Decomposing the Effect of Trade on the Gender Wage Gap[1]

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Abstract

This paper utilizes regional variation in exposure to increased Chinese imports in Brazil to investigate the impact of trade on gender wage inequality. We find that rising imports reduced wages in local Brazilian labor markets, but that this wage reduction was entirely borne by male workers (thus reducing the gender wage gap). Using Oaxaca-Blinder decompositions, we find that this reduction in the wage gap was largely explained by differences in the occupational employment of female and male workers, with trade increasing the female share of workers in higher-paying occupations and increasing the (relative) returns to primarily-female occupations.

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1. Introduction.

It is a well-established fact that, globally, women make less than men even after controlling for individual characteristics such as age and education. While there has been a lot of attention paid to the impacts of globalization on income inequality, only recently has there developed a literature looking at the impact of globalization on the gender wag gap.[1] In this paper, we follow an approach pioneered by Autor et al. (2013) to relate changes in local labor market outcomes to changes in exposure to Chinese import competition and apply it to the question of how trade shocks (i.e., increased foreign competition) might affect gender wage inequality using Brazilian administrative individual-level data.[2] We then utilize regional Oaxaca-Blinder decompositions to provide insight into the channel by which trade is impacting the Brazilian gender wage gap.

During the time period under consideration (2000-2010) imports from the rest of the world to Brazil increased by 45 percent in real terms. However, during the same time period, imports from China to Brazil increased by 994 percent. Thus, the "China trade shock" in Brazil seems an ideal trade episode to study in looking at the link between foreign competition and labor market outcomes.[3] Using Brazilian census data (RAIS) and microregions as our unit of observation (a geographical area similar to the commuting zones of the U.S.) we compute regional exposure to Chinese import competition using variation in the industry structure of the region. We first show that, almost identical to Autor et al. (2013)'s results for the U.S., a more exposed Brazilian microregion (75th percentile) saw a .96 percent decline in wages relative to a less trade-exposed region (25th percentile).[4] However, we also find that this wage decline was borne entirely by male workers (i.e., more exposed Brazilian regions saw no statistically or economically significant decline in in female wages), thus resulting in

[1]For research on globalization and inequality see survey articles by Goldberg and Pavcnik (2007) and Harrison et al. (2011). For research on the gender wage gap see the survey article by Blau and Kahn (2008).

[2]Other papers that have taken a local labor markets approach to the impact of trade liberalization on labor market outcomes include Topalova (2010), Kovak (2013) and Hakobyan and McLaren (2016).

[3]Similar to Autor et al. (2013) we instrument for the growth in Brazilian imports from China by using Chinese import growth to other similar South-American countries.

[4]For the U.S., Autor et al. (2013) estimate a .8 percent decline.

a (relative) decline in the gender wage gap of around 1 percentage point in the more trade exposed regions.

The question then becomes the mechanism by which foreign competition might be having a differential effect on male and female wages. One of the advantages of using regional variation and worker-level data is that we can run Oaxaca-Blinder decompositions to divide regional gender wage gaps into their different components and see which component import competition is influencing. We use a three-fold decomposition which divides the gender wage gap into a part due to observable differences in the characteristics of workers (explained), a part due to differences in returns (unexplained) and a part which captures the interactions between the two (interaction). Our observable worker characteristics in the log wage regressions are worker age, education, occupation and industry of employment. Estimating our regional trade exposure regressions on each of these components, we find that the 1 percent decline in the wage gap is due almost entirely a reduction in the *explained* portion, as the more exposed regions saw a 1.03 percent larger decline in the explained part of the wage gap with statistically (and economically) insignificant declines in the other portions. Thus, our results are more consistent with a story of trade increasing overall wages in female-dominated occupations/industries (explained) and less consistent with trade increasing female wages relative to male wages within the same occupation/industry (unexplained).

Since trade exposure seems to be operating through the explained portion of the gender wage gap, we can then divide that explained component into the parts due to the different worker characteristics (age, education, occupation and industry). In this case, while each of the components are contributing to the reduction in the wage gap, changes in observed occupational differences between male and female workers appears to be the primary contributor to the reduction. Specifically, about half of the 1 percent larger decline in the gender wage gap within more exposed regions is coming from the occupation component of the wage gap. Thus, our results are more consistent with a story of trade increasing overall wages in female-dominated occupations rather than increasing wages in female-dominated industries (or age groups or education levels).

Finally, we can decompose the change in the occupation component of the (explained) gender wage gap into the part due to changes in the labor share of male and female workers in different occupations and the part due to changes in overall occupation returns. Rerunning our regressions, we find that decline in the gender wage gap in more exposed regions is coming equally from both parts. Specifically, about half (.2 percent) is coming from changes in the observed differences between male and female workers in occupational employment. Intuitively, this result suggests that exposure to Chinese imports is reducing the gender wage gap by increasing the share of female workers in higher-paying occupations (at least in the more trade exposed regions).[5] However, the other half of the decline (.3 percent) is coming from changes in the returns to the different occupations. Basically, this would be due to a (relative) increase in the returns to "traditionally female" occupations in more exposed regions.[6]

Our paper is related to a growing body of literature that investigates the impact of globalization on the gender wage gap. Many of these previous papers have exploited industry variation in trade exposure. For example, Black and Brainerd (2004) found that U.S. industries facing larger increases in import competition observed declines in the gender wage gap (at least within a set of industries that were already non-competitive). Juhn et al. (2014) found that Mexican firms in industries that saw the the largest foreign tariff reductions, post-NAFTA, tended to engage in technology upgrading and increase both relative female wages and employment. Finally, Ederington et al. (2009) used the Colombian trade liberalization episode of the 1980's and found that firms facing the greatest increase in foreign competition tended to increase the female share of their employment.[7]

Our paper is obviously complementary to these as we exploit regional variation in

[5]This result is potentially consistent with a mechanism, such as in Ederington et al. (2009), where foreign competition breaks down discriminatory barriers to hiring female workers in traditionally male occupations.

