Productivity, competition and shared prosperity

Draft version: February 2018[1]

Given existing physical and human capital assets, Brazil could almost triple its income per capita if it managed to achieve the United States efficiency level. Cross-country evidence confirms that upgrading productivity instead of accumulating more physical capital and increasing the size of the workforce is the main driver of income differences across countries and of sustainable per capita income growth (Easterly and Levine, 2001; Caselli, 2017). As shown in Qiang et al. (2018), this is no exception for Brazil. Productivity gains involve the generation and commercialization of frontier technologies and the adoption of existing better technologies by firms, fueled by policies that promote access to technologies and know-how embedded in foreign intermediary inputs, that promote competition in output and input markets and that enhance firm capabilities. When such policies address factor misallocation, they incentivize workers and capital to move across industries and across firms within industries towards the most efficient firms, implying that available resources are used in the most efficient way, increasing their rate of return and overall income.

Positive spinoffs of such efficiency upgrading for the bottom 40 percent of the income distribution is the key to achieve productivity growth with inclusion. Considering that Brazil's productivity is so low relative to its existing labor and capital assets, the income gains from reforms that increase productivity are likely large enough to benefit most Brazilians. But real income gains from a more productive economy can be widely shared with households across all segments of society's income distribution or unequally distributed regionally, across skills and industries. And while productivity gains usually materialize on consumer benefits for all, from the income side adjustment costs from the factor reallocation process can fall disproportionally on less well-off people. The basis to achieve shared prosperity resides therefore in ensuring that all people in the lower-end of the income distribution experience a net benefit from changes in their consumption and earnings. This will typically require adjustment support policies for those able

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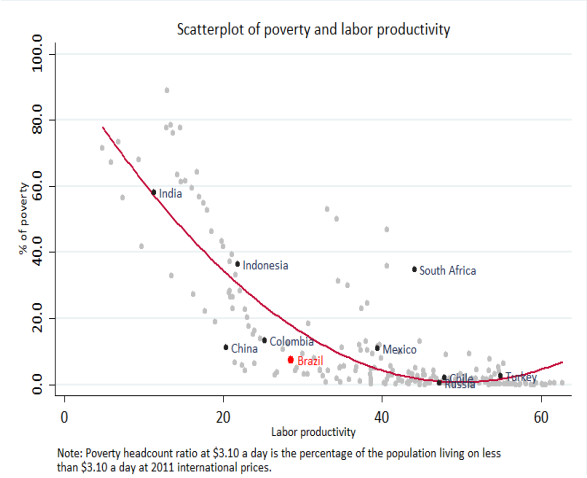
to actively participate in the productivity upgrading process as workers or capital owners; and income support policies for retired workers and others unable to directly participate.

1 Cross-country evidence supports the inclusive benefits of productivity growth

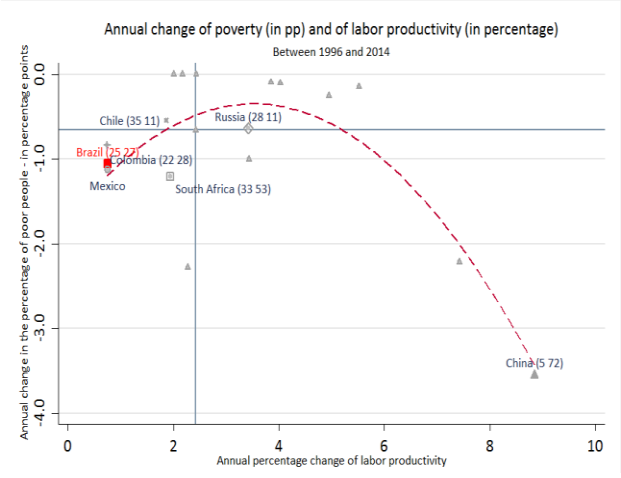
Productivity growth is a necessary condition to sustainably reduce absolute poverty. Higher labor productivity is often associated with lower poverty both in levels (Figure 1) and in variations (Figure 2). Productivity upgrading is the main driver of sustainable income growth, and the latter is by far the largest determinant of a country's success in reducing poverty.[2] Productivity upgrading also has a direct impact on poverty reduction by influencing households' earnings and consumption through changes in input and output markets. Pre-reform household endowments will determine how productivity policies differently influence people across the income distribution and particularly those below the poverty line.

Figure 1: Correlation between poverty and labor productivity in levels



Source : OECD and WDI

Figure 2: Correlation between poverty and labor productivity in changes



Source : OECD and WDI

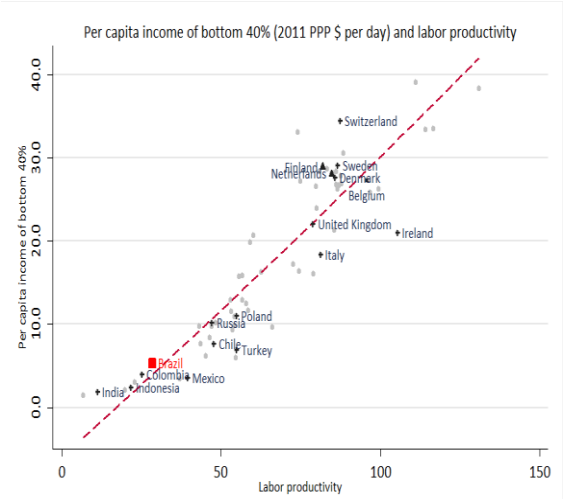
Productivity growth is also a necessary condition to achieve shared prosperity. Through the same economic growth channel, productivity policies are also likely to foster inclusion over the long term (measured as the growth of the real per capita income of the bottom 40 percent of the income distribution). Higher labor productivity is also often associated with more inclusion both in levels (Figure 3) and in changes (Figure 4) across countries. The association between productivity policies and within-country income inequality (measured using interpersonal or

[2] For instance, extensive cross-country evidence suggests that globalization (measured through tariff liberalization, trade flows, foreign direct investment, etc.), one of the main drivers of productivity gains, is on average positively related to income growth (Dollar and Kraay, 2004; Bolaky and Freund, 2008; Wacziarg and Welch, 2008; Huchet-Bourdon et al., 2017) and through this channel to absolute poverty reduction (Bergh and Nilsson, 2014).

spatial differences) is more ambiguous as outcomes are determined by initial household endowments and local conditions.[3]

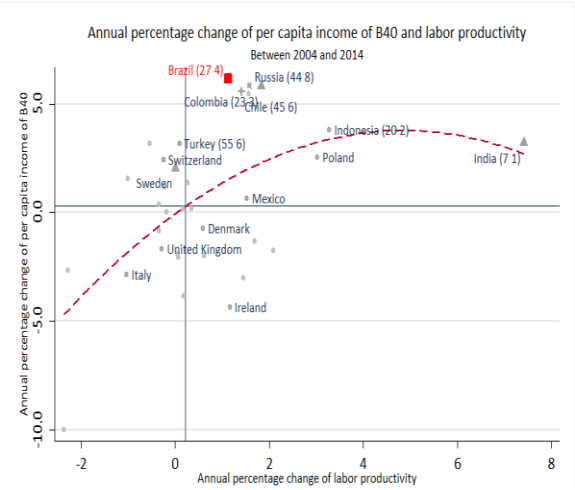
Growing disparities in firm productivity within industries, suggesting significant resource misallocation, are likely to be associated with increasing wage inequality. Recent evidence suggests that wage dispersion is largely explained by an increase in wage differentials between firms within industries rather than between industries or within firms. Across OECD countries, this increasing wage dispersion is linked to growing differences in productivity between high and low productivity firms within narrowly-defined industries (Berlingieri et al. 2017). Therefore, narrowing the gap between the least and the most productive firm within the same industry in a country is likely to be associated with lower wage inequality.

