

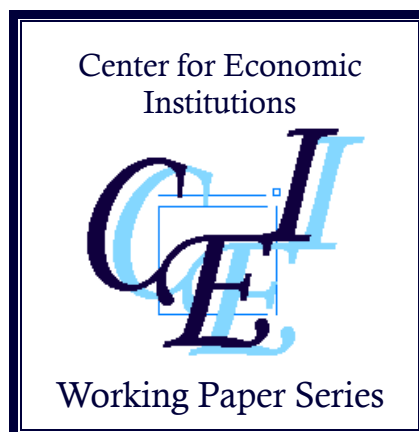
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**“Export boom, employment bust? The paradox of Indonesia’s  
displaced workers, 2000-14”**

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# Export boom, employment bust? The paradox of Indonesia's displaced workers, 2000-14

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## *Abstract*

In Indonesia, an export boom and sustained, rapid GDP growth in the decade after 2000 was accompanied by real earnings that were flat on average, and even declining for many workers. Conventional models of growth and trade predict that labor productivity rises as an economy develops; that this should not be observed during a period of high GDP growth is a puzzle that merits careful investigation. In this paper we explore these seemingly paradoxical trends using several waves of a panel of individual employment data. Economic growth is rarely balanced in a sectoral sense, and the nature of the structural change experienced by Indonesia is also strongly associated with lower competitiveness in sectors where formal employment rates are high, causing some degree of involuntary labor movement from formal to informal modes of employment. We explore this econometrically and find that the earnings of workers displaced from formal to informal jobs are significantly lower relative to workers who remain in the formal market. The fact of this displacement, and its implications for individual earnings, undercuts conventional thinking about the welfare gains from a sustained growth experience. Our findings add, perhaps for the first time, a developing-country dimension to the existing job displacement literature. They also shed some light on the causes of Indonesia's unprecedented increase in inequality during the same growth epoch.

JEL codes: E24, F16, J23, J46, J63, O17

Keywords: Displacement, Formal, Informal, Earnings, Indonesia

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## I. Introduction

Charles Dickens' phrase "it was the best of times; it was the worst of times" is, for many Indonesian workers, an apt summary of their experience during the early 2000s. While the national economy and especially its resource-exporting sectors enjoyed a trade-driven growth boom of unprecedented magnitude and duration, millions of blue-collar workers and labor market entrants found themselves paradoxically sidelined from well-paid jobs in manufacturing, and instead forced to seek livelihoods in low-paid, low-skill service sector jobs. This happened at a time when many Asian countries, led by China, were enjoying (continued) expansion of manufacturing trade by participating in global production networks, which in turn created better employment opportunities for their less-skilled agricultural workforces. For many Indonesians, on the other hand, the boom was a period of stagnating real wages and diminished earnings prospects, even as national income and spending surged ahead and overall expectations for the future became increasingly bright. For workers, the consequence of job displacement due to structural change would have been particularly severe during this time.

The phenomenon of job displacement accompanied by earnings losses is familiar from studies of advanced-country labor markets. A substantial literature explores the causes, duration and implications of job displacement in developed countries (e.g. Jacobson et al. 1993; Kletzer 1998; Couch & Placzek, 2010; Korkeamäki and Kyrrä 2014). In some Western countries, trade-related "downskilling" (Modestino et al. 2016) and declining real earnings, especially for blue-collar workers, has become increasingly widespread, and has been linked to competition from lower-cost manufacturers including China (Autor, Dorn, Hansen and Song 2014; Autor, Dorn and Hansen 2016).<sup>1</sup> Widespread job displacement has also been a concern in Latin American countries undergoing major trade policy adjustments, typically under highly adverse macroeconomic conditions (Goldberg and Pavcnik 2003, 2005; McMillan and Rodrik 2011). In most developing countries, however, job displacement has not been in the forefront of issues studied by economists, likely because in those countries structural change usually involves a transition to better jobs.

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<sup>1</sup> This has directly contributed to current political backlash against globalization and trade in the United States and Europe.

In contrast to the foregoing, Indonesian data reveal job displacement in a setting that differs in one very visible way: it occurs not during a negative trade shock or a period of crisis-induced macroeconomic adjustment, but against a background of rapid economic expansion. Studies of comparable “job displacement” in the U.S. and Europe dwell almost without exception the after-effects of *negative* shocks, whether these are caused by recessions or by trade competition from emerging economies such as China. Indonesia’s manufacturing industries have also been impacted by external competition (Coxhead 2007). But in addition, Indonesia—along with Brazil and numerous other developing economies—has experienced strong and sustained growth in global demand for its energy and natural resource products. It is this resource export growth that has been the dominant driver of structural change since about 2000.

There is in addition another subtler set of differences in the Indonesian case. These arise from the fact that Indonesia, unlike even the large Latin American economies, was (at the beginning of this period, at least) a low-income economy. While the *rate* of Indonesia’s economic growth during the recent export boom was high, the boom induced changes in the *structure* of economic activity—and thus of employment—that were biased against high-wage jobs for blue-collar workers and were sufficiently large as to deny many poor Indonesians a share in the proceeds of the boom. The paradox is solved by noting that during this structural change, industries (largely in manufacturing) that offer “good” semi-skilled jobs, and especially, industries in which *formal* employment is widespread, contracted sharply relative to industries (largely services) in which skills are seldom rewarded and in which regulation of wages and employment conditions is almost totally absent. Increased labor market rigidity due to new regulations were likely contributing factors. As a result, new labor market entrants and workers displaced from the former types of jobs could still find employment—but only in sectors and occupations that pay less, offer few prospects for promotion and no contractual security.

Each of these features of the Indonesian experience is salient to the analysis we conduct, as will become clear. In this paper, we explore how workers who started out in formal employment fare several years later, and how their transition out of the sector affects earnings. We utilize the 2000, 2007 and 2014 rounds of the Indonesian Family Life Survey data, which tracks individual workers over time. We find that transition out of formality, which is strongly associated with manufacturing jobs, leads to substantial earnings loss. The results demarcate an episode of job displacement and earnings losses during “the best of times” that has not

previously been examined in rigorous fashion. Building on our previous work examining the consequences of Indonesia's palm oil export boom for the structure of the labor market, inequality, and educational incentives (Coxhead and Shrestha 2016), we show that high growth does not automatically translate into positive labor market changes for workers. One implication is that high growth not matched by increased formalization or creation of more formal jobs could be a reason for exacerbation of inequality in Indonesia.

## **II. Trade shocks and job displacement**

Given the seemingly strong symbiosis between growth of labor-intensive manufacturing and increases in incomes, it is unsurprising that development economists have expressed concern over two phenomena that appear to indicate an ongoing structural change in this relationship. One of these is “premature deindustrialization,” wherein (for reasons including policy changes and loss of global competitiveness) the GDP share of manufacturing peaks at a lower value, and at a lower level of income per capita, than was true in earlier development experiences (Rodrik 2015). The underlying notion is that economic growth led by labor-intensive-manufacturing is preferable for countries with a large pool of less-skilled labor. Loss of momentum in labor-intensive manufacturing is unlikely to cause overall employment to drop; rather, it is part of a structural shift in which job opportunities in “good” (mainly formal) employment are replaced by growth of less productive, poorly paid and insecure jobs mainly in informal services.

Concerns over job displacement have long been widespread in advanced economies, and a large literature explores its causes, duration and implications in those cases (e.g. Jacobson et al. 1993; Kletzer 1998). In early contributions to that literature, job displacement was typically observed during macroeconomic downturns resulting from the internal dynamics of the business cycle (Jacobson 1993; Couch and Placzek 2010). Because business-cycle recessions are typically brief, the main policy concern was less with temporary earnings drops and spells of unemployment, but rather with persistent loss of individual earning power over longer periods (Jacobson et al. 1993). Persistent losses from job displacement were explained by loss of job-specific human capital and loss of returns to job tenure (Carrington and Fallick 2014).

More recently, attention has shifted from business-cycle displacement to deeper structural causes associated with changes in the relative competitiveness of domestic and foreign

industries. Studies of the effects of China-related trade shocks on US workers (Autor et al., 2014, 2016) find that US workers who are more exposed to a trade shock from China had worse outcomes in terms of cumulative earnings growth and employment. There is a substantial amount of switching between jobs, industries, and sectors, but a surprisingly low rate of geographical relocation. Because of this, trade-related job displacement can have prolonged negative effects on welfare, especially among less-skilled workers. Splitting their labor market sample by terciles of pre-exposure earnings to capture heterogeneity of impact on workers with different earnings capabilities, Autor et al. (2014) find that workers in the lowest tercile face a larger effect from exposure to a negative shock than do workers at the top end. Furthermore, this effect is driven by lower ability of low-earnings workers to adjust at the extensive margin, i.e. to exit from sectors with greater exposure and find jobs in less-exposed sectors. Thus, the capacity to recover from a negative labor market shock is positively correlated with initial earnings. This result is less surprising when we reflect that variation in initial earnings is itself a measure of individual education and ability.

