Poverty, labour markets and trade liberalization in Indonesia

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Abstract

We measure the effects of trade liberalization over the period of 1993-2002 on regional poverty levels in 259 Indonesian regions, and investigate the labour market mechanisms behind these effects. The identification strategy relies on combining information on initial regional labour and product market structure with the exogenous tariff reduction schedule over four three-year periods. We distinguish between tariffs for output markets and for intermediate inputs, and find that poverty reduced more in regions that were more strongly exposed to import tariff liberalization. Among the potential channels behind this effect, we show that job formation and increases in low-skilled wages were related to reductions in import tariffs on intermediate goods and not to reductions in import tariffs on final outputs. These results point towards increasing firm competitiveness as a driving factor behind the beneficial poverty effects.

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Keywords: Trade liberalization, labour markets, poverty, Indonesia

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1. Introduction

Trade liberalization has been widely expected to contribute substantially to poverty reduction in developing countries (e.g., the Doha Ministerial Declaration, WTO 2001). Under a more open trade regime, rising demand for unskilled labour could benefit poor workers by increasing workers' real wages (Stolper and Samuelson 1941) as well as creating more jobs in the formal economy. However, the growing body of micro-empirical evidence on the welfare implications of trade liberalization is not unequivocal.[1] Short- to medium-run labour market effects of liberalized trade seem to be very much context specific and depend among others on the previous structure of protection (Attanasio et al. 2004), regional market access (Chiquiar 2008) as well as the degree of market flexibility. For example, overregulated local labour markets that inhibited the adjustment to structural change could explain the unfavourable regional poverty effects of trade reform in India (Topalova 2010).[2] By contrast, bilateral trade liberalization between the US and Vietnam led to clear reductions in Vietnamese rural poverty, potentially also due to higher labour market mobility (McCaig 2011). In this latter case, poverty reduction resulted from large improvements in the access to the US market whereas the loss of import protection to local markets was negligible. The question remains whether multilateral trade liberalization episodes, where the reduction in import protection and hence temporary job displacement plays a potentially larger role, could also benefit the poor.

Studies focusing on labour market and wage effects of tariff reductions present indirect evidence on potential effects of trade liberalization on poverty, again with mixed results. Reductions in protection and increased foreign competition generally seem to have increased skill premia in Latin America (e.g., Attanasio et al. 2004, Galiani and Sanguinetti 2003, Goldberg and Pavcnik 2005), although with some exceptions (e.g., Gonzaga et al. 2006 for Brazil). While most of these studies focus on formal manufacturing employment, Goldberg and Pavcnik (2003) also document an increase in informality in the sectors most exposed to tariff cuts in Colombia, although not in Brazil. These empirical findings of increases in skill premia and informality in Latin America suggest that it is less likely that trade would have had strongly favourable poverty effects in the region. However, contrasting evidence is presented by Porto (2006) who finds pro-poor distributional effects of Mercosur in Argentina through price changes and wage responses.

[1] See e.g., Goldberg and Pavcnik (2007) and Winters et al. (2004) for surveys of the earlier literature.
[2] In a similar vein, tariff reductions in Brazil were associated with increases in urban poverty, which anecdotal evidence attributes to adjustment frictions and rising urban unemployment (Castilho et al. 2012).

Indonesia offers an interesting case to study the poverty effects of trade liberalization. It is considerably more abundant in unskilled labour than large Latin American countries such as Mexico or Brazil and hence has a more pronounced comparative advantage in unskilled-labour intensive goods. In the period that we will study in this paper, Indonesia also had relatively flexible labour markets that could potentially restrict the adverse effects of trade reforms on poverty. Moreover, its vast geographic and economic diversity yields potentially large regional variation in the effects of trade liberalization.

With the completion of the Uruguay round in 1994, Indonesia committed itself to substantially lower its remaining tariff barriers across all tradable goods over the following ten years. The tariff reductions were concentrated in the hitherto most protected sectors and resulted in an overall convergence of sectoral protection levels; average import tariff lines decreased from around 17.2 percent in 1993 to 6.6 percent in 2002 (see Figure 1). During the same period, poverty rates also declined, although it is a priori unclear to what extent this decrease can be attributed to trade liberalization.

The existing empirical evidence suggests that trade liberalization could potentially explain a part of the reductions in Indonesian poverty during the nineties. Amiti and Cameron (2012) show that industrial skill premia (defined as the relative wage bill of nonproduction to production workers in manufacturing establishments with at least twenty employees) decreased as a response to tariff reductions. By distinguishing between tariffs on output and intermediate goods used by those firms they are also able to show that skill premia changed mostly because of improved firm competitiveness due to reductions in tariffs on intermediate goods. Kis-Katos and Sparrow (2011) document that child labour decreased faster in regions that were relatively more exposed to trade liberalization, with indirect evidence that this was driven by positive income effects for the poor. Descriptive evidence also shows the presence of ongoing structural change and reductions in wage inequality (Suryahadi 2003) as well as improvements in labour conditions (Robertson et al. 2009) over the same time period. However, this evidence, although suggestive, does not directly address the poverty effects of trade liberalization and the relative importance of the different channels for poverty reduction.

In this study we assess the causal effects of tariff reductions on poverty in Indonesian districts in the period of 1993 to 2002. Our study extends the literature on the poverty effects of trade liberalization by explicitly distinguishing tariffs for output markets and for intermediate inputs, and analysing the effects of reducing these tariffs in a geographically diverse Southeast-Asian country with large labour

mobility. Using district pseudo-panel data, we find that tariff reductions reduced the depth and severity of poverty.

In addition, our analysis focuses on the channels of labour market dynamics, job formalization, wages, job creation and displacement. With regard to wage effects and job creation, we are able to identify the regionally differential effects of tariffs on output and intermediate goods using firm level data (following Amiti and Cameron, 2012) and labour market surveys. We find that increased competitiveness of firms due to lower import tariffs on intermediate goods offers the main explanation for increases in manufacturing employment and wages. This contributes to the scant empirical evidence on the effects of trade liberalization on labour markets, in particular highlighting the differences in the mechanisms of liberalization affecting intermediate and output goods.[3]

The next section presents the data sources for the pseudo-panel analysis and section 3 describes the context and trends in tariff reductions and poverty. Section 4 presents the identification strategy; the results follow in section 5. Section 6 discusses caveats, considers potentially remaining sources of bias and provides a sensitivity analysis. Section 7 concludes.

2. Data

We measure the extent of trade liberalization by reductions in the average (unweighted) tariff lines in 19 tradable goods sectors for the years 1993, 1996, 1999, and 2002.[4] The source of the tariff information is the UNCTAD-TRAINS database (retrieved through the WITS system of the World Bank). We combine this tariff data with information on the district level labour market structure before the tariff reform, based on the 1990 Indonesian Census.[5] It provides the main sector of occupation for each individual in the sample at the 2-digit level. In order to combine tariff data with the information on labour market structure, we compute average tariffs at the same level of product aggregation as the available labour market data; we are thus able to distinguish between 5 subsectors in agriculture (plants and animals; forestry; hunting; sea fishery; fresh-water fishery), 6 subsectors in mining (coal; metal ore; stones; salt; minerals and chemicals; other mining) and 9 in

[3] Goldberg and Pavcnik (2003) assess the effects of trade liberalization on the informal sector in Brazil and Colombia. Autor, Dorn and Hanson (2012) look at job displacement in the US due to imports from China, while Iacovone, Rauch and Winters (2013) find displacement effects in Mexico as a result of increased competition from China for its exports on US markets.

