over 40 percentage points in the last 25 years. However, how many more people could have earned their way out of poverty if firms did not behave monopsonistically in the labor market? Monopsonistic firms pay lower wages and hire fewer workers than do firms operating competitively. This paper attempts to quantify how many more people could have been lifted out of poverty in Indonesia if the labor markets were perfectly competitive. I find that wages would increase by 72% and employment would increase by 38% in the manufacturing sector. These changes would have lowered the poverty rate by 8.5% in 2007. There are two channels by which changing to a competitive labor market could influence poverty, by increasing wages of existing workers, and by increasing the level of employment. I find that the relative impact of these two channels on poverty is about the same.

Keywords: Poverty; Monopsony; Deadweight Loss; Indonesia.
JEL Classifications: I30, J42, O12.

*Address: 261 Alston Hall, University of Alabama, Tuscaloosa, AL 35487, USA, e-mail: *peter.brummund@ua.edu*. The author is grateful to Garrick Blalock for generously providing the data used in this analysis. I would also like to thank John Abowd, Chris Barrett, Francine Blau, Brian Dillon, Ravi Kanbur, Carlos Rodriguez-Castelan, and the participants of the Economics of Global Poverty workshop for helpful comments. All errors are my own.

1 Introduction

Industrialization is often seen as an engine of growth that will help lift people out of poverty. The jobs that people are able to get in formal labor markets tend to have both higher and more stable wages than what they could earn in agriculture or the informal sector. As the industrial sector grows in an economy, people leave the agricultural sector to find jobs in manufacturing plants. Along with the new job, comes better pay which allows the worker to increase the standard of living for their household. This process has occurred in many settings and is happening in Indonesia.

Indonesia's GDP per capita has increased five-fold in the last 40 years, and its poverty rate has declined by over 40 percentage points in the last 25 years [1]. Some of this decline in poverty in Indonesia can be attributed to the growth of its manufacturing sector. In the last 25 years, the manufacturing sector has created over 14 million new jobs. The average yearly wage of a manufacturing worker in Indonesia is US$ 1,819, which alone is enough to support a family of three above the poverty line. With over 14 million new jobs, this roughly suggests that 43% of the poverty reduction in Indonesia over the last 25 years has been due to people getting jobs in the manufacturing sector. These numbers reflect amazing progress for Indonesia, however, could they have been even better?

That is, could Indonesia's process of industrialization have lifted even more people out of poverty? Industrialization might have had a bigger impact on poverty if the jobs paid higher wages or if the jobs were more geographically dispersed. This paper investigates the impact of another factor, the competitiveness of the labor market. Recent work has shown that 60% of the manufacturing firms in Indonesia are sourcing labor monopsonistically (Brummund 2012). Firms sourcing labor monopsonistically pay lower wages and hire fewer workers than do firms operating competitively, implying that monopsonistic behavior is a drag on poverty reduction. This paper will quantify how many more people could have been lifted out of

[1] All figures referenced in this section are based on the author's calculations using data from the World Bank's World Development Indicators and from Indonesia's manufacturing census (SI). The poverty line used is US$1.25 converted at purchasing power parity rates.

poverty in Indonesia if the labor markets were perfectly competitive.

Using firm-year level estimates for each firm's market power, this paper will calculate the implied deadweight loss for each firm. I will then estimate what the wage and employment levels would have been for each firm if they hired labor competitively. These estimates are then taken to household data where I calculate how many more people would have been able to work their way out of poverty through industrialization if the labor markets were not monopsonistic. This exercise has not been possible previously as the evidence for the monopsonistic behavior of firms was not granular enough to facilitate the link to household consumption.

The next section provides a brief literature review. Section three explains the empirical methods used for the analysis. Section four describes the data, and section five presents the results in three sub-sections, market power, deadweight loss, and poverty. Section six concludes and provides a brief policy discussion.

2 Literature

This research is connected to two main sets of literature. First, this paper examines a common theme in the development literature on the importance of industrialization in the development of an economy, and the associated reduction in poverty. The second literature discusses the link between competition policy and poverty.

There have been many papers discussing both the theoretical foundations for the role of industrialization in economic development, and also empirical evidence for the phenomenon. Rosenstein-Rodan (1943) discusses the role of industrialization in the context of a "big-push", where the development of the industrial sector creates its own demand for goods produced by the industrial sector as the newly employed workers have higher incomes with which they demand additional goods. Murphy, Shleifer and Vishny (1989) extend this idea by showing that multiple equilibria are possible, both a non-industrial economy and an industrialized economy, depending the parameter values.

Rostow (1960) more directly discusses the role of industrialization in the development of an economy, with each of his five stages being described in relationship to the nature of industrialization in the economy. The stages go from no industrialization, to advancement of a few industries, and then diversification and wide-spread growth. Its not too difficult to see examples of this pattern throughout history, starting with the Industrial Revolution in England, and more recently with Korea and China.

There have also been more formal analyses of the impact of industrialization on poverty. The 1990 World Development Report (WDR) focused on poverty and the progress that had occurred up till then at reducing poverty. The report describes how poverty alleviation has been achieved through two primary means, harnessing the most valuable asset of the poor, their labor, and also through the increased provision of basic social services to the poor. One of the background papers for the 1990 WDR examined more specifically how the wages for unskilled workers changed throughout industrialization (Polak and Williamson 1991). They find that real wages for unskilled workers grow more slowly initially, but then grow proportionately with the rest of the economy as industrialization progresses.

