The effect of FDI on Indonesia's jobs, wages and structural transformation

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Abstract

Foreign direct investment (FDI) can provide important opportunities for middle-class jobs by stimulating employment growth, paying wage premiums and helping to shift workers out of less productive sectors. This analysis exploits regional variations in sales to examine the effect that multinational corporations (MNCs) in the manufacturing sector have on employment and wages in Indonesia between 2007 and 2015. Using interaction effects, it explores how these effects differ by workers' education level, occupation and employment status. The study finds that manufacturing MNCs raise average wages in their sector. Yet, higher-educated workers benefit more, and white-collar workers see greater benefits than blue-collar workers. Women also appear to benefit more than men, as a result of the type of labor-intensive sectors MNCs engage in. The study finds evidence that manufacturing FDI can help to accelerate structural transformation, as workers move out of lower-productivity sectors (agriculture and low-skilled services) and into higher-productivity manufacturing.

JEL Classification: F21, J23, J31, L16

Keywords: Foreign direct investment, labor demand, wage differentials, structural change

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1. INTRODUCTION

The creation of middle-class jobs is a key priority for the government of Indonesia. While its overall employment rate reached a two-decade record high in 2018, two-thirds of jobs created in the past two decades are in low-productivity sectors, such as wholesale and retail trade, restaurants and hotels, while also raising dependence on commodity-based industries (Alatas and Wihardja, forthcoming). In contrast, there has been a relative decline in some jobs that command higher salaries (“middle-class jobs”), such as in medium and large manufacturing industries. To improve its upward mobility and provide opportunities for future generations, Indonesia needs to generate more high-paying jobs. As noted recently by the World Bank (2019) “If the pathway to economic security of the middle class is not made available to all citizens, there is a risk of a divided Indonesia.”

Attracting foreign direct investment (FDI) in manufacturing can provide important opportunities for middle-class employment growth. This paper focuses on FDI as a key driver of labor demand. It will show that foreign-owned manufacturing firms can be important for stimulating employment growth and also pay wage premiums, therefore contributing to middle-class jobs. Yet, Indonesia is not as welcoming as it can be to foreign investors. According to the OECD FDI Restrictiveness Index, Indonesia is the third-most restrictive out of 68 rich and middle-income countries, with significant foreign equity restrictions, foreign workers regulations, regulatory uncertainties, and high labor costs for employers (Basri, 2019; Lembong, 2019, Manning and Pratomo, 2019). This has limited foreign investment and hampered job creation, including in the labor-intensive manufacturing sector. FDI as a share of GDP has averaged less than 2% over the past three years, among the lowest in the region (Figure 2). However, a recent legal amendment is seeking to reduce foreign investment restrictions. As noted by the World Bank: The Omnibus Law on Job Creation (passed on October 5, 2020) is a major reform effort to make Indonesia more competitive and support the country’s long-term aspiration of becoming a prosperous society” (World Bank, 2020d).

To better understand what role FDI can play in future job creation, this paper will consider the historical effect that manufacturing FDI has had on Indonesia's labor market. In particular, it will focus on answering three research questions:

1. **What has been the effect of manufacturing FDI on job creation in Indonesia?**
2. **What has been the effect of manufacturing FDI on average wages in Indonesia?**
3. **What has been the effect of manufacturing FDI on structural transformation in Indonesia?**

The paper is outlined as follows: Section 2 will briefly summarize the literature on FDI, structural transformation and labor market outcomes in Indonesia. Section 3 presents descriptive statistics around manufacturing FDI and employment in Indonesia. Section 4 provides details on the methodology used throughout the paper. Section 5 focuses on the role of manufacturing FDI in inter-sectoral employment dynamics (job creation and structural transformation). Section 6 considers the effect of manufacturing FDI on within-sector wage dynamics. Section 7 concludes.

2. FDI, STRUCTURAL TRANSFORMATION AND LABOR MARKET OUTCOMES

FDI can be important for creating higher-paying jobs by stimulating productivity both *within* and *across* sectors. There are two main ways to stimulate labor productivity growth in an economy. First, productivity can grow *within* economic sectors through capital accumulation, technological change or reduction of misallocation across plants. Second, labor can move *across* sectors, from low-productivity sectors to high-productivity sectors (McMillan, Rodrik and Verduzco-Gallo, 2014). Jointly, these two components are commonly referred to as structural transformation. FDI can play an important role in stimulating both of these components.

There is considerable evidence of FDI's beneficial impacts within its economic sector, raising overall employment and average wages (Steenbergen and Tran, 2020). Much of existing evidence points to FDI

raising wage levels, driven primarily by new technology and increased labor productivity, a review by Hale and Xu (2016) notes. In many cases, the literature also finds a positive effect of FDI on aggregate employment. For example, FDI was found to increase the employment rate in China, the Czech Republic, and Uruguay (Karlsson et al. 2009; Dinga and Mnich 2010; Peluffo 2015). FDI also had a strong positive employment effect on Mexico's manufacturing FDI, with stronger effects in export-oriented industries (Waldkirch and Nunnenkamp 2009).

FDI has also raised Indonesia's manufacturing employment². Lipsey et al (2010) find that foreign establishments have played a role in Indonesian growing manufacturing employment between 1975 and 2005. While plants with some foreign ownership, made up less than 10% of manufacturing employment in 1975, they employed around 20% in 2005. They also find that employment in foreign-owned plants grew about 5% faster than domestic-owned firms, while plants that were acquired by foreigners grew about 10% faster. Considering that foreign plants are on average considerably larger than domestic plants, the difference in the number of jobs created was large (Lipsey et al, 2010).

The increased employment associated with FDI inflows has also helped pull workers out of low-productivity and into higher-productivity sectors. While the number of studies is scarce, there is a growing body of evidence that finds important *across-sector* employment effects from FDI. Escobar and Muhlen (2018) covers the period 2006-2016 and find that FDI flows to Mexico led to considerable reallocation of labor between sectors. Using Mexican states as the unit of observation, they find that direct investments in the industrial sector helped draw workers out of (low-productivity) agriculture and increase the employment share of manufacturing. Interestingly, as an illustration of wider economic spillovers, it also demonstrated a positive effect on the employment share in relatively productive service sectors. As a result, labor reallocation was present for both low- and medium-skilled workers. To our

² For additional studies on FDI in Indonesia see e.g. Blomström and Sjöholm (1999), Lipsey and Sjöholm (2004), Takii (2005), Blalock and Gertler (2008), and Arnold and Javorcik (2009).

knowledge, no studies have considered the effect of FDI on Indonesia's intersectoral employment. However, Steenbergen et al (forthcoming) does show a strong relationship between inflows in manufacturing FDI from the United States to Indonesia, and Indonesia's aggregate number of manufacturing jobs (Figure 1).

Figure 1. Indonesian manufacturing employment and US manufacturing FDI inflows into Indonesia

Source: Steenbergen et al, forthcoming. Note: data on employment comes from the Groningen Growth and Development Centre (GGDC) and US FDI data comes from the Bureau of Economic Analysis.

Recent new firm-level evidence further confirms the importance of FDI, and the costs of foreign entry restrictions for Indonesia's productivity and investment. Cali et al (forthcoming) find that industries with fewer foreign entry restrictions receive more foreign investment, which in turn leads to important productivity effects for domestic firms. Around 60% of this impact comes from technology spillovers from MNCs, while around 40% of this impact stems from stronger competitive pressure, inducing incumbents to innovate to preserve market shares. Interestingly, they also find that the removal of FDI restrictions positively affects both FDI and domestic investments, where the influx of the former crowds in the latter.

Such complementarity may be related to competitive pressure on domestic investors, positive technology spillovers from FDI and/or the expansion of the sector following the FDI increase, all of which stimulate increased investments by domestic firms (Cali et al, forthcoming).