[4] Since tariff data is missing for the years 1994, 1997 and 1998, we base our analysis on four equally spaced time periods.

[5] We use a 1% random sample available for public use through the IPUMS system (Minnesota Population Center, 2011).

manufacturing (food, beverage and tobacco; textile, apparel and leather; wood and products; paper and products; chemicals; non-metallic mineral products; basic metals; metallic products; other manufacturing).

Our primary source of household information is the annual national household survey, *Susenas* (*Survei Sosial Ekonomi Nasional*). This repeated cross-section survey is representative at the level of Indonesian districts.[6] Poverty measures are derived from a comparison of monthly per capita household expenditures with province-specific urban/rural poverty lines (based on Suryahadi, Sudarno and Pritchett, 2003). Based on this, we calculate three poverty measures: the poverty headcount ratio (P0, the ratio of people living under the poverty line), the poverty gap (P1, the aggregated income gap of the poor normalized by the total income needed to reach the poverty line), and the squared poverty gap (P2, depicting the depth of poverty, which is defined as the sum of squared individual deviations from the poverty line of those living below the poverty line, normalized by the squared value of the poverty line income).

We use additional information from *Susenas* to record whether individuals are active in the labour market and whether they are employed in the formal sector. All adults (aged 16 years or older) are considered to be active in the labour market if they report having a permanent job, having worked at least one hour during the week preceding the survey, or having been in search for work. Formal employment is defined as working for an employer with permanent workers, the government or a firm in the private sector. Because of changes in questionnaire design, we can consistently measure formality only until 1996. We also record the primary sector of work for each individual in the sample and distinguish between agriculture, mining, manufacturing and a number of service industries (utilities, construction, trade, transportation, financial and other services).

A second source of individual level information is the annual labour force survey, *Sakernas* (*Survei Angkatan Kerja Nasional*). This allows us to compute monthly wages, which are not available from the household surveys. *Sakernas* data are representative at the level of 27 provinces.

Information on the number of industrial workers and on total industrial wage payments in each district comes from the annual industrial census SI (*Survei Industri*) that includes all Indonesian firms operating with at least 20 employees. Additionally, we use the data on SI firms to describe the regional industrial structure, which enables us to generate alternative regional tariff exposure measures for 60 tradable output sectors.

[6] For calculating district level variables we use the population weights provided in *Susenas*.

Following Amiti and Konings (2007) and Amiti and Cameron (2012), we distinguish between the reduction in tariffs on outputs and intermediate inputs, by generating a proxy of the regional sectoral input structure based on regional outputs and a national input-output-table. We use the latest national input-output table from the time period before the reforms, which distinguishes between 161 input and output sectors. The IO-table is based on the economic census (*Sensus Ekonomi*) of 1990, and has been compiled by Statistics Indonesia (BPS). We combine this information with the regional economic structure (based on either sector labour market shares or industrial production) and our tariff variables.

Information on migration flows across regions is derived from the intercensal survey Supas (*Survei Penduduk Antar Sensus*) from 1995, available through IPUMS (Minnesota Population Center, 2011). In order to incorporate migration data, we adjust the analyzed time frame to reflect the 5-year recollection period of Supas. Due to the lower number of districts covered in the intercensal survey, the analysis of migration refers to 203 districts only.

We use these various data sources to build a balanced pseudo-panel of Indonesian districts, which are classified as either rural districts (*kabupaten*) or municipalities (*kota*). Districts are practical units of analysis for assessing the poverty effects of trade liberalization as they are well defined geographic areas and key administrative units in Indonesia that reflect local labour markets. During the period under study, new districts emerged as a result of district splits. We deal with these splits by applying the 1993 district definition frame.[7] Some of the districts had to be dropped from the sample. After excluding peripheral regions with incomplete or missing socio-economic data (all districts in the provinces of Aceh, Maluku and Irian Jaya) as well as East Timor (which gained independence in 1999) we are left with a balanced panel of 259 districts. Table 1 presents descriptive statistics for the sample.

3. Descriptive trends

Indonesia started to liberalize its trade regime from the mid-1980s, involving a first reduction in tariff lines and a slow tariffication of nontariff barriers (Basri and Hill 2004). These reforms were accompanied by reforms of fiscal policy, tax reforms and financial deregulation. The second wave of

[7] Districts splits followed almost entirely sub-district boundaries within the relevant district, and did not affect borders with neighboring districts. See Fitrani, Hofman and Kaiser (2005) for a more complete account of this process. Statistics Indonesia maintains a full list of district codes over time (see http://www.bps.go.id/mstkab/mfkab_03_09.pdf). Maps in Figure 2 and Figure 3 show the boundaries of 440 districts (based on PODES 2000), filled with information on 259 original districts.

trade liberalization started in the beginning of the 1990s. By the end of the Uruguay round, Indonesia entered formal multilateral agreements to apply binding tariff ceilings of maximum 40% on 95% of its products (up from 9% of binding tariff ceilings before) (WTO 1998). In May 1995 Indonesia announced a unilateral tariff reduction schedule, to be accomplished by 2003, that went even further than its WTO obligations (WTO 1998).

Figure 1 shows the reduction in average unweighted effectively applied tariff lines across the 1990s: on average, tariff lines reduced from 17.2% in 1993 to 6.6% in 2002. Tariff reductions were the largest preceding the formation of the WTO but a second substantial wave of tariff reductions followed in the post monetary crisis period as part of the IMF conditionality package, starting with 1999. Table 2 shows the detailed evolution of the tariff schedule for 20 major tradable sectors, which are defined according to a concordance of tariff information and census labour market data. These tariff reductions happened across the board and were the highest in those industries that started with the highest original tariff levels, due to the prevalence of firm-specific protection measures in Indonesia (Basri and Hill 1996). In particular, some manufacturing sectors (such as wood, textiles or other manufacturing) with high initial average levels of protection saw average tariff rates reduce to below 10% by 2002. The food sector is an exception (with an average tariff of 12.6% in 2002), partly because of tariffication and later exemption of alcoholic beverages.

The period before the economic crisis was also characterised by high labour market flexibility and a highly elastic supply of unskilled labour (Manning 2000). The early 1990s saw a continued shift from agricultural towards urban employment, an expanding service sector and the growth of an export-oriented economy. These structural changes were accompanied by steadily decreasing poverty rates. Suryahadi, Suryadarma and Sumarto (2009) argue that the growth in urban services was a powerful driving force behind these poverty reductions. Increases in inequality during this period suggest, however, that the beneficial effects of the reforms were not concentrated on the very poor (Miranti 2010). At the same time, labour regulation started to tighten somewhat, with rising minimum wages and extensions of social security coverage.

The 1997/98 crisis had its roots in a monetary contagion leading to a large outflow of foreign capital, currency depreciation, as well as short-term agricultural price hikes. This also led to a sudden increase in expenditure poverty and a temporary restructuring of the labour force towards subsistence production in agriculture. The crisis' impacts were geographically clustered (Java being most strongly hit), but did not differ considerably between rural and urban regions or by the initial levels of poverty (Wetterberg, Sumarto and Pritchett 2001). The extent of expenditure poverty

peaked around November of 1998 and declined sharply afterwards, with a quick recovery in consumption growth (Suryahadi, Sumarto and Pritchett 2003).