[6]This result seems more consistent with the mechanism in Juhn et al. (2014) where foreign competition increases female wages by inducing technology upgrading that is more complementary to female skills.

[7]Also contributing to this literature is a recent paper, Bøler et al. (2015) which exploited firm variation in comparing the female share of exporting and non-exporting firms.

trade exposure as opposed to industry variation.[8] In this sense, the paper most directly related to ours is Gaddis and Pieters (2016) that exploited regional variation in exposure to the Brazilian trade liberalization episode of the 1990's to observe the impact of foreign competition on labor force participation. They found that trade liberalization did reduce participation rates, but did not find any statistically significant differences between male and female participation. Similar to Gaddis and Pieters (2016) we do not find evidence that trade has a differential impact on male vs female employment. Obviously we are using a different time period (2000-2010) and different trade episode (China trade shock), but the main difference is we investigate the impact of trade on wages as opposed to just employment and we explore and quantify the mechanisms through which trade impacts the gender wage gap.

One of the main benefits of focusing on wages (and using a local labor markets approach) is that it allows us to utilize Oaxaca-Blinder decompositions to gain insight into the mechanism by which trade is affecting labor market outcomes. In a recent survey article, Blau and Kahn (2016) discuss trends in the gender wage gap over time as well as the myriad theories that have been put forth as explanations for change in gender wage inequality over time. By providing evidence on which "part" of the wage gap that foreign competition is affecting, this paper can provide guidance to future theoretical work.

In what follows, Section 2 provides a brief discussion of the data while Section 3 provides evidence on the gender wage gap in Brazil (at both the national and regional levels). Section 4 provides our primary estimates of the impact of the Chinese trade shock on labor market outcomes (for both male and female workers). Section 5 conducts our empirical decompositions in which we see through which channels trade is influencing the gender wage gap. Finally, Section 6 concludes.

[8]Of course, which approach to use depends on assumptions about labor mobility. If labor is highly mobile across regions, than this mobility would suppress any wage differentials thus making it harder to identify the impact of trade at the regional level. However, Autor et al. (2013), provide evidence that regional adjustment to labor demand shocks tends to be slow and incomplete, thus making the regional approach plausible.

2. Data Sources.

2.1. Worker-level Records.

Our main source of data is a detailed administrative census of workers in Brazil denominated RAIS (Relação Anual de Informações Sociais).[9] This data is collected annually by the Brazilian government for social security purposes and covers the universe of formal sector employment. For our analysis we use the 2000 and 2010 cross-sections.

This census has several advantages that are key to our empirical strategy. First, it contains a large set of detailed variables describing labor market outcomes and worker characteristics, including educational attainment, gender, age, occupation, and industry. The industry, occupation and educational attainment variables are extremely detailed, to a larger extent than what is available in the population census or household surveys. Educational attainment is reported using nine different categories, ranging from workers with no formal education to graduates from tertiary education. Industry codes capture workers' establishments main activity. We aggregate this to the three-digit level of the Brazilian Classification of Economic Activities - obtaining 195 three-digit industries.[10] Workers' occupations are reported using the Brazilian Occupational Classification (CBO 1994). We aggregate these to the three-digit level, obtaining 352 different occupational categories. In each job spell and year, the data reports average monthly earnings, which is our measure of earnings.

A second advantage is that the data is geographically indexed, allowing us to exploit regional variation in trade exposure. The data indicates the municipality in which each worker is employed. We use the next largest geographical unit, microregions, to approximate the concept of local labor market. Brazil is divided into 558 microregions, which are grouped into 27 states and 5 macroregions.

[9]Other papers that have used RAIS include Helpman et al. (2016), Dix-Carneiro (2014) and Benguria (2017).

[10]Industry codes are originally reported at the five-digit level of the Brazilian Classification of Economic Activities (CNAE), which is closely related to the international and widely used ISIC classification, with minor variations.

A third key feature is that we are able to use the full census, not a random sample. In this regard, Brazil's census of population, for which a 10% sample is available, would not allow us to compute our region-by-region Oaxaca-Blinder decompositions with accuracy.

On the other hand, there are two limitations of this data. First, it does not include informal workers, so our conclusions apply only to the formal sector. Second, we only see employed workers, which does not allow us to estimate a first-stage selection equation in our Oaxaca-Blinder decomposition.

We restrict the sample to working age (20 to 59) male and female workers in the 2000 and 2010 cross-sections. When workers report more than one job in a given year we choose the one with the longest duration. We exclude workers employed in government and quasi-public sectors of the economy.[11] Our data has then 19.4 million workers in 2000 and 35.1 million in 2010.