However, FDI may also increase the wage gap between skilled and unskilled workers. FDI often introduces new technologies that raise the demand for higher-skilled workers especially. There is considerable empirical evidence confirming that FDI contributes to rising wage inequality in host countries. In developing countries, wage inequality increases with stocks of inward FDI, cross-country study by Figini and Görg (2011) shows. A rise in Japanese FDI in developing countries is associated with an increase in nonproduction wages (for more skilled workers) relative to production wages (for less skilled workers) (Head and Ries, 2002). Similar effects of foreign investments have been found for firms in Indonesia and Mexico (Lee and Wie 2015; Feenstra and Hanson 1997). Yet, technological change is not necessarily biased in favor of skilled workers, as it depends largely on the type of FDI attracted (Luo 2017). FDI in some types of low-skilled sectors (such as textiles and food processing) could disproportionately benefit unskilled workers (Leamer 1998; Cruz et al. 2018). For this reason, Cornia (2016) finds that FDI in labor-intensive manufacturing and infrastructure is associated with declining inequality in Ethiopia, Ghana, and Mozambique.

The effects of FDI are often local, at least in the short term. Overall employment in receiving industries tend to increase with FDI. Yet, due to their greater reliance on technology that requires complementary skills, a larger presence of foreign firms or affiliates in the region and industry also increases demand for skilled labor. Because the supply of skilled labor is highly inelastic in the short and medium term, this further pushes up the wages of skilled workers in the region and industry with higher FDI presence (Hale and Xu, 2016). Given that most developing countries have considerable restrictions on worker mobility between regions, the effects tend to be rather concentrated in local labor markets (Dix-Carneiro and Kovak 2015; Pavcnik 2017). This also means that FDI can lead to another form of inequality—geographical

inequality—as have been found in Bolivia and Vietnam (Nunnenkamp, Schweickert, and Wiebelt 2007; McLaren and Yoo 2016).

Overall, the literature suggests that FDI has positive but unequal effects on host countries' labor markets. FDI is associated with higher aggregate employment and a rise in average wages. This can also provide important benefits for structural transformation by helping draw workers out of low-productivity and into higher-productivity sectors. Many of these benefits accrue more to higher-skilled workers, while lower-skilled workers may experience adverse effects (Steenbergen and Tran, 2020).

3. DESCRIPTIVE STATISTICS

Indonesia's FDI inflows

Indonesia's overall FDI inflow as a percentage of GDP is relatively low, while the relative importance of manufacturing FDI has increased. Figure 2, Panel A shows that the ratio of FDI inflows to GDP has been stable but low at around 2%. This is considerably lower than all other countries in the region, including Malaysia, Vietnam, Philippines, Cambodia or Thailand. However, the relative importance of manufacturing FDI in overall FDI has increased immensely over time. The sectoral decomposition of Greenfield FDI announcement data (using newspaper announcements aggregated by the Financial Times' FDImarkets), shows a steady increase in the share of manufacturing FDI in total FDI from around 27% in 2003-2007 to almost 50% in 2013-2018 (Figure 2, panel b).

Figure 2. FDI inflows in GDP and sectoral decomposition

**Panel A: Total Inward FDI – Indonesia vs.
Comparators (2009-2018)**

Panel B: Sectoral Decomposition (2003-2018)

Source: Authors' calculations using WDI and FDImarkets

Firm dynamics in Indonesia's manufacturing sector

The presence of MNCs in Indonesia's manufacturing sector has shown a slight increase over the sample period. Over the period of our sample, around 9% of firms in manufacturing are foreign owned, masking heterogenous shares of foreign firms across districts and sectors—ranging from 0% to 100%. The unweighted average MNC employment share at the sector-district level is 11.5%, while the average output and value added shares generated by MNCs are slightly higher at 12.5%. Figure A1 in the annex shows that the district-sector share of MNCs in the total number of firms, employment, output and value added has evolved over time. Despite some slow-down during 2011-2013, MNC activities rebounded in 2015. The share of MNCs' output in total output has risen from around 11% in 2007 to over 12% in 2015, with a peak at 13% in 2010.

Manufacturing MNC activity across regions

There is critical geographical distribution of MNCs across Indonesia, with the largest number of firms in Java. Figure 3 shows the number of MNCs per district in 2007 (panel a) and 2015 (panel b). In 2007, around 55% of districts have no MNC activity at all. In 2015, the share of districts with no MNC activity has fallen

below 50%. On the other side of the distribution, 5 districts have more than 100 MNCs. The district with the highest number of MNCs (349 in 2007, 400 in 2015) is Bekasi in West Java.

Figure 3. Geographical distribution of MNCs in 2007 and 2015

Source: Authors' calculations using Indonesia's manufacturing survey

There is also considerable heterogeneity in the relative shares of MNC activity in manufacturing across Indonesia's districts. The average MNC output share in Java is the highest at 12.5%, while on the Lesser Sunda Islands it is the lowest at 5.4%. In 2015, the highest average MNC output share can be seen in West Papua (22%), while the Lesser Sunda Islands continue to be at the lower end of the distribution. Different regions in Indonesia exhibit different patterns of MNC activity growth over time. While in districts in Sumatera and Sulawesi MNC output share has declined on average between 2007 and 2015, it has gone up in all other regions of Indonesia. The strongest growth of MNC activity share over time can be seen in

West Papua, where three districts have seen increases in MNC output share from below 12.5% in 2007 to above 62.5% in 2015.

Sectors with highest manufacturing MNC activity

Most of the sectors in which manufacturing MNCs dominate are in lower-skilled sectors (see annex table A1 for details of the sectoral classification). Figure 4 shows for each district the sector with the highest MNC output. In almost 50% of districts, MNCs from food products manufacturing have generated the highest output. About 19% of total MNC output comes from this sector. Other common activities include beverages, textiles/apparel, wood products and rubber and plastics. Note that all of these are lower-skilled sectors. There are only a small number of sectors that specialize in high-skilled manufacturing, including production of chemical and motor vehicles. Java has the most heterogeneous MNC landscape among Indonesian regions. Its districts show a higher presence of textiles and wearing apparel industries, rubber, plastic and other non-metallic mineral products manufacturing, as well as manufacturing of motor vehicles among the top output generators.

Figure 4. Dominant sectors of manufacturing MNCs (average 2007-2015)

Source: Authors' calculations using Indonesia's manufacturing survey

While there has been little change among the most dominant MNC sectors, some higher-skilled sectors have exhibited high growth rates during 2007-2015. Error! Reference source not found.3 shows the growth of the number of MNCs (panel a) and real MNC output (panel b) by sector, where the number (output) of MNCs in 2007 is normalized to 1. Most notably, the number of MNCs in the manufacture of coke and refined petroleum products sector has more than doubled and their output in subsequent years is up to 20 times as high as in 2007. The number of MNCs in repair and installation of machinery and equipment is 70% higher in 2015 than it was in 2007 and their output is around 35 times of their initial level. While starting from a low base, it is encouraging to see that much growth was concentrated in higher-skilled sectors.

While both domestic and foreign manufacturing firms provide a good source of “middle-class jobs”, average wages are considerably higher for foreign-owned firms. Using the income bracket classification in “Aspiring Indonesia: Expanding the Middle Class” (World Bank, 2019a), we see that the manufacturing sector could provide an important contribution for higher-paying employment. For domestic firms, an average of 15% of all jobs have wages that are for the “middle class”, while the same is true for 29% of all jobs for foreign-owned firms (Figure 5, Panel A). Yet, wages are higher on average in MNCs: 3.2 IDR million, as compared to 1.8 IDR million per month, on average (Figure 5, Panel B).