Figure 3: Correlation between inclusion and labor productivity in levels



Source : OECD and WDI

Figure 4: Correlation between inclusion and labor productivity in changes



Source : Source : OECD and WDI

[3] For instance, the economics literature has concluded that while globalization, one of the main determinants of productivity growth, contributes to within-country individual earnings inequality, it is not its main driver (Goldberg and Pavcnik 2007; Helpman 2016). Recent cross-country analysis from the economic geography literature also suggests that globalization is differently associated with widening regional disparities because: (i) the relation follows an inverted U-shape where trade-induced economic growth increases or decreases regional inequality depending on the pre-reform level of development of the country; and (ii) the timing of structural transformation due to raising agricultural productivity, the degree of internal market integration and agglomeration effects determine how globalization modifies the relative profitability of locations (Ezcurra and Rodriguez-Pose, 2013; Lessmann and Seidel 2017; Henderson et al., 2017).

2 Within-country evidence for Brazil and other emerging economies also supports the inclusive benefits of policies that foster productivity growth

Productivity policies have distributive implications on household welfare through changes in consumption and income. Ideally, the impacts of productivity growth on inclusion should be measured by comparing individual well-being over their entire lifetime, where the most appropriate measure is consumption.[4] The consumption effect of a productivity gain is usually positive for all households through a reduction in the cost of living and increased product variety. Its distributive impact depends on how the productivity change affects relative prices of goods that are consumed at different intensities across the income distribution, affecting real income. However, households are also employees and capital owners. The distribution of gains on the labor income side are more ambiguous and depend on workers' skills and performed tasks, geographical location and the characteristics of the employing firm. Likewise, changes in profits for entrepreneurs will depend on the initial level of productivity of the owned firm as well as on changes in output and input prices following the productivity policy. Therefore, the impact of a productivity measure on individuals is transmitted not only through income changes but also through changes in the purchasing power of their current incomes.

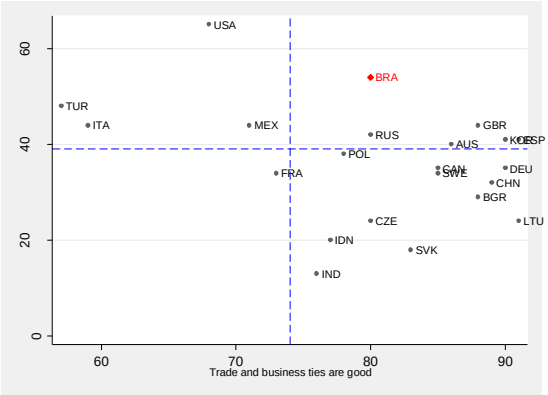
Consumer gains from trade opening, a major determinant of productivity growth, are pro-poor and inclusive. There is a pro-poor bias of trade opening in every country and Brazil register one of the most progressive gains.[5] Coming back to a closed economy in Brazil would be extremely costly for the poor, with real income loss that reach 57 percent for individuals at the 10th percentile of the income distribution and 3 percent for the 90th percentile. This positive bias in the gains from trade in favor of poor consumers hinges on the fact that these consumers spend relatively more on goods that are more traded, whereas high-income individuals consume relatively more services, which are less tradable. Additionally, low-income consumers concentrate spending on products with a lower elasticity of substitution between imported and domestic goods, which makes them lose relatively more when the country raises its trade barriers. The range of goods available to consumers also increases with trade opening, inducing a reduction in consumption prices (Broda and Weinstein, 2006; Goldberg et al., 2010; De Loecker et al., 2016). Brazilians' perception about the opportunities offered by trade seem in line with these inclusive gains (Figure 5).

[4] Current consumption captures lifetime well-being to the extent that consumers can inter-temporally shift resources through lending and borrowing. However, due to data constraints in household surveys, consumption is rarely used as the basis for measuring the inequality effects of a policy change. Wage inequality, while a narrower definition, is usually the preferred measure.

[5] Fajgelbaum and Khandelwal (2016).

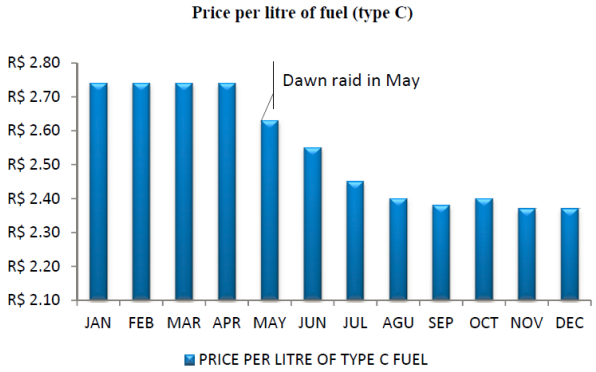
Likewise, consumer gains from increased domestic competition, another major determinant of productivity growth, are pro-poor and inclusive. The same mechanisms explain the positive impact of competition on poverty and shared prosperity. Extensive evidence suggests that homogeneous goods with low elasticity of substitution that tend to be relatively more consumed by the poor are more easily subject to imperfect competition at different stages of their production and distribution chain (World Bank 2016, 2017). In Brazil, the lack of competition in the cement, fuel retail and the industrial and medicinal gas markets impacted the life of the poorest through higher housing, consumer goods, transportation and health services prices (OECD, 2013). For instance, a dawn raid carried out in 2007 uncovered an important gasoline cartel in the city of Joao Pessoa, capital of the State of Paraiba. Since transportation costs directly affect the final prices of basic goods as well as bus tickets, high fuel prices were having a direct impact on the day-to-day life of the poor people.[6] After the intervention, fuel prices dropped by more than 10 percent leading to savings that reached more than 1 Million USD per month (Figure 6).

Figure 5: Brazilians' perception about benefits of trade are in line with significant pro-poor consumer gains



Source: PEW Global Attitude Survey (latest available year) and Fajgelbaum and Khandelwal (2016).

Figure 6: Competition enforcement leads to lower prices in some of the poorest localities in Brazil



Source: OECD (2013).

The use of new technologies also brings significant gains to all consumers. There are sizable consumer gains from the adoption of ICT and home broadband: on the order of more than USD 3,000 per year for the median person and reaching USD 32 billion per year in the United States. Likewise, internet has brought between Euros 18 to 44 billion in consumer gains in some

[6] Brazil remains highly dependent on its highway network for cargo and people transportation. For instance, the highway network accounts for 62 percent of total cargo transportation and even more for agricultural products.

European countries.[7] The introduction of personal computers in the United States has also generated welfare gains equivalent to 2- 3 percent of consumption expenditure. As discussed in Iootty et al. (2018), Brazil is one of the countries with the highest cost of adopting digital technologies. Removing tariffs and special taxes on ICT goods and services should lower prices and increase end-user demand (particularly for less-wealthy consumers) that is estimated to increase GDP per capita by 1.5 percent per year (Iootty et al. 2018).