4. Methods

Following Topalova (2010), several recent studies identify regionally differential effects of trade liberalization by distinguishing between different levels of regional exposure to trade based on the pre-reform labour market structure of the region (Kovak 2013, McCaig 2011, Fukase 2013, Castilho et al. 2012). The advantage of this method is that it does not only focus on the manufacturing sector or formal employment but measures the effects of trade liberalization at the household level. To define tariff exposure, it uses the labour structure of local residents based on household surveys, irrespectively of the specific place and geographic location of their work, and hence focuses on tariff effects important for local residents. The main poverty measures are derived from household expenditure surveys, which capture the overall extent of regional poverty. We complement this household based information with data from firm and labour market surveys in order to investigate the labour market mechanisms that are behind these poverty effects. For firm and wage outcomes we alternatively define tariff exposure measures that are weighted by the regional firms' output and input structure.

4.1 Measuring tariff exposure at district level

Our empirical strategy applies measures of district tariff exposure that combine variation over time in nationally determined import tariffs with information on the districts' economic structure in the initial pre-reform period. Following the insights of Amiti and Konings (2007) and Amiti and Cameron (2012), we distinguish between tariffs on output products and tariffs on the intermediate inputs used in local production. While output tariffs can be expected to affect the productivity of sectors through increased competition on the output markets, lower input tariffs have a more direct productivity enhancing role by rendering inputs cheaper (Amiti and Konings 2007). Input (but not output) tariff reductions have also been shown to go along with reductions in industrial skill premia (Amiti and Cameron 2012).

Output tariffs of district k in year t are computed by weighting the actual average import tariffs of each sector s by the sector's relative importance in the local economy, measured in an initial, pre-reform time period:

$$Tariff_{kt} = \sum_{s=1}^{S} \left(\frac{Q_{sk,t=0}}{Q_{k,t=0}} \times Tariff_{st} \right) \quad (1)$$

For our main poverty analysis, the relative importance of a sector in a district economy is measured by its original employment share, and hence the weights are given by the relative share of the employment of the output sector s ($Q_{sk,t=1990}$) in the total labour force of district k ($Q_{k,t=1990}$), measured before the reform, in 1990.[8] Figure 2 maps the variation in starting levels of the output tariff measure in 1993 across all Indonesian districts included in the analysis.

In addition to our main labour market based output tariff measure, we also compute an output tariff measure weighted by the district industrial structure, which enables us to identify the effects of tariff changes on the wage bill and employment of local firms. This alternative tariff measure is based on the output structure of formalized firms with at least 20 employees (from SI, the industrial census). The output tariff measure weights national tariffs in sector *s* at year *t* by the industry's initial share in region *k*'s industrial output, $Q_{sk,1993}/Q_{k,1993}$, as recorded in the industrial census in the initial year 1993.[9]

For computing the input tariffs, we rely on a national input-output table from 1990 to generate a measure of regional exposure to input tariffs based on the district sectoral structure:

$$InputTariff_{kt} = \sum_{s=1}^{S} \left(\frac{Q_{sk,t=0}}{Q_{k,t=0}} \times \sum_{j=1}^{J} \left(\frac{M_{js,1990}}{M_{s,1990}} \times Tariff_{jt} \right) \right) \quad (2)$$

For this, we weight the tariff on each input good j in year t by the initial share of the *j*-th industry among the inputs of any output sector s, $M_{js,1990}/M_{s,1990}$. We once again aggregate these input tariff measures across all output producing sectors or industries of the region, which are then weighted by the output sector's initial relative regional importance. Since our input-output data does not vary across regions, we have to assume that the national structure of inputs adequately describes the regional input structures, at least on average. By using a pre-reform input-output table we can ensure that tariff induced shifts in the sectoral structure are not reflected in the measure. We capture the relative importance of specific sectors, $Q_{sk,1993}/Q_{k,1993}$, once again either through labour market shares (for household based measures) or shares in output production (for firm

[8] Our labour shares are calculated based on *S=20* different sectors, see section 2.

[9] After taking tariff and input-output table concordances into account, we are able to distinguish between *S=60* different tradable output industries.

employment and wages).[10] Figure 3 maps the regional variation in starting levels of import tariffs on input goods.

These tariff measures reflect the presence of nontradable goods to a different extent. Our labour weighted output tariff exposure measure is implicitly affected by the size of the non-tradable sector as weights are normalized by the size of the total labour force of the district, and not only by the labour force employed in tradable sectors. This is in line with the main definition applied by McCaig (2011) but deviates from the methods employed by Topalova (2010) or Kovak (2013). Topalova (2010) instruments tariffs weighted by labour market shares that include nontradables with tariffs weighted by labour market shares in tradable sectors only. Kovak (2013) argues that one should drop the nontradables sector altogether since there should be a perfect pass-through effect from tradable price changes to nontradable prices. Under robustness checks in section 6.1 we address the sensitivity of our results to the exclusion of the nontradable sectors from the weighting scheme. The output tariff weighted by manufacturing sector output shares includes tradable goods only since all industrial products included in the weighting scheme are tradable. The labour and manufacturing output weighted input tariff measures both take nontradable inputs into consideration implicitly, by including nontradable goods in the total sectoral inputs $M_{s,1990}$. Alternatively, section 6.1 discusses results using input tariffs that exclude nontradables from the input-output table as well.

4.2 Empirical specification and identification

The primary interest of our study lies in understanding how regional exposure to tariff reductions affected regional levels of poverty. According to the neoclassical theory of comparative advantage, reduction in trading costs in a labour abundant economy can be expected to increase specialization in the production of unskilled labour intensive goods, which should lead to relative improvements in the wages of the less skilled population. Hence, the poverty reducing effects of international trade will be primarily transmitted through labour market mechanisms. In order to investigate these mechanisms, we focus not only on poverty measures but also on labour market outcomes. More specifically, we test whether tariff reductions affect sector mobility, labour market participation and formalization, job creation and wages.

Our main estimating equation takes the following first difference specification:

$$\Delta y_{kt} = \alpha + \beta_1 \Delta OutputTariff_{kt} + \beta_2 \Delta InputTariff_{kt} + \Delta X'_{\mathrm{kt}}\gamma + I'_k\theta + \lambda_{rt} + \Delta\varepsilon_{kt},$$

[10] Due to differences in sector definitions and concordances between different sectors, we are able to distinguish between 12 (77) input sectors for the labour (manufacturing output) weighted tariffs.

where y_{kt} denotes the district level dependent variables (poverty rates, labour force participation and formalization shares, average or total wages and employment). X_{kt} is a vector of time variant control variables (share of rural population, share of working population aged 16-60, adult (20+) literacy rates, minimum wages). The vector of initial conditions, I_k, includes the 1990 labour shares in the region that are used as tariff weights, aggregated to one digit sectors, the 1990 rural population shares, and, in some specifications, the initial levels of the dependent variable. Time and island interaction terms, λ_{rt}, are included to control for regions specific time effects. The main islands are defined as Java, Sumatra, Kalimantan, Sulawesi, while the remaining smaller islands are grouped together.

The difference specification addresses the potentially endogenous nature of the components in the tariff exposure measure. First, the potential bias due to endogenous tariff setting at the national level is eliminated by controlling for national variation over time and by considering only within-district variation. Second, by taking first differences and removing district fixed effects, we purge any bias due to unobserved heterogeneity that might be introduced by the initial district sectoral structure in employment and industry output. Moreover, the district labour and industry output shares by sector are taken at 1990 and 1993 values respectively and are therefore not directly influenced by district poverty profiles and labour market developments after 1993.