Figure 5. Wage dynamics for production workers – domestic vs. MNC firms (average 2010-2015)

Panel A: Wage levels by firm type	Panel B: Average monthly wages by firm type
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Source: Authors calculations using manufacturing survey. 'Poor' denotes a wage below the poverty threshold, 'Vulnerable' denotes a wage below 1.5 times the poverty threshold, 'Aspiring Middle Class' denotes a wage between 1.5 and 3.5 times the poverty threshold, 'Middle Class' is between 3.5 times and 17 times the poverty threshold. 'Upper Class' is more than 17 times the poverty threshold (see "Aspiring Indonesia: Expanding the Middle Class", World Bank, 2019, for details).

Manufacturing Employee Statistics

There are gradual shifts in the level of education, employment and occupation type of worker in Indonesia's manufacturing sector between 2008 and 2015 (Table A2). Approximately 57% of the labor force in manufacturing is male, and the average age is 33.7 years. Over time, the workforce has become more educated – while in 2008 around 36% of the workforce had secondary education or higher, this increased to 49% by 2015. The share of employees has also gone up from 75% to 85% while the shares of both self-employed as well as casual workers have gone down. The majority of jobs in manufacturing are blue collar jobs (86% of the labor force), while only a small share (14%) of the workforce hold white collar positions.

4. METHODOLOGY

The key focus of this paper is to consider the effect of manufacturing FDI on job creation, average wages and structural transformation in Indonesia. To do so, our analysis links firm-level data with labor force survey data to examine the effect that economic activity from multinational corporations (MNCs) has on employment and wages. We exploit regional variations in total sales of manufacturing MNC (as share

of a region's total output) to assess how manufacturing FDI affects employment in its own sector. To consider the effect on aggregate employment across districts, we use the total number of MNC firms as our preferred proxy for FDI activity. Both metrics build on the empirical finding that labor markets are localized, and individuals require physical proximity to MNCs to see any effect to their employment. This local labor market literature comes out of pioneering work assessing the effect of trade on labor markets, such as Autor, Dorn, and Hanson (2013) and Dix-Carneiro and Kovak (2015). The approach follows studies of FDI's within-sector effects from Steenbergen and Tran (2020) and across-sector effects from Escobar and Muhlen (2018).

Data

We combine data from three different sources: firms, individuals and national accounts (Table 1). First, we use firm-level data from Indonesia's Manufacturing Survey (IBS) to construct indicators of MNC activity between 2007 and 2015 (the latest available data). The data span 222,962 observations from up to 400 Indonesian regencies and municipalities (henceforth referred to as "districts") and 24 ISIC rev. 4 2-digit sectors. Firms are classified as MNCs if their foreign capital share is at least 10%. Second, we merge the sector-district level indicators of MNC activity with data from Indonesia's Labor Force Survey (LFS). The final sample consists of 154,393 employee level observations from 2008 until 2015 in the manufacturing sector with non-missing information on district, 2-digit ISIC rev. 4 sector of employment, real monthly wage, and other individual level characteristics. The number of observations in our sample represents 75,774,851 Indonesians. Third, we use data on a region's gross domestic product (GRDP) in agriculture, manufacturing and services from the National Accounts.

Table 1. Data used for analysis

Type	Indicators Used	Use
Manufacturing survey	<ul style="list-style-type: none"> - Firm's sector - Firm's location - Firm's total output - Firm's foreign ownership 	Estimate MNE manufacturing output as a share of gross regional domestic product per region (treatment indicator)

Labor force survey	<ul style="list-style-type: none"> - Individual sectoral employment - Individual location - Individual average wages 	Estimate the total employment per region and broad sector Estimate the average wages per sector/region
National accounts	<ul style="list-style-type: none"> - Region's gross regional domestic product (GRDP) - Region's GRDP per sector 	Estimate the total output per region and broad sector

For the empirical strategy, the within-sector and across-sector analysis are performed separately. We will discuss each in turn.

Within-sector analysis

The baseline model (within-sector) is at the individual level, and estimates the following:

$$(1) \ y_{irst} = \beta \times FDI_{srt-1} + \delta X_{irst} + \gamma \times tariff_{st} + d_s + d_{rt} + \varepsilon_{irst}$$

Here, y denotes (log) wages; where i is the specific individual, s is the 2-digit sector, r is the region (Daerah Tingkat II – level 2 regions), and t is the year. FDI_{srt-1} denotes lagged FDI activity, calculated as the share of foreign firms' revenue in the total output of a sector and region within a country. β is the main coefficient of interest, which measures the percentage change in wages associated with a unit change FDI activity. Implicitly, this specification assumes that the relevant labor market is within a sector and region. There is adjustment cost to move between sectors and between regions so that there are differences in individual employment and wages due to differences in FDI activities. We control for a set of individual characteristics in X_{irst} , including age, gender, and education level to account for potential selection of workers into regions and sectors with higher FDI. The sectoral fixed effects d_s control for inherent differences in sectoral labor demand that could be correlated with FDI attractiveness.

The main empirical challenge is to separate the impact of FDI from other unobserved changes in policies or market trends that can affect the labor markets at the same time. For example, infrastructure spending can attract FDI as well as other domestic investments that boost employment and wages. MNCs in certain sectors can also choose to locate in low-wage regions because of cost considerations, in which case higher FDI activity might appear to be associated with lower wages. As a result, a simple correlation between FDI

activity and labor market outcomes can either inflate or underestimate the true impact of FDI. To account for this potential bias, lagged global FDI growth was used as an instrument to capture supply-side changes that affect FDI inflows and eventually MNC presence but are unlikely to be correlated with other domestic shocks.

We estimate (1) using Instrumental Variables, where FDI_{srt} is instrumented for by growth in global FDI (greenfield and M&A) in sector s in year $t-4$, interacted with the original shares of FDI in region sector rs , that is, the shares at the beginning of the sample period. We also include a quadratic term of the instrument to capture potential non-linear effects of between the instrument and our variable of interest. Global FDI captures supply shocks that are unlikely to be correlated with other domestic changes. Nevertheless, this instrument is not exogenous if there are regional shocks that affect both the labor markets and FDI shares. To account for this, we also control for a set of region-year fixed effects. Finally, the model also controls for average tariff in the sector to separate out the potential impact of FDI from trade liberalization, as FDI reforms are often accompanied by trade liberalization. To assess the heterogenous treatment effects of FDI, we use a number of different interaction effects, including education, employment status, occupation type and gender.

Across-sector analysis

The second model (across-sector) is at the regional level, and includes simultaneous regressions across three broad sectors (primary goods, manufacturing and services) using three-staged least squares (3SLS) with one joint instrument. It estimates the following:

$$(2) \ y_{srt} = \beta \times FDI_{rt} + \delta X_{rt} + d_r + d_t + \varepsilon_{srt}$$

Here, y denotes (log) number of employees, employment shares or (log) gross regional domestic product; s is the broad sector, r is the region, and t is the year. We also include the total number of a domestic manufacturing firms as a district-level control in X_{rt} . FDI_{rt} denotes manufacturing FDI activity, estimated as the number of foreign manufacturing firms in the region. β is the main coefficient of interest, which

measures the change in formal employment associated with a unit change FDI activity. The region fixed effects d_r and year fixed effects d_t control for inherent differences in regional make-up and yearly shocks that may be correlated with FDI attractiveness. We again estimate (2) using Instrumental Variables, where FDI_{rt} is instrumented for by the global FDI (greenfield and M&A) in year $t-4$ in all manufacturing sectors in the region (weighted based on ISIC2's relative size in the region at the beginning of the sample period), interacted with the original shares of manufacturing FDI in region at the beginning of the sample period. To account for the fact that much of the overall variation in MNC activity generally takes place in larger districts, we further weight the regression by each district's total GDP.