A recent study has found evidence for the “big push” proposed by Rosenstein-Rodan. Magruder (2011) examines changes in the minimum wage in Indonesia over the 1990’s. He finds that formal employment increases in response to higher minimum wages, along with demand for locally produced products, which supports the idea of a coordinated move from a non-industrialized equilibrium to an industrialized one.

The second literature that I build on is work dealing more directly with the link between competition and poverty. Rodriguez-Castelan (2011) examines the theoretical link between product market concentration and poverty. He finds conditions for which higher market concentration could both lower or raise the poverty index, though the conditions for higher market concentration leading to higher levels of poverty are more realistic.

Goto (2011) studies the optimal minimum wage for poverty reduction, and finds that the optimal minimum wage is only equal to the competitive wage in certain special cases. Typically, the optimal minimum wage is higher than the competitive wage. Two other papers have also studied the relationship between minimum wage and poverty, finding that the impacts of a minimum wage policy depends on the employment composition of the household (Fields and Kanbur 2007; Fields, Han and Kanbur 2007).

This paper builds on these literatures by providing, to my knowledge, the first empirical evidence for the relationship between competition policy and poverty. This paper also shows how industrialization could have had even larger impacts on poverty if the labor market was more competitive.

3 Empirical Approach

3.1 Market Power

Joan Robinson is credited with first discussing the idea of imperfect competition in labor markets (1933). This analysis has been incorporated into many introductory economics textbooks and is the complement of the standard monopoly treatment. This static treatment of monopsony says that firms will set wages where $R'(L) = W(L)+W'(L)L$, with $R'(L)$ being the marginal revenue product of labor, and the right hand side is the marginal cost of labor with $W(L)$ being the inverse labor supply curve. The difference between this condition and the classic competitive treatment is that the wage is a function of labor, L, and not constant. From here, Pigou's measure of monopsonistic behavior[2] is given as:

$$E = \frac{R'(L) - W(L)}{W(L)}. \tag{1}$$

[2]This measure is analogous to the Lerner Index used to measure product market power.

It is easy to show that $E = \epsilon^{-1}$, where ϵ is the elasticity of the labor supply curve[3]. In the competitive framework, firms hire up to the point where $R'(L) = W$, which implies that Pigou's measure would be equal to zero, and the elasticity would be infinity. If firms are behaving monopsonistically, $W'(L)L > 0$ and then Pigou's measure is strictly positive.

Since it is common for establishment data to have information on wages paid to workers, the key step in generating this measure of market power is to develop a credible estimate for the marginal revenue product of labor (MRPL) for firms. This paper follows the work of Brummund (2012), where a technique for estimating MRPL was developed and tested. The general idea of the approach is to estimate a firm's production function and then evaluate the derivative of the production function at each firms' current levels of revenue and employment to get a firm-year specific measure of MRPL. To estimate the production function, I use methods based on Blundell and Bond's System GMM estimator for dynamic panel data models (1998, 2000). I will briefly explain the standard approach for estimating production functions, and then explain why its necessary to use the dynamic panel data method for this analysis.

The literature often represents the production function of a firm with a Cobb-Douglas specification or a transcendental-logarithmic (trans-log) form. Brummund (2012) has shown that the trans-log form does not fit the Indonesian data well, so I focus on the Cobb-Douglas specification here. The Cobb-Douglas takes the form, $Y_{it} = AL_{it}^{\beta_L} K_{it}^{\beta_K}$, where Y_{it} is the output of firm i at time t, L_{it} is the amount of labor used in production, K_{it} is capital, and A is total factor productivity[4]. β_j is the factor share of factor $j \in \{L, K\}$. The most direct way to estimate this is to convert it to logs and estimate the equation:

$$y_{it} = \beta_L l_{it} + \beta_K k_{it} + \epsilon_{it}, \tag{2}$$

[3]Let $\epsilon = \frac{WL'(W)}{L(W)}$. Substitute the first order condition for wages into the equation for E to get $E = \frac{W'(L)L}{W(L)} = \epsilon^{-1}$

[4]The empirical work considers two types of labor, intermediate inputs, and capital as inputs into the production function, but I focus on just two inputs here for clarity.

where the lowercase letters represent the log version of the variable and the constant term is subsumed into the error term. An OLS estimate of this equation will lead to biased results as there are factors unobserved to the econometrician that affect both the firm's choice of inputs and the firm's output. These factors are most often described as firm specific productivity and incorporated into the model as:

$$y_{it} = \beta_L l_{it} + \beta_K k_{it} + \omega_{it} + \nu_{it}, \tag{3}$$

with ω_{it} representing firm-specific productivity and ν_{it} capturing any measurement error or optimization errors on the part of the firm. A standard way to estimate this equation was developed by Olley and Pakes (1996), who made assumptions about the timing of the evolution of productivity, capital and labor. The authors used the investment of the firm to break the endogeneity between capital and productivity, arguing that the investment decisions were made prior to the realization of the current productivity shock. Various authors (Levinsohn and Petrin 2003; Ackerberg, Caves, and Frazer 2006) have improved upon this method, though this strand of approaches does not allow for firms to hire labor monopsonistically, which makes the choice of labor endogenous with the error term.