The identifying variation comes from within-district differences in changes to tariff exposure across time.[11] This approach relies on the indentifying assumption that there are no unobserved time variant confounders. This assumption will be violated if poverty trends and labour market dynamics are related to the initial sectoral composition of district economies. The most relevant potential confounding trends include structural change, overall economic development and social policies. Structural change involves a gradual shift from agriculture to manufacturing and service sectors. The extent and speed of such structural change may vary by the initial size of the agricultural sector and the share of the population living in rural areas. Changes in poverty incidence will also be driven by overall economic development as well as targeted social policies. These may vary by initial levels of poverty (due to convergence or policy targeting) and by local economic structure.

We deal with these potential confounding trends by adding controls for initial conditions: initial sectoral labour shares (measured at the one-digit level) as well as the share of rural population in 1990. As an additional sensitivity check we include the 1993 value of the dependent variables (P0, P1 and P2) to proxy for convergence and targeting.

[11] Figure 2 and Figure **3** show a considerable across-island variation for the starting protection levels based on output and input tariffs.

The 1997/98 financial crisis poses a potential problem for our empirical strategy. Although our observation period only includes pre- and post-crisis years (1996 and 1999), the post-crisis recovery remains a potentially confounding effect. We deal with this concern in two ways: we include in all regressions island-year fixed effects that distinguish between five main geographic units and allow the crisis effects to vary across the regions. Given the empirical evidence on the strong geographical clustering of the poverty effects of the crisis (Wetterberg, Sumarto and Pritchett 2001), we are able to capture a part of the crisis effects already through this strategy. Additionally, we also re-estimate our models for separate, shorter time periods (pre- and post-crisis: 1993-1996 and 1999-2002) and for the long difference between 1993 and 2002.

5. Results

5.1 Poverty

The general effects of tariff reductions on our three poverty measures (P0, P1 and P2) for different specifications are shown in Table 3. There is a positive correlation between the poverty head count and tariff exposure, implying that tariff reduction is associated with a reduction in poverty. This relationship persists only for input tariffs after controlling for year-island interactions, time variant controls, and initial labour force and rural population shares, while the coefficient for output tariffs diminishes and loses statistical significance. However, when we include both input and output tariffs in the same specification the coefficient for input tariffs is also no longer statistically significant.

For both the poverty gap and poverty severity, on the other hand, the estimates are robust to including initial conditions. Tariff reductions for intermediate inputs seem to have contributed to alleviating the depth of poverty in Indonesia and have been particularly favourable for the very poor. In our preferred specifications (column 3), a percentage point reduction in input tariff exposure is associated with a decrease of the poverty gap equivalent to 2.3 percent of the poverty line, and a decrease of poverty severity by 0.011. Again, we find no effect of changes to output tariffs.

Column (4) in Table 3 presents a specification where we control for initial levels of the dependent variable, to assess whether initial poverty is associated with differential parallel trends that may confound our estimates. We find no evidence of this, as the results are robust to including these variables. Since we prefer not to include lagged levels of the dependent variable in a fixed effects specification, we omit these in the remainder of the analysis.

Table 4 disaggregates the results from our preferred specification (column 3 in Table 3) by skill level of the household head. We distinguish between three educational categories: household heads with at most primary education, those with completed junior secondary education, and those with at least a completed senior secondary education. We see that tariff reductions in intermediate inputs reduce poverty across all education levels: for the low-skilled population these effects are observed mainly at the lower end of the income distribution, while for the high skill population the effects are more prominent closer to the poverty line. The reductions in severity of poverty seem to be driven by low- and medium skilled labour. The effects on the poverty gap are similar across education levels, although the estimates for the share of population where the household head has at most primary education is not as precise as those for the middle-skilled. We find a reduction in the poverty headcount only for the high skilled population, presumably because the relatively high educated poor are likely to be concentrated closer to the poverty line than the low educated poor.

5.2 Labour market dynamics

As documented in Table 5, we find that changes to output and input tariffs induce countervailing effects on labour market participation. Decreasing output tariffs decrease participation, suggesting job loss due to increased competition from imported goods. By contrast, a decrease in tariffs on intermediate inputs leads to job creation, probably due increased competitiveness of local firms. The effect of decreasing input tariffs seems to outweigh those of decreasing output tariffs considerably.

Increased competition on output markets due to output tariff reduction is associated with increased formal sector employment, which measures the share of the active population employed either by the government, a private sector employer or an employer who has permanent workers. This effect is driven by an increasing formalization of the labour force among low skilled workers whereas this is not observed for higher skill workers.[12] As formal sector jobs are usually generating larger and less volatile (more secure) incomes, job formalization could potentially contribute to the favourable poverty effects of trade liberalization. However, the results also suggest that the informal sector is particularly sensitive to increased competition associated with output tariff reductions, leading to job loss and a decreasing labour share. In absence of formal social protection, this may temporarily increase poverty for displaced workers that are not easily absorbed in the formal sector.

5.3 Firms: wages and workers

[12] These estimates are available only for the time period 1993 to 1996 because we are not able to construct a time consistent variable for formal labour due to changes in the *Susenas* questionnaire in both 1999 and 2002.

Previous studies document that trade liberalization in Indonesia has improved firm productivity (Amiti and Konings 2007) and increased the relative magnitude of the wage bill paid by manufacturing firms to lower as opposed to high skilled workers (Amiti and Cameron 2012). These effects were in particular due to decreases in import tariffs on intermediate production goods used by the firms. These findings suggest that direct improvements in the profitability of local firms might also help explain the observed favourable income effects to the poor. In order to investigate this channel more closely, we extend the analysis to the total wage bill of manufacturing firms in the region and total employment by those firms. We use the same manufacturing firm data as the two studies above and also differentiate between the effects of tariffs for intermediate inputs and production outputs, but run the analysis at the level of the regional economies in order to retain comparability with our previous results.

Panel A of Table 6 shows that both the total manufacturing wage bill and total employment increase with a decrease in tariffs on product groups that are relevant as input goods for the regional production: a one percentage point reduction in input tariffs increases the average wage bill by 8.2 percent and total employment by 4.7 percent.[13] By contrast, we do not find evidence that reductions in tariffs that are relevant to the structure of the regional economic output affect employment or the wage bill. Together with the findings by Amiti and Cameron (2012), this seems to suggest that trade liberalization has led to job creation in the formal manufacturing sector. Moreover, the total wage bill has increased relatively more strongly due to tariff reductions than total employment, suggesting an average increase in wages or at least an increase in per capita work intensity.

Since the SI data does not provide information on the hours worked, we cannot distinguish between these two potential margins of adjustment. However, we can look at average wages at province level, which are collected by the labour force survey (*Sakernas*). As the number of provinces is considerably lower than the number of districts (23 as compared to 259), this is admittedly a much cruder measure, but can be disaggregated by education level. We address the intra-province correlation due to imputing province level average wages for each district by clustering standard errors in these regressions at the province level.

The province level estimates are show in Panel B of Table 6 and confirm that wages have increased as a result of tariff reductions for intermediate inputs, while no significant effects could be observed from changes in output tariffs. A one percentage point reduction in input tariffs increased average hourly wages by 2.4 percent. Moreover, the effects seem larger for relatively low skilled workers, although the estimates are imprecise.

[13] In our sample, the input tariff measure decreased on average by 1.8 percentage points per period.

6. Sensitivity analysis and caveats

6.1 Robustness of poverty results to confounding trends and definitions of tariff measures

In our analysis we define the tariff measures based on the labour shares of the total regional economy, including both traded and non-traded sectors. However, some studies propose a different approach and argue that labour shares should be calculated only with respect to the size of the tradable sectors (e.g. Topalova 2011, Kovak 2013).