Finally, the estimated average impact of FDI is used to calculate the aggregate impact on aggregate employment and average sectoral output in a simple back-of-the-envelope counterfactual exercise. To compare the actual employment numbers, employment distribution and output per sector to the hypothetical case without FDI presence, the exercise assumes that there is a constant effect of FDI on all districts that is equal to the estimated average effect. The counterfactual employment is then assumed to be equal to the actual employment minus the estimated average employment gain (loss) due to FDI.

5. THE EFFECT OF FDI ON WITHIN-SECTOR WAGE DYNAMICS

There is a positive relationship between MNC activity and wages in Indonesia's districts in the manufacturing sector. Table 2 shows results from the second-stage IV regression of our baseline specification for 2007-2015. The marginal effect of MNC output share on wages is positive and significant at the 1% level. This suggests that, holding all other factors constant, when a sector-region sees a ten percentage point increase in output share going to MNCs, the average wages in that sector-region are

likely to increase by 2.25%. The magnitude of this effect size is in line with other countries (see Steenbergen and Tran (2020) for similar estimates for Turkey, Vietnam and Ethiopia).

Table 2. Average effect of MNC output share on wages (2nd stage IV)

Outcome Variable	Wage (ln)
MNCs Output Share (Lagged 1 Period)	0.225*** (0.0627)
Controls	Education, Gender, Age, Sectoral Tariffs
Fixed effects	Region-Year, Sector
Observations	154,292

Source: Authors' calculations. Note: Standard errors are clustered at the region*sector level. See annex 2 for details.

Effects on skills premium

FDI provides greater benefits to higher-skilled workers in Indonesia's manufacturing sector, indicating that FDI inflows are associated with a skill premium. The positive effect of MNC activity on wages increases with an individual's educational outcome. Interacting MNC output share with education levels shows a negative but statistically insignificant effect for those with no education, but positive effects on wages for all other education levels (Table 3). Relatedly, the effect is larger for white collar jobs than it is for blue collar jobs (Table 4).

Breaking the sample down into low-skilled and high-skilled manufacturing (see annex table A1 for details), the benefits of FDI are more widespread for the low-skilled than high-skilled manufacturing sector. Increased MNC activity in low-skilled manufacturing is associated with benefits for workers with primary and secondary education, but is especially pronounced in those with tertiary education. For high-skilled manufacturing, the benefits are concentrated to workers with secondary education only (while statistically insignificant for other groups). A similar findings holds for occupation type, where low-skilled sectors benefits both blue and white-collar workers, but the benefits are restricted only to the latter for high-skilled sectors. This result could be explained by the difference in overall skill requirement for these types of sectors. Another reason may be that the results are more *widespread* for low-skilled

manufacturing, as they make up most of Indonesia's manufacturing sector, and also sees greater concentrations from MNCs (see section 3 for details).

Table 3. Within-sector effect of FDI by education level (2nd stage IV results)

Outcome Variable	(1)	(2)	(3)
Manufacturing Sector	All	Wage (ln) Low-Skill Mf	High-Skill Mf
MNCs Output Share (Lagged 1 Period) * No Education	-0.0180 (0.171)	-0.00561 (0.181)	-0.377 (0.302)
MNCs Output Share (Lagged 1 Period) * Primary Education	0.256*** (0.0771)	0.330*** (0.0843)	-0.0167 (0.0424)
MNCs Output Share (Lagged 1 Period) * Secondary Education	0.229*** (0.0705)	0.310*** (0.0750)	0.107** (0.0420)
MNCs Output Share (Lagged 1 Period) * Tertiary Education	0.359*** (0.120)	0.607*** (0.158)	0.0762 (0.0920)
Controls		Education, Gender,	
Fixed effects		Age, Sectoral Tariffs	
Observations		Region-Year, Sector	
	154,292	138,153	15,928

Source: Authors calculations. See annex 2 for details. Note: Standard errors are clustered at the region*sector level. See annex 2 for details.

Table 4. Within-sector effect of FDI by occupation (2nd stage IV results)

Outcome Variable	(1)	(2)	(3)
Manufacturing Sector	All	Wage (ln) Low-Skill Mf	High-Skill Mf
Output MNCs (Lagged 1 Period) * Blue collar	0.0656*** (0.0192)	0.0820*** (0.0213)	-0.00314 (0.00917)
Output MNCs (Lagged 1 Period) * White collar	0.0823*** (0.0216)	0.0985*** (0.0288)	0.0359*** (0.0110)
Controls		Education, Gender,	
Fixed effects		Age, Sectoral Tariffs	
Observations		Region-Year, Sector	
	209,086	191,425	17,471

Source: Authors calculations. Note: Standard errors are clustered at the region*sector level. See annex 2 for details.

Effects by employment status

Most of the wage benefits of MNC activity in Indonesia's manufacturing sector accrue to employees.

Table 5 shows results that interact MNC output share with different job types. For both casual workers and self-employed, we see a negative effect on average wages. These results are in line with different explanations. The most likely option is that FDI increases the demand for formal employees. As the most

skilled workers are absorbed by MNCs, average wages for casual workers and self-employed workers may go down. An alternative, less likely scenario is that these other workers are self-employed or work for small, informal firms, and face increased competition over prices of their products from manufacturing MNCs and thus see downward pressure on their earnings. Interestingly, self-employed do appear to benefit in high-skilled manufacturing, which could possibly indicate increased demand for producers of inputs for high-skilled manufacturing.

Table 5. Within-sector effect of FDI by employment status (2nd stage IV results)

Outcome Variable Manufacturing Sector	(1)	(2)	(3)
	All	Wage (ln) Low-Skill Mf	High-Skill Mf
MNCs Output Share (Lagged 1 Period) * Self-Employed	-0.246* (0.126)	-0.308*** (0.111)	0.220** (0.0864)
MNCs Output Share (Lagged 1 Period) * Employee	0.379*** (0.0831)	0.523*** (0.0877)	0.0753* (0.0433)
MNCs Output Share (Lagged 1 Period) * Casual Worker	-1.048*** (0.191)	-0.956*** (0.192)	-1.339*** (0.330)
Controls		Education, Gender, Age, Sectoral Tariffs	
Fixed effects		Region-Year, Sector	
Observations	154292	138153	15928

Source: Authors' calculations. Note: Standard errors are clustered at the region*sector level. See annex 2 for details.

Effects by gender

Female workers in low-skilled manufacturing are among the biggest beneficiaries of increased MNC activity in Indonesian manufacturing. Table 6 shows the effect of the interaction between MNC output share and gender on wages. The overall effect is positive but insignificant for males. For females, the overall effect is positive and highly significant, especially in the low-skilled manufacturing subset. This may be explained by the gender-bias in the types of industries dominated by MNCs (e.g. apparel, leather, and food products) which employ a large number of females. Evidence for this is presented in Figure 6, which shows a clear positive relationship between the share of employment from foreign-owned firms and the share of female employment. An alternative or complementary explanation may be that FDI leads to a rise in the total demand for labor, thus creating job opportunities for otherwise informally working women

(see, for instance, Ver Beek 2001). It might also point to wage discrimination against females by domestic firms or a preference of (higher paying) MNCs for hiring women (Tang and Zhang 2007).

Table 6. Within-sector effect of FDI by gender (2nd stage IV results)

Outcome Variable	(1)	(2)	(3)
Manufacturing Sector	All	Low-Skill Mf	High-Skill Mf
MNCs Output Share (Lagged 1 Period) * Female	0.622*** (0.0956)	0.685*** (0.115)	0.161** (0.0736)
MNCs Output Share (Lagged 1 Period) * Male	0.00295 (0.0750)	-0.00802 (0.0955)	0.0120 (0.0350)
Controls		Education, Gender, Age, Sectoral Tariffs	
Fixed effects		Region-Year, Sector	
Observations	154292	138153	15928

Source: Authors' calculations. See annex 2 for details.