The most direct way to deal with this new form of endogeneity in the production function is to instrument for the choice of labor. This naturally leads to another main approach for estimating production functions, that of Blundell and Bond, which generates instruments from within the data itself. Their technique is based on the work of Anderson and Hsiao (1982) and Arellano and Bond (1991), who used lagged variables as instruments for first differences within panel data. Blundell and Bond (1998, 2000) build on this by adding instruments for current levels with lagged differences, and combining both sets of instruments into a system, hence the name System GMM.

I use the Blundell-Bond estimator for three reasons. First, the data set lacks a reliable instrument for employment, which is necessary in order to implement the Olley-Pakes based approaches in the presence of monopsony. The Blundell-Bond approach provides the necessary instrumental variables. Second, because Indonesia is an emerging economy, there are likely large fixed differences in the unobserved qualities of firms, which suggests that firm fixed effects are important, and the Blundell-Bond method allows the inclusion of firm fixed effects whereas the Olley-Pakes approaches do not. Third, the Blundell-Bond estimator is considered to be more robust to measurement error (Van Biesebrock 2007), which is always a concern with large firm-level data sets from developing countries.

This process generates estimates for the parameters of the production function. The above process assumes that all firms in the estimation sample share the same technology, in that I only estimate one β_L. To weaken the impact of this assumption, I estimate the production function separately by four-digit industries. With these industry specific estimates for the parameters of the Cobb-Douglas production function, I then generate firm-year specific measures for the marginal revenue product of each firm as

$$MRPL_{it} = \frac{\partial Y_{it}}{\partial L_{it}} = \frac{\hat{\beta}_{L_j} Y_{it}}{L_{it}}, \tag{4}$$

for firm i, year t, and industry j. It is then straightforward to calculate the firm-year specific measure of market power from equation (1).

3.2 Deadweight Loss

If firms are behaving monopsonistically, then there is a deadweight loss as a result of their production decisions. Firms are choosing levels of employment and wages and that are less than efficient to the economy as a whole. The size of this deadweight loss can be calculated using the measure of market power estimated in the previous section, and the observed production choices for each firm. The key step is to find what the efficient combination of employment and wages are for each firm (L^* and W^* respectively), and then compare those with the observed monopsonistic choices.

The firm's optimal combination of employment and wages is found at the intersection of the marginal revenue curve and the marginal cost curve. In the labor market, the marginal revenue curve is labor demand curve, and if the labor market is competitive, the marginal cost curve is the labor supply curve to the firm. If the labor market is not competitive, then the labor supply curve is not equal to the marginal cost curve, which leads the firm to choose a different optimal bundle (Point A on Figure 1). However, even if the labor supply curve to the firm is not competitive (i.e. not flat), it is still efficiency increasing for the firm to choose the point where the labor demand curve intersects the labor supply curve (Point B), instead of the marginal cost curve (Point A), as the firm can sell the output generated by the extra worker for more than what the firm would have to pay in wages. But it is not optimal from the firm's perspective to hire more than L workers if it is facing an upward sloping labor supply curve, because it would have to raise the wages of all the existing workers, and the total additional costs are greater than the additional revenue the firm can generate. Thus the deadweight loss is equal to the triangle ABC in the Figure 1.

To find the efficient combination of employment and wages (L^* and W^*), I first need to estimate the parameters of the labor supply and labor demand curves. The labor demand curve shows the marginal revenue product of labor for each level of employment at a particular firm. This curve is estimated by separately regressing the marginal revenue product of labor on employment for each firm. There is an observation for each year that a firm is in the data set, providing the sample for each regression. This approach yields one labor demand curve for each firm, which implies that a firm's technology does not change over time. While this is a restrictive assumption, the alternative is to assume that all of the firms in a particular industry share the same technology, which could vary over time. I think the differences in productivity across firms are greater than the differences in productivity within a firm over time, implying that the assumption of a firms technology not changing over time is more accurate.

The measure of market power, E, is used to determine the labor supply curve for each firm. And since the measure of market power is captured for each firm in each year, there is a distinct labor supply curve for each firm in each year. This implies that a firm's efficient choice of employment and wage changes from year to year based on changes in the local labor market, not due to changes in the firm's productivity.

The firm specific measure of market power can be expressed as an elasticity, and using the observed levels of employment and wages, the slope of the labor supply curve, β_1, can be determined as follows:

$$\begin{aligned} E &= \frac{\partial W}{\partial L}\frac{L}{W} \\ \frac{MRPL - W}{W} &= \frac{\partial W}{\partial L}\frac{L}{W} \\ \frac{MRPL - W}{L} &= \frac{\partial W}{\partial L} = \beta_1 \\ \beta_1 &= \frac{MRPL - W}{L}. \end{aligned} \tag{5}$$

The y-intercept of the labor supply curve, β_0, can then be determined:

$$\begin{aligned} \beta_0 &= W - \beta_1 L \\ \beta_0 &= W - \frac{MRPL - W}{L} * L \\ \beta_0 &= 2W - MRPL. \end{aligned} \tag{6}$$

Letting the labor demand curve be represented as, $W(L) = \alpha_0 + \alpha_1 L$, the intersection of the two curves yields the efficient choices of employment and wages can be found according to:

$$W^* = \frac{\beta_1 * \alpha_0 - \alpha_1 * \beta_0}{\beta_1 - \alpha_1} \tag{7}$$

$$L^* = \frac{W^* - \beta_0}{\beta_1}. \tag{8}$$

The deadweight loss is then calculated for each firm with market power as $DWL = (1/2)(MRPL-$

$W)(L^* - L)$, where $MRPL$ is the value of the labor demand curve at the actual employment level L.