Table 7 contrasts our results to those using the alternative weighting scheme. Panel A reproduces the results from column 3 in Table 3, while panel B includes only tradable sectors as weights of the district economic structure for both output and input tariffs and only tradable sectors from the input-output matrix when generating input tariffs. The results are robust to the choice of weighting scheme, although the coefficients are smaller when non-tradables are excluded from the weights. These results seem to suggest that the perfect pass-through assumption does not necessarily hold in the short run.

6.2 The monetary crisis and differential effects over time

The Southeast Asian monetary crisis of 1997/98 constitutes a potentially important confounding factor during the analysed time period, especially since it induced a short-time spike in relative food prices and sharp short-term increases in poverty. Since the effects of the crisis were strongly geographically clustered, the inclusion of island-year fixed effects deals partly with this problem. However, in order to exclude that the crisis confounds our estimates, we repeat our main specifications, excluding the crisis years, for the pre-crisis and post-crisis periods separately.

Table 8 shows the results by time period for the poverty measures. The estimates are not precise and cannot be attributed to a specific time period, presumably due to the considerably smaller sample size. By contrast, the effects of tariff reductions on wages and employment are measured with precision across time periods (Table 9). The results for province average hourly wages suggest that these effects also translated into higher wages, especially after the crisis. Moreover, the post-crisis wage increase was especially strong for low skilled workers, while pre-crisis effects on wages were mainly observed for workers with junior secondary schooling.

6.3 Migration

Migration can offer a further channel of transmission for the effects of trade liberalization by measuring the extent of regional reallocation of labour; at the same time it can also confound our poverty estimates over time. In order to test for a correlation between tariff reductions and

migration, Table 10 relates across-district migration between 1990 and 1995 to changes in district tariff exposure over the same time period. We focus on the first part of our period of analysis since migration flows preceding 2000 were strongly affected by the economic crisis as well as high-intensity conflict.[14] The available data do not allow us to identify causal effects of tariff reductions on internal migration. Nevertheless, we do find descriptive evidence that the direction of internal migration flows is towards districts with relatively high exposure to tariff reductions, controlling for province fixed effects (for 25 provinces), district population size and labour shares by sector.

The results show no considerable association between regional exposure to tariff reductions and emigration from the district for the period of 1990-1995. That is, we do not find evidence for displacement effects due to structural change leading to out-migration of workers. At the same time there is a statistically significant negative relationship between changes in output tariff exposure and immigration, especially for lower skilled workers. Thus, if anything, increased market competition due to output tariff liberalization has acted as a pull factor for migration. One possible explanation behind this effect is the creation of new low skilled jobs that lead to increased immigration of low wage workers. These results also imply that we might underestimate the extent of poverty reducing effects of output tariff reductions, since it is especially lower skilled and hence more likely poor workers who migrate into the regions more affected by structural change. These migration inducing effects of tariff changes are in line with the overall findings of McCaig (2011) on Vietnamese migration following the bilateral trade agreement with the US; although unlike in Indonesia, in Vietnam migration increased for all skill categories, with somewhat higher effects on the higher skilled.

7. Conclusion

We have examined the effects of trade liberalization in Indonesia from 1993 to 2002 on poverty levels in 259 Indonesian districts and the role of labour market as channel for these effects. During this period, Indonesia reduced its tariff barriers across all tradable sectors, with average import tariffs decreasing from 17.2 percent in 1993 to 6.6 percent in 2002. This period also saw overall reductions in poverty, despite a temporary setback from the 1997/1998 economic crisis.

The identification strategy relies on combining information on initial regional labour and product market structure with the exogenous tariff reduction schedule over three-year intervals. The results are robust to specification and controlling for initial conditions in labour market structure.

[14] Repeating the same regressions for the period of 1995 to 2000 shows no significant correlation between exposure to tariff reductions and cross-regional migration.

Our results suggest that trade liberalization has contributed partially to poverty reduction in Indonesia by increasing incomes for the poorest segment of the population. While we do not see substantial effects on the poverty head count, we do find that tariff reductions led to a statistically significant reduction of the depth and severity of poverty.

The driving mechanism behind these effects seems to be increasing firm competitiveness as a direct result of reductions in import tariffs on intermediate goods, which seems to have outweighed the displacement effects from increased foreign competition due to reductions in import tariffs on final outputs. Increased firm competitiveness in turn induced job formation and wage increases for low- and medium skilled labour. These experiences with trade liberalization add caution to the current policy debate in light of the recent surge in protectionist tendencies in Indonesian trade and economic policies (Nehru 2013).

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Tables

Table 1 Descriptive statistics

Variables	Mean	SD	Min	Max	No. obs.
Dependent var.					
P0	0.2723	0.1736	0	0.8726	1036
P1	0.0568	0.0494	0	0.3403	1036
P2	0.0177	0.0194	0	0.1555	1036
Labour market participation	0.5830	0.0739	0.4094	0.8191	1036
Formal sector employment	0.2955	0.1533	0.0407	0.6893	777
ln Firm wage bill	15.9102	2.4354	8.7806	22.1963	991
ln Total firm employment	7.9432	2.0552	2.9957	12.9947	991
ln Hourly wage	7.0960	0.4872	5.5213	8.1542	1036
ln Immigration	9.9146	0.9964	7.3914	12.6431	203
ln Emigration	10.1127	0.8617	7.5470	12.5040	203
Explanatory var.					
Labour weighted output tariffs	6.1859	3.4828	0.3095	17.8596	1036
Labour weighted input tariffs	7.4879	2.4791	3.3503	13.7396	1036
Manuf. output weighted tariffs	14.5944	6.8459	0	47.1813	1036
Manuf. input weighted tariffs	7.3058	3.5427	0	28.6421	1036
Labour weighted output tariffs (tradables only)	12.2083	4.9927	3.5145	27.6609	1036
Labour weighted input tariffs (tradables only)	6.8966	3.3990	0.5056	16.1250	1036
Rural share	0.6421	0.3166	0	1	1036
Share of aged 16 to 60	0.6493	0.0416	0.5183	0.8137	1036
Adult literacy rate (>20)	0.8443	0.1071	0.3122	0.9988	1036
Minimum wage	17.3567	11.1523	4.80	59.13	1036
Initial share of agric. workers	0.4977	0.2575	0	0.9377	1036
Initial share of mining workers	0.0126	0.0230	0	0.2169	1036
Initial share of manuf. workers	0.0996	0.0783	0	0.4410	1036
Initial rural share	0.6909	0.3399	0	1	1036

Table 2 Evolution of average effectively applied tariff rates by sector

	1993	1996	1999	2002
Agriculture				
Plants and animals	17.1	12.0	10.3	4.8
Forestry	7.7	3.9	3.5	3.8
Hunting	5.3	4.3	2.2	2.7
Sea fishery	24.9	16.6	14.0	5.2
Fresh-water fishery	10.0	0.0	0.0	0.0
Mining				
Coal mining	5.0	5.0	5.0	5.0
Metal ores mining	3.3	3.2	3.5	2.8
Stones and sand mining	7.0	5.6	3.6	3.5
Salt mining	20.0	15.0	15.0	7.4
Minerals and chemicals mining	2.9	3.0	3.0	2.7
Other mining	4.0	3.4	3.6	3.6
Manufacturing				
Food, beverages, tobacco	23.4	18.1	17.1	12.6
Textiles, apparel, leather	26.0	20.1	16.5	9.4
Wood and products	30.0	16.6	14.1	7.7
Paper and products	20.2	9.5	8.1	4.8
Chemicals and products	11.9	9.4	8.7	6.1
Non-metallic mineral products	20.4	9.5	7.0	5.6
Basic metals	10.3	8.0	7.6	6.4
Metal products	15.8	8.1	7.9	4.9
Other manufacturing	32.0	18.9	18.4	9.6

Note: Sectors are defined based on a concordance between tariff and census labour market data.
Source: UNCTAD-TRAINS database.