Figure 6. Share of Female Employment and Share of Foreign Firms' Employment by Sector

Source: Authors' calculations. Note: average from 2007-2015.

Overall, we find that manufacturing MNCs have important, but heterogenous effects on a sector's wages. FDI increases average wages, and benefits most workers who have at least primary education. Yet, some workers are expected to benefit more than others. There is a skills premium, so that higher-educated workers would benefit more, and white-collar workers see greater benefits than blue-collar workers. Interestingly, women appear to benefit more than men (likely as a result of the type of sectors MNCs engage in). Overall, the effects are more widespread for low-skilled than higher skilled manufacturing sectors, so that such sectors may still need to be prioritized for promoting investment).

6. THE EFFECT OF FDI ON INTER-SECTORAL EMPLOYMENT AND OUTPUT

Across districts in Indonesia, we see that the total number of manufacturing MNCs is significantly associated with their manufacturing employment and output. Figure A.3 provides a set of scatterplots that show the descriptive relationships between the number of manufacturing MNCs (they key proxy variable for FDI in this section), and manufacturing employment shares (Panel A) or manufacturing GDP (Panel B). For each graph, the blue fitted line shows a clear, upward trend that is reasonably tightly fitted (as indicated by the R-Squared of 35 and 60% respectively). A notable finding here is that the effect from MNCs appears to be non-linear, and increases more for higher numbers of MNC firms. This may suggest that aggregation of many MNCs may lead to agglomeration effects within districts (see Crozet, Mayer and Muchielli, 2004; Wagner and Timmins, 2009).

Effects on employments

Our regression analysis suggests that manufacturing MNCs significantly affect aggregate employment, as well as the relative employment shares of various sectors. Results on the second-stage IV for the district-level regressions show that as a district's gains a manufacturing MNC, its total employment in the district increases by 0.4% (Table 7, regression 1). The overall employment share also changes when more manufacturing MNCs come in. This raises the total manufacturing employment share (Table 7, regression

2), and lowers the services employment share by roughly the same amount (Table 7, regression 4). A small negative effect on primary employment is observed, but this is not statistically significant (Table 7, regression 3). Interestingly, when breaking down services employment in low- and high-skilled services (see Annex table A2 for details), the whole shift towards manufacturing appears to come from *low-skilled* services (Table 7, regression 5). In contrast, an increase in the number of manufacturing MNCs appears to have no significant effect on high-skilled services' employment shares (Table 7, regression 6).

Table 7. Effect of FDI on employment across sectors (2nd stage IV results)

VARIABLES	(1) Log(Total Emp)	(2) Manu Emp Share	(3) Primary Emp Share	(4) Services Emp Share	(5) Low-Skilled Services Emp Share	(6) High-Skilled Services Emp Share
MNC Count (Mfn)	0.00395*** (0.000464)	0.00152*** (0.000156)	-0.000035 (0.000160)	-0.00148*** (0.000183)	-0.00152*** (0.000187)	0.000039 (0.000062)
Controls	Number of domestic manufacturing firms					
Fixed effects	Region, Year					
Observations	2,218	2,218	2,205	2,205	2,205	2,205
R-squared	0.990	0.940	0.987	0.974	0.960	0.938

Note: Authors' calculations. Note: Mfn = manufacturing. Standard errors are clustered at the region level. See annex 2 for details.

A simple counterfactual exercise shows that applied to Indonesia as a whole, the effects on manufacturing employment are large. Using the findings in Table 7 suggests that manufacturing FDI created a total of 3.1 million new manufacturing jobs in Indonesia between 2007 and 2015 (Figure 7). In total, over 4.6 million new jobs were created in Indonesia due to manufacturing FDI. In aggregate this raises the overall share of manufacturing jobs by around 3%, while lowering the employment share for primary and service sectors by 1.3 and 1.5% respectively (Table 8).

Figure 7. Total manufacturing employment with- and without FDI (counterfactual results)

Source: Authors' calculations.

Table 8. Effect of manufacturing FDI on national employment shares (%)

year	Manufacturing Sector			Primary Sector			Service Sector		
	Current	No FDI	Effect	Current	No FDI	Effect	Current	No FDI	Effect
2007	14.5%	12.4%	+2.2%	45.4%	46.0%	-0.7%	40.0%	41.1%	-1.1%
2008	14.5%	12.2%	+2.3%	44.6%	45.4%	-0.8%	40.8%	42.0%	-1.2%
2009	14.7%	12.4%	+2.3%	44.1%	45.1%	-1.1%	41.3%	42.5%	-1.2%
2010	15.6%	13.0%	+2.7%	42.8%	44.1%	-1.3%	41.5%	42.8%	-1.3%
2011	17.0%	13.8%	+3.2%	41.1%	42.7%	-1.6%	41.9%	43.5%	-1.6%
2012	17.7%	14.6%	+3.2%	39.8%	41.0%	-1.2%	42.4%	44.1%	-1.7%
2013	17.2%	13.8%	+3.4%	39.5%	41.0%	-1.5%	43.3%	45.0%	-1.8%
2014	17.0%	13.6%	+3.4%	38.7%	40.2%	-1.5%	44.3%	46.1%	-1.9%
2015	16.7%	13.2%	+3.4%	37.3%	38.9%	-1.6%	46.0%	47.9%	-1.8%
Average	16.1%	13.2%	+2.9%	41.5%	42.7%	-1.3%	42.4%	43.9%	-1.5%

Source: Authors calculations using regression results from Table .

Effects on output and structural transformation

Manufacturing FDI also contributes to the overall district-level GDP, stimulating both the manufacturing and services sector. Table 9 presents the 2nd stage-IV results when considering the effect of manufacturing MNCs on GDP in the three broad sectors. This suggests that each additional MNC coming into a district raises the real manufacturing GDP by 0.4 billion. Interestingly, it also has a positive spillover effect on the real services GDP, with an effect size of 0.4 billion. However, we see that an increased focus on manufacturing reduces a district's primary GDP by 0.12 billion (possibly by diverting capital investment away from agriculture and mining and into manufacturing and services).

Table 9. Effect of FDI on output across sectors (2nd stage IV)

Outcome Variable	(1) Real GDP in Manufacturing (IDR Billion)	(2) Real GDP in Primary (IDR Billion)	(3) Real GDP in Services (IDR Billion)
MNC Count (Mfn)	0.397*** (0.0210)	-0.115*** (0.0310)	0.434*** (0.0680)
Controls	Number of domestic manufacturing firms		
Fixed effects	Region, Year		
Observations	2,218	2,218	2,218
R-squared	0.982	0.946	0.970

Note: Authors' calculations. Mfn = manufacturing. Standard errors are clustered at the region level. See annex 2 for details.

Putting together the results, we find that manufacturing FDI has significant effects on inter-sectoral employment and output dynamics, and helps bring about structural transformation. Table 10 presents the current and counterfactual output per worker across the three main sectors, as estimated through the regressions above (Table 7 and Table 9). This shows that increased manufacturing FDI is associated with a significant increase in the output per worker in manufacturing, and an increase in output per worker in services (likely because low-skilled workers moved out of the sector and towards manufacturing). Figure 8 provides the summary of these results, visualizing the effect of manufacturing FDI on each sector's output per worker and employment share in 2015. In line with expectations, the biggest effect from manufacturing FDI comes from an increased output per worker in the manufacturing sector (the within-sector effect). We also find evidence of structural transformation, where workers move out of lower-productivity and into higher-productivity-sectors (the across-sector effect). Jointly, this suggests that attracting more manufacturing FDI will be highly important for generating high-value jobs in Indonesia.