3.3 Poverty

If firms are behaving monopsonistically in the labor market, then both L^* and W^* would be greater than the observed levels of employment and wages. This implies that if labor markets operated competitively, more workers would be employed in the manufacturing sector in Indonesia, and all workers for monopsonistic firms would have higher wages. These changes imply that more people would be above the poverty line, and this section describes how to quantify exactly how many.

Market power is measured at the firm level, but poverty is determined at the individual level. Without knowing exactly who works for what firm, I pass the changes in wages and employment to the individual worker through their local labor market. This assumption states that if a labor market operated competitively, the workers in that labor market would be the most impacted. Since market power is determined by both market and firm specific factors (Manning 2003, Brummund 2012), it would be preferable to connect workers to specific firms, but that is not possible with the data used in this analysis. I define the local labor market as the local geographic district (kabupaten), which is similar to a county in the United States. This implies that a manufacturing worker in a district could work for any other manufacturing firm in the same district, but would not be able to move to a different district.

To carry over the implied changes in wages and employment to individuals, I calculate the median change for each district in each year in the firm data. For wages, I apply the median change in wages to each manufacturing worker and their household in that district in that year. However, poverty is commonly measured in developing countries based on each person's level of consumption, as there is often a lot of non-market production that contributes to the household standard of living which is not captured in their measured income. To carry over the increase in wages, I assume that if wages increased by 25%, than consumption also increased by 25%. For example, if the median firm with market power in district X in year Y would have paid 25% higher wages if it hired labor competitively that year, I increased the per capita consumption every manufacturing workers' household in district X in year Y by 25%.

It is a little more complicated to carry over the implied changes in employment, as I need to determine who gets hired. I pick people not currently employed in manufacturing, but who look most like those employed in manufacturing. I use standard propensity score methods to determine who has the highest probability to be employed in manufacturing. I run a probit over the whole sample with an indicator for whether the person is employed in the manufacturing sector as the dependent variable. As independent variables, I use information about the person themselves, their spouse, their household, as well as province dummies. For the person, I use their age, sex, education, an indicator for whether their spouse is present, an indicator for whether they are employed, and an indicator for self-employment. I use their spouse's level of education, an indicator for whether the spouse is employed, and an indicator if the spouse is employed in manufacturing. For individuals that do not have a spouse, these spouse variables are set to 0. The spouse variables are then interactions with the spouse-present variable. This formulation allows all of the observations to be included, yet still conditioning on information about the spouses. I also use information about the other members of the household. I use an indicator if other members (besides themselves and their spouse) are present, controls for the average years of education for the other members, the total number of people employed, and the total number of people employed in manufacturing. Each of these values excludes the respondent and the spouse (if present) in their construction. The household variables are also set to 0 if no other members of the household are present. After estimating, I predict each person's probability of being employed in the manufacturing sector. I then select the people with the highest propensity scores, who are not currently employed in manufacturing, and who consume less than the average manufacturing worker in their district, to be added to the manufacturing sector. This selection is done separately by district.

For example, if there were 100 people employed in district X in year Y, and employment would have increased by 30% if that labor market operated competitively, I pull the 30 people with the highest propensity scores into the manufacturing sector in that district. Since being employed in the manufacturing sector is usually the household's primary income source, I first give each household member the average current consumption of all manufacturing workers in their district, and then the average competitive consumption. I apply these changes in steps in order to separate out the wage and employment impacts of making the labor markets competitive.

I calculate poverty at the individual level, based on household consumption. I then compare the per capita consumption to the US $1.25 per day poverty line using Purchasing Power Parity exchange rates. I calculate both the poverty headcount ratio and the poverty gap indices. Both measures can be represented using the Foster, Greer, and Thorbecke (1984) class of poverty measures, P_α, defined as:

$$P_\alpha = \frac{1}{N} \sum_{i=1}^{H} \left(\frac{z - y_i}{z} \right)^\alpha, \tag{9}$$

where N is the number of observations, H is the number of poor people, z is the poverty line, y_i is person i's income, and α is the sensitivity parameter. The headcount ratio is P_0 and the poverty gap is P_1, which takes into account how far people are below the poverty line.

I then calculate each poverty measure four times. The first is the actual poverty measure. The second is the poverty measure after the wages of existing manufacturing workers have been increased. Third, the poverty measure is calculated after some people have been pulled into manufacturing employment from unemployment, but no wages have been increased. Finally, the poverty measure is calculated after both wages and employment increased. These measures are calculated separately to identify how much of the overall change in poverty is due to the increase in wages, or due to the increase in the number of people employed in the manufacturing sector.