The majority of the literature dwells on advanced-economy cases where labor markets are typically more complete, with lower search and matching costs than in developing countries. Earnings losses associated with job displacement are likely to be much more severe in the context of a developing country, where the co-existence of formal and informal labor market institutions greatly increases the significance of job displacement. Displacement from formal employment could result in large losses in individual welfare due to low earnings in informal employment. The existing literature has focused on understanding the characteristics of formal and informal workers, and in particular on whether informality is voluntary or forced (see discussion in Gindling 2014). But we know much less about how transition between formality and informality affects individuals.

Likewise, the welfare implications of job displacement are arguably more important where unemployment insurance is lacking. In addition, analysis of labor market adjustments is more complicated because it typically takes place in an economy undergoing a secular process of structural change in addition to short-run macroeconomic shocks. Distinguishing these and their effects on labor demand and returns to specific worker characteristics is an important task.

### **III. Indonesia's recent trade and employment trends**

Indonesia is a relatively poor country—GDP per capita was just 31 per cent of the world average in 2017—but since 2001 its economy has grown at 5-6 percent per year, about double the world average. At this rate, aggregate labor demand growth should be correspondingly rapid, and with labor force growth much slower at about two percent per year, real wages should rise. However, growth has been accompanied by significant changes in the structure of production and employment. Notably manufacturing, a prominent driver of growth in the 1990s, has been sluggish, while output and employment in a wide range of services industries has expanded (Aswicahyono et al. 2011).

Although Indonesia's exports are now dominated by primary commodities, manufacturing trade was a major source of job creation in the decade prior to the Asian Financial Crisis (AFC). During the 1980s and early 1990s, manufacturing industry (especially labor-intensive, export-oriented sectors like textiles, garments, and footwear) expanded much faster than GDP. Between 1980 and 1991, the share of production of these sectors in total manufacturing value-added increased from 19% to 30% (Sjöholm 1999). In 1996, just before the AFC, textiles and garments accounted for over 10% of Indonesian exports (Figure 1). Subsequently, however their share has steadily declined as that of primary commodities has risen, as shown in Figure 2. While total value of their exports has grown, their share in Indonesia's total exports (and in world exports also) have both been falling sharply. The commodity boom caused substantial real exchange rate appreciation, rendering Indonesian exports less competitive.<sup>2</sup> Product-market competition from low-cost Chinese manufacturers further depressed what had been an important source of employment growth in the 1990s. Both of these channels led to specialization in non-tradable sectors.<sup>3</sup>

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<sup>2</sup> A more positive interpretation of the Indonesian experience in the 2000s is that of the Balassa-Samuelson hypothesis, in which productivity growth in tradable sectors drives up real wages across the entire economy, combined with income-elastic preference for nontradable services (Dornbusch 1988). However, there is no evidence either of differential productivity growth, or of rising real wages.

<sup>3</sup> In the case of Indonesia, trade shocks may also interact with labor market regulations. Indonesian labor market reforms introduced in 2003 are thought to have discouraged expansion of formal jobs (Garnaut 2015; World Bank 2010). These reforms included greater freedom to unionize and bargain collectively for wages, higher minimum wages, stricter hiring and firing rules, and increased severance pay and long-service pay requirements upon job separation (Manning and Roesad 2007). Stringent labor laws have been proposed as an explanation for low rates of formal sector job creation in general (World Bank 2010). The labor regulations in Indonesia increased the cost associated with both hiring and firing, making it harder for displaced workers to find other formal jobs. If workers are unable to access formal jobs upon displacement, then labor market regulations such as these are likely to create segmentation in the labor market and protect the lucky few who can maintain formal employment status.

[Figure 1: Indonesia's export and import composition by sectors in 1996.]

[Figure 1: Trends in Indonesia's exports of key products, 1990-2016]

From an employment perspective, labor-intensive manufacturing is crucial to the development of nearly all emerging countries. Labor-intensive sectors tend to have a higher employment elasticity of output, and as such their expansion leads to greater job creation. The mid-1990s, as it happens, was the high-water mark of Indonesia's manufacturing job expansion. According to data in Aswicahyono et al. (2011), employment growth in manufacturing, which had averaged 6 percent per year in 1990-96, fell to an average rate of just 0.9 percent per year in 2000-08—less than half the overall employment growth rate. The fastest rates of job growth in 2000-08 were in construction (5.7%/yr), transport (3.9%) and other services (3.6%) as well as mining (3.7%). Census data obtained from the IPUMS international (Minnesota Population Center 2017), show that the fraction of males and females aged 20-49 working in manufacturing peaked in the 1990s, but in 2000, following the 1997-99 financial crisis, it was once again below its 1990 level. It recovered slightly between 2000 and 2010, but did not regain the 1995 peak (Figure 3).

[Figure 3: Manufacturing employment as share of the population aged 20-49 for males and females]

The pre-crisis manufacturing expansion was beneficial not only for the numbers of jobs created, but also for their characteristics. For given labor quality and production technology, growth of workers' earnings depends heavily on complementarities between labor and other factors of production such as land and capital. For countries with low-skilled labor, investment in the manufacturing sector, by increasing the stock of capital, provides a direct path to higher labor productivity and thus labor earnings.

In addition to higher unit earnings, labor-intensive manufacturing provided an opportunity for many workers to be formally employed. In Indonesia as in other developing countries, formal employment means a great deal but is quite rare among blue-collar workers.

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One recent survey estimates that labor productivity in the median informal firm in Indonesia is just 4.5% that of the average formal firm; labor productivity in the two sectors converges only in the top few percentiles (Rothenberg et al. 2017). Nearly all informal firms are tiny (under 5 workers). The 1990s manufacturing boom was dominated by growth in relatively large firms. As such, it is no surprise that the share of Indonesia's labor force recorded as engaged in formal employment reached a peak of about 45% immediately prior to the AFC—and has declined since (World Bank 2010).

Other surveys and allow us to further study the characteristics of the jobs created by Indonesia's manufacturing growth prior to AFC. According to SAKERNAS, the Indonesian labor force survey, at the peak of the manufacturing boom in 1997 over 5% of the Indonesian workforce was engaged in the “textile, ready to wear clothes and leather” industry and the “wooden commodities industry including furniture” industry.<sup>4</sup> Among younger workers (aged 15-29), the proportion was higher at 9%, thus providing opportunities for Indonesia's younger population to engage in stable work outside of agriculture. Geographically, these jobs were highly concentrated, with over 50% of employment in these two sectors located on Java. In terms of education, workers in these sectors were slightly more educated than the overall population, but not by much. These sectors had slightly higher concentration of workers with junior level schooling. They also had slightly better gender ratios than overall non-agricultural work, so they were also crucial for improved participation of women in formal work. By 2007, however, SAKERNAS recorded less than 4% of workers as being involved in these sectors.<sup>5</sup> The concentration of younger workers had also declined, to 5.3%.

Studies on job transitions in Indonesia have by and large focused on the secular movement of labor out of agriculture and into “modern” sectors such as manufacturing or urban services. Suryahadi, Hadiwidjaja, and Sumarto (2012) and Suryadarma, Suryahadi and Sumarto (2013) both find that service sector growth made a substantial contribution to poverty reduction in Indonesia in the 2000s. A few studies have examined labor market responses to macroeconomic shock such as the Asian financial crisis (e.g. Manning 2000); however, these studies have been more descriptive than quantitative. Our own previous work (Coxhead and

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<sup>4</sup> Corresponding industry codes are 32 and 33 in Sakernas 1997.

<sup>5</sup> The industry classification codes used in SAKERNAS 2007 differs from 1997 as it uses 3-digit classification codes rather than 2-digit codes. The relevant sectors have codes between 171 and 210 in 2007.

Shrestha 2016) provides causal connections from trade shocks to structural change in the labor market, notably the shift from formal to less formal employment.

The fact that formal jobs in labor-intensive sectors provide opportunities for low-skilled individuals to raise their earnings and move out of poverty motivates our exploration of the consequences of slower growth in high productivity sectors and occupations, especially in a developing country with relatively large endowment of low skilled workers. Possible effects of slow growth include the relegation of some less-skilled workers into low-productivity sectors due to lack of opportunities, and/or reduced earnings and job security for workers who get displaced by shrinking of these sectors. The situation for individual workers is much more difficult when slow job creation is coupled with structural change that increases the rate of job separation or reduces growth in formal jobs.