Table 10. Effect of manufacturing FDI on output per worker (IDR Million)

year	Manufacturing Sector			Primary Sector			Service Sector		
	Current	No FDI	Effect	Current	No FDI	Effect	Current	No FDI	Effect
2007	121	80	+40	33	37	-4	86	69	+17
2008	128	88	+40	37	41	-4	88	70	+17
2009	129	89	+40	37	41	-4	91	74	+18
2010	126	90	+37	41	45	-4	96	79	+18
2011	122	83	+39	50	55	-5	103	83	+20
2012	118	81	+37	53	58	-6	105	85	+20

2013	129	91	+39	57	63	-6	113	93	+20
2014	136	97	+39	60	66	-6	116	96	+20
2015	143	102	+41	60	66	-6	117	98	+20
Average	128	89	+39	48	52	-5	102	83	+19

Source: Authors calculations using regression results from Table and Table .

Figure 8. Employment share & output per worker in 2015, with and without manufacturing FDI.

Source: Authors' calculations.

7. CONCLUSION

The analysis in this report finds that manufacturing FDI are key for Indonesia's middle-class job creation, and bring significant benefits in terms of higher wages, new manufacturing employment and structural transformation. The analysis links firm-level data with labor force survey data and exploits regional variations in MNC activity to assess how manufacturing FDI affects employment and wages in its own sector, and aggregate employment and output across sectors. From this, we find that FDI brings significant benefits to Indonesia in terms of higher wages, new manufacturing employment and structural transformation (intersectoral labor re-allocation and increased output-per-worker). The study finds that manufacturing MNCs raise average wages in their sector. Yet, higher-educated workers benefit more, and

white-collar workers see greater benefits than blue-collar workers, indicating that FDI inflows are associated with a skill premium. The benefits of FDI are more widespread for the low-skilled than high-skilled manufacturing sector. Women also appear to benefit more than men, likely as a result of the type of labor-intensive sectors MNCs engage in.

It is likely the case that the heterogeneity of sectors *within manufacturing* matters a lot to the employment and wage effects and to the inequality effects observed for FDI. The analysis suggests that employment and wage effects are more likely to arise for the low-skilled manufacturing sector, and for women. Indeed, this paper suggests the gender effects are due to labor market sorting, with women being more prevalent in sectors benefitting a lot from FDI. We find evidence of a clear positive relationship between the share of employment from foreign-owned firms and the share of female employment. This may suggest that foreign investment in specific low-skilled sectors such as garment manufacturing is labor-augmenting and that in such a case, for example, the provision of a sewing machine dramatically increases the marginal product per hour worked of a seamstress.

Indonesia can further raise the potential of FDI for its development by using more targeted foreign investment promotion and by removing FDI restrictions. Targeting foreign investment promotion to a select set of priority sectors can improve the overall effectiveness of investment promotion agencies (Javorcik 2004). This report found that while there are significant benefits from all manufacturing FDI, the aggregate labor market effects are most widespread for low-skilled manufacturing sectors (in line with its wider skill base). Yet, on the strategic roadmap of the Indonesian Investment Coordinating Board (BKPM) (BKPM (2020), there is no explicit focus on low-skilled manufacturing sectors. The BKPM may wish to consider a more targeted approach to help the promotion and facilitation of foreign investors in low-skilled manufacturing. Another priority lies with the removal of FDI restrictions. Firm-level evidence suggests that removing such FDI restrictions will likely increase foreign investment, crowd in domestic investment and increase technological spillovers and productivity growth in domestic firms (Cali et al,

forthcoming). As noted recently by the World Bank's Indonesia country office: By removing heavy restrictions on investment and signaling that Indonesia is open for business, the Omnibus Law on Job Creation can help attract investors, create jobs and help Indonesia fight poverty" (World Bank, 2020d).

The evidence presented in this paper should reaffirm to policy makers the critical role of FDI for development, however, further research is needed to better understand the policy levers that shape the inflow of manufacturing FDI, and the transmission effects of such FDI on wage, employment and structural transformation. This report sought out to identify the aggregate relationship between manufacturing FDI and employment dynamics but could not directly observe the factors that shape this dynamic. Future research would be warranted to directly explore the impacts of different policies (e.g. investment regulations, labor laws and social protection) that may shape the inflow of FDI and its impact on employment and wage dynamics in Indonesia. In addition, it should also consider the transmission effects more explicitly. Possible questions include whether the employment and wage effects are driven more by exporting FDI firms (tapping into external demand) or by domestic-market-supplying FDI firms (tapping into the changing composition of domestic consumer demand as Indonesia grows). It would also be worth considering to what extent some types of manufacturing FDI are preferable to policymakers over others. This may depend in part on the expected productivity spillovers brought by different types of manufacturing FDI. In addition, it also depends on whether investment is labor augmenting (e.g. a sewing machine that require a worker to deploy it) or labor displacing (e.g. computerized robots in Mexico's car manufacturing plants). We leave such extensions to future researchers.

Annex 1: Additional graphs

Figure A1. MNC activity shares over time

Source: Authors' calculations using Indonesia's manufacturing survey

Figure A2. Growth of MNC activity by sector

Panel A. Number of MNCs (relative to 2007)

Panel B. Growth of MNC activity (relative to 2007)

Source: Authors' calculations using Indonesia's manufacturing survey

Figure A3: District scatterplots - MNC count and manufacturing employment numbers, shares and GDP

Source: Authors' calculations. Note: each dot represents a district per year. Scatterplots cover 2007-2015.

Annex 2: Additional tables

Table A1 – Sector classification

Broad sector	Subsectors
Low-skilled manufacturing	Food, beverages, and tobacco products
	Wood and wood products
	Other nonmetallic mineral products
	Fabricated metal
	Paper and paper products; printing and publishing
	Rubber and plastics products
	Basic metals
	Textiles, wearing apparel, and leather products
	Furniture; manufacturing n.e.c. (not specified)
High-skilled manufacturing	Coke and refined petroleum products
	Chemicals and chemical products
	Machinery and equipment n.e.c. (not specified)
	Transport equipment
	Electrical machinery and equipment
	Computer, electronics, optical equipment
	Pharmaceutical products
Low-skilled services	Construction
	Wholesale and retail trade; repair of motor vehicles and motorcycles
	Transportation and storage (land, warehousing)
	Accommodation and food service activities
	Security, landscape and employment activities
High-skilled services	Transportation and storage (water, air, postal)
	Information and communication
	Financial and insurance activities

	Professional, scientific and technical activities
	Travel agencies and tour operators
	Office administration and other business support activities

Source: Authors' elaborations following Steenbergen and Tran (2020) and Hallward-Driemeier and Nayyar (2017).

Note: Based on the ISIC Rev4 classification. Low-skilled manufacturing is made up of ISIC 10-18, 22-24, 31-32. High-skilled manufacturing covers ISIC 19-21, 25-30, 33. Low-skilled services is defined by ISIC 41-49, 52, 55-56, 68, 77-78, 80, 81. High-skilled services covers ISIC 50-51, 53, 58-66, 69-75, 79, 82. n.e.c. = not elsewhere classified.