I also use four different poverty lines. The lowest poverty line is the national poverty line. The next is the more internationally comparable line of $1.25/day, which I convert to Rupiah using Purchasing Power Parity (PPP) exchange rates. The third poverty line I use is the $2.00/day, also converted via PPP. The last, and highest, poverty line is the $1.25/day poverty line, but converted to Rupiah using the real exchange rate. Each of the poverty lines provides information about a slightly different part of the income distribution.

4 Data

The data used to calculate market power come from 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. Firms are required to fill out the survey each year, and the dataset covers years 1988-2006. Among the substantial number of variables in the dataset are the following which I use in this study: output (revenue), intermediate inputs, investment, capital, wages, non-wage compensation, number of employees, ownership, location, industry, etc.

To calculate the impact of market power on poverty, I make use of data from Indonesia's Family Life Survey (IFLS). The IFLS data is a privately collected longitudinal survey in Indonesia, containing detailed information on individuals, households, and communities. The sample is representative of about 83% of the Indonesian population in 1993 and contains over 30,000 individuals living in 13 of the 27 provinces in the country. I use data from year 2007, the most recent wave of the IFLS survey.

Using the SI data, I construct an average wage measure for each firm by adding total wages to total benefits, and then dividing by the number of employees in each firm. I repeat this step for production and non-production workers, to get the average wage for each type of worker. Since prices are different for consumers than they are for industries, I deflate wages using Indonesia's consumer price index to constant 2000 Rupiah and I deflate all other monetary values using industry specific wholesale price indices to constant 2000 Rupiah. The exchange rate in the year 2000 was about 8,400 Rupiah to 1 US Dollar. The question in the survey on establishment ownership asks how much of the firm's capital is owned by the local government, central government, foreign interests, or private interests.

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. See Hallward-Driemeier and Rijkers (2010) for details.

Summary statistics for the SI data can be found in Table 1. Each observation is a firm-year. Firms are on average 14.5 years old, which is different from the average number of years of data I have for each firm, 12.4. Firms have on average 192 employees, with about 84% of them working as production workers (as opposed to non-production, or white-collar workers). Production workers make on average 4,261,000 rupiah/year, which is about US$506 (in year 2000 dollars). The non-production workers earn over twice as much.

Summary statistics for the IFLS data can be found in Table 2. In 2007, there were 6.3 people in each household. The average wage was 31 years, and 50% of the people in the sample are female. The average monthly per capita consumption is just over 500,000 Rupiah, which is about US$55. About 39% of the workforce is self-employed. The sector with the largest share of workers is agriculture, followed by wholesale and retail sales, the public sector, and then manufacturing. The other sectors that are not displayed are mining, electricity, construction, transportation, finance, and other.

5 Results

5.1 Market Power

The first set of results summarize the monopsonistic behavior of manufacturing firms in the labor market[5]. Table 3 shows Pigou's E for both production and non-production workers. The median value of market power for production workers is 1.93, which suggests that the median firm has significant amounts of market power over production workers. If the firm operated competitively, Pigou's E would be equal to zero, as the marginal revenue product of labor would equal the wage paid. The last three columns of Table 3 categorize the distribution of market power by displaying the percentage of observations that lie in three ranges of market power. Column (4) shows the percentage of firms with values of Pigou's E below 0.33, which implies that firms have little to no market power. Column (5) has firms with measures of Pigou's E between 0.33 and 2, which suggests that they have some market power. The value of 2 for Pigou's E indicates that workers' MRPL is three times higher than their wage. The last column is for firms with a lot of market power, having measures greater than 2. The categories show that 40% of firms have little to no market power, whereas 28% have some market power, and about 31% have a lot of market power

While the bottom half of the table shows results for non-production workers, these results are suspect, because this approach for measuring market power assumes that all of the workers within each category have the same level of productivity. This is a restrictive assumption, but may be appropriate for low-skilled manufacturing workers of the type considered in this data. However, this assumption definitely does not hold for non-production workers, whose category includes both management and administrative staff. For this reason, and because the production workers comprise the vast majority of the workforce, I will focus the rest of the analysis on the production workers.

[5]These results match those found in Brummund (2012), and more details about the estimation and tests of the results can be found in that paper.

5.2 Deadweight Loss

Using these measures of market power for each firm and year, the next step in the analysis is to determine the size of the deadweight loss implied by their monopsonistic behavior. While this value is informative, the more practical values are the predicted changes in employment and wages, ΔL and ΔW. In order to find those values, the parameters of the labor demand and labor supply curves must be estimated.

The labor demand curve is estimated by separately regressing the marginal product of labor on the level of employment for each firm. This regression was run 33,290 times, once for each firm in the data. The summary of the results of these regressions are shown in the top half of Table 4. The average curve is downward sloping, as theory would predict, though there is considerable variation. The median curve is also downward sloping. 86.4% of the slope coefficients are statistically significant. The bottom half of Table 4 summarizes each firm's labor supply curve. These parameters are calculated from each firm's market power measurement, and their observed levels of wages and employment. Both the mean and median curves are upward sloping, which is consistent with basic economic theory.