At the aggregate level, we can study patterns of job displacement by tracking employment patterns of the same age cohorts across time. For example, workers aged 20-24 in 1985 would be aged 25-29 in 1990, 30-34 in 1995, and so on. By comparing sectoral distribution of employment of the same initial cohort, we can see how structural change over time affects employment patterns. Stark evidence of structural change can be especially found in data for younger workers, as first-time job seekers are most likely to enter the sector that has been expanding. So, a growing manufacturing sector would attract more young workers. We can observe this in repeated cross sectional data by focusing on successive cohorts of labor market entrants.

Figure 4 plots share of manufacturing employment among cohorts that were aged 20-24 in the initial year (either 1985, 1990, 1995, 2000, or 2005) between 1985 and 2010. First, the figure shows that after 1995 the fraction of new job market entrants finding employment in manufacturing fell sharply. Furthermore, each line in the figure tracks a cohort of individuals initially aged 20-24 in the beginning year. These data show a rise in manufacturing employment share in the 1990s followed by a sharp decline in the early part of the 2000s within the same age cohort. For the male cohort aged 20-24 in 1985, at least 12% worked in manufacturing until 1995, after which the share fell to less than 10%. More than 13% of the 1995 urban cohort started out in manufacturing, but by 2010 only 10% remained in this sector. By 2005 only 8% of 20-24-year old men had manufacturing jobs, although this number increased slightly by 2010.

[Figure 4: Trends in share of male and female manufacturing employment by age cohort]

What can be inferred from these patterns? Overall, these figures demonstrate that since the late 1990s, not only were new entrants into the labor market less likely than their predecessors to land manufacturing jobs, but workers already holding manufacturing jobs were also transitioning out of the sector. This trend in manufacturing jobs comes despite growth in sector output—albeit at a rate much lower than in the 1990s (Aswicahyono et al. 2011). Part of the reason could also be that this cohort was staying in school at a greater rate than previous cohorts, but lack of opportunity in manufacturing is likely to be a big factor.

#### **IV. Data and estimation**

To understand the impact of such displacement on worker earnings, we require a panel data that tracks individual workers over time. The Indonesian Family Life Survey (IFLS) provides such an opportunity to explore the Indonesian case. The IFLS is a panel study that began in 1993, with follow-up rounds in 1997, 2000, 2007 and 2014 (for detailed description of the survey, please see Straus et al. 1996, 2009). We perform two different analyses, making use of two features of the IFLS data. The panel nature of IFLS enables us to track the evolution of labor market status of individual workers over time. In addition, in a module asking about each worker's displacement experience over the past five years, added in 2007, asked respondents to report any termination from a salaried job in the previous five years. Although the Indonesian structural change is one of declining manufacturing competitiveness in textile, footwear, and wood products, unavailability of detailed data (industry codes in IFLS are only available at 1-digit level) means that we use information on all formal workers.

The pattern over time in IFLS employment data matches closely to that observed in national surveys. Table 1 panels (a) and (b) shows the distribution of workers by occupation and sector respectively. In term of occupation, the proportion of production and semi-skilled workers, who are mostly associated with the manufacturing sector, have remained unchanged or slightly declined between 1993 and 2014, after a slight increase in 1997. Likewise, sectoral

distribution has moved towards greater concentration in services sector and decline in agriculture and manufacturing.

[Table 1: Table 1: Employment characteristics in Indonesian Family Life Survey data, 1993-2014]

The core empirical task is to compare earnings growth of workers who remained formally employed to those who moved out of formality, conditional on observable characteristics of workers and their initial jobs. Consider a labor market in which there are two types of job, denoted by 0 and 1. In the first period, all workers hold jobs of type 0. In the second period, some of these workers are found to have moved to jobs of type 1. Each worker possesses a set of general characteristics  $X$  with returns  $\alpha$ , and also an endowment of job type-specific human capital denoted by vector  $A = (a_0, a_1)$ .

First-period earnings of worker  $i$  are determined by:

$$Y_{i0} = \beta + X_i' \alpha + \theta_0 a_0 + e_{i0}. \quad (1)$$

Due to structural change, both the returns to general characteristics,  $\alpha$ , and returns to specific human capital,  $a_0$ , can change. In the second period, worker  $i$ 's earnings in job  $j$  are given by:

$$Y_{ij} = \bar{\beta} + X_i' \bar{\alpha} + \bar{\theta}_j a_j + e_{ij} \quad (2)$$

Therefore, if individual  $i$  stays in job 0 the difference in earnings over time is:

$$dY_i = (\bar{\beta} - \beta) + X_i' (\bar{\alpha} - \alpha) + (\bar{\theta}_0 - \theta_0) a_0 + v_{i0}, \quad (3)$$

and if he switches to job 1, by

$$dY_i = (\bar{\beta} - \beta) + X_i' (\bar{\alpha} - \alpha) + \bar{\theta}_1 a_1 - \theta_0 a_0 + v_{i1}. \quad (4)$$

The differential earnings growth between switchers and stayers is thus given by:

$$D_i = (\bar{\theta}_1 a_1 - \theta_0 a_0) - (\bar{\theta}_0 - \theta_0) a_0. \quad (5)$$

The second term in (5) measures the change in returns to workers who remain in job 0. The first term captures the effects on workers who are displaced to job 1. For this group, not only do returns to human capital change, but the value of their human capital may differ in the new occupation. On the other hand, the second term is hypothetical for those displaced from job 0. We can estimate this term from data on stayers if the unobserved characteristics are similar for switchers and stayers, i.e.,  $E(a_0|S_i = 1) = E(a_0|S_i = 0)$ , where  $S_i = 1$  if the individual switches employment and zero otherwise.

In general there are reasons to believe that switchers will be different from stayers. If the transition is voluntary, the Roy (1951) self-selection model implies that individuals select into occupations where returns to their skills are highest. So the earnings potential of switchers may be different than that of stayers. For example, those with high  $a_0$  may be more likely to stay in job 0 if growth in returns to this skill is positive. These unobserved skills might drive both switching out of formal employment and earnings conditional on switching. This means that the observed earnings of switchers provides a biased estimate of the potential earnings of non-switchers.

On the other hand, if job changes are involuntary, workers with low  $a_0$  might be the first to be laid off from jobs of type 0, which means that expected  $a_0$  among switchers and stayers is different. At this time—and by contrast with the much richer datasets available to displacement studies from wealthy countries—we lack the data needed to adequately resolve this selection issue.<sup>6</sup> What we do know, however, is that among workers who self-report displacement from a formal job (defined here as earning a salary), the rate of formal employment in a subsequent survey round is much lower than for workers who do not switch, and median hourly earnings, while still much higher than for workers who were never formally employed, are 20-30% lower

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<sup>6</sup> Systematic selection of displaced workers is an important issue in the job displacement literature. One way to tackle this issue is to include worker-specific time trends to account for unobserved worker characteristics that evolve linearly over time (Couch and Placzek 2010; Jacobson, LaLonde, and Sullivan 2005). The U.S. literature finds that point estimates on earnings losses are slightly smaller, but not statistically different, when using matching estimators that compare workers with similar ex-ante probability of being displaced (Couch & Placzek, 2010).

than for workers who did not switch. Adding to this the likely loss of job security, fringe benefits and better-regulated working conditions, and it seems plausible that among blue-collar workers with formal employment, only an exceptional few would *voluntarily* choose to move to informal employment. We analyze these data in greater detail later, in section 7.

In translating these concepts into statistical analysis, we focus on workers aged 20-53 who are employed formally in the baseline year (2000 or 2007, analyzed separately) and analyze their labor market outcomes in the next survey wave. Reasons for focusing on those aged 20-53 in the baseline year are to minimize possibilities of job transition through retirement after age 60. We still have to worry about the issues related to endogenous labor force participation of women.

We classify workers as formal if they are private employees (thus excluding government workers) who work in firms comprising of at least five workers. Larger firm size is associated with greater productivity and compliance to labor market regulation, including job stability and benefits. However, a heavy concentration of small firms with low productivity is a feature of developing countries, including Indonesia (Hsieh and Olken 2014). In such a setting, displacement can easily result in a large loss in earnings. In the IFLS, the highest rates of formal employment among low-skilled occupations are found in the manufacturing sector (Table 2).

[Table 2: Proportional of formal jobs by occupation and sector]

We focus on formal workers as these are the individuals who are most obviously vulnerable to displacement. In the data, formal workers earn at a higher rate, and are more likely to get benefits such as medical insurance (Table 3). This is true even if we focus only on employees (thus excluding the self-employed) or on specific sectors such as manufacturing. Therefore, movement out of formal jobs is more likely to be involuntary. Furthermore, workers who were informal in the initial period are very likely to remain informal in the subsequent period as well. Between 2000 and 2007, only 10% of informal workers transitioned into formal employment.