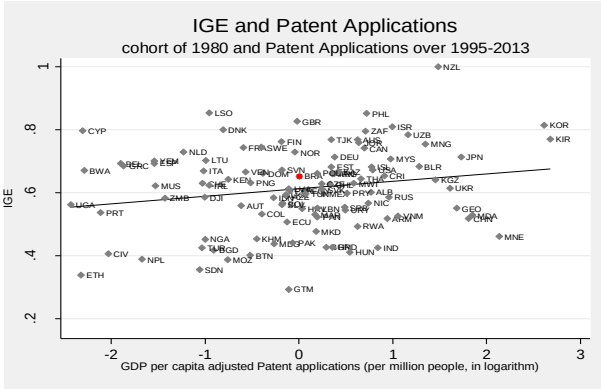
Greater innovation is also directly associated with improved opportunities for social mobility. Innovation has been a driver of some measures of social mobility in various OECD countries, including in Finland and the United States (Aghion et al., 2016, 2017). Assuming that entrepreneurial talent is evenly distributed across the population, innovation opens the door for less well-off individuals to move from low to high-income within one generation.[8] Across the globe, the cohort of people born in the 1980s experienced greater social mobility in economies that had higher patent applications per million inhabitants, controlling for GDP per capita in constant 2010 US dollars (Figure 7)[9]. An increase of 10 percent in country patent applications per million inhabitants is associated with a 0.42 percent higher social mobility. Likewise, the cohort of Brazilians born in the 1980s living in states with higher patent applications per million inhabitants (controlling for state GDP per capita, constant PPP 2010) experienced higher social mobility; an increase of 10 percent in state patent applications per million inhabitants is associated with a 0.73 percent higher social mobility (Figure 8). A similar positive association with greater social mobility exists for Brazilians who live in states with relatively higher access to the internet. A business environment that spurs innovation by new entrants (instead of protecting incumbents) is among the potential drivers of these positive relationships.

[7] Goolsbee and Klenow (2006), Dutz et al. (2012), Greenwood and Kopecky (2013); and Pantea and Martens (2014).

[8] Aghion et al. (2016) find that an increase in the number of patents per inhabitants in US cross-community zones by 10 percent is associated with a 0.7 percent higher probability for a person to belong to the 5th quintile when parents belonged to the 1rst quintile of the income distribution; and this relationship is mainly driven by innovation from new entrants (instead of incumbents). Likewise, Aghion et al. (2017) find that becoming an inventor enhances both intragenerational and social mobility in Finland.

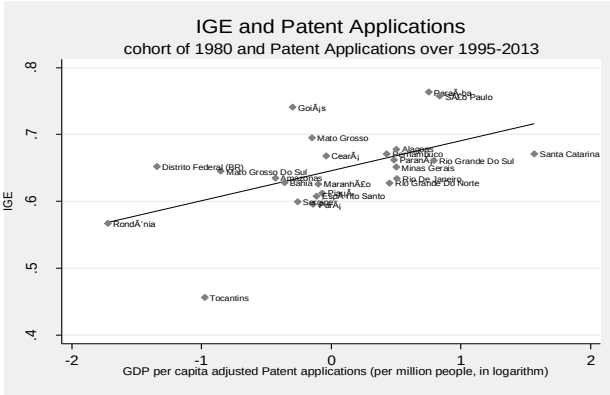
[9] Following the forthcoming "Fair progress? Educational mobility around the World" World Bank report, social mobility or intergenerational mobility (IGE) is measured by the extent to which the education of a generation is independent of the education of their parents, using the coefficient from regressions of children's years of education on the education of their parents. To facilitate interpretation, Figures 7 and 8 use the inverse of the indicator, so that an increase can be interpreted as an improvement in social mobility. These social mobility-innovation correlations control for GDP per capita, usually the best predictor of many social-economic indicators such as education levels; and patents is here a proxy for business environments that spur more innovation (and that lead entrepreneurs to allocate their talent to innovative activities rather than rent seeking).

Figure 7: Countries with higher patent applications have greater social mobility



Source: Social Mobility database and WDI.

Figure 8: Brazilians from states with higher patent applications had greater social mobility



Source: Social mobility database and OECD regional database.

Productivity policies can lead to lower wage inequality and higher aggregate income levels through general equilibrium price effects and through economic growth over the longer term – but short-term adjustment costs might arise and they tend to be spatially concentrated. As shown in Qiang et al. (2018), an increasing total factor productivity dispersion has been observed within industries in Brazil during the last decade; a synonym of factor misallocation suggesting that some workers remain employed in low productive firms paying relatively lower wages compared to competitors in the same industry. In fact, two-thirds of Brazilian wage inequality arises within industry-occupations for workers with similar characteristics, driven by wage dispersion between firms related to firm size and export orientation (Helpman et al., 2016). Policies that narrow the gap between the least and the most productive firm within the same industry are therefore likely to be associated with lower wage inequality. Competition policy is one of them, and evidence across OECD countries, Mexico, France and Egypt confirms that product market reforms boost employment in the longer term and on aggregate (World Bank, 2016). Extensive evidence has also shown that lack of market competition in input markets, such as fertilizers, seeds, pesticides and transportation services can increase the cost of inputs for low-income producers. Likewise, excessive downstream buyer power can depress purchasing prices for small producers. Trade openness has been similarly associated with higher levels of employment at the aggregate national level across countries and in Brazil.[10] While the recent evidence on the effects of trade liberalization or of technology adoption on local labor markets, based on the use of region-specific industry changes as a strategy to isolate the impact, have

[10] Dutt et al., (2009) ; Felbermayr et al. (2011). However, in explaining long-run unemployment rates, economists point instead to the more relevant role of labor-market institutions and technical change in driving employment.

shed light on the magnitude of adjustment costs towards the new market equilibrium, such analysis can only explain regional differences (namely region-specific deviations from the national aggregate trend) but cannot identify the role of productivity policies in explaining the trend itself (Pavcnik, 2017).

2.1 New evidence from Brazil indicates that tariff liberalization benefited households across the income distribution and was largely pro-poor, with net welfare gains

The 1990s trade liberalization on average benefited all households across the income distribution and was largely pro-poor and inclusive. New findings for the report (World Bank, 2018) are in line with and build on previous evidence for Brazil and other countries. Changes in local prices induced by tariff liberalization impact households' real income differently depending on their patterns of consumption (the weight of specific tradable goods in total expenditure), their endowments (labor income, skills and sector of employment) and their location (tariff pass-through to local prices)[11]. It is already well-known that Mercosul had on average a pro-poor impact by reducing tradable goods consumption prices and by having an almost insignificant impact on labor income (Borraz et al., 2013). In Argentina, Mercosur benefited the average household across the entire income distribution, with a pro-poor bias mainly through the labor channel, as the previous protection structure was in favor of relatively skilled-intensive goods (Porto, 2006). Tariff liberalization during the 1990s in India also benefited on average all households across the income distribution and was pro-poor, mainly driven by the consumption channel (Marchand, 2012). China's entry into the WTO in 2001 was pro-poor by lowering more the tariffs of goods highly consumed by the lower-end of the income distribution (Han et al., 2016). However, Mexico's 1990s tariff liberalization led on average to an increase in real income across the whole income distribution in favor of richer households, mainly due to a widening of the wage gap between skilled and unskilled labor, a higher reliance by richer households on labor earnings compared to agricultural sales for poorer households, and a higher dependence of the latter on subsistence activities (Nicita, 2009).

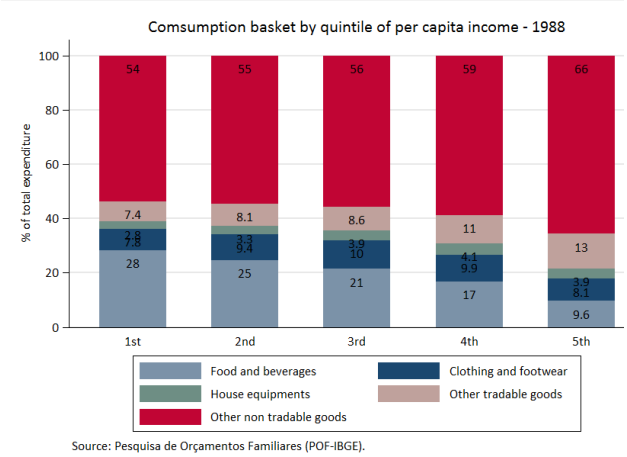
[11] Cf. Annex for a methodological discussion.