Using these parameters for the labor supply and labor demand curves, the levels of employment and wages that would prevail if the firms operated competitively in the labor market can be calculated. These competitive outcomes, as well as the associated changes in each value are displayed in Table 5. I drop any observations that did not have statistically significant estimates for the labor demand curve, and recode any values for the change in wages and change in labor that predicted a decrease in wages or employment to be zero. The top half of the table displays summary statistics for the current wage, the estimated competitive wage, and the associated percentage change in wages. The median percentage change in wages is 72%, which says that the median worker's wages would increase by 72% if the manufacturing firms behaved competitively in the labor market. The bottom half of the table presents results for employment. The median worker works for a firm that would would hire 38% more workers if the firm operated competitively. The percentage change for both wages and employment are high, and suggest that manufacturing firms in Indonesia are hiring too little cheap labor.

Table 6 presents the percentage change in wages and employment separately for each major industry in the SI data. Looking at the median values for the change in wages, the industries with the largest changes are Communication, Publishing, Tobacco, Chemicals, and Apparel. The industries with the smallest changes in wages are Minerals, Transportation, Leather, and Furniture. Looking at the median values for the change in employment, the values are much more closely bunched. The industries with the highest values are Publishing, Apparel, Communication, and Chemicals, which matches the industries with the largest changes in wages. For the most part, the industries with the smallest changes in wages also had small changes in employment, Minerals, Machinery, Transportation, Leather, and Tobacco.

The last step in this section is to carry over these predicted changes in wages and employment to the individual level data, IFLS. I do that by aggregating up the percentage changes in wages and employment to the district (kabupaten) for each year. I take the median value weighted by the number of production workers after restricting the sample a few ways. I ensure that all of observations come from industries that produced valid estimates of the productions function.

5.3 Poverty

The previous section showed that if the firms in the manufacturing sector operated competitively, there would be significant increases in both wages and employment. This section examines how those predicted changes impact the poverty rate in Indonesia. However, the manufacturing sector only comprised 15% in 2007 of total employment, so we may not expect a very large change in the overall poverty rate. As mentioned above, I calculate both the poverty headcount ratio (P_0) and the poverty gap (P_1) using four different poverty lines.

The IFLS has broad coverage, but is not nationally representative. Therefore, I first compare the poverty headcount ratios I calculated in the IFLS to national poverty rates. These results are presented in Table 7. The first column shows results using the World Bank's World Development Indicators, and the second column shows the results using the IFLS data. Overall, the IFLS finds lower levels of poverty than the World Bank data. This could be due to the relatively small sample size, or because the regions the IFLS chose to sample from have lower levels of poverty than do the other regions.

Table 8 then displays the actual poverty headcount ratio, and three alternative poverty rates in 2007. The first alternative is shown in column (2), and shows what the poverty rate would be if the existing manufacturing workers were paid a competitive wage. Column (3) displays what the poverty rate would be if there was a competitive level of employment, all who were paid at the existing rate. The last column combines both the competitive wage and the competitive level of employment. The top panel shows the poverty headcount ratio using four different poverty lines, and the bottom panel shows the poverty gap.

While all of the poverty lines are informative, I will focus the discussion on the $1.25/day (PPP) poverty line, as that is the most internationally comparable figure. In 2007, the poverty rate was 16.4%. If manufacturing workers were paid competitively, the poverty rate would have been 15.7%, a 0.7 percentage point reduction. If manufacturing firms hired up to the competitive level of employment, but paid them the current wage, the poverty rate would have been 15.5%. If both changes are applied, the competitive wage and level of employment, the poverty would have been 15.1% in 2007, a 1.3 percentage point reduction. This is a significant effect considering the manufacturing sector is a small portion of the overall workforce.

The bottom half of Table 8 shows the results for the poverty gap measure in 2007. The actual measure is 0.083, and would decrease to 0.081 if the labor market was competitive. Changing to the competitive level of employment has a similar impact on the poverty gap as does the change to the competitive wage. The relative size of the two channels is about the same for both the headcount ratio measure of poverty and for the poverty gap.

The results in this section show that monopsonistic behavior by manufacturing firms in the labor market is a drag on the poverty reduction progress of Indonesia in 2007. If the manufacturing firms operated competitively in the labor market, the overall poverty rate would have been 1.3 percentage points lower in 2007, about an 8% reduction. The two different facets of the change, competitive wages and competitive levels of employment, had similarly sized impacts on poverty reduction.

6 Conclusion

This paper has investigated the impact of the monopsonistic behavior of manufacturing firms in Indonesia on poverty. It first identified the amount of market power each firm had by estimating each firm's marginal revenue product of labor and comparing it to the wages each firm paid. The median value of market power was 1.93, with about 60% of the firms having significant amounts of market power. I then calculated labor supply and labor demand curves for each firm enabling the calculation of the optimal level of employment and wages. If manufacturing firms hired labor competitively, the wages of their workers would have increased by 72% and they would have hired 38% more workers.

The next step was to take these relative changes in wages and labor to the IFLS dataset to enable the poverty analysis. Using the US $1.25/day poverty line and Purchasing Power Parity exchange rates, the actual poverty rate in Indonesia was 16.4% in 2007. However, if the manufacturing firms behaved competitively, the poverty rate would have been 15.1%. These results show that the monopsonistic behavior of firms was a drag on poverty reduction progress in Indonesia.

Changing to competitive labor markets could influence poverty through two channels, by increasing wages or by increasing the level of employment. The results show that each channel had a significant impact on poverty reduction, and had similar magnitudes.