Table 3 Poverty, 1993-2002, labour weighted tariffs

	Model			
	(1)	(2)	(3)	(4)
Panel A:	*Dependent: P0*			
Output tariffs	0.0098**	0.0098**	0.0055	0.0040
	(0.0033)	(0.0033)	(0.0070)	(0.0066)
Input tariffs	0.0477**	0.0493**	0.0459†	0.0374
	(0.0180)	(0.0182)	(0.0271)	(0.0267)
Output tariffs	0.0075†	0.0072†	0.0014	0.0007
	(0.0039)	(0.0040)	(0.0070)	(0.0063)
Input tariffs	0.0226	0.0254	0.0439	0.0364
	(0.0214)	(0.0221)	(0.0271)	(0.0259)
Panel B:	*Dependent: P1*			
Output tariffs	0.0041**	0.0041**	0.0056*	0.0051*
	(0.0011)	(0.0011)	(0.0025)	(0.0023)
Input tariffs	0.0213**	0.0217**	0.0276**	0.0248**
	(0.0060)	(0.0061)	(0.0087)	(0.0085)
Output tariffs	0.0029*	0.0028*	0.0035	0.0032
	(0.0012)	(0.0013)	(0.0024)	(0.0022)
Input tariffs	0.0117†	0.0124†	0.0226**	0.0201**
	(0.0067)	(0.0069)	(0.0082)	(0.0077)
Panel C:	*Dependent: P2*			
Output tariffs	0.0017**	0.0017**	0.0027*	0.0025*
	(0.0005)	(0.0005)	(0.0011)	(0.0011)
Input tariffs	0.0093**	0.0096**	0.0130**	0.0119**
	(0.0025)	(0.0026)	(0.0036)	(0.0035)
Output tariffs	0.0011*	0.0010†	0.0017	0.0016
	(0.0005)	(0.0005)	(0.0011)	(0.0010)
Input tariffs	0.0058*	0.0062*	0.0105**	0.0096**
	(0.0027)	(0.0028)	(0.0033)	(0.0031)
N	777	777	777	777
Year-island dummies	Yes	Yes	Yes	Yes
Time variant controls	No	Yes	Yes	Yes
Initial labour force and rural pop. shares	No	No	Yes	Yes
Dependent variable 1993	No	No	No	Yes

Note: Each block of the table reports tariff coefficients, generated by first difference estimates of the reported dependent variables on tariffs and further controls. Time variant controls include first differences of the share of rural population, the share of working age population (16-60), literacy rates at age 20-99 and minimum wages. Standard errors, clustered at the district level, are reported in parentheses. **,*,† mark statistical significance at the 1, 5, 10% level.

Table 4 Poverty by education level of the head of household, 1993-2002, labour weighted tariffs

Head education:	Max. primary	Jun. second.	Senior sec. or higher
Panel A:		Dependent: P0	
Output tariffs	-0.0045	0.0027	-0.0022
	(0.0080)	(0.0091)	(0.0061)
Input tariffs	0.0089	0.0256	0.0894**
	(0.0337)	(0.0349)	(0.0239)
Panel A:		Dependent: P1	
Output tariffs	0.0022	0.0043†	-0.0004
	(0.0028)	(0.0025)	(0.0013)
Input tariffs	0.0158	0.0157†	0.0163**
	(0.0101)	(0.0089)	(0.0057)
Panel A:		Dependent: P2	
Output tariffs	0.0013	0.0018†	-0.0002
	(0.0013)	(0.0010)	(0.0004)
Input tariffs	0.0091*	0.0075*	0.0046*
	(0.0040)	(0.0033)	(0.0027)
N	777	777	777

Note: Each block of the table reports separate tariff coefficients, generated by first difference estimates of the reported dependent variables on tariffs and further controls. Specification includes year-island dummy variables, time variant controls variables in first difference form (share of rural population, share of working age population (16-60), literacy rates at age 20-99, minimum wages), 1990 labour shares used for tariff weights and 1993 rural population shares. Standard errors, clustered at the district level, are reported in parentheses. **,*,† mark statistical significance at the 1, 5, 10% level.

Table 5 Labour market participation and formal sector employment, by education level of the head of household, labour weighted tariffs

	All	Max. primary education	Junior secondary education	Senior sec. or higher education
Panel A		Time period: 1993-2002		
Dependent:		Labour market participation		
Output tariffs	0.0050†	0.0073*	0.0015	0.0013
	(0.0029)	(0.0033)	(0.0047)	(0.0039)
Input tariffs	-0.0295**	-0.0528**	-0.0433**	0.0059
	(0.0105)	(0.0123)	(0.0164)	(0.0131)
N	777	777	777	777
Panel B		Time period: 1993-1996		
Dependent:		Formal sector employment		
Output tariffs	-0.0126*	-0.0124†	-0.0173	0.0033
	(0.0058)	(0.0065)	(0.0114)	(0.0111)
Input tariffs	0.0448	0.0367	0.0256	0.0108
	(0.0607)	(0.0797)	(0.0892)	(0.0842)
N	259	259	259	259

Note: Each block of the table reports separate tariff coefficients, generated by first difference estimates of the reported dependent variables on tariffs and further controls. Specification includes year-island dummy variables, time variant controls variables in first difference form (share of rural population, share of working age population (16-60), literacy rates at age 20-99, minimum wages), 1990 labour shares used for tariff weights and 1993 rural population shares. Standard errors, clustered at the district level, are reported in parentheses. **,*,† mark statistical significance at the 1, 5, 10% level.

Table 6 Wage bill, total employment and hourly wages, by education level of the head of household, 1993-2002, tariffs weighted by manufacturing output

Panel A:		Firm census (district level)	
Dependent:		Ln firm wage bill	Ln total firm employment
Output tariffs		-0.0162	-0.0044
		(0.0145)	(0.0123)
Input tariffs		-0.0820*	-0.0474†
		(0.0323)	(0.0267)
N		734	734
Panel B:		Labour market surveys	
Dependent:		Ln hourly wage (provincial averages)	
Sample	All	Max. primary education	Junior secondary education	Senior sec. or higher education
Output tariffs	0.0014	0.0011	-0.0019	0.0009
	(0.0036)	(0.0040)	(0.0038)	(0.0031)
Input tariffs	-0.0243†	-0.0179	-0.0188*	-0.0115
	(0.0118)	(0.0110)	(0.0101)	(0.0072)
N	777	777	7777	777

Note: Each block of the table reports separate tariff coefficients, generated by first difference estimates of the reported dependent variables on tariffs and further controls. Specification includes year-island dummy variables, time variant controls variables in first difference form (share of rural population, share of working age population (16-60), literacy rates at age 20-99, minimum wages), 1990 labour shares used for tariff weights and 1993 rural population shares. Standard errors, clustered at the district level (province level for hourly wages), are reported in parentheses. **,*,† mark statistical significance at the 1, 5, 10% level.