Table 1: Some regions have been bypassed by tariff liberalization

Tariff pass-trough	Regional specific effect	Geographical remoteness
Belo Horizonte	46%	29%
Belem	1%	21%
Brasilia	14%	27%
Curitiba	30%	30%
Fortaleza	24%	21%
Goiania	30%	28%
Porto Alegre	44%	30%
Recife	32%	22%
Rio de Janeiro	26%	30%
Salvador	20%	24%
Sao Paolo	27%	31%
Overall tariff pass-through	**Country average** 27%	

Source: Estimates derived from Table A.1.

Figure 9: Tradable goods have a relatively higher weight in poor households' expenditures



Source: Brazil POF 1988, IBGE

Benefits for many Brazilian households were limited by the low pass-through from tariffs to local prices. On average across metropolitan areas, only 27 percent of the border tariff reductions were transmitted to local consumption prices, based on annual consumer price data at the metropolitan level for four categories of tradable goods between 1991 and 1999 (Table 1 and A1).[12] This is lower than a previous estimate for Brazil, where it was found that on average 44 percent of Mercosul tariff liberalization were transmitted to local consumption prices (Borraz et al., 2013). This report's new findings are in line with an approximatively 30 percent pass-through estimated for Mexico (33 percent for agricultural goods and 27 percent for manufacturing goods according to Nicita, 2009) and 29 percent for urban China (Hang et al., 2016). Yet these estimates are lower than the 64-68 percent tariff pass-through estimated for urban areas in India (33-49 percent in rural areas) according to Marchand (2012). This imperfect tariff pass-through can be influenced by policy-related factors, such as lack of competition in transport and wholesale and retail services, with privileged firms capturing part of the reduction in prices by raising their margins.[13] This offers an opportunity for stricter enforcement of

[12] Regressions control for regional, product and year fixed effects to account for unobservable features specific to these dimensions.

[13] Low pass-throughs can also be due to factors out of reach of policymakers, such as imperfect competition in export markets, where foreign exporters capture part of the reduction in tariffs by raising their export prices, or to low elasticities of substitution between imported and domestic varieties.

competition policy to be pro-poor, by allowing lower-income households to directly benefit from the lower international prices.

Benefits were heterogeneous within the country, with some metropolitan areas being bypassed by trade liberalization due to limited internal market integration. Results in Table 1 indicate that local specificities changing slowly over time led to significant differences in tariff pass-through between metropolitan regions. The regions with the highest price transmission are Belo Horizonte (46 percent) and Porto Alegre (44), while Brasilia (14) and Belem (1) are characterized by the lowest pass-through. Regional differences do not seem considerably related to geographical remoteness (computed as the metropolitan area distance to the port of Santos) but instead to market segmentation (Goes and Matheson, 2015), partly associated with the inadequacy of transport infrastructure (Garcia-Escribano et al., 2015). Lack of competition in transport and distribution services or differences in state-level indirect taxes (e.g. ICMS) could also explain these results. Similar regional heterogeneities in tariff pass-through have been found in Mexico, China and India, with adverse distributive implications for the impact of trade opening on households' welfare.[14]

Trade liberalization lowered consumption prices for all Brazilians and raised relatively more the wages of the poor

Trade opening in Brazil was pro-poor through the expenditure channel as tradable goods are relatively more consumed by the poor. Figure 9 confirms that households in the lowest quintiles of the income distribution allocated a higher share of their budget to food and beverages, clothing and footwear, house equipment and other tradable goods, compared to services which are less tradable. The positive compensating variations computed for all Brazilian households on average across the income distribution illustrated in Figure 10 indicates that household were better off after the changes in local prices induced by trade liberalization. Such benefits from the expenditure side remain one of the main sources of distributive gains from trade opening (Fajgelbaum and Khandelwal, 2016).

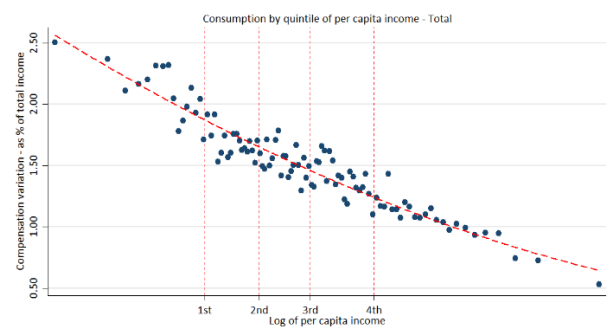
Tariff liberalization was inclusive on average through the labor income channel as the previous protection structure was in favor of skilled labor. Trade policy was not the main factor behind changes in labor income inequality in Brazil, as worker characteristics instead of changes in local prices are the main determinants of labor income (for formal and informal workers alike, Table A.2.).[15] While having a limited impact relative to the expenditure structure, workers' skills still shaped the distributive impact of trade opening on Brazilian households. Wages of workers with

[14] In Mexico for example, urban areas and states the closest to the United-States border benefited relatively more from lower local consumer prices for manufacturing goods after the trade policy change, while most southern states were largely bypassed by changes in local prices (Nicita, 2009). After China's entry to the WTO, the level of competition of the private sector at the city level led to differences in regional tariff price transmissions (Han et al, 2016). In particular, higher competition enhanced the pro-poor effects of trade opening by increasing the pass-through in goods registering higher expenditure shares in poor households' consumption basket.

[15] Regressions include formal and informal employees (workers without a signed work card), but do not include self-employed as their revenues are more heterogeneous and arise from profit maximization.

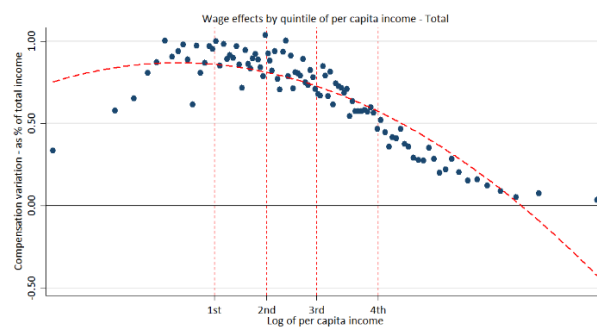
tertiary education fall with the reduction in local prices of electronics and other housing equipment, as the production of these goods was intensive in skilled labor (Figure A.2.).[16] Considering households' skills endowments, households in the upper quintile of the income distribution appear to have been negatively affected by the reduction in tariffs for such products. Similarly, the fall in consumer prices of clothing and footwear reduced on average the wages for less-skilled workers situated in the first quintiles of the income distribution. Assuming that wages equalized across sectors within regions by level of education, the labor demand for less-skilled workers increased relative to the labor demand for skilled workers after the changes in relative prices.[17] Results are in line with previous evidence for Brazil showing that relative prices fell in skill-intensive sectors (Gonzaga et al. 2006) and regional tariff decreases led to a decline in the skill premium in local labor markets (Lusting et al, 2013; Dix-Carneiro and Kovak, 2015; Dix-Carneiro and Kovak, 2017b). This Brazilian feature has not been observed in the Colombia, Mexico and Morocco trade liberalization patterns (Goldberg and Pavcnik, 2007). Labor income effects would have been even more inclusive had the pass-through reached 46% for all regions (the highest regional pass-through in Brazil), as the first two quintiles of the income distribution would have benefited relatively more from the price changes (Figure 11).

Figure 10: Tariff liberalization was pro-poor and inclusive from the expenditure channel (average compensating variation by percentile of income per capita)



Assumption: Regional tariff pass-troughs (Table 1, column 1).