2.2. Trade Data.

Trade data comes from the United Nations' COMTRADE and is extracted by four-digit ISIC codes. We transform this to CNAE (Brazil' industrial classification) at the three-digit level using a concordance provided by the Brazilian Statistical Institute (IBGE). We transform these figures from US dollars to Brazilian Reais and then deflate it using the Brazilian consumer price index. Finally, employment shares by industry and region used to compute the measure of trade exposure defined in section 3 are obtained from our employment census, RAIS, described earlier.

3. Gender Wage Gap in Brazil.

If one just looks at average wages of male and female employees in Brazil, one finds that men are typically paid over 20 percent more.[12] However, this wage gap could be due

[11]We exclude workers in the federal and local governments, as well as health and education which are to a large extent public in Brazil.

[12]For more information on the gender wage gap in Brazil see Marquez Garcia et al. (2009).

to observable differences in worker characteristics between male and female workers (other than simply gender). For example, if one looks at Table 1, one finds that, in Brazil, female workers are typically younger than their male colleagues, making up 32 percent of workers in the age 20-29 category, but only 21 percent of those aged 50-59. On the other hand, women are typically more highly educated comprising 43 percent of high education workers (high-school education and above) and only 19 percent of those workers with low education levels (less than five years of schooling).

Likewise, male and female workers are not uniformly distributed over industries or occupations in Brazil. From Tables 2 and 3 we see that women are predominately employed in industries like apparel (a female to male ratio of about 3.86) and footwear manufacture. In contrast, men are disproportionately employed in the manufacture of sugar, motor vehicles, beverages and ceramics (all industries where women make up less than 15 percent of workers). Similarly, men are overwhelmingly employed in occupations such as welder, machine fitter and cabinet maker while women are much more likely to be employed as sewers or shoe cutters.

Thus, to get an idea of both the size and reasons for the gender wage gap in Brazil we run a Oaxaca-Blinder decomposition on wages for the years 2000 and 2010 (Blinder 1973 and Oaxaca 1973). Specifically, let W_M and W_F be the means of the natural logs of male (M) and female (F) wages. Estimating a standard log wage model separately for male and female workers, one can express the log wage differential as:

$$W_F - W_M = \left(\bar{X}_F - \bar{X}_M\right) \cdot \beta_M + (\beta_F - \beta_M) \cdot \bar{X}_M + \left(\bar{X}_F - \bar{X}_M\right) \cdot (\beta_F - \beta_M) \qquad (1)$$

where $\bar{X}_M$ and $\bar{X}_F$ are vectors of the means of the regressors for male and female workers (age, education, industry of employment and occupation) and β_M and β_F are the estimated coefficients. Thus, we can decompose the difference between female and male log wages into a part explained by differences in the regressors (the "explained part"), a term reflecting differences in the returns as well as the intercepts (the "unexplained component"), and a term capturing the interaction between these two components. With respect to our regressors, we have age, 9 different categories of education, 195 industries (3-digit) and 352 occupational categories (3-digit).

Note that our base specification is a three-fold decomposition which evaluates the explained component in terms of male wage coefficients (i.e., the expected change in average male wages if men had similar regressors as women) and the unexplained component in terms of male regressors (i.e., the expected change in average male wages if men had similar coefficients as women). It is also common in the discrimination literature to specify a "non-discriminatory" coefficients vector which can be used to create a two-fold decomposition (e.g., see Oaxaca 1973). We also ran our regressions using a two-fold specification and received very similar results but found our three-fold decomposition cleaner to interpret with respect to our later trade-exposure regressions and thus present those results throughout the paper.

3.1. National Gender Wage Gap-2000 and 2010.

The results of the Oaxaca-Blinder decomposition for 2000 are reported in Table 4. As can be seen, women are paid, on average, about 19.2 percent less than males overall in Brazil.[13] This wage gap is due primarily to a significant unexplained difference in returns (17.9 log points) that is largely constant across age, education, industry of employment or occupation. However, there is a smaller portion of the wage gap (resulting in a 5.5 log point increase of the wage gap) that can be explained by male employees having different observable characteristics than female employees. Specifically, male workers in Brazil are employed in higher paying industries (increasing the wage gap by 5.4 log points), occupations (5.0 log points) and disproportionately represented in higher-paying age groups (1.8 log points). Countering this, female workers in Brazil are more highly educated (as discussed in the

[13] To calculate the percentage differential note that $100 * (\frac{w_f}{w_m} - 1) = 100 \cdot (e^{log(w_f) - log(w_m)} - 1)$. Thus, using the numbers for 2000, $log(w_f) = 5.943$ and $log(w_m) = 6.156$, the difference comes to -19.2 percent.

previous section). The tendency for female workers to have higher eduction levels reduces the overall wage gap (and the portion due to explained characteristics) by 6.7 log points.

What is noteworthy is that this gender wage gap actually grew over the decade to a differential of 21.3 percent in 2010. As can be seen, the unexplained component is largely unchanged, and it is the explained component that has led to increased wage inequality (an increase of around 4 log wage points in the gender gap). The question addressed in this paper is whether the rapid increase in Chinese imports over the decade contributed to this increase in the gender wage gap or worked against it.