[Table 3: Characteristics of formal jobs: earnings and benefits]

The IFLS employment module asked individuals to report, among other things, sector, occupation, hours worked per week, number of weeks worked per year, the number of workers in their place of employment, and yearly earnings. For our purposes, the main outcome of interest is growth of hourly earnings. We calculate this by dividing yearly salaries for wage workers (or for self-employed workers, yearly profits) by the total number of hours worked in a year. We use annual rather than monthly earnings because the latter could fluctuate on a seasonal basis.

A major empirical challenge in the study of displacement is constructing counterfactual earnings for displaced workers. Some studies, especially those with richer datasets, have used the workers' pre-displacement wage trajectory and information on non-displaced workers (Carrington and Fallick 2014). However, due to selection, choosing an appropriate comparison group is still a challenge. Couch and Placzek (2010) use panel estimator with individual fixed effects and propensity score matching, but this is a data-intensive approach not feasible in our study.

We use two different regression approaches. In the first, we regress log earnings per hour on lagged log earnings, formality status, and other control variables that measure the worker's human capital – education, gender, and tenure. The inclusion of lagged earnings, while not uncontroversial econometrically, allows us to control for all human capital that is rewarded in the market. In the second approach, we regress change in log earnings over time on formality status, adding other controls. Both approaches provide similar results, but with slightly different point estimates.

In the earnings regression, we control for the worker's variables measured in 2000 including age (dummies for bins of age), educational status (dummies for less than elementary, junior, senior and tertiary), and occupation in the baseline year. Standard errors are robust to heteroskedasticity.

To address endogeneity due to unobserved ability of the worker correlated with formality status in subsequent year, we check robustness of our estimates across multiple specifications.

## **V. Results**

### Descriptive statistics for 2000-2007 sample

In the 2000 survey, there are 2,750 formal workers who meet the demographic criteria and report positive earnings (1,773 are men and 977 are women). This constitutes 25.7% of all workers in the age group. The rate of formality varies greatly by sector and education levels. Mining (54%), manufacturing (49%) and financial services (62%) have highest rates of formal employment. Likewise, more educated workers are more likely to hold formal jobs: their formal employment rate is 35%, against just 19% among those with no more than primary education.<sup>7</sup>

Table 4 shows the distribution of formal workers by occupation, sector and education level for workers who meet our sampling criteria. The table shows that most formal workers are performing low-skilled and semi-skilled tasks – about 45% of formal workers fall within the last three occupational categories, broadly described as “production and related workers, transport operators, and laborers.” Taking advantage of the 2-digit classification of occupations in IFLS we find that largest shares of male formal workers are in construction (11.3% as “stone-layers, carpenters and other building workers”), in transportation (6.3% as “sea and land transportation workers”), and in plantation agriculture (6.2% as “agriculture and animal husbandry workers”). For females, the most common formal occupation is plantation work (17.4%), followed by sales (9.7%), tailoring (7.4%) and teaching (6.9%). A relatively large share of formal work created in the agricultural sector is explained by the development of large plantation estates for oil palm production. It also seems that sources of formal jobs are quite distinct for males and females, indicating some segregation in the labor market by gender.

The other occupational category includes service workers, for example maids, barbers, and housekeepers. This is also confirmed by looking at sectoral distribution of these workers – the majority are employed in manufacturing and social services. Within manufacturing, food and beverage processing workers are the most common, comprising over 16% of formal workers in the manufacturing sector. In terms of education, there seems to be two modes: those with primary or less education and those with senior level education. This indicates that there is heterogeneity in skill requirements within the formal sector, with some formal work requiring little education. These low-skilled formal jobs may contribute greatly to poverty reduction, but are also likely to be more vulnerable to a slowdown in economic growth.

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<sup>7</sup> The informal employment rate among the highest educated workers in our data set is biased upward by inclusion of some government employees classed as in informal employment. Excluding government employees from the sample increases formality rate among tertiary educated workers from 30% to 46%.



[Table 4 Distribution of formal workers in 2000 by occupation, sector and education levels]

The 2007 IFLS contains detailed labor market information for 2,140 of these individuals, out of which 1,892 report being employed. We lose some observations because entire households couldn't be tracked and others because they have moved out of the household. As a result, we have earnings information for 2,130 individuals, reducing the sample by 23%.<sup>8</sup>

The main explanatory variable of interest is formal status in 2007. We create a dummy variable taking a value 1 if displaced and 0 otherwise. Unlike existing work on job displacement which uses administrative data, we do not know directly whether an individual changed employers between 2000 and 2007.<sup>9</sup> The results should be interpreted accordingly – we estimate earnings loss associated with moving out of formal employment.

Transition out of formality is large – just over 42% of workers are still classified as formal in 2007, although greater than 50% are classified as employees. The transitions are slightly different for males and females. Men transition into self-employment and casual non-agricultural employment to a greater extent than other job types, whereas females transition into unemployment and unpaid family work.

Table 5 reports the transition into informality by sector. The table shows that those in manufacturing in 2000 had a slightly greater chance of staying formal than other sectors besides financial services (which is relatively small). Wholesale/retail trade and social services formal workers in 2000 are also more likely to be found in either informal or formal work in 2007. On the other hand, agricultural workers were more likely to transition out of formality to informality. In terms of educational achievement, all those who transitioned out of formality had primary or lower levels of education; formal employment rates were higher for all higher educational levels.

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<sup>8</sup> Attrition could lead to some issues. The distribution of workers in the baseline year, divided by those in and out of the sample in subsequent year, shows some divergence. This is reported in Appendix Table 1. Those not in the 2007 sample are more likely to come from the agricultural sector. Younger workers are also more likely to be missing, possibly due to migration. A similar pattern of attrition is evident between 2007 and 2014, shown in Appendix Table 2. Similarly, those with junior or college level education tend to be missing from the sample. This may lead to possible bias in the estimates but the direction of this bias is uncertain a priori.

<sup>9</sup> Each IFLS survey contains a module on employment history for the previous eight years based on recall data. Due to lack of information necessary to construct our formality measure, we do not use this information.

The heterogeneity within formal jobs is again apparent in the variation in transition rates across different demographics.

[Table 5: Transitions to formality by education levels and sector in 2000.]

### Descriptive statistics for 2007 – 2014 sample

We now examine trends for those formally employed in the later baseline, 2007. There are 3,569 such individuals in the sample, which is 27.5% of total workers fulfilling the demographic criteria. Similar to 2000, formality rates are higher in manufacturing (54%), among those with senior level schooling (36%), and 20-29 year-olds (36%). The earnings differential between formal and informal workers was slightly higher in 2007 than in 2000, ranging from 0.26 log difference in hourly earnings among 20-29 year-olds to 0.46 among 40-53 year-olds.

Table 6 presents distribution of formal workers meeting our sampling criteria by occupation, sector, and education levels. Comparing with 2000 (Table 3), we note that construction and wholesale/retail trade sector comprise a greater share of formal jobs in 2007. Analyzing the distribution of formal workers at 2-digit occupational levels, we find that while construction work still accounts for the largest share of formal workers in 2007 (12.7%), the second largest formal occupation is now sales work (7%). For females, plantation (12%), teaching (9.6%) and sales (9.4%) are the top three formal occupations. The increase in education composition is also noticeable – formal workers have greater proportion of senior and college educated workers.

[Table 6: Distribution of formal workers in 2007 by occupation, sector and education levels]

Once again, we lose a significant portion of this sample between survey waves. Out of the 3,569 workers in 2007, 2,512 are still employed in 2014 and we do not have information on 734. Among those with non-missing job status information, 57% are reported as working in the

formal sector – a much larger proportion than in the 2000-07 sample.<sup>10</sup> This could be partly due to higher levels of reported formality overall in 2014: among males aged 20-53, 34.9% are formally employed, a much higher share than in 2000 or 2007.

[Table 7: Transitions to formality by education levels and sector in 2007]

The importance of education in maintaining formality status becomes clear by comparing the last two columns of Table 7. Less-educated workers were less likely to continue formal employment than high educated workers. The difference between formality rate of lowest and highest educated workers is over 15 percentage points. In 2000-07, this difference was just under 9 percentage points.

Our analysis suggests that attrition could lead to some potential issues. In Appendix Tables A1 and A2, we report shares of worker's status (unemployed, employed, missing) in subsequent year by sector and education of the worker in the baseline years 2000 and 2007 respectively. We find that workers in skill intensive sectors, those that have higher education, are missing at a greater rate. For example, in both the samples, over 30% of higher educated workers are missing from the sample. These workers are likely to have maintained formal jobs had they been in the sample. This may lead to possible bias in the estimates but the direction of this bias is uncertain a priori.