Table A2. Descriptive statistics of manufacturing labor force

Year	General		Level of Education				Employment Type			Occupation Type	
	(% Male)	Av. Age	No education	Primary education	Secondary education	Tertiary education	Self-employed	Employee	Casual Worker	Blue collar	White collar
2008	55%	33	9%	54%	32%	4%	16%	75%	9%	88%	12%
2009	54%	33	12%	49%	35%	5%	11%	78%	11%	87%	13%
2010	55%	33	10%	48%	38%	5%	21%	73%	6%	86%	14%
2011	57%	33	10%	49%	38%	3%	13%	81%	6%	87%	13%
2012	57%	34	9%	47%	39%	5%	10%	84%	6%	86%	14%
2013	58%	34	9%	46%	41%	5%	11%	85%	4%	84%	16%
2014	58%	34	8%	45%	42%	5%	11%	83%	6%	86%	14%
2015	58%	35	8%	43%	43%	6%	11%	83%	6%	84%	16%
Av.	57%	34	9%	48%	39%	5%	13%	80%	7%	86%	14%

Source: Authors calculations using labor force survey

Additional tables and robustness checks

Table A.3 Within-sector effect of FDI – OLS results

Outcome Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	All	All	Low-Skill Mf	High-Skill Mf	All	Low-Skill Mf	Wage (ln) High-Skill Mf	All	Low-Skill Mf	High-Skill Mf	All	Low-Skill Mf	High-Skill Mf
Manufacturing Sector													
MNC Output Share (Lagged)	0.128*** (0.0269)												
MNC Output Share (Lagged) * No Education		0.00997 (0.0574)	0.00735 (0.0634)	-0.00503 (0.0837)									
MNC Output Share (Lagged) * Primary		0.167*** (0.0381)	0.200*** (0.0411)	-0.0378 (0.0364)									
MNC Output Share (Lagged) * Secondary		0.107*** (0.0263)	0.139*** (0.0279)	0.0204 (0.0262)									
MNC Output Share (Lagged) * Tertiary		0.132* (0.0686)	0.224** (0.0968)	-0.0425 (0.0728)									
MNC Output Share (Lagged) * Blue Collar					0.0923*** (0.0303)	0.132*** (0.0321)	-0.0536* (0.0315)						
MNC Output Share (Lagged) * White Collar					0.309*** (0.0380)	0.365*** (0.0367)	0.128*** (0.0390)						
MNC Output Share (Lagged) * Self-employed								- (0.0765)	- (0.0747)	0.122** (0.0548)			
MNC Output Share (Lagged) * Employee								0.214*** (0.0424)	0.278*** (0.0425)	0.00274 (0.0315)			
MNC Output Share (Lagged) * Casual Worker								- (0.133)	- (0.131)	-0.894*** (0.134)			
MNC Output Share (Lagged) * Female											0.323*** (0.0351)	0.335*** (0.0408)	0.129*** (0.0414)
MNC Output Share (Lagged) * Male											-0.0207 (0.0256)	0.00321 (0.0290)	-0.0475 (0.0338)
Controls						Education, Gender, Age, Sectoral Tariffs							
Fixed effects						Region-Year, Sector							
Observations	154292	154292	138153	15928	154283	138146	15926	154292	138153	15928	154292	138153	15928

Note: Robust standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01"

Table A. 4 Within-sector effect of FDI – Robustness Check (Additional Controls)

Outcome Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
			Low-Skill	High-Skill		Low-Skill	Wage (ln) High-Skill		Low-Skill	High-Skill		Low-Skill	High-Skill
Manufacturing Sector	All	All	Mf	Mf	All	Mf	Mf	All	Mf	Mf	All	Mf	Mf
MNC Output Share (Lagged)	0.197*** (0.0612)												
MNC Output Share (Lagged) * No Education		0.0219 (0.158)	0.0170 (0.162)	-0.296 (0.379)									
MNC Output Share (Lagged) * Primary		0.257*** (0.0728)	0.322*** (0.0783)	0.0542 (0.0468)									
MNC Output Share (Lagged) * Secondary		0.168** (0.0677)	0.230*** (0.0757)	0.107** (0.0532)									
MNC Output Share (Lagged) * Tertiary		0.239* (0.126)	0.384** (0.196)	0.0786 (0.0790)									
MNC Output Share (Lagged) * Blue Collar					0.137** (0.0642)	0.213*** (0.0698)	0.00574 (0.0663)						
MNC Output Share (Lagged) * White Collar					0.443*** (0.0812)	0.579*** (0.0890)	0.248*** (0.0542)						
MNC Output Share (Lagged) * Self-employed								-0.262* (0.136)	0.332*** (0.126)	0.171*** (0.0653)			
MNC Output Share (Lagged) * Employee								0.354*** (0.0822)	0.485*** (0.0881)	0.0916* (0.0490)			
MNC Output Share (Lagged) * Casual Worker								- (0.189)	- (0.189)	-1.518*** (0.435)			
MNC Output Share (Lagged) * Female											0.600*** (0.0978)	0.640*** (0.114)	0.192** (0.0888)
MNC Output Share (Lagged) * Male											-0.0321 (0.0745)	-0.0338 (0.0947)	0.0128 (0.0518)
Controls					Education, Gender, Age, Marital Status, Rural/Urban, Sectoral Tariffs								
Fixed effects					Region-Year, Sector								
Observations	119858	119858	107235	12459	119850	107229	12457	119858	107235	12459	119858	107235	12459

Note: Robust standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01"

Table A.5 Within-sector effect of FDI – Robustness Check (MNC Value Added Shares)

Outcome Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
			Low-Skill	High-Skill		Low-Skill	Wage (ln) High-Skill		Low-Skill	High-Skill		Low-Skill	High-Skill
Manufacturing Sector	All	All	Mf	Mf	All	Mf	Mf	All	Mf	Mf	All	Mf	Mf
MNC Value Added Share (Lagged)	0.228** *												

MNC Value Added Share (Lagged) * No Education	(0.0607)	-0.0179 (0.171) 0.253**	-0.00808 (0.179)	-0.364 (0.306)									
MNC Value Added Share (Lagged) * Primary		*	0.325*** (0.0753) 0.233**	0.00931 (0.0810)									
MNC Value Added Share (Lagged) * Secondary		*	0.309*** (0.0683) 0.369**	0.105** (0.0706)									
MNC Value Added Share (Lagged) * Tertiary		*	0.620*** (0.119)	0.0974 (0.0871)									
MNC Value Added Share (Lagged) * Blue Collar					0.156** (0.0652) 0.518**	0.241*** (0.0708)	-0.0173 (0.0476)						
MNC Value Added Share (Lagged) * White Collar					*	0.686*** (0.0851)	0.249*** (0.0547)						
MNC Value Added Share (Lagged) * Self-employed								-0.238* (0.130)	-0.309*** (0.114)	0.229** (0.0963)			
MNC Value Added Share (Lagged) * Employee								0.381*** (0.0807)	0.520*** (0.0818)	0.0828* (0.0458)			
MNC Value Added Share (Lagged) * Casual Worker								- 1.029*** (0.199)	-0.942*** (0.198)	-1.315*** (0.341)			
MNC Value Added Share (Lagged) * Female											0.619** *	0.688*** (0.110)	0.147* (0.0835)
MNC Value Added Share (Lagged) * Male											0.00906 (0.0727)	-0.00818 (0.0933)	0.0227 (0.0338)
Controls													
Fixed effects													
Observations													

Note: Robust standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01"

Table A.6 Within-sector effect of FDI – Robustness Check (Limited Information Maximum Likelihood)

Outcome Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Manufacturing Sector	All	All	Low-Skill Mf	High-Skill Mf	All	Low-Skill Mf	High-Skill Mf	All	Low-Skill Mf	High-Skill Mf	All	Low-Skill Mf	High-Skill Mf
MNC Output Share (Lagged)	0.226*** (0.0629)												
MNC Output Share (Lagged) * No Education		-0.0178 (0.172)	-0.00526 (0.182)	-0.377 (0.302)									
MNC Output Share (Lagged) * Primary		0.256***	0.331***	-0.0165									