Figure 11: Tariff liberalization was pro-poor and inclusive from the labor income channel (average compensating variation by percentile of income per capita)



Assumption: Regional tariff pass-troughs (Table 1, column 1).

The net effect of trade liberalization on households' welfare was pro-poor and inclusive

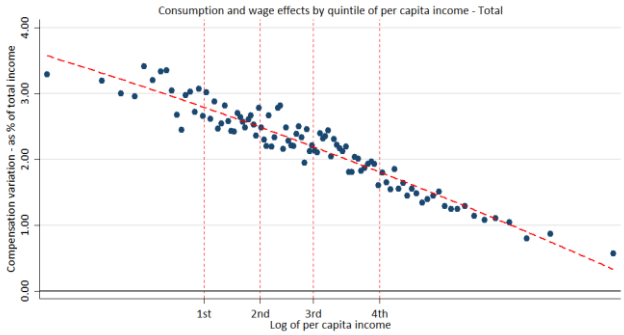
Combining both the expenditure and the labor income channels, results confirm that trade opening benefited the average Brazilian household across the entire income distribution and was pro-poor and inclusive, largely due to the consumption channel. Benefits for households in the first quintile of the per capita income distribution reached almost 4 percent of total household income per capita, while benefits for the last quintile reached 2 percent (Figure 12).

[16] Results are consistent with Stolper Samuelson effects.

[17] The underlying assumption that wages are equalized across sectors within regions by level of education is in line with the evidence for Brazil that suggests that labor mobility costs across regions are higher than across industries.

This magnitude is similar to the results quantified for Mexico (Nicita, 2009). Poverty in Brazil would have been higher without trade opening; and poverty reduction policies could have been more effective if internal markets were better integrated. While on average all households benefited across the income distribution, some categories of households might have experienced an erosion of their purchasing power or might have been completely bypassed by the changes in relative prices.[18] However, results suggest that these sub-groups that might have lost remain small compared to the full population within each percentile, as average effects remain positive across the entire per capita income distribution.

Figure 12: Tariff liberalization net effect (expenditure + labor income) was pro-poor and inclusive



Assumption: Regional tariff pass-troughs (Table 1, column 1).

2.2 Further trade opening should benefit all households and remain inclusive, offering opportunities for financing redistributive policies

Further trade liberalization is expected to increase the size of the economic pie, as average effects are positive along the income distribution, and should remain inclusive by raising the welfare of the bottom 40 percent of the population. If the domestic market segmentation remains similar to what was observed during the nineties, simulations of changes in local consumption prices following the implementation a trade reform at the Mercosur level (reducing tariffs by 50 percent with respects to non-Mercosur countries and streamlining non-tariff measures among Mercosur parties) suggest that all Brazilian households would benefit on

[18] The methodology employed does not identify individual households that might have lost from trade opening, as compensating variations are presented as average by percentile of household per capita income and estimated price-wages elasticities are average effects. In addition, we cannot identify if the new wage resulting from trade liberalization is only offered in informal labor markets due to the existence of labor market rigidities; or if it falls below the worker reserve wage (the person falls in unemployment). Also, we do not quantify how trade liberalization induced changes in local prices affect non-labor income (e.g. profits for employers and self-employees, sales for agricultural producers).

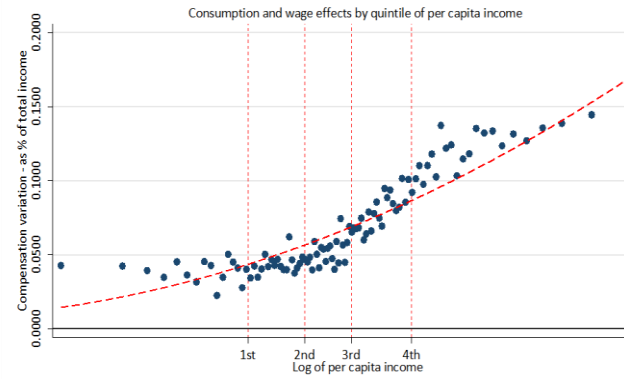
average across each percentile of the income per capita distribution. The poverty rate could fall by 3.2 percentage points (based on USD 5.50 a day at 2011 purchasing power parity) lifting almost 6 million people out of poverty.[19] And simulations from a complementary study find that all tariffs being reduced to zero would increase the purchasing power of people in the lowest income decile by 15 percent compared to an average household income increase of 8 percent (Arnold et al. 2017). Gains are inclusive in the sense that the welfare of the bottom 40% of the population increases; but they might raise inequality concerns as the gains are expected to be relatively higher for the last quintile of the income per capita distribution, as well as for the southern states (Figure 13 and Map 1).[20] The pro-rich labor market effects dominate the pro-poor consumption effects. While the poor benefited significantly from tariff reductions on food and beverages in the 1990s, tariffs for these products are already low, and so consumption gains among the poor are more limited. More importantly, tariff reductions on low-skill intensive goods such as clothing and footwear would negatively affect earnings of poor workers in these industries, partially offsetting the average gains from lower prices. [21] Some communities with preponderant employment in declining industries may see increased levels of poverty due to job losses. More economically diversified communities might see simultaneously high employment creation and destruction (SAE 2018, Goes et al. 2017).

[19] The changes in poverty rate were computed using PNAD 2008, by applying the average compensating variation by percentile of household per capita income illustrated in Figure 13 to each household in PNAD depending on his location in the income distribution. These changes in household real income reduce the number of poor people from 57.2 Million to 51.3, thus allowing 5.9 Million people to get out of poverty (using the regional pass-through estimated in Table 1). Measures to improve the price transmission implemented in parallel, with tariff pass-through reaching 46% in all localities (the level observed in the best performing municipal area -c.f. Table 1), could lift an additional 2.7 million people out of poverty. PNAD 2008 was used to remain concistent with the fact that welfare effects where computed using POF2008.

[20] On the one hand, benefits from the consumption side remain pro-poor but with a lower magnitude, as tariffs for the tradable goods the most consumed by the poor, such as food and beverages, are already low. On the other hand, as the current structure of protection in now biased against skilled workers, changes in labor income would benefit relatively more the last quintiles of the income per capita distribution that tend to live in the southern states. Household welfare is computed using the latest household expenditure and income database (POF2008).

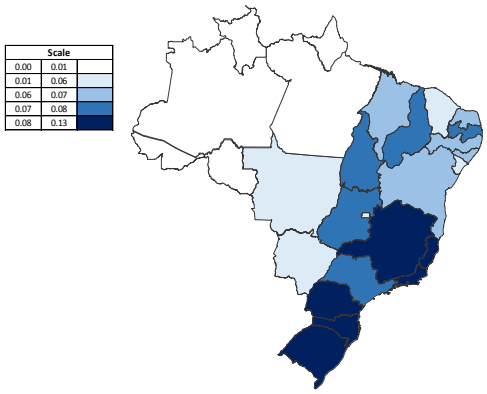
[21] Arnold et al. (2017) use exogenous exchange rate movements as proxies for changes in trade protection and intensity of competition. They find that only a very few sectors would likely reduce their activities in Brazil as trade barriers fall, namely textiles and shoes. However, these studies do no account for the possibility of improvements in productivity through learning and capabilities upgrading as a result of increased competition discipline if public policies supported such upgrading, which in principle could then result in output expansion and increased sales.

Figure 13: Further tariff liberalization might be inclusive (average compensating variation by percentile of income per capita)



Assumption: Regional tariff pass-troughs (Table 1, column 1).