### **Earnings function estimates**

We estimate the earnings equations separately for 2000-07 and for 2007-14. The observations are workers aged 20-53 who were formally employed in the base year (i.e., either 2000 or 2007) and have non-zero earnings in the survey year (i.e., either 2007 or 2014). The variable of interest is the indicator for formal employment in the later year. This takes the value 1 if an individual is still in formal employment, and zero otherwise.

We use two different dependent variables. In one specification, we use the log of earnings in the current year (2007 or 2014) as the dependent variable. In this set of models, we also

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<sup>10</sup> By comparison, about 16% of workers transitioned from non-formal to formal work.

control for lagged earnings (2000 for the 2007 model, 2007 for the 2014 model). In another specification, we use the change in log earnings over time as the dependent variable.

Results are shown in Tables 8 and 9. In each table we report first a basic model without controls other than for the log of baseline earnings, then add age, sex, and education controls and region fixed effects, and finally add occupation controls. Choice of occupation is arguably endogenous, so among the three models, the second is to be preferred on *a priori* grounds. The last three columns of the tables show results in first-difference form.

[Table 8 Impact of displacement on earnings in 2007]

[Table 9 Impact of displacement on earnings in 2014]

Results are quite consistent across models. The dummy for formal employment in the survey year is very precisely estimated in each case and its coefficient values diminish only slightly with the addition of controls. Because we are using a semilog specification with a dummy variable, the elasticity of earnings in the survey year with respect to formal employment status is calculated as  $e^b - 1$ , where  $b$  is the coefficient estimate. For values in the range of our estimates, the elasticities are slightly larger than the coefficient estimates. In Table 8, model (2), formal status is associated, on average, with per hour earnings 25% higher than informal status ( $e^{0.224} - 1 = 0.25$ ). In the differenced version (model 5) the elasticities is 0.22. In Table 9, model (2), the same elasticity is 0.4, or a 40% premium.

Comparing these results with those from previous studies, we can draw a few tentative conclusions. First, the estimated magnitudes of earnings loss are comparable with those from studies of involuntary displacement. Advanced-economy studies, with access to annual data, typically show a sharp earnings drop following displacement, followed by a partial recovery over several subsequent years. Our survey waves are seven years apart and we don't know with any precision when in that interval each worker changed jobs or employment status. Therefore, our results are best understood as an average of short and long-term impacts.

Second, displaced workers in advanced economies typically have access to at least partial income insurance through unemployment benefits or other social safety net instruments. Because of this, estimates of wage declines are likely to be greater than the change in actual income. These mechanisms do not apply in Indonesia – or at least, not through official channels, though

households may engage in less formal sharing behaviors. So our estimates are likely to be closer to actual income changes than seen in the advanced-economy studies.

Third, although we do not as yet have the means to decompose results, our estimates of earnings differences in the survey year must reflect a combination of factors. Among these are losses due to frictional or cyclical unemployment; losses due to reduced returns to sector-specific human capital, and losses due to movement across the extensive margin of formal labor market institutions. Because our data are from an economy undergoing rapid expansion, the first type of earnings loss is likely to be small relative to findings from advanced economies. Moreover, since most of the workers in our sample are blue-collar wage-earners with little formal education, we can speculate with some confidence that the second type of loss is also small relative to other studies. If so, we may hypothesize that the third, institutional effect is a more important driver of observed earnings differences. If that is confirmed, it sharply refocuses attention on labor market policies, since the more stringent of these may cause employers to limit their offers of formal labor contracts (as has been argued for Mexico; see Hansen 2010). This is a topic for deeper investigation in the future.

## **VI. Self-reported displacement and earnings**

The foregoing analysis yields estimates of an average earnings effect of movement from formal to informal sector, but we are unable to establish a rigorous chain of causality. In this section we explore an alternative approach. IFLS 2007 and 2014 asked some detailed questions about an individual's job history over the preceding five years. The surveys asked whether the individual held any salaried positions over the previous five years and, if yes, whether he or she had been fired or had quit. The survey also inquired about the year of the latest job termination and the primary reason for termination.

Based on responses to these questions, we can get one step closer to identifying exogenous job displacement and its impact on earnings. We create a categorical variable "displacement status" that indicates the status of the workers: (1) never held a salaried position; (2) held a salaried position that terminated due to firing;<sup>11</sup> (3) held a salaried job that terminated

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<sup>11</sup> The list of possible reasons included in the surveys are: Fired by the company because business was closed down/relocated/restructured; Fired for other reason; Wage/salary was too low; Not conducive working

due to other reasons; and (4) held a salaried position and never terminated. This variable is closer to the true notion of displacement that has been used in the current literature as it captures separation from an employer. The goal is to relate this variable to differences in earnings.

To keep these results comparable with the earlier work, we focus on workers aged between 27 and 60 in the survey year. This keeps the sample's age consistent with the earlier analysis. Second, our estimation sample is limited to workers who are (1) currently formal and never displaced (assuming they were formal before as well<sup>12</sup>), or (2) displaced from a formal job, where we use the same definition of formality as before.<sup>13</sup>

One issue is that earnings information from previous jobs is asked of only those who report being displaced, which means we cannot compare earnings growth due to lack of information on past earnings for workers who are never displaced. We address this issue by merging information from the previous survey for workers who appear in both years. Second caveat is that workers are displaced at different times within the last five years. Due to the small sample, we pool all workers who are displaced into the aforementioned categories without distinguishing the timing of displacement.

Before exploring the earning patterns, we look at worker characteristics and labor market status by displacement status for all workers. These are shown in Tables 10 and 11. The first three columns in each table report demographic characteristics, the next column employment status, and the final column median earnings. Our 2007 sample comprises of 2,593 individuals,<sup>14</sup> of which almost 10% reported displacement due to firing or business closure. Our 2014 sample comprises 4,275 workers, of which 220 (5%) are displaced involuntarily and 1,040 report voluntary job changes.

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environment; Refused being relocated; Prolonged sickness; Marriage; Childbirth; Other family reason. We consolidate workers experiencing displacement into "fired" (first two reasons) and "other reasons."

<sup>12</sup> This may not be exactly accurate as the size of these workers' firms may have expanded over time.

<sup>13</sup> The workers who reported being displaced were asked about the size of their firm and whether they worked in the government or private sector.

<sup>14</sup> To arrive at respective sample for each year, we start with the individuals who appeared in the displacement module. We exclude workers who did not fall into our age range or those who never held salaried jobs. If the worker reported being displaced, we check to ensure that they were non-government workers employed at a firm with at least 5 workers. If they reported never being displaced, we check their current formality status and remove those who were currently informal.

The tables show that gender and education is highly correlated with displacement status. The sample of workers who report involuntary displacement comprises mostly of men. Those with tertiary education tend to have stable salaried jobs or voluntarily switch employment. Only 14% of workers who were involuntarily displaced at tertiary level education, while this percent is over 21 for the other two categories. Furthermore, those experiencing displacement have under 60% formality rate in both years. Current formality rate is similar for workers who were displaced, regardless of the stated reason. Conditional on employment, median earnings are much higher than median earnings of workers who never experienced displacement.

Comparing these statistics across years, we find a greater share of formal workers reporting involuntary displacement in 2007. Furthermore, median earnings of those who changed jobs voluntarily are very similar to those never displaced in 2014. However, it is not clear whether this suggests an improvement in the health of Indonesian labor market, as the sample is highly selected and not representative of the Indonesian economy in those years.

[Table 10 Characteristics of workers in 2007 by displacement category]

[Table 11 Characteristics of workers in 2014 by displacement category]

In Figure 5 we look at the cumulative distribution of log hourly earnings by displacement status in 2007. The graph reveals that while continued employment dominates displacement at the lower end in terms of expected earnings, there is considerable overlap in the distribution at the upper tail. This is illustrative of the two broad types of individuals who make up the displaced sample – a very small number who left their original employment for a better opportunity (or who were exogenously displaced but “landed on their feet”), and those that were forced or sorted into lower earnings. Similar patterns are also evident in 2014, as shown in Figure 6.

[Figure 5 Distribution of log hourly earnings by displacement status in 2007]

[Figure 6 Distribution of log hourly earnings by displacement status in 2014]

We now analyze the impact of displacement status on earnings in a regression setting. The dependent variable is log of hourly earnings and the main explanatory variable is displacement status. As in the previous section, we control for human capital variables including gender, age categories, and education, and lagged earnings information from the preceding

survey (2000 or 2007). Merging with previous surveys inevitably leads to loss of some observations as they do not appear in those surveys.