3.2. Regional Wage Gaps.

The geographic unit of observation is a microregion, which is an official Brazilian geographical unit that encompasses groups of neighboring municipalities with similar features, and thus serves as a good proxy for a local labor market (see discussion in Gaddis and Pieters 2016). Brazil has 558 microregions (comparable to U.S. commuting zones) spread over 27 states and 5 macrorregions.[14]

Figure 1 provides evidence (probability density curves) on the regional distribution of the gender wage gap and employment gap. The majority of regions have wage differentials of around 20-30 percent (the mean of the distribution is at -27.0 log wage points). However, there is a large degree of variability across regions as moving from the 25th percentile to the 75th percentile increases the gender wage gap from -17.5 log points to -36.8 log points.

4. Empirical Framework and Overall Results.

In a recent paper, Autor et al. (2013), use the "China shock" (rising import competition from China over the past decade) to investigate the impact of foreign trade on local wages

[14] As a point of comparison, there are 741 commuting zones in the U.S. (a country approximately 15 percent larger and 50 percent more populous). Brazil has over 5000 municipalities which are too small and interdependent to represent a local labor market. Other papers that have used microregions as a measure of local labor markets include Kovak (2013) and Dix-Carneiro et al. (2016).

and employment in the U.S.. Basically, they assume that regional variation in industry employment will be correlated with a region's exposure to foreign competition (i.e., a region specializing in industries which are also Chinese export goods will experience a larger increase in foreign competition). In this section we utilize a similar strategy to consider the effects of the growth of Chinese exports on wages and employment in Brazilian regions and how that shock might have differentially affected male and female workers

There are several reasons to expect that the growth of Chinese exports would have a significant impact on local labor markets in Brazil. First, there was a significant rise in Brazilian imports from China due to the rapid growth in the Chinese economy. As can be seen in Figure 2, imports from China rose abruptly, especially over the period 2000-2010, relative to overall imports. Indeed, the share of imports from China rose from 2.2 percent in 2000 to 14.4 percent in 2010.

However, there is also significant regional variation in exposure to this "China Shock" due to differential industry specialization. China has a pronounced comparative advantage in certain labor-intensive industries (see Amiti and Freund (2010)), and thus, for example, textile imports from China to Brazil increased between 2000-2010 by 637 USD per worker (in real terms using 2000 figures as base). In contrast, an industry like food and beverages only saw an increase in China imports of 133 USD. Thus, variation in industry specialization across Brazilian regions would lead to large differences in exposure this "China shock".

Our measure of regional exposure to the increase in import competition from China follows Autor et al. (2013) closely. First, we define the increase in import competition faced by region r between 2000 and 2010 as the weighted average of industry-level imports with weights given by industry-level employment shares for that region in the initial year ($\frac{L_{ir}}{L_r}$) and imports normalized by national industry employment (L_i).

$$\Delta IP_r = \sum_i \frac{L_{ir}}{L_r} \cdot \frac{\Delta M_i}{L_i} \qquad (2)$$

where ΔM_i is the difference in imports from China in each industry i between 2000 and

2010. Thus, we are measuring variation in a region's exposure to the Chinese trade shock through variation in the industry structure of Brazilian regions (i.e., regions which are more specialized in import-intensive industries are considered to be more exposed).

However, a concern with the above estimation is that imports from China might be correlated with domestic industry demand and productivity shocks. Thus, we once again follow Autor et al. (2013) by constructing an instrument for the growth of Chinese imports to Brazil by using contemporaneous Chinese imports to other "similar" countries. Specifically, we instrument for ΔIP_r by using a non-Brazil measure of exposure (ΔIP_r^{OTHER}) with weights according to Brazilian regional employment shares but imports from China to a set of South American countries:

$$\Delta IP_r^{OTHER} = \sum_i \frac{L_{ir}}{L_r} \cdot \frac{\Delta M_i^{OTHER}}{L_i} \tag{3}$$

where ΔM_i^{OTHER} is the growth in imports in each industry i from China to Argentina, Bolivia, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay and Venezuela. This IV strategy will assist with identification provided that increased Chinese imports is due to Chinese growth or falling trade costs and not due to correlations in productivity or demand shocks across our set of countries (e.g., a negative Brazilian productivity or demand shock correlated with shocks in other South American countries).[15]

Summary statistics for regional exposure to growth in Chinese imports (ΔIP) are given in Table 5. As can be seen, there is a significant degree of variation across regions as our measure of regional exposure increases by a factor of 7.93 in moving from a region at the 25th percentile ($\Delta IP = 0.0469$) to a region at the 75th percentile ($\Delta IP = 0.372$).

4.1. China Trade Shock and Wages/Employment.

Our baseline specification is a regression of regional exposure to increased Chinese import competition on changes in regional wages and employment in Brazil:

[15] See Autor et al. (2013) for a detailed discussion of the assumptions behind this IV strategy.

$$\Delta Y_r = \beta_1 \Delta IP_r + \beta_2 X_r^0 + \epsilon_r \tag{4}$$

The dependent variable is the change in log wage or log employment (from 2000-2010) for region r while ΔIP_r is the change in region $r's$ trade exposure (defined in the previous section - we also instrument for the change in import exposure as discussed). The geographic unit of observation is a microregion and we include fixed effects (at the state level) and a regions share of high school graduates in 2000 as control variables (to control for start of the period demographic characteristics that might independently impact employment outcomes).