Map 1: Heterogeneous regional gains (average compensating variation by households geographical location)



Assumption: Regional tariff pass-troughs (Table 1, column 1).[22]

These aggregate overall positive gains open the door to financing redistributive policies, generating resources to implement mitigating policies for people left behind. People experiencing at short term a net negative effect from further trade opening are few, as real labor income is likely to increase on average for all households within each percentile of the household income per capita distribution. However, as trade opening will reduce relatively more the tariffs of less-skilled intensive goods, and changes in tariffs on goods relatively more consumed by poor households will be small compared to the 1990s dramatic changes in protection, some households will likely experience a net negative welfare effect. They are likely to be concentrated at the lower-end of the income distribution and in some localities where employment is highly dependent on less-skilled labor (e.g. clothing and footwear). Lack of adequate compensation including a mix of adjustment and income support for these individuals could derail globalization and undermine public support for market-based policies that are welfare enhancing for most households across Brazil. Indeed, the 1990s' trade liberalization induced a short-term rise in crime in the regions most exposed to import competition, even though this effect receded overt time following the recovery of the labor market (Dix-Carneiro et al. 2016). Hence, redistributing part of the gains from trade liberalization to address adverse distributional outcomes and compensate less well-off individuals left behind is critical.

3 Productivity growth offers opportunities for redistribution towards people left behind

[22] These average compensating variations by households' geographical location are those measured in the vertical axis of Figure 13.

Brazil should learn from its past and from international experience to implement policies that facilitate the adjustment of people instead of policies that hinder resource reallocation by protecting firms with unproductive jobs. Improved labor market outcomes have been the main driver of poverty and inequality reduction in Brazil. Productivity policies can be inclusive by raising labor productivity, reducing wage disparities among workers with similar characteristics and connecting the poor to more and better-paid jobs. Investing in labor market policies that provide transitional income support, intermediation services, up-skilling or re-skilling and incentives to migrate, rather than measures that protect jobs, allows for an efficient reallocation of labor, supporting the process of competition and efficient firm growth (Word Development Report, 2013). Resources are thus allocated in ways that lead to productivity gains; and if followed with significant output expansion by productive firms, the process of competition will lead to enough job creation to offset the employment decline induced by the reallocation process. As discussed in Packard (2018), increasing the efficiency of Brazil's diverse set of labor market regulations, institutions and programs, as well as making sure that they address the needs of less well-off individuals whose skills have become obsolete is therefore key to accompany the labor reallocation process. Preserving unproductive jobs that are no longer economically viable, on the contrary, prolongs an inefficient allocation of resources, creating subsidized and costly jobs – which need to be compared to the opportunity of overall net job creation, social mobility and consumer gains generated by productivity policies. In addition, all protectionist policies entail a high risk of capture by beneficiary firms, politicians and policymakers, with the danger, as observed in Brazil, of distortionary measures becoming permanent rather than temporary. As discussed in Clarke (2018), job protection policies in Brazil have allowed firms or even whole industries to coordinate to engage in rent seeking, securing permanent government support that generates rents. These rents, in turn, are typically very unequally distributed among workers and capital owners.

One of the main learnings from Brazil's experience is that insufficient geographical labor mobility has impeded the reallocation process triggered by productivity policies, distributing unevenly the costs and benefits of productivity growth across regions. For changes in regional labor market outcomes due to an increase in imports, a key finding in Brazil is that the trade opening of the 1990s had a negative impact on earnings in some regions that was three times larger twenty years after trade liberalization than ten years after and displaced workers experienced long spells of unemployment.[23] In addition, tradable and non-tradable sectors were sufficiently integrated in these regions so that a productivity change affecting initially workers in

[23] This was driven by imperfect labor mobility and declining labor demand, due to a slow process of capital dis-investment and agglomeration economies running in reverse. Slow inter-regional mobility in this instance was due to entrepreneurs waiting that their capital investment depreciates fully before closing their firms, and by negative regional agglomerations effects that amplified the fall of labor income in regions adversely affected by import-competition relative to other regions (Dix-Carneiro and Kovak, 2017a). Dix Carneiro and Kovak (2017b) confirms these results using worker level data instead of aggregate regional labor outcomes and use nominal and effective tariff reductions, confirming that results are robust when accounting for intermediate input linkages.

tradable sectors ended up affecting all workers in the region. For changes in regional labor market outcomes due to an increase in exports, greater local labor demand triggered by exports, better access to foreign markets (the rest of the world has over recent years reduced its own trade barriers, including vis-a-vis Brazil exports) and FDI have indeed fueled within-country migration flows in Brazil (Aguayo-Tellez et al., 2010; Hering and Pallacar, 2015). However, these flows have remained too modest to-date to compensate sufficiently for the lack of out-migration of workers in regions affected by import competition, possibly due to an asymmetric migration response from workers to positive versus negative changes in labor demand.[24] It is likely that after a negative labor demand change, a migrant considers not only the potential gains from out-migration, but also the increase in the cost of the easiest out-migration option as neighboring areas that have a similar industrial production structure are equally negatively affected by the change.

Labor mobility costs across regions have been higher than across industries, and displaced workers have often moved to informality rather than migrating. Aggregate productivity gains can lead to transitional unemployment in the short term as the economy adjusts to new conditions; to the extent that this unemployment disproportionally affects poor people, it will have adverse consequences for income inequality. The relatively small magnitude of industry wage responses and the simultaneous lack of labor reallocation across regions in Brazil following the 1990s trade liberalization seem to be explained by the rise of the informal sector. Some tradable sector workers facing larger regional tariff declines transitioned into non-tradable employment, unemployment or out of the labor force.[25] Workers adversely affected by import competition did not then migrate to less-affected regions since the informal sector provided a fallback option that was more attractive relative to the uncertain costs of moving (Carneiro and Kovak, 2017b). Yet, to the extent that informal employment reduces wage and non-wage benefits and workers' rights and protections—such as fewer opportunities for training and advancement and generally less favorable working conditions—transitions out of formal employment towards informality are likely to involve declines in the well-being of these workers.

Modern intermediation and job-search services though new technologies can help reduce these spatial mobility costs. Sector-specific compensation for displaced workers such as the United States Trade Adjustment Assistance is likely to fail to address negative employment outcomes in Brazil as sectors in local labor markets remain closely integrated (Almeida et al. 2017;

[24] In-migration dropped in response to the 1990s tariff liberalization while out-migration did not change. Migration did not significantly respond positively to the increase in exports following the increased demand from China, while it did respond to the import increase created by greater import competition from China (Dix-Carneiro and Kovak, 2017a; Costa et al, 2016). Costa et al. (2016) also find that the Brazil-China 2000s commodities-for-manufactures trade boom impacted wages by the same magnitude but in different directions (depending on workers' location in net exporting versus net importing micro-regions) leading to a net impact on wages close to zero.

[25] Carneiro and Kovak, (2017); Paz (2014); Dix-Carneiro and Kovak (2017b); Menezes-fihlo and Muendler, (2011).

Dix-Carneiro and Kovak; 2017b).[26] On the contrary, a geographical-specific labor market strategy would be more adapted. For costs related to spatial relocation, compensation of moving expenses could be provided to workers showing proof of relocation (World Bank, 2014). As discussed in Packard (2018), if workers are risk-averse about moving because they lack information about other job markets, job-search assistance could reduce information asymmetries and increase the probability of finding a job. If there is a skills mismatch, displaced workers could acquire new skills adapted to market demand through specially designed classroom and on-the-job training programs. Technological advances can augment the efficiency of such intermediation and job-search services. As job-search and retraining is costly, transitional income support is also key. Finally, early announcement and gradual policy reform could give workers time to transition and public institutions time to learn and adapt their offering to the specificities of displaced workers.