Table 12 and 13 report results from 2007 and 2014 sample respectively. In 2007, we find that those with stable formal jobs had greater earnings relative to those involuntarily displaced. In this case, the results are robust to inclusion of additional controls and alternative dependent variables. In 2014, the results are similar when we use estimation with lagged earnings as one of the controls, but the statistical significance of the results disappears in the difference model. This could again indicate some improvement in labor market conditions and post-AFC recovery. However, we still need to interpret the results with caution due to small sample size.

[Table 12 Regression results from self-reported displacement 2007]

[Table 13: Earnings growth and displacement, 2014]

## **VII. Conclusions**

Indonesia is a developing economy which, by virtue of its specialization in natural resources, minerals and labor-intensive manufactures, is especially vulnerable to shocks from the global market. In the 2000s Indonesia experienced rapid growth and equally rapid structural change, largely as a consequence of global market trends. Both the overall growth of the economy and price-induced changes in the structure of production led to large changes in the vitality and composition of labor demand. Textbook models of economic growth and trade predict that greater openness and more growth should raise labor demand and productivity in low-income, labor-abundant economies. Yet in Indonesia, an export boom and rapid GDP growth in the decade after 2000 was accompanied by real wages that were flat on average, and declining earnings for a large fraction of workers. This is likely because the source of growth was not low-skilled manufacturing, as was the case before the AFC, but exports of natural resources.

We explored these seemingly paradoxical trends using individual employment data from the Indonesian Family Life Survey (IFLS). We hypothesized that observed trends in wages and earnings may be connected to involuntary changes in sector or occupation. We found that the earnings of workers with informal jobs who had held formal jobs in a previous survey round



were significantly lower relative to workers who remained in the formal market—and that this effect appears to be much larger than any effect due to changing returns to sector-specific skills. This distinction adds an important developing-country dimension to the job displacement literature.

Our findings in this research add one piece to the puzzle of the causes of a startling increase in Indonesia inequality during the same decade. From 2003-2013, Indonesia's Gini coefficient for individual income inequality rose one third, from 0.32 to 0.43 (Yusuf, Sumner and Rum 2014). This rise has many possible causes, both from income changes and from fiscal and other policies, and a formal decomposition of changes in the Gini has yet to be conducted. But the magnitude of the shift away from formal employment and the earnings drop experienced by workers so displaced is undoubtedly a strong contributing factor.

The phenomenon of job displacement and what appears as “jobless growth” during an economic boom may be a uniquely Indonesian paradox, but the conditions in which they become possible are broadly shared in the developing world. While displacement to informal employment is almost certainly part of the explanation, the constraint of working with a dataset that is designed for other purposes means that the task of establishing a rigorous *causal* connection remains incomplete. At an individual level, more work is needed to identify characteristics that may predict job displacement. At the labor market level, the apparent displacement of workers from formal sector jobs has several possible causes. These include secular changes in economic structure, trade-induced changes in industry-level activity and employment, and domestic policy innovations. Identifying these and distinguishing among them is an important task for future work.

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## Figures

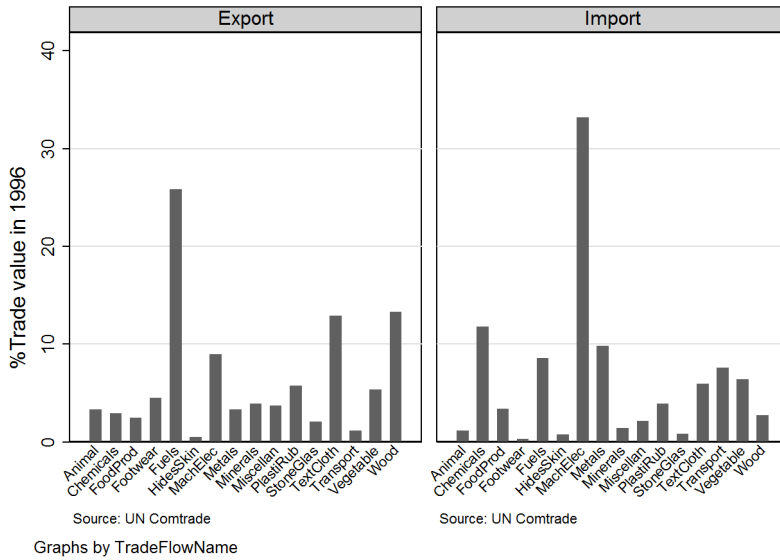
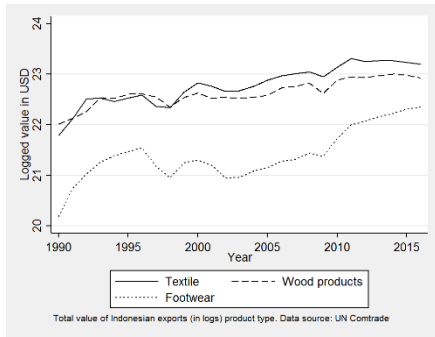
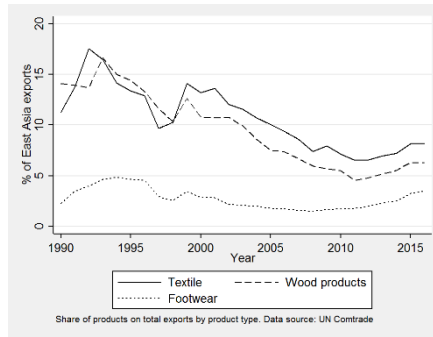


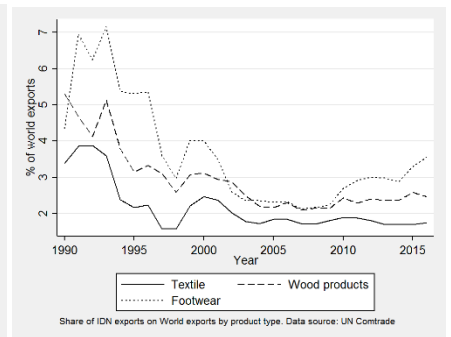
Figure 1 Indonesia's export and import composition by sectors in 1996. Data source: UN Comtrade.



(a) Total value



(b) Share in total domestic exports



(c) Share in world exports

Figure 2 Trends in Indonesia's exports of key products, 1990-2016. Data source: UN Comtrade.

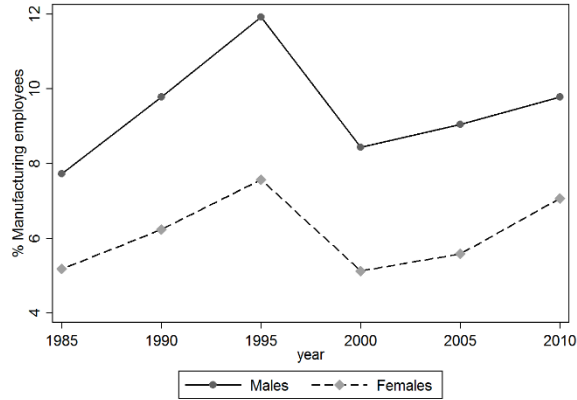


Figure 3: Manufacturing employment as share of the population aged 20-49 for males and females

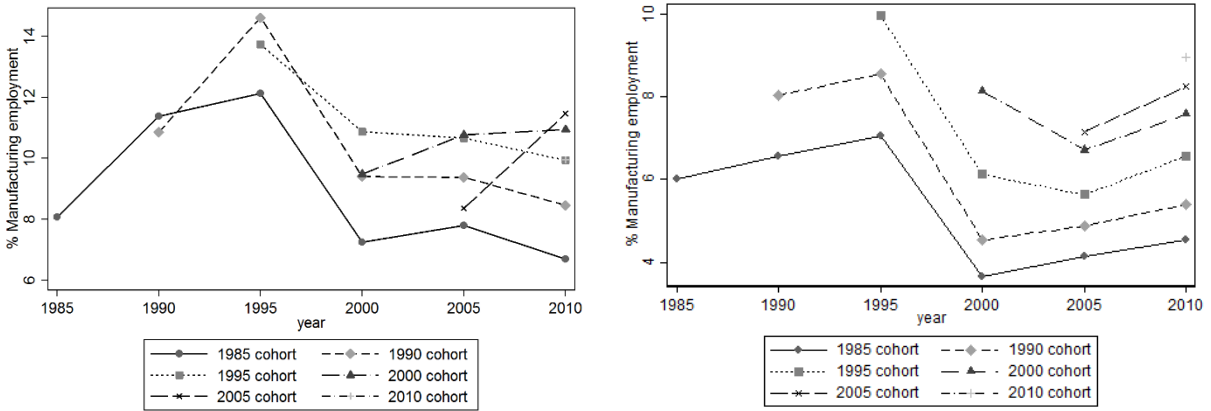


Figure 4: Trends in share of male and female manufacturing employment by age cohort. Age cohorts are aged 20-24 years old in the first year of their appearance.