First, consider the effect of the trade shock on log wages (average monthly earnings).[16] The results of this estimation are given in column 1 (Earnings) of Table 6. The first row (Overall) reports the raw coefficient estimates of β_1 while the second row (p25-p75) reports the difference (in log points) on the dependent variable when one moves between the 25th and 75th percentiles of changes in regional trade exposure. As can be seen, the sign of β_1 is negative and statistically significant which is consistent with the growth of Chinese imports reducing wages in those regions most exposed to Chinese competition. Specifically, in comparing two Brazilian microregions (one at the 25th and the other at the 75th percentile in exposure to Chinese trade), the more exposed region had a .96 percentage point larger decline in wages. This result is actually very similar to those of Autor et al. (2016) for the U.S. as they report a .8 percent decline in wages in moving from the 25th to 75th percentile in trade exposure.

Next, consider the effect of the trade shock on regional employment (count of the number of workers workers in each microregion weighted by the fraction of the year in which they were employed there).[17] The results of this estimation are given in Column

[16]It should be noted that these results should be treated with caution as the dependent variable is average regional wages and thus if less-skilled (lower wage) workers are more likely to lose their employment as a result of the negative trade shock, increased trade exposure might actually be correlated with an increase in average wages in the region. However, as we will show later, we fail to find significant effects of increased trade exposure on regional employment or any differential impact on male and female employment, suggesting our wage results are not overly subject to this upward bias.

[17]Employment numbers are from the RAIS which covers the formal sector of the economy.

2 (Employment) of Table 6 and are not statistically significant.[18] Thus, at least at the local labor market level, we fail to find evidence that foreign competition appears to be having a noticeable impact on aggregate employment. However, this is fortunate for our wage decomposition exercise as is suggests large changes in employment (i.e., either regional migration or selection in the local labor market) are not suppressing our identification of differential wage changes across regions.

4.2. China Trade Shock and the Gender Wage Gap.

Next, we estimate (4) separately for male and female workers. The results for log wages are given in the next several rows (Male and Female) of Table 6 which, once again, report the raw coefficient estimates of β_1 as well as the effect of moving between the 25th and 75th percentiles of regional trade exposure. These results suggest that the decline in wages driven by increased import competition is almost entirely borne by male workers. Specifically, more exposed regions saw a 1.05 percent larger decline in wages for male workers, but no significant decline (either statistically or economically) in wages for female workers.[19]

Finally, consider the differential effect of the negative trade shock on male and female employment. The results of this estimation are given in Column 2 of Table 6 and none of the results on employment, for either male or female workers, are statistically significant.[20] Thus,

[18]The results are consistent with about a 1.2 percentage point decline in employment, however the large standard errors suggest this estimate is quite imprecise.

[19]We also ran a single regression on both male and female workers and utilized an interaction term between a male dummy variable and the IP_r variable (while allowing all the other coefficients to vary between male and female workers). A Wald test verified that the interaction term was statistically significant (and negative) for earnings but not for employment.

[20]In this case, the coefficient estimates suggest very similar declines of about 1.2 percentage points in male and female employment. However, neither of these estimates are statistically significant at conventional levels. The similar (and statistically insignificant) results for male/female employment are actually consistent with those of Gaddis and Pieters (2016) which investigated the impact of Brazil's trade reforms in the 1990s on regional employment (labor force participation and total employment) for male and female workers. Similar to our approach, they construct a measure of the change in regional trade exposure from 1990-1998 (in their case, using Brazilian trade liberalization reforms) and regress on changes in regional employment for male and female workers using Brazilian microregions as the unit of observation. In contrast to our results, they do find some statistically significant negative results on employment, but similar to our results, they do not find any significant differences between male and female workers with regards to employment. However, Gaddis and Pieters (2016) does not investigate the impact of trade on regional wages, which is the focus of this paper (as well as allowing the decomposition exercise reported in the following section).

our overall results suggest that increased foreign competition from China had a negative impact on regional wages (particularly among Brazilian microregions more exposed to the negative trade shock). However, this negative wage shock was entirely borne by male workers thus decreasing the gender wage gap in the exposed regions. The question then becomes the mechanism by which trade is reducing the wage gap, which we address in the following section where we decompose the effect of the trade shock on the gender wage gap.

5. Empirical Decomposition.

One of the advantages of using regional variation in trade exposure is that it allows us insight, not only in into the direction and magnitude of the overall effect of trade on wages, but also the mechanism by which trade is affecting the gender wage gap. Since we have run Oaxaca-Blinder wage regressions for each region that decomposes the gender wage gap into its various components (both before and after the trade shock), we can examine the impact of the China trade shock on those various components. Specifically, we can estimate (4) where, once again, ΔIP_r is the change in region $r's$ trade exposure over the time period (2000-2010) but now the dependent variable is the change in a particular component of the gender wage gap for region r (e.g., that portion of the wage gap due to male and female workers having different labor shares across the occupational categories).