This research has several policy implications. The primary implication is about the importance of competitive labor markets in helping reduce poverty within a country. A labor market could be made more competitive in many ways. One way would be to reduce the moving costs associated with workers finding new jobs. This could be a reduction in the real physical moving costs, or an increase in the information about other jobs, making it easier for workers to learn about other opportunities. An increase in the number of employers would also make the labor market more competitive, as the firms have to compete for workers. The labor market could also become more competitive if the working conditions at each firm were made more similar. This would reduce the difference in preferences workers have for firms, and flatten the labor supply curve to each firm.

Another main implication of this research is about the relevance of a minimum wage in Indonesia. A minimum wage policy can increase efficiency in a monopsonistic labor market, however each firm in this analysis has a different optimal wage level, so a minimum wage policy might be too blunt of a policy tool. Another policy implication is about the types of labor market policies that have the greatest impact on poverty. While this paper considered changes in wages and employment as a result of the elimination of monopsonistic behavior, there could be a multitude of other mechanisms to generate similar changes. This paper has shown that both channels have a similar sized impact on poverty reduction, though attention should be given as to where the targets of the policy currently are in the income distribution as compared to the poverty line. The relative impacts of the two channels would differ if the average manufacturing wage is not enough to support a household above the poverty line or if the average new manufacturing worker had a much lower previous level of income.

There are also related topics that would be interesting to pursue further. While this paper focused on poverty, market power might also influence inequality. Inequality would capture changes to the whole distribution of incomes, and not just those around the poverty line as done in this paper. It would also be interesting to compare the the size of the deadweight loss found in Indonesia to that of a different country.

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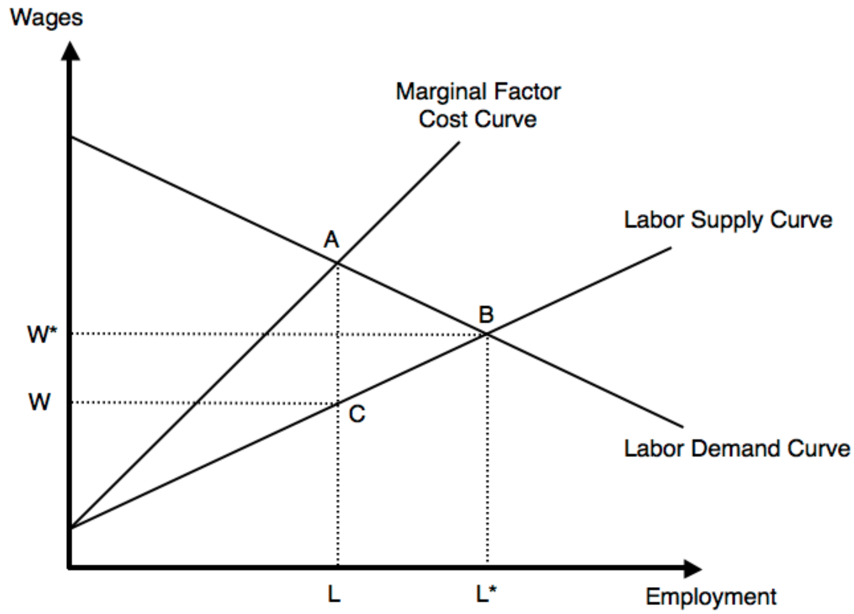

Figure 1: Labor Market Diagram with an Increasing Labor Supply Curve

Table 1: Summary Statistics of All Indonesian Manufacturing Establishments Using the SI Data

	Mean (1)	SD (2)	Min (3)	Max (4)
% Foreign Ownership	4.32	(18.20)	0.00	100.00
Output (bn-Rph)	19.58	(160.07)	0.00	17,769
Raw Materials (bn-Rph)	12.65	(90.36)	0.00	17,693
Investment (bn-Rph)	1.72	(92.75)	0.00	24,030
Capital Stock (bn-Rph)	18.49	(584.34)	0.00	179,044
% Output Exported	11.45	(29.28)	0.00	1,220
Value Added/Emp (mn-Rph)	22.71	(130.67)	-6.84	31,486
Firm Age	14.50	(14.49)	0.00	105.00
# Employees	192.03	(653.02)	10.00	42,649
% Production Wkrs	83.84	(14.23)	1.19	100.00
% w/ HS diploma	27.38	(26.86)	0.00	192.00
% w/ College degree	1.12	(2.71)	0.00	53.33
Avg Wage-PR (th-Rph)	4,261	(2,990)	0.78	137,339
Avg Wage-NP (th-Rph)	9,491	(79,403)	0.00	34,927,880
Labor Mkt Share	0.016	(0.066)	0.000	1.000
Labor Conc. 8CR	0.253	(0.127)	0.091	1.000
Num	306,217			

Notes: All values are in constant 2000 Rupiah (Rph). Data covers years 1988 - 2006. Standard deviations are in parentheses. The export data is only available for years 1990-2000, 2004, and 2006. The education information is available for years 1995-1997, and 2006. PR stands for Production workers and NP stands for Non-Production workers.