Source: Authors' computations using census data obtained from IPUMS (Minnesota Population Center 2017).

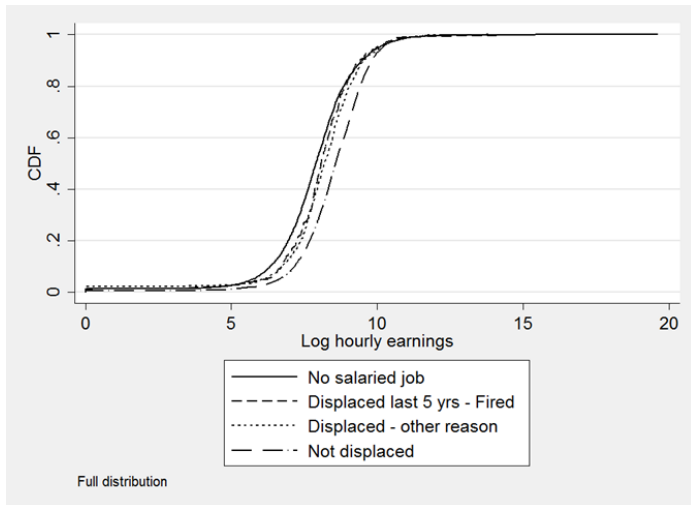


Figure 5: Distribution of log hourly earnings by displacement status in 2007

Source: Authors' calculation from IFLS 2007

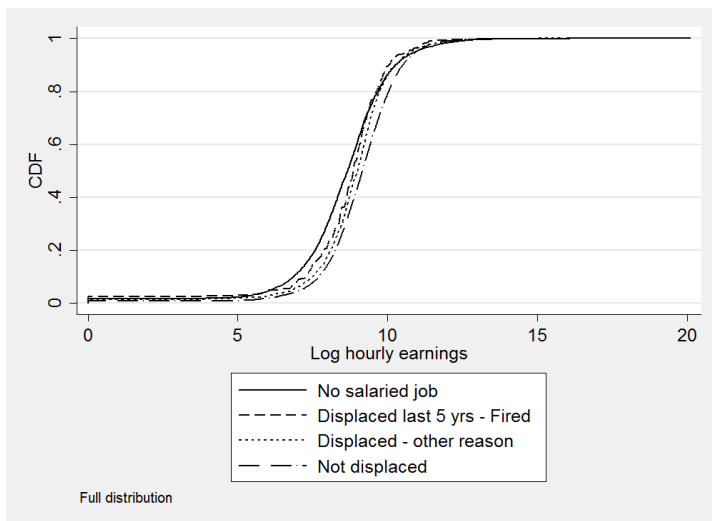


Figure 6: Distribution of log hourly earnings by displacement status in 2014

Source: Authors' calculation from IFLS 2014



## Tables

Table 1: Employment characteristics in Indonesian Family Life Survey data, 1993-2014

Table 1a: Distribution of workers aged 20-65 by occupation (%)

	1993	1997	2000	2007	2014
Professional	4.59	5.28	4.81	5.09	5.37
Admin	1.92	0.24	0.37	0.32	0.41
Clerical	3.62	5.21	4.38	4.24	5.74
Sales	18.69	22.19	16.28	19.02	19.73
Service	6.76	5.09	14.71	15.26	15.72
Agriculture	38.90	33.37	32.83	30.07	25.13
Production	8.13	9.75	8.28	7.70	7.58
Semi-skilled	3.21	4.44	3.00	3.07	3.23
Laborer	12.32	12.54	13.52	13.29	15.01
Others	1.85	1.90	1.83	1.94	2.08
<i>N</i>	9064	10540	14899	18174	21819

Source: Authors' calculation from various IFLS surveys

Table 1b: Distribution of workers aged 20-65 by sector (%)

	1997	2000	2007	2014
Agriculture	33.56	33.06	30.25	25.76
Mining	0.62	0.55	0.64	1.30
Manufacturing	15.64	13.88	13.34	13.07
Utilities	0.51	0.34	0.32	0.51
Construction	5.58	4.50	4.78	5.00
Wholesale/retail trade	22.52	22.20	24.69	25.52
Transport	4.54	4.19	3.51	2.45
Fin. services	0.85	0.78	0.89	4.70
Social services	16.18	20.50	21.57	21.68
<i>N</i>	10540	14896	18174	21819

Source: Authors' calculation from various IFLS surveys. IFLS 1993 did not contain sector categories.

Table 2: Proportional of formal jobs by occupation and sector

Table 2a: Proportion of formal jobs by occupation

	2000	2007	2014
Professional	0.26	0.29	0.36
Admin	0.25	0.24	0.51
Clerical	0.41	0.44	0.52
Sales	0.11	0.12	0.13
Service	0.17	0.19	0.24
Agriculture	0.10	0.09	0.13
Production	0.39	0.39	0.48
Semi-skilled	0.45	0.53	0.58

Laborer	0.31	0.35	0.39
Others	0.30	0.27	0.37
<i>N</i>	14899	18174	21819

Source: Authors' calculation from various IFLS surveys. Sample includes workers aged 20-65 in each survey. IFLS did not collect firm size information to measure formality in 1993 & 1997.

A worker is classified as formal if they are private employees with 5 or more workers.

Table 2b: Proportion of formal jobs by sector

	2000	2007	2014
Agriculture	0.10	0.10	0.12
Mining	0.48	0.34	0.48
Manufacturing	0.43	0.46	0.56
Utilities	0.24	0.41	0.54
Construction	0.37	0.43	0.46
Wholesale/retail trade	0.11	0.12	0.17
Transport	0.17	0.20	0.32
Fin. services	0.61	0.63	0.49
Social services	0.24	0.26	0.27
<i>N</i>	14896	18174	21819

Source: Authors' calculation from various IFLS surveys. Sample includes workers aged 20-65 in each survey. IFLS did not collect firm size information to measure formality in 1993 & 1997.

Table 3: Characteristics of formal jobs: earnings and benefits

	2000		2007	
	Informal	Formal	Informal	Formal
Med. log hourly earnings	7.13	7.38	7.96	8.34
Job benefits <sup>a</sup>				
Housing benefits	0.04	0.06	0.04	0.06
Car	0.02	0.04	0.01	0.03
Transport allowance	0.09	0.22	0.07	0.17
Health expense	0.12	0.30	0.10	0.22
Insurance policy	0.04	0.22	0.08	0.24
Clinic	0.05	0.22	0.06	0.15
Credit	0.26	0.38	0.21	0.28
Number of observations	9695		11732	

Informal excludes government employees. Number of observations pertain to earnings data.

(a) Benefits questions were only asked of employees (N=4910 in 2000 and 6646 in 2007)

Table 4: Distribution of formal workers in 2000 by occupation, sector and education levels

Occupation	%	Sector	%	Education	%
Professional	5.93	Agriculture	15.74	≤ Primary	36.74
Clerical	0.51	Mining	1.35	Junior HS	16.08
Admin	9.17	Manufacturing	30.86	Senior HS	33.90
Sales	9.03	Utilities	0.36	≥ College	13.28
Service	11.98	Construction	8.49		
Agriculture	15.51	Wholesale/retail trade	12.35		
Production	16.89	Transport	3.68		
Semi-skilled	6.99	Fin. services	2.48		
Labourer	21.15	Social services	24.70		

Total number of observations is 2749. Source: Authors' calculation from Indonesian Family Life Survey 2000.

Table 5: Transitions to formality by education levels and sector in 2000.

Sector in 2000	N	% Formal	Education levels	N	% Formal
Agriculture	340	0.31	≤ Primary	841	0.38
Mining	30	0.33	Junior HS	333	0.38
Manufacturing	683	0.47	Senior HS	721	0.49
Utilities	9	0.44	≥ College	244	0.47
Construction	188	0.40			
Wholesale/retail	269	0.46			
Transport	71	0.42			
Fin. services	40	0.60			
Social services	507	0.41			

Note: Total number of observations is 2137. Source: Authors' calculation from Indonesian Family Life Survey 2000 and 2007.

Table 6: Distribution of formal workers in 2007 by occupation, sector and education levels

Occupation	%	Sector	%	Education	%
Professional	7.23	Agriculture	13.17	≤ Primary	27.29
Clerical	0.34	Mining	1.01	Junior HS	15.77
Admin	8.85	Manufacturing	29.48	Senior HS	38.64
Sales	11.24	Utilities	0.48	≥ College	18.30
Service	13.51	Construction	9.53		
Agriculture	12.75	Wholesale/retail	14.54		
Production	14.35	Transport	3.25		
Semi-skilled	7.82	Fin. services	2.63		
Laborer	21.49	Social services	25.92		

Note: Total number of observations is 3,569. Source: Authors' calculation from Indonesian Family Life Survey 2007.