We think there are two reasons such empirical decompositions are valuable. First, it could provide insight into the mechanism by which the Chinese trade shock affects the gender wage gap. Many explanations for gender wage inequality revolve around the explained portion of the gap (for example, they fact that women are more likely to be employed in occupations that pay lower wages). One possibility is that trade is influencing gender wage inequality by differentially affecting industry/occupation wages and thus impacting the gender wage gap due to gender segregation in the labor market (i.e., the tendency for female workers to be disproportionately represented in certain industries or occupations). For example, foreign competition could induce changes in the production process (e.g., technology upgrading as in Bustos 2011) that impact the demand for different occupations and thus occupation wages (even within the same industry). Indeed, this is roughly the story behind a sequence of papers (Juhn et al. (2013) and Juhn et al. (2014)) that argue that trade liberalization might induce firms to acquire new technologies that are more complementary to female labor. If so, then we might expect to see trade differentially increasing the returns to (female-dominated) occupations within the more trade exposed regions and thus reducing the gender wage gap in those regions. In contrast, other explanations revolve around the unexplained portion of the wage gap (e.g., employer discrimination or bargaining). For example, Ederington et al. (2009) suggests that trade might reduce firm-level discrimination against female workers by increasing the cost of engaging in discriminatory behavior through Becker-type competitive forces. If so, then we might expect to see trade differentially increasing either the fraction of female workers in the higher-paying (male-dominated) industries/occupations or reducing the overall "unexplained" part of the wage gap.[21]

Second, decomposing the effect of trade on the gender wage gap could also provide insight into whether our results for Chinese trade with Brazil are likely to be applicable to other trade shocks and countries. For example, one possibility is that trade affects gender wage inequality by changing relative prices across industries. If so, then we might expect to see the China import shock reducing the gender wage gap by disproportionately reducing prices/wages in industries that employ greater numbers of male workers. However, if this is the mechanism behind our section 4 results, then we would not necessarily expect to see a similar decline in the wage gap for other episodes of trade liberalization or for increased imports from other (more developed) countries, as such episodes might move prices/wages in a different direction.

[21] It should be noted that while our approach can provide insight into the mechanism by which the China trade shock reduced the gender wage gap in Brazil, it cannot provide definite proof of any given theory. For example, if we observe trade exposure being correlated with the movement of female workers into previously male-dominated occupations/industries, it could be due to reduced discrimination in hiring decisions, but also could be due to unobserved differences in male and female workers (even for very precisely defined occupations). Likewise, a decline in the overall "unexplained" wage gap is consistent with a reduced discrimination story, but is also potentially consistent with a change in bargaining power story as in Card et al. (2016).

Thus, in the following sections we do progressively more detailed decompositions to see how variations in trade exposure across regions are correlated with different components of the wage gap.

5.1. Explained vs Unexplained.

First, for each region we decompose the wage gap into its threefold components (explained, unexplained and interaction) and re-estimate (4) where ΔY_r is now the change in a particular component of the gender wage gap for region r. Results are provided in Table 7.

To interpret these results, recall from (1) that the change in the explained component of the wage gap for region r will be given by:

$$\Delta EXPLAINED_r = \Delta[(\overline{X}_{Fr} - \overline{X}_{Mr}) \cdot \beta_{Mr}] \tag{5}$$

where $\bar{X}_{Fr}, \bar{X}_{Mr}$ are the observable characteristics of male and female workers in the region, while β_{Mr} are the regional returns to those characteristics (using male workers as a reference point). Thus, to the extent that the Chinese trade shock is reducing the explained portion of the gender wage gap within regions, it would do so by either a reduction in observable differences between male and female workers (i.e., women moving into higher-paying occupations/industries) or a reduction in the returns to those observable differences (i.e., traditionally female occupations/industries paying more).

In contrast, the change in the unexplained component of the wage gap is given by:

$$\Delta UNEXPLAINED_r = \Delta[(\beta_{Fr} - \beta_{Mr}) \cdot \overline{X}_{Mr}] \tag{6}$$

Thus, trade would reduce the unexplained portion of the gender wage gap within regions by either reducing the (unexplained) difference in returns between similar workers (i.e., female workers being paid relatively more within the *same* industry/occupation) or by a change in the composition of the workforce to minimize these (unexplained) differences (i.e., a reduction in employment in those industries with high wage disparities).[22]

As can be seen in Table 7, trade appears to be reducing the gender wage gap almost entirely through the explained portion of the gap. Specifically, consistent with Section 3, we see a reduction in the wage gap (difference in the predicted log wages of male and female workers) in those Brazilian regions more exposed to Chinese trade. According to the first two rows (Wage Gap) a more exposed region (75th percentile) had about a 1.24 percentage point larger decline in the gender wage gap than a less exposed region (15th percentile). However, as can be seen from the next set of rows (Explained), this is almost entirely a reduction in the *explained* wage gap, as the more exposed region saw a 1.04 percent larger decline in the explained part of the wage gap with statistically (and economically) insignificant declines in the other portions of the wage gap. Thus, our results are more consistent with a story of trade increasing overall wages in female-dominated occupations/industries/demographics (explained) and less consistent with trade increasing (relative) female wages within the same occupation/industry/demographic (unexplained).

5.2. Industry, Occupation, Education and Age.

Next, recall that within our Oaxaca-Blinder wage regressions the explained portion of the wage gap is based on four observable worker characteristics: industry of employment, occupation, education and age. Thus, we can implement a more detailed decomposition and test the extent to which trade exposure is correlated with a decline in each of these components of the explained wage gap.[23] Such a decomposition might be particularly relevant for insight into whether or Brazilian results are likely to be replicated in other countries. For example, if one finds that the Chinese trade shock is reducing wage gaps by increasing

[22]Likewise, $\Delta Interaction$ is the change in the third component of (1). However, the interaction results are of less concrete interest and fail to be statistically significant in our specifications.