Table 7 Poverty, 1993-2002, labour weighted tariffs, sensitivity to excluding non-tradable sectors from the weighting scheme

Panel A Weighting scheme	Including nontradable sectors both for output & input tariffs		
Dependent:	P0	P1	P2
Output tariffs	0.0014	0.0035	0.0017
	(0.0070)	(0.0024)	(0.0011)
Input tariffs	0.0439	0.0226**	0.0105**
	(0.0271)	(0.0082)	(0.0033)
Panel B	Excluding nontradable sectors from output tariffs		
Weighting scheme	& from input and output sectors weights used with input tariffs		
Dependent:	P0	P1	P2
Output tariffs	-0.0049	-0.0001	0.0003
(tradable)	(0.0046)	(0.0013)	(0.0005)
Input tariffs	0.0134*	0.0053**	0.0020*
(tradable inputs & outputs)	(0.0060)	(0.0019)	(0.0008)

Note: Each block of the table reports separate tariff coefficients, generated by first difference estimates of the reported dependent variables on tariffs and further controls. Specifications are identical to those of column (3) of Table 3. Panel A repeats the results of Table 3 (column 3); panel B includes only tradable sectors in output tariff weights (Q_k) as well as in the input and output weights for input tariffs (Q_k and M_k). Standard errors, clustered at the district level, are reported in parentheses. **,*,† mark statistical significance at the 1, 5, 10% level.

Table 8 Robustness: Poverty effects by time period, tariffs weighted by labour shares

Time period	1993-2002	1993-1996	1999-2002	1993-2002 Long diff.
Panel A:	Dependent: P0			
Output tariffs	0.0014	-0.0126	-0.0060	0.0005
	(0.0070)	(0.0127)	(0.0163)	(0.0072)
Input tariffs	0.0439	0.0544	0.0415	0.0086
	(0.0271)	(0.1070)	(0.0969)	(0.0441)
Panel B:	Dependent: P1			
Output tariffs	0.0035	-0.0028	0.0051	0.0019
	(0.0024)	(0.0036)	(0.0054)	(0.0022)
Input tariffs	0.0226**	-0.0150	0.0195	0.0007
	(0.0082)	(0.0365)	(0.0298)	(0.0165)
Panel C:	Dependent: P2			
Output tariffs	0.0017	-0.0011	0.0033	0.0009
	(0.0011)	(0.0015)	(0.0023)	(0.0009)
Input tariffs	0.0105**	-0.0106	0.0079	-0.0004
	(0.0033)	(0.0161)	(0.0124)	(0.0074)
N	777	259	259	259

Note: Each block of the table reports separate tariff coefficients, generated by first difference estimates of the reported dependent variables on tariffs and further controls. Specifications replicate those of column (3) of Table 3 (Panel A) for the full time period, for the first and second time periods and for the total 9 years. Standard errors, clustered at the district level in panels A and B and at the province level in panel C, are reported in parentheses. **,*,† mark statistical significance at the 1, 5, 10% level.

Table 9 Robustness: Employment and wages by time period, input tariffs weighted by manufacturing

Time period	1993-2002	1993-1996	1999-2002	1993-2002 Long diff.
Panel A		*Firm census (district level)*		
Dependent:		Ln firm wage bill		
Output tariffs	-0.0162	-0.0102	-0.0153	-0.0067
	(0.0145)	(0.0146	(0.0258)	(0.0115)
Input tariffs	-0.0820*	-0.0788*	-0.1426*	-0.1412**
	(0.0323)	(0.0351)	(0.0618)	(0.0408)
Dependent:		Ln total firm employment		
Output tariffs	-0.0044	-0.0064	-0.0009	0.0036
	(0.0123)	(0.0120)	(0.0236)	(0.0091)
Input tariffs	-0.0474†	-0.0587*	-0.0758	-0.0716*
	(0.0267)	(0.0290)	(0.0581)	(0.0345)
N	734	247	240	239
Panel B		Labour market survey		
Dependent:		Ln hourly wage (provincial average)		
Sample:		All		
Output tariffs	0.0014	0.0001	0.0058	-0.0024
	(0.0036)	(0.0031)	(0.0069)	(0.0040)
Input tariffs	-0.0243†	-0.0138*	-0.0513*	-0.1426*
	(0.0118)	(0.0062)	(0.0204)	(0.0618)
Sample:		Max. primary education		
Output tariffs	0.0011	0.0020	0.0046	0.0010
	(0.0040)	(0.0025)	(0.0068)	(0.0037)
Input tariffs	-0.0179	-0.0102	-0.0496*	-0.0233*
	(0.0110)	(0.0065)	(0.0194)	(0.0117)
Sample:		Junior secondary education		
Output tariffs	-0.0019	-0.0006	-0.0046	-0.0014
	(0.0038)	(0.0038)	(0.0059)	(0.0023)
Input tariffs	-0.0188*	-0.0220*	-0.0251	-0.0201**
	(0.0100)	(0.0085)	(0.0176)	(0.0058)
Sample:		Senior second. or higher education		
Output tariffs	0.0009	-0.0007	0.0056	-0.0032
	(0.0031)	(0.0042)	(0.0055)	(0.0038)
Input tariffs	-0.0115	-0.0055	-0.0217	-0.0131
	(0.0072)	(0.0082)	(0.0154)	(0.0099)
N	777	259	259	259

Note: Each block of the table reports separate tariff coefficients, generated by first difference estimates of the reported dependent variables on tariffs and further controls. Specifications replicate those of column (3) of Table 3 (Panel A), and column (1) of Table 6 (Panel B and C) for the full time period and for the first and last time periods. Standard errors, clustered at the district level in panel A and at the province level in panel B, are reported in parentheses. **,*,† mark statistical significance at the 1, 5, 10% level.

Table 10 Domestic migration flows, 1990-1995, labour weighted tariffs, by individual education level

Sample	Total	Max. primary ed.	Jun. sec. or higher ed.
	(1)	(2)	(3)
Panel A		Outcome: *ln* Immigration	
Output tariffs	-0.2666*	-0.2982*	-0.1581
	(0.1143)	(0.1205)	(0.1553)
Input tariffs	0.7585	0.5352	0.8934
	(0.4853)	(0.5225)	(0.6988)
Panel B		Outcome: *ln* Emigration	
Output tariffs	-0.1393	-0.1181	-0.2097
	(0.0954)	(0.1036)	(0.1445)
Input tariffs	0.6547	0.8282	0.6317
	(0.4760)	(0.5855)	(0.6359)
N	203	203	203

Each block of the table reports tariff coefficients, generated by regressing migration flows of the reported groups on changes in tariffs and further controls in the form of province fixed effects, district population size, and initial sectoral labour market shares. Robust standard errors are reported in parentheses. **,*,† mark statistical significance at the 1, 5, 10% level.