MNC Output Share (Lagged) * Secondary	(0.0775) 0.230***	(0.0847) 0.311***	(0.0424) 0.107**										
MNC Output Share (Lagged) * Tertiary	(0.0709) 0.360***	(0.0753) 0.610***	(0.0421) 0.0764										
MNC Output Share (Lagged) * Blue Collar	(0.121)	(0.159)	(0.0921)	0.153**	0.245***	-0.0246							
MNC Output Share (Lagged) * White Collar				(0.0675)	(0.0756)	(0.0436)							
MNC Output Share (Lagged) * Self-employed				0.514***	0.680***	0.246***							
				(0.0853)	(0.0803)	(0.0553)							
MNC Output Share (Lagged) * Employee							-0.245*	0.307***	0.221**				
							(0.127)	(0.112)	(0.0867)				
MNC Output Share (Lagged) * Casual Worker							0.381***	0.525***	0.0757*				
							(0.0839)	(0.0883)	(0.0435)				
MNC Output Share (Lagged) * Female							-	-	-				
							1.050***	0.957***	-1.339***				
							(0.192)	(0.193)	(0.330)				
MNC Output Share (Lagged) * Male										0.624***	0.688***	0.161**	
										(0.0962)	(0.115)	(0.0737)	
										0.00372	-0.00765	0.0122	
										(0.0756)	(0.0964)	(0.0351)	
Controls							Education, Gender, Age, Sectoral Tariffs						
Fixed effects							Region-Year, Sector						
Observations	154292	154292	138153	15928	154283	138146	15926	154292	138153	15928	154292	138153	15928

Note: Robust standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01"

Table A.7 Intersectoral effect of FDI on employment – additional results (total emp, emp shares)

VARIABLES	OLS				IV-2SLS			
	(1) Log(Total Emp)	(2) Manu Emp Share	(3) Primary Emp Share	(4) Services Emp Share	(7) Log(Total Emp)	(8) Manu Emp Share	(9) Primary Emp Share	(10) Services Emp Share
Number of MNC Manufacturing Firms	0.000648** (0.000308)	0.000550*** (0.0000914)	-0.000115* (0.0000699)	-0.000434*** (0.000104)	0.00395*** (0.00102)	0.00152*** (0.000366)	-0.0000319 (0.000228)	-0.00148*** (0.000417)
Number of Domestic Manufacturing Firms	0.0000454 (0.0000564)	0.000115*** (0.0000322)	-0.0000831*** (0.0000190)	-0.0000317 (0.0000362)	-0.000390** (0.000152)	-0.0000131 (0.0000573)	-0.0000941*** (0.0000338)	0.000107* (0.0000650)
Fixed Effects	Region, Year				Region, Year			
Observations	2215	2215	2215	2201	2215	2215	2215	2201
N_clust								
r2_a	-0.108	0.0615	-0.102	-0.0716	-0.531	-0.186	-0.103	-0.308
idstat					8.673	8.673	8.673	8.664
idp					0.0131	0.0131	0.0131	0.0131
widstat					5.822	5.822	5.822	5.814
j	0	0	0	0	0.0224	0.00220	1.117	0.353
jp					0.881	0.963	0.291	0.552

Note: Robust standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01"

Table A.8 Intersectoral effect of FDI on employment – additional results (low- and high-skilled services)

	OLS	IV-2SLS
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VARIABLES	(1) Low-Skilled Services Emp Share	(2) High-Skilled Services Emp Share	(3) Low-Skilled Services Emp Share	(4) High-Skilled Services Emp Share
Number of MNC Manufacturing Firms	-0.000420*** (0.0000991)	-0.0000151 (0.0000204)	-0.00152*** (0.000406)	0.0000390 (0.000166)
Number of Domestic Manufacturing Firms	0.0000244 (0.0000363)	-0.0000559*** (0.0000121)	0.000170*** (0.0000649)	-0.0000630** (0.0000268)
Fixed Effects		Region, Year		Region, Year
Observations	2215	2201	2215	2201
N_clust				
r2_a	-0.0925	-0.0694	-0.351	-0.0739
idstat			8.673	8.664
idp			0.0131	0.0131
widstat			5.822	5.814
j	0	0	0.0121	1.502
jp			0.913	0.220

Note: Robust standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01"

Table A.9 Effect on output across sectors – additional results

	OLS									IV-2SLS								
	(1)			(2)			(3)			(4)			(5)			(6)		
VARIABLES	Real (IDR b)	GDP	Manu	Real (IDR b)	GDP	Prim	Real (IDR b)	GDP	Serv	Real (IDR b)	GDP	Manu	Real (IDR b)	GDP	Prim	Real (IDR b)	GDP	Serv
Number of MNC Manufacturing Firms	0.199*** (0.0202)			-0.0475*** (0.00940)			0.0662** (0.0319)			0.397*** (0.0718)			-0.115** (0.0541)			0.434* (0.227)		
Number of Domestic Manufacturing Firms	-0.00351 (0.00724)			0.0144*** (0.00341)			-0.0869*** (0.0199)			-0.0298** (0.0124)			0.0234*** (0.00856)			-0.135*** (0.0323)		
Fixed Effects						Region, Year									Region, Year			
Observations	2215			2215			2215			2215			2215			2215		
N_clust																		
r2_a	0.463			-0.112			-0.0190			-0.0517			-0.142			-0.214		
idstat										8.673			8.673			8.673		
idp										0.0131			0.0131			0.0131		
widstat										5.822			5.822			5.822		
j	0			0			0			0.541			0.0150			0.0000578		
jp										0.462			0.902			0.994		

Note: Robust standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01"

Annex 3: Robustness, possible limitations and future improvements

The main empirical challenge is to separate the impact of FDI from other unobserved changes in policies or market trends that can affect the labor markets at the same time. For example, infrastructure spending can attract FDI as well as other domestic investments that boost employment and wages. MNCs in certain sectors can also choose to locate in low-wage regions because of cost considerations, in which case higher FDI activity might appear to be associated with lower wages. As a result, a simple correlation between FDI activity and labor market outcomes can either inflate or underestimate the true impact of FDI. To account for this potential bias, lagged global FDI growth was used as an instrument to capture supply-side changes that affect FDI inflows and eventually MNC presence but are unlikely to be correlated with other domestic shocks.

The overall validity of the analysis thus depends on the instrumental variable, which rests on two key components: relevance and exogeneity.

To assess relevance (weak identification), we first consider the Kleibergen-Paap Wald F-statistic. This metric is consistently significantly different from zero, and bigger than 10 for all regressions (suggesting high relevance). A second check is to see if the instrument is significant in the first-stage. This is the case for all across-sector regressions, and for the main within-sector regressions. Due to challenges of sample size, we see that not all of the regressions with interactions (on education, gender and work status) are significant, which suggests that the instrument is somewhat weak (a limitation of the analysis). This challenge is exacerbated when considering interactions on a reduced sample (e.g. education for high-skilled manufacturing) due to challenges of statistical power.

Global FDI in manufacturing appears a highly exogenous instrument (and in line with much of the literature that uses global supply shocks to measure in-country economic dynamics). While exogeneity

can never be fully proven with statistical tests, one helpful metric comes from the Hansen J-statistic, where the joint null hypothesis is that the instruments are valid, i.e., uncorrelated with the error term, and that the excluded instruments are correctly excluded from the estimated equation. In all the regressions on the across-sector analysis, the p-value much exceeds 10%, so that the null is not rejected (indicating a valid instrument). In the case of the within-sector analysis, however, the results vary, with some of the p-values around or just below 5% (especially for smaller samples, e.g. those interactions that are restricted to higher-skilled manufacturing). This suggest that part of the within-sector analysis may be over-identified, and that some of the regressions (especially the interactions and reduced samples) have to be interpreted with caution. This is a second weakness of the analysis.

Going forward it would be important to continue to look for relevant instruments for FDI (beyond the global sectoral inflow of FDI) that may be more relevant/specific to Indonesia, but still exogenous. For now, we believe that the current results are relevant, intuitive and robust to a range of different specifications. We also made sure to flag any irregularities throughout the report as weaknesses. A range of additional tests were done for both the within-sector and across-sector analysis (incl. choosing different proxies for MNCs, adding controls, and changing the time lag), and results were reasonably robust. These findings are available upon request.

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