An additional important lesson learned from Brazil experience is that a strong output expansion from productivity upgrading, especially for less-skilled intensive industries, is essential for policies to result in more and better paid jobs for less well-off people. The limited job gains that lower-skilled workers have experienced in Brazil from the increased productivity associated with technology adoption could be expanded significantly if these firms have greater opportunities for efficient global output expansion. Of all Latin America countries studied on the inclusive growth impact of digital technology adoption (Dutz, Almeida and Packard, 2017), Brazil is the only country with no positive jobs impact on lower-skilled workers. Country studies on Argentina, Chile, Colombia and Mexico find inclusive growth due to the increased productivity impact of adoption of digital technologies. Studies on Brazil find no positive economy-wide net effect on the total number of formal jobs in the municipalities at the time that they benefit from internet roll-out (Dutz et al., 2017), and a negative impact on employment in the short run with a larger negative impact for lower-skilled, routine and manual tasks (Almeida et al., 2017). Negative employment effects are the strongest in the more non-tradable sectors of the economy that have more limited output-expansion opportunities. These findings are not unexpected in a country like Brazil where there have been more limited opportunities for efficient global output expansion in light of its policy distortions including high trade and other product market expansion barriers. Output expansion is the main driver of jobs, fueled by productive firms that are able to respond to greater demand and grow, as well as by new and expanding firms attracted to the market. Moving forward, supporting larger, export-oriented firms in expanding their outputs could reduce wage inequality as they are likely to increase labor demand (including for lower-skilled workers) and pay higher wages.

Finally, the administration of current passive labor market and social programs could be enhanced to ensure that income support is provided to less well-off individuals unable to

[26] Programs that target only industries directly affected by import competition are likely to omit many workers whose employment and earnings prospects are indirectly affected by trade liberalization (Dix-Carneiro and Kovak, 2017b)

adjust to the new market conditions and directly contribute to productivity growth. Not all individuals will be able to adapt to new employment conditions, skill requirements or move to another location. Brazil has various income support programs that could be re-tailored to ensure that they cover in a timely way income losses of less well-off individuals for which active labor market programs would not be enough to reactivate their labor market entry. Under tight fiscal restrictions, increasing the efficiency of such public spending and reducing the overlap between programs would allow to expand beneficiaries' coverage and enhance their progressivity. Gains arising from productivity growth and the closing of costly ineffective policies will also generate additional public resources to increase the amount of income support provided and further expand programs' coverage.

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ANNEX

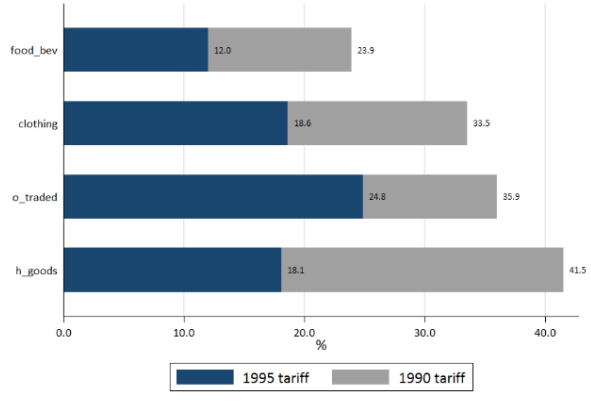
The early 1990s tariff liberalization allows the distributive effects of productivity policies on household welfare to be estimated, including how they depend on household endowments and on the different reactions of local prices across Brazil. The dramatic changes in tariffs between 1990 and 1995, with average tariffs falling from 30.5 to 12.8 percent, were implemented to bring tariff levels across industries in line with levels negotiated within the WTO and Mercosur, rather than to cater to special lobby interests. Industries with initially higher level of protection experienced greater tariff declines, changing the structure of protection across sectors. This suggests that industry lobbies might have had less influence on the magnitude of the tariff changes during the reform period (Pavcnik et al. 2004). This policy led to productivity growth in Brazil through better access to cheaper and more varied intermediary inputs (Lisboa et al. 2010) and increased competition in output markets (Muendler, 2004; Schorr, 2005).

Following the methodological framework developed by Porto (2006), and replicated by Nicita (2009), Marchand (2012) and Borraz et al. (2013), the distributive impact of trade liberalization on household welfare can be analyzed in a general equilibrium model of trade: (i) by estimating how changes in border prices due to tariff liberalization are transmitted to local consumption prices; and (ii) by quantifying how such new local prices affect each household’s expenditures

(through their savings from the consumption of lower-priced tradable goods) and incomes (through their changed labor income). Because households in different parts of the pre-reform welfare distribution differ in the composition of their consumption bundles and their education endowments, they will be differently impacted by price changes. For example, less well-off households spend a higher share of their budget on basic items such as food, and typically have a lower educational level than richer households. It is therefore possible to simulate the effect of trade policy changes on the distribution of household welfare (proxied by household income per capita), based on estimates of wage-price elasticities together with estimates about the changes in traded goods prices in various localities. It is then possible to compute the average compensating variation that would leave households indifferent to the situation before the policy reform at different levels of the income per capita distribution, based on expenditure and income data at the household level.

The data used to estimate the extent of tariff pass-through for the period 1991-1999 for four categories of tradable goods (food and beverages; clothing and footwear; electronics and other house equipment; and other tradable goods) are local consumer prices (IPCA - Índice de Preço ao Consumidor Amplo) from IBGE. Producer prices (IPA - Índice de Preços por Atacado) originate from IBRE-FVG. International prices come from Muendler's online database and tariff data from Kume-Honorio as well as WITS. The distances to the port of Santos are collected using Google Maps. Wage-price elasticities for tradable goods by type of skills are estimated using PNAD, the annual labor market survey for the period 1986-2001. Simulations of trade-induced changes in consumer prices and wages on households' expenditure and labor income are based on the household expenditure and income survey (POF) for the year 1988 for backward-looking simulations and 2008 for the forward-looking simulations.

Figure A.1.Tariff changes by goods category for the 1990s trade liberalization



Source: Kume-Honorio

The national tariff pass-through estimating equation is given by:

$$ln(P)_{grt} = \beta_0 + \beta_1 ln(PP)_{gt} + \beta_2 ln(PX_{gt}) + \gamma \ln(1 + \tau_{gt}) + \rho_g + \vartheta_r + \mu_t + \varepsilon_{grt} \qquad (1)$$

The regional tariff pass-through estimating equation is given by:

$$ln(P)_{grt} = \beta_0 + \beta_1 ln(PP)_{gt} + \beta_2 ln(PX_{gt}) + \beta_3 lnTC_r + \gamma \ln(1+\tau_{gt}) + \gamma_1 \ln(1+\tau_{gt}) TC_r + \rho_g + \mu_t + \varepsilon_{grt} \quad (2)$$

$with\ \ P$=$local\ consumer\ price$; PP=$domestic\ producer\ price$; PX=$international\ price\ in\ local\ currency$; TC=$domestic\ trade\ cost\ (distance\ to\ port\ of\ Santos\ or\ regional\ dummy)$; τ=$tariff$; g,r,t = tradable goods (4 categories), region, year specific effects; ε_{grt} is the i.i.d. error term. The specification is estimated using ordinary least squares with specific effects. The year fixed effects (t) control for the time-varying factors that are common to all states; and the industry specific effects (g) control for the movements in industry-specific producer costs that are associated with changes in production technology or input costs. The state fixed effects (r) in the first specification take regional price differences into account, while in the second specification (2) they allow tariff pass-through coefficients to vary by state.