[23]In this and the following section we focus on the explained portion of the wage gap for two reasons. First, as can be seen in Table 7, trade exposure only seems to be significantly correlated with a reduction in the explained portion of the wage gap. Second, as discussed in Jann (2008), more detailed decompositions of the unexplained portion of the wage gap can be impacted by arbitrary decisions with respect to scaling and the choice of the base category.

the returns to higher-education (where female workers are overrepresented in Brazil's formal sector), it might suggest similar results will not apply to countries where higher-education is more male-dominated.

Thus, for each region we decompose the explained portion of the wage gap into its four observable components (industry, occupation, eduction and age)and re-estimate (4) where ΔY_r is now the change in that particular component of the explained part of the gender wage gap. For example, the change in the Occupation component of the explained wage gap for region r is given by:

$$\Delta OCCUPATION_r = \Delta[(\bar{X}_{Fr}^{OCC} - \bar{X}_{Mr}^{OCC}) \cdot \beta_{Mr}^{OCC}] \tag{7}$$

where β_{Mr}^{OCC} is a vector of the (male) returns to the various occupations in region r and $\bar{X}_{Fr}^{OCC}, \bar{X}_{Mr}^{OCC}$ are the means of the occupation dummy regressors (basically the share of female and male workers (respectively) in each occupation in each region). The change in the industry, age and education components are defined similarly.

Results are provided in Table 8. While each of the four components are contributing to the reduction in the wage gap, changes in observed occupational differences between male and female workers appear to be the primary contributor to the reduction. Recall that the more exposed regions saw a 1.04 log wage point decline in the explained part of the wage gap relative to less exposed regions. The third set of rows (Occupation) of Table 8 shows that about half of that decline is coming from the occupation component of the wage gap. Thus, our results are more consistent with a story of trade increasing overall wages in female-dominated occupations rather than female-dominated industries (or age groups or education levels).

5.3. Occupational Segregation vs Occupation Returns.

Finally, we can employ one more decomposition. Note from (7) that we can breakdown the change in any component of the explained wage gap into the changes in the employment shares ($\Delta[X_{Fr} - X_{Mr}]$) and changes in the associated returns ($\Delta\beta_{Mr}$). Intuitively, the change in employment shares captures changes in the wage gap due to male and female workers reallocating across employment categories (i.e., women moving to higher paying occupations) and the change in the returns refers to changes in the returns to those employment categories that differentially affect male and female workers due to labor market segregation (i.e., wages rising in an occupation that disproportionately employs females):

$$\Delta\left[\left(\bar{X}_{Fr} - \bar{X}_{Mr}\right) \cdot \beta_{Mr}\right] = \beta_{Mr}^{AV} \cdot \Delta\left(\bar{X}_{Fr} - \bar{X}_{Mr}\right) + \left(\bar{X}_{Fr} - \bar{X}_{Mr}\right)^{AV} \cdot \Delta\beta_{Mr} \qquad (8)$$

where

$\beta_{Mr}^{AV} = \frac{\beta_{Mr}^{2000} + \beta_{Mr}^{2010}}{2}$ is the "average" return over the time period (2000-2010) and $\left(\bar{X}_{Fr} - \bar{X}_{Mr}\right)^{AV} = \frac{\left(\bar{X}_{Fr} - \bar{X}_{Mr}\right)^{2000} + \left(\bar{X}_{Fr} - \bar{X}_{Mr}\right)^{2010}}{2}$ is the "average" difference in employment shares.

For example, in decomposing the occupation component, the first part of the RHS of (8) would represent the effects on the wage gap of changes in the observed differences between male and female workers in occupation employment (i.e., what we will refer to as changes in the X's) . If trade is reducing gender wage gaps by having women move into traditionally male dominated (higher paying) occupations it would be captured by this term. In contrast, the second part of the RHS of (8) are changes in the returns to the different occupations (which we refer to as changes in the β's). Thus, if trade is reducing gender wage gaps by increasing the pay of traditionally female-dominated occupations it would be captured by this term. Similar decomposition between quantities and returns can be done for the other components of the explained wage gap (industry, age and education).

Thus, for each region we decompose the explained portion of the wage gap (and its different components) into these two parts (changes in the X's and $\beta' s$) and re-estimate (4) where ΔY_r is now the change in that particular component of the gender wage gap. Results are provided in Table 9.