Table 7: Transitions to formality by education levels and sector in 2007

Sector in 2007	N	% Formal	Education	N	% Formal
Agriculture	343	0.45	≤ Primary	733	0.48
Mining	26	0.46	Junior HS	407	0.55
Manufacturing	740	0.63	Senior HS	955	0.64
Utilities	12	0.75	≥ College	416	0.63
Construction	261	0.49			
Wholesale/retail	350	0.59			
Transport	84	0.49			
Fin. services	58	0.53			
Social services	637	0.64			

Note: Total number of observations is 2,511. Source: Authors' calculation from Indonesian Family Life Survey 2007 and 2014.

Table 8 Impact of displacement on earnings in 2007

	Hourly earnings (logs)			Difference		
	(1)	(2)	(3)	(4)	(5)	(6)
Formal	0.260*** (0.0546)	0.224*** (0.0536)	0.210*** (0.0535)	0.198*** (0.0596)	0.172*** (0.0603)	0.164*** (0.0605)
Lag Log earnings per hr	0.467*** (0.0366)	0.300*** (0.0352)	0.288*** (0.0347)			
Constant	4.695*** (0.273)	5.675*** (0.258)	5.870*** (0.288)	0.790*** (0.0454)	0.958*** (0.109)	0.928*** (0.167)
Demographic vars	No	Yes	Yes	No	Yes	Yes
Educ	No	Yes	Yes	No	Yes	Yes
Occupation	No	No	Yes	No	No	Yes
Region	No	Yes	Yes	No	Yes	Yes
Observations	1761	1760	1758	1761	1760	1758

Robust standard errors in parenthesis. Source IFLS 2000 and 2007. Sample includes workers in 2007 with positive earnings who were aged 20-53 and formally employed in 2000. Age dummies include 30-39 and 40-53 with 20-29 as base group. Region dummies include indicators for Java, Kalimantan, Sulawesi and Papua, with Sumatera as base group. Demographic vars include male dummy, age dummies, and education. Occupation vars includes indicators for 9 categories of occupation. \* p<.1, \*\* p<.05, \*\*\* p<.01

Table 9 Impact of displacement on earnings in 2014

	Hourly earnings (logs)			Difference		
	(1)	(2)	(3)	(4)	(5)	(6)
Formal	0.343*** (0.0646)	0.313*** (0.0642)	0.301*** (0.0643)	0.257*** (0.0679)	0.258*** (0.0697)	0.343*** (0.0646)
Lag Log earnings per hr	0.429*** (0.0379)	0.309*** (0.0376)	0.291*** (0.0381)			0.429*** (0.0379)
Constant	5.278*** (0.305)	5.848*** (0.319)	6.419*** (0.361)	0.616*** (0.0607)	0.705*** (0.123)	5.278*** (0.305)
Demographic categories	No	Yes	Yes	No	Yes	Yes
Educ	No	Yes	Yes	No	Yes	Yes
Occupation	No	No	Yes	No	No	Yes
Prov	No	Yes	Yes	No	Yes	Yes
Observations	2336	2336	2336	2336	2336	2336

Robust standard errors in parenthesis. Source IFLS 2007 and 2014. Sample includes workers in 2007 with positive earnings who were aged 20-53 and formally employed in 2000. Age dummies include 30-39 and 40-53 with 20-29 as base group. Region dummies include indicators for Java, Kalimantan, Sulawesi and Papua, with Sumatera as base group. Demographic vars include male dummy, age dummies, and education. Occupation vars includes indicators for 9 categories of occupation.

\* p<.1, \*\* p<.05, \*\*\* p<.01

Table 10 Characteristics of workers in 2007 by displacement category

	Age	Male	Tertiary edu	Formal	Non gov workers
Displaced last 5 yrs - Fired	36.53	0.81	0.13	0.52	3571.43
Displaced - other reason	34.54	0.74	0.25	0.50	3900.00
Not displaced	36.45	0.67	0.20	1.00	4813.16
<i>N</i>	2593				

Source: Authors' calculations from IFLS 2007. Sample includes workers aged 27-60. For earnings, only those with non-missing earnings information and non-government workers are included.

Table 11 Characteristics of workers in 2014 by displacement category

	Age	Male	Tertiary edu	Formal	Non gov workers
Displaced last 5 yrs - Fired	37.45	0.80	0.14	0.59	7694.13
Displaced - other reason	35.25	0.73	0.22	0.58	9209.04
Not displaced	37.50	0.63	0.21	1.00	9558.82
<i>N</i>	9987			9263	8470

Source: Authors' calculations from IFLS 2014. Sample includes males aged 25-60. For earnings, only those with non-missing earnings information are included.

Table 12 Regression results from self-reported displacement 2007

	(1)	(2)	(3)	(4)
Displaced - other reason	0.225 (0.155)	0.150 (0.157)	0.261 (0.160)	0.223 (0.163)
Not displaced	0.473*** (0.130)	0.454*** (0.131)	0.425*** (0.135)	0.394*** (0.138)
Log earnings 2000	0.494*** (0.0375)	0.333*** (0.0426)		
_cons	4.344*** (0.310)	5.175*** (0.340)	0.649*** (0.132)	0.762*** (0.178)
Human capital vars	No	Yes	No	Yes
Region dummies	No	Yes	No	Yes
Observations	1519	1519	1519	1519

Robust standard errors in parenthesis. Source IFLS 2000 and 2007. Sample includes workers in 2007 who were salaried 5 years before and aged 27-60. Age dummies include 40-49 and 50-60 with 27-39 as base group. Region dummies include indicators for Java, Kalimantan, Sulawesi and Papua, with Sumatera as base group. Human capital vars include male dummy, age dummies, education in 2007. Occupation vars includes indicators for 9 categories of occupation.

\* p<.1, \*\* p<.05, \*\*\* p<.01

Table 13: Earnings growth and displacement, 2014

	(1)	(2)	(3)	(4)
Displaced - other reason	0.320** (0.154)	0.329** (0.149)	0.292 (0.213)	0.265 (0.214)
Not displaced	0.372** (0.147)	0.414*** (0.143)	0.241 (0.201)	0.246 (0.203)
Log earnings 2007	0.195*** (0.0215)	0.139*** (0.0190)		
_cons	7.185*** (0.226)	7.142*** (0.208)	0.747*** (0.198)	1.074*** (0.246)
Human capital vars	No	Yes	No	Yes
Region dummies	No	Yes	No	Yes
Observations	2545	2545	2545	2545

Robust standard errors in parenthesis. Source IFLS 2007 and 2014. Sample includes workers in 2014 who were salaried 5 years before and aged 27-60. Age dummies include 40-49 and 50-60 with 27-39 as base group. Region dummies include indicators for Java, Kalimantan, Sulawesi and Papua, with Sumatera as base group. Human capital vars include male dummy, age dummies, education in 2014.

\* p<.1, \*\* p<.05, \*\*\* p<.01

## Appendix

Table A1: Distribution of workers in 2000 across occupation, age and schooling by their presence in the 2007 sample

<i>Sector in 2000</i>	Unemployed	Employed	Missing	<i>Education</i>	Unemployed	Employed	Missing
Agriculture	9.95	68.75	21.30	Primary or less	10.10	73.17	16.73
Mining	2.70	78.38	18.92	Junior	10.63	64.71	24.66
Manufacturing	12.63	68.00	19.36	Senior	8.37	68.99	22.64
Utilities	0.00	90.00	10.00	College	5.75	61.10	33.15
Construction	4.29	76.39	19.31				
Wholesale/retail trade	11.80	67.55	20.65				
Transport	0.99	69.31	29.70				
Fin. services	2.94	55.88	41.18				
Social services	6.49	68.29	25.22				

Rows sum to 100%

Table A2: Distribution of workers in 2007 across sector, schooling by their status in the 2014 sample

<i>Sector in 2007</i>	Unemployed	Employed	Missing	<i>Education</i>	Unemployed	Employed	Missing
Agriculture	12.13	72.98	14.89	Primary or less	10.68	75.36	13.96
Mining	0.00	72.22	27.78	Junior	9.59	72.29	18.12
Manufacturing	11.22	70.44	18.35	Senior	9.21	69.25	21.54
Utilities	0.00	70.59	29.41	College	5.82	63.71	30.47
Construction	3.82	76.76	19.41				
Wholesale/retail trade	10.60	67.44	21.97				
Transport	6.03	72.41	21.55				
Fin. services	8.51	61.70	29.79				
Social services	7.03	68.86	24.11				