Figures

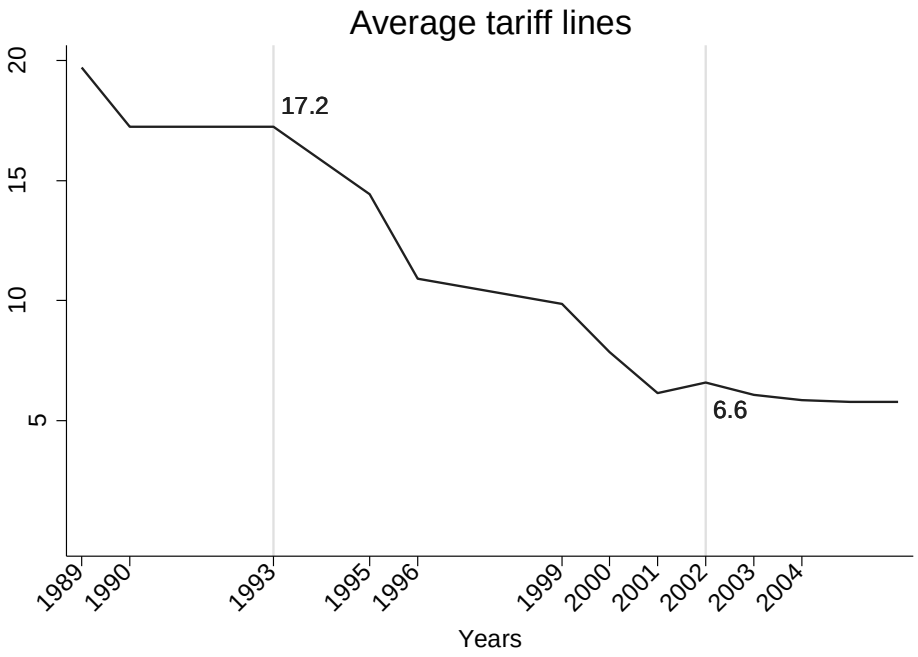

Figure 1 Evolution of average tariff lines 1993-2002, source: Kis-Katos and Sparrow (2011)

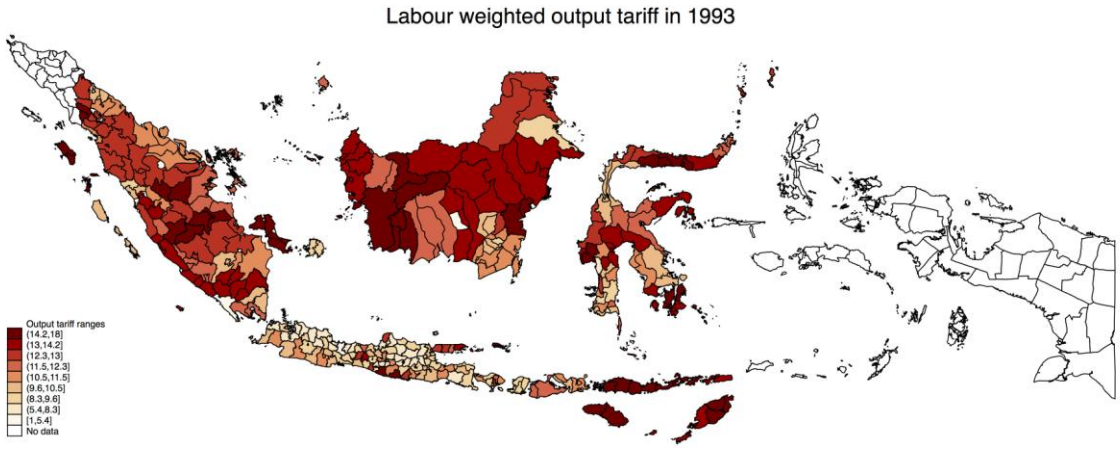

Figure 2 Labour weighted district output tariff measures in 1993

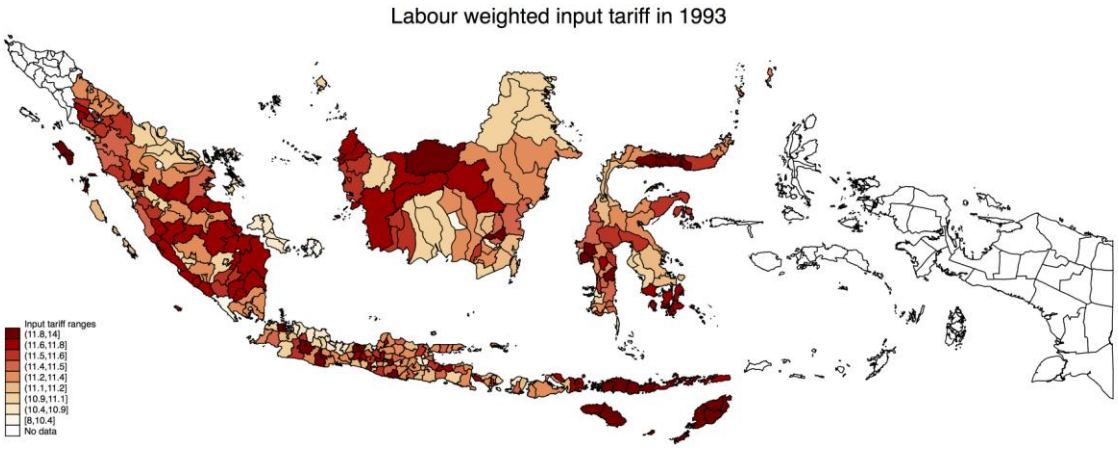

Figure 3 Labour weighted district input tariff measures in 1993

Supplemental appendix

Table A1. Descriptive statistics of dependent variables by education category

Variable	Max. primary education	Junior sec. education	Senior sec. or higher education
P0	0.3184 (0.1839)	0.1902 (0.1424)	0.0966 (0.0917)
P1	0.0673 (0.0548)	0.0358 (0.0372)	0.0160 (0.0199)
P2	0.0212 (0.0220)	0.0103 (0.0141)	0.0043 (0.0069)
Formal sector	0.2114 (0.1357)	0.3197 (0.1502)	0.5759 (0.1035)
Activity	0.5375 (0.1033)	0.5469 (0.0941)	0.7841 (0.0678)
ln Hourly wage	6.8013 (0.4415)	6.9824 (0.3867)	7.2615 (0.6345)
ln Immigration	9.4992 (1.0209)	8.7417 (1.0585)	
ln Emigration	9.6573 (0.9098)	9.0027 (0.9200)	

Note: Cells of the table present means and standard deviations (in parentheses) for the various dependent variables. Education categories refer to household heads, except for log hourly wages, where education refers to individual workers. The number of observation is 1036 in all cells, except for Formal sector (N=777) and for ln Immigration/Emigration (N=203).

Table A2. Full specification for selected estimates of Table 3

Dependent	ΔP0	ΔP1	ΔP2
	(1)	(2)	(3)
Δ Output tariffs	0.0014	0.0035	0.0017
	(0.0070)	(0.0024)	(0.0011)
Δ Input tariffs	0.0439	0.0226**	0.0105**
	(0.0271)	(0.0082)	(0.0033)
Δ Rural share	0.0954	0.0238	0.0087
	(0.0732)	(0.0213)	(0.0083)
Δ Share of aged 16-60	-0.2248	-0.0138	0.0160
	(0.1976)	(0.0687)	(0.0309)
Δ Adult literacy rate (>20)	-0.1149	-0.0265	-0.0097
	(0.1482)	(0.0465)	(0.0194)
Δ Minimum wage	-0.0001	0.0000	0.0000
	(0.0010)	(0.0003)	(0.0001)
Initial share of agric. workers	-0.0019	0.0169	0.0091†
	(0.0355)	(0.0123)	(0.0055)
Initial share of mining workers	-0.0774	-0.0345†	-0.0147*
	(0.0766)	(0.0207)	(0.0077)
Initial share of manuf. workers	0.0512	0.0563**	0.0267**
	(0.0610)	(0.0203)	(0.0089)
Initial rural share	-0.0143	-0.0063	-0.0027
	(0.0170)	(0.0055)	(0.0023)
Year-island dummies	*Yes*	*Yes*	*Yes*
N	777	777	777
R2	0.519	0.419	0.328

Note: The table reports the full results of column (3) of Table 3 from first difference estimates. Standard errors, clustered at the district level, are reported in parentheses. **,*,+ mark statistical significance at the 1, 5, 10% level.