Table 2: Summary Statistics of the IFLS Data

	2007	
	Mean	SD
	(1)	(2)
Household Size	6.32	3.06
Age	31.13	21.02
Female	0.50	0.50
Education	8.60	4.22
Employed	0.34	0.47
Consumption	503,915	483,513
Self-Employed	0.39	0.49
Manufacturing	0.15	0.35
Agriculture	0.35	0.48
Wholesale	0.22	0.41
Public	0.19	0.39
Num	50,526	

Notes: All monetary values are nominal. Consumption is monthly per capita consumption expenditure.

Table 3: Summary of Pigou's Measure of Market Power, E

				Percent of firms with		
	Num	Mean	Median	$E < 0.33$	$0.33 \leq E \leq 2$	$E > 2$
	(1)	(2)	(3)	(4)	(5)	(6)
Production Workers	241,093	5.35 (0.30)	1.93	40.35	28.44	31.21
Non-Production Workers	177,473	10.17 (3.58)	0.40	44.43	22.47	33.11

Notes: Data is from the SI and covers years 1988 - 2006. Means are weighted by the number of employees of each type in each firm. Standard errors are in parentheses.

Table 4: Summary of Estimated Labor Supply and Labor Demand Curves

	Num (1)	Mean (2)	Std. Dev. (3)	Median (4)
Demand - Intercept	223,668	21,593.5	242,608.8	7,558.9
Demand - Slope	223,668	-111.52	7,826.8	-11.71
Supply - Intercept	226,209	-9,112.40	91,443.6	656.3
Supply - Slope	226,209	259.7	2,199.9	32.9

Notes: Data is from the SI and covers years 1998 - 2006. All values are in constant 2000 Rupiah, and are weighted by the number of production employees in each firm.

Table 5: Summary of Competitive Wage and Employment Levels

	Num (1)	Mean (2)	25th (3)	50th (4)	75th (5)
Current Wage	226,209	5,505.4	3,273.9	4,887.2	6,938.8
Competitive Wage	223,668	18,247.6	3,063.4	8,611.9	25,882.1
% Change W	223,668	9.58	0.00	0.72	3.64
Current Employment	226,209	1,718.0	168.0	550.0	1,352.0
Competitive Employment	223,668	2,278.5	89.2	572.3	2,016.0
% Change L	223,668	2.09	0.00	0.38	0.92

Notes: Data is from the SI and covers years 1998 - 2006. All values are in constant 2000 Rupiah and are weighted by the number of production employees in each firm.

Table 6: Summary of Changes in Wage and Employment by Industry

	Wages			Employment		
Industry	25th	50th	75th	25th	50th	75th
	(1)	(2)	(3)	(4)	(5)	(6)
Food & Beverage	0.00	0.34	2.76	0.00	0.33	0.77
Tobacco	0.04	2.23	6.18	0.00	0.29	0.53
Textiles	0.00	0.87	3.37	0.00	0.37	0.88
Apparel	0.00	1.72	5.56	0.00	0.52	1.17
Leather	0.00	0.16	1.28	0.00	0.27	0.82
Wood	0.03	1.34	3.92	0.14	0.53	1.06
Paper	0.04	1.23	4.24	0.11	0.47	1.06
Publishing	0.65	2.99	7.55	0.21	0.66	1.35
Chemicals	0.03	1.49	8.83	0.04	0.47	1.03
Plastics	0.00	0.54	2.42	0.00	0.42	0.98
Minerals	0.00	0.02	0.42	0.00	0.23	0.83
Metals	0.17	0.96	2.51	0.22	0.46	0.74
Fabricated Metals	0.00	0.45	2.59	0.00	0.35	0.86
Machinery	0.00	0.35	2.81	0.03	0.34	0.71
Electrical	0.00	0.14	1.98	0.00	0.18	0.74
Communication	0.00	2.37	12.86	0.00	0.49	1.23
Vehicles	0.00	0.07	1.22	0.00	0.28	0.81
Transport	0.00	0.08	0.45	0.00	0.22	0.41
Furniture	0.00	0.29	1.53	0.00	0.34	0.83

Notes: Data is from the SI and covers years 1998 - 2006. All values are in percentages and are weighted by the number of production employees in each firm.

Table 7: Comparing Poverty Rates in 2007 from IFLS to National Poverty Figures

Poverty Line	World Development Indicators (1)	IFLS Data (2)	Difference (3)
\$1.25/day	0.24	0.16	0.08
\$2.00/day	0.56	0.39	0.17
National	0.17	0.13	0.04

Notes: All IFLS calculations use sampling weights.

Table 8: Summary of Poverty Rates in 2007, Using Multiple Poverty Lines

	Actual (1)	Comp. Wage (2)	Comp. Employment (3)	Both Comp. (4)
Poverty Headcount Ratio				
National	0.134	0.127	0.127	0.124
$1.25/day (PPP)	0.164	0.157	0.155	0.151
$2.00/day (PPP)	0.387	0.365	0.360	0.348
$1.25/day (real)	0.490	0.459	0.462	0.438
Poverty Gap				
National	0.075	0.073	0.073	0.072
$1.25/day (PPP)	0.083	0.081	0.080	0.080
$2.00/day (PPP)	0.156	0.149	0.147	0.144
$1.25/day (real)	0.204	0.193	0.192	0.186

Notes: Data is from IFLS. All figures use sampling weights.