Table A.1. National and regional tariff pass-through

VARIABLES	(1) lnp_consumer	(2) lnp_consumer	(3) lnp_consumer	(4) lnp_consumer
lnp_producer	0.0729***	0.0729***	0.0729***	0.0764
	(0.00155)	(0.00153)	(0.00153)	(0.0832)
lnp_imports	-0.0254	-0.0254	-0.0254	-0.0254
	(0.0186)	(0.0184)	(0.0184)	(0.0189)
lni_tariff	0.265**	0.313**	0.297**	0.460***
	(0.112)	(0.117)	(0.113)	(0.112)
1b.region#co.lni_tariff				0
				(0)
2.region#c.lni_tariff				-0.450***
				(0)
3.region#c.lni_tariff				-0.323***
				(0)
4.region#c.lni_tariff				-0.162***
				(0)
5.region#c.lni_tariff				-0.225***
				(0)
6.region#c.lni_tariff				-0.163***
				(0)
7.region#c.lni_tariff				-0.0253***
				(0)
8.region#c.lni_tariff				-0.143***
				(0)
9.region#c.lni_tariff				-0.205***
				(0)
10.region#c.lni_tariff				-0.257***
				(0)
11.region#c.lni_tariff				-0.193***
				(0)
lndis_santos		0.00139		
		(0.00228)		
lnt_santos_bis		-0.0350*		
		(0.0162)		
lndis_clospor			0.00179	
			(0.00115)	
lnt_ports_bis			-0.0709	
			(0.0394)	
Constant	4.327***	4.327***	4.331***	4.281***
	(0.0829)	(0.0826)	(0.0839)	(0.383)
Observations	352	352	352	352
Year dummies	Y	Y	Y	Y
Metropolitan area dummies	Y	N	N	Y
Sector dummies	Y	Y	Y	Y
R-squared	0.990	0.990	0.989	0.991

Robust standard errors in parentheses (clustered by metropolitan areas)
*** p<0.01, ** p<0.05, * p<0.1

Source : Authors' calculations.

The individual wage responses to changes in local prices for four categories of tradable goods following tariff liberalization are estimated using the following specification:

$$logW_i = \sum_{g \in T} logP_i^g(e_i\beta_i) + e_i'\delta + z_i'\gamma + \varepsilon_i \; ; \qquad (3)$$

with e_i' = worker characteristics (i.e. educational attainment, number of hours worked, formality, urban, age, age2, gender, kids under 6, kids between 6-13 years old); z_i'= fixed effects (state, year, sector and type of activity). The specification is estimated using ordinary least squares with specific effects.

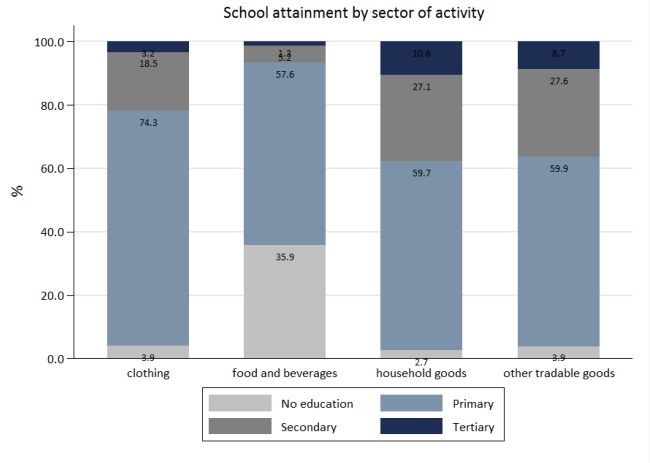
Table A.2.: Individual wage responses to changes in prices of tradable goods by type of skills (OLS with specific effects).

VARIABLES	(1) Log of the real wage	(2) Log of the real wage	(3) Log of the real wage
0b.edu_att#c.lclothing	-0.310	-0.318	-0.379
	(0.355)	(0.349)	(0.308)
2.edu_att#c.lclothing	0.463	0.406	0.331
	(0.301)	(0.266)	(0.250)
3.edu_att#c.lclothing	-0.228	-0.140	-0.101
	(0.193)	(0.158)	(0.141)
4.edu_att#c.lclothing	-0.690***	-0.621***	-0.569***
	(0.240)	(0.215)	(0.180)
0b.edu_att#c.lfood_bev	0.682	0.512	0.406
	(0.435)	(0.388)	(0.362)
2.edu_att#c.lfood_bev	0.574	0.360	0.273
	(0.415)	(0.367)	(0.353)
3.edu_att#c.lfood_bev	0.110	0.0100	-0.0471
	(0.416)	(0.364)	(0.338)
4.edu_att#c.lfood_bev	-0.269	-0.382	-0.399
	(0.433)	(0.405)	(0.368)
0b.edu_att#c.lh_goods	-0.0874	-0.178	-0.111
	(0.381)	(0.349)	(0.318)
2.edu_att#c.lh_goods	-1.011**	-0.992***	-0.903**
	(0.388)	(0.347)	(0.331)
3.edu_att#c.lh_goods	-0.124	-0.291	-0.357*
	(0.293)	(0.225)	(0.208)
4.edu_att#c.lh_goods	0.787**	0.649**	0.533***
	(0.304)	(0.241)	(0.183)
0b.edu_att#c.lo_tradable_goods	-0.163	-0.147	-0.123
	(0.443)	(0.452)	(0.438)
2.edu_att#c. lo_tradable_goods	0.0819	0.102	0.107
	(0.416)	(0.414)	(0.407)
3.edu_att#c. lo_tradable_goods	0.279	0.243	0.258
	(0.535)	(0.492)	(0.465)
4.edu_att#c. lo_tradable_goods	0.263	0.208	0.215
	(0.605)	(0.600)	(0.566)
Educational attainment = 2, Primary Education	0.557***	0.334***	0.261***
	(0.0734)	(0.0728)	(0.0655)

Educational attainment = 3, Secondary Education	1.348***	0.866***	0.782***
	(0.144)	(0.115)	(0.102)
Educational attainment = 4, Tertiary Education	1.930***	1.384***	1.314***
	(0.169)	(0.146)	(0.118)
Log of the number of hours worked in the reference week of PNAD	0.460***	0.497***	0.436***
	(0.0203)	(0.0223)	(0.0225)
Did the person have a formal job in the reference week of PNAD?			0.379***
			(0.0179)
Urban or rural area	0.303***	0.160***	0.146***
	(0.0239)	(0.0197)	(0.0177)
Age	0.0188***	0.0178***	0.0156***
	(0.000312)	(0.000447)	(0.000685)
Square of age	-1.87e-05***	-1.76e-05***	-1.55e-05***
	(2.96e-07)	(4.18e-07)	(6.58e-07)
Gender	-0.459***	-0.380***	-0.377***
	(0.0125)	(0.00917)	(0.00908)
Kids below 6 years old in the household	0.0866***	0.0856***	0.0773***
	(0.00731)	(0.00812)	(0.00861)
Kids between 6 and 13 years hold in the household	-0.00869**	-0.000180	0.00526
	(0.00407)	(0.00392)	(0.00347)
black	-0.160***	-0.103***	-0.105***
	(0.0106)	(0.00973)	(0.00993)
pardo	-0.122***	-0.0901***	-0.0875***
	(0.00807)	(0.00726)	(0.00672)
yellow	0.122***	0.104***	0.121***
	(0.0170)	(0.0110)	(0.0106)
indigena	-0.0768***	-0.0458**	-0.0206
	(0.0145)	(0.0214)	(0.0194)
Constant	3.821*	4.765**	5.117***
	(1.919)	(1.778)	(1.712)
Observations	1,005,712	1,005,712	1,005,712
Year dummies	Y	Y	Y
Metropolitan area dummies	Y	Y	Y
Sector dummies	N	Y	Y
Occupation dummies	N	Y	Y
R-squared	0.529	0.583	0.607

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure A.2. Skills intensity by category of tradable goods



Source: Authors' calculations.