Since the majority of the decline of the explained wage gap is coming from the occupation component, we will focus on that part (i.e., third set of rows (Occupation) of Table 9). Recall that about half of the decline in the wage gap (.5 log wage points) is coming from the occupation component. As can be seen from Column 1 (Change in X's) and Column 2 (Change in β's), this decline is coming equally from both parts.[24] Specifically, about half (.2 log wage points) is coming from changes in the observed differences between male and female workers in occupational employment. Intuitively, this result suggests that exposure to Chinese imports is reducing the gender wage gap by increasing the share of female workers in higher-paying occupations (at least in the more trade exposed regions). This result is actually consistent with the mechanism and results of Ederington et al. (2009) where foreign competition increases the female share of workers by increasing the cost to discriminatory behavior by firms. They provide evidence (using the Colombian trade liberalization episode of the 1980's) that firms facing greater foreign competition increased their share of female workers. Although we are investigating a different country (Brazil), trade episode (China trade shock) and exploited a different source of variation (regional), our result that regions facing greater competition saw an increase in the share of female workers employed in higher-paying occupations is similarly suggestive that foreign competition might be breaking down (occupational) labor-market barriers to women.[25]

However, the other half of the decline (.3 log wage points) is coming from changes in the returns to the different occupations. Basically, this would be due to a (relative) increase in the returns to "traditionally female" occupations such as embroiderer, telephone-operator or bookkeeper. This result seems consistent with the story and results of Juhn et al.

[24]One question that arises is how our results are affected by the level of aggregation of our regressors. Although we are prevented by a small numbers problem from using more disaggregated classifications, we did experiment with running our regressions at the more aggregate 2-digit level of classification. Results were largely the same: a decline in only the explained portion of the gender wage gap of approximately 1 log wage point with the majority coming from the occupation component. However, the results differed in that, when we used the 2-digit industry/occupation classification, the decline in the occupation component of the wage gap was almost entirely due to the "change in the X's". That is, at the 2 digit classification level, the story is mostly about a decline in the gender wage gap due to females moving into higher paying occupations.

[25]Of course, the above result is also consistent with a story of unobserved skill differences between male and female workers, where foreign competition might be inducing some type of technology upgrading that is more conducive to female workers even within the same occupation classification.

(2014) where foreign competition increases female wages by inducing technology upgrading that is more complementary with female skills. They provide evidence (using the NAFTA agreement) that tariff reductions induced Mexican firms to upgrade their technology and replace male workers with female workers. Once again, using a different country, trade episode and source of variation, we find a parallel result in which regions facing greater foreign competition saw a relative increase in the wages paid to more female-dominated occupations.

6. Conclusion

A new technique in investigating the effects of globalization on income inequality is to utilize regional variation in trade exposure across local labor markets. In this paper, we apply these techniques to the question of how trade might affect wage inequality between male and female workers using Brazilian census data and the rapid expansion of Chinese imports in the years 2000-2010. The advantage of using worker census data across local labor markets is that it allows us to decompose the gender wage gap across regions and thus observe which component of the wage gap increased trade exposure appears to be influencing. We find that Brazilian microregions more exposed to the Chinese trade shock did see a decline in the gender wage gap and that this decline was primarily related to both female workers moving into higher-paying occupations and an increase in wages to traditionally female occupations.

This paper complements a growing theoretical and empirical literature that examines the impact of globalization on gender income inequality. Such research has taken on increased importance over the years, especially for developing countries, as several papers have documented a correlation between female earnings and childhood outcomes such as education and health (e.g., see Thomas (1990), Duflo (2003) and Qian (2008)). Thus, gender wage inequality has become an important issue in the development community. Combined with the fact that many developing countries have turned to trade liberalization as a development strategy (either through unilateral trade liberalization or through the joining of regional and multilateral trade agreements), the question of how trade impacts gender specific wages might have important implications for the future.

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Table 1: Descriptive Statistics; Employment and Wages by Gender, Age, and Educational Attainment.

		Employment			Earnings		
		Male	Female	Ratio	Male	Female	Ratio
All		13.70	5.74	0.42	723.82	562.01	0.78
Education							
	Low	3.89	0.89	0.23	455.82	322.09	0.71
	Mid	6.45	2.37	0.37	550.39	373.21	0.68
	High	3.36	2.49	0.74	1366.92	827.69	0.61
Age							
	20 to 29	5.59	2.70	0.48	488.60	448.40	0.92
	30 to 39	4.44	1.78	0.40	774.14	620.49	0.80
	40 to 49	2.68	0.98	0.37	1037.09	752.20	0.73
	50 to 59	1.00	0.28	0.28	975.76	619.97	0.64

Notes: This table reports employment and mean earnings for male and female workers by groups according to age and educational attainment in year 2000. Employment is in millions. Earnings are the mean of workers' average monthly earnings in 2000, expressed in Reais of 2000.

Table 2: Descriptive Statistics; Employment and Wages in Male-Dominated and Female-Dominated Industries.

Industry Code	Industry Name	Employment			Earnings		
		Male	Female	Ratio	Male	Female	Ratio
Male							
455	Building completion	110.05	6.52	0.06	503.95	518.75	1.03
452	Construction of buildings	1130.97	70.06	0.06	553.10	654.29	1.18
156	Manufacture of sugar	136.74	9.54	0.07	486.42	452.26	0.93
454	Building installation	96.04	7.12	0.07	651.01	619.75	0.95
201	Sawmilling and planing of wood	83.56	6.62	0.08	344.56	308.40	0.90
746	Investigation and security activities	313.54	27.97	0.09	588.00	477.26	0.81
453	Building of electrical and telecommunication facilities	105.33	9.44	0.09	683.98	757.74	1.11
602	Other land transport	907.93	94.07	0.10	673.04	562.12	0.84
502	Maintenance and repair of motor vehicles	105.72	11.68	0.11	441.00	370.67	0.84
11	Production of seasonal crops	304.30	35.58	0.12	400.10	300.78	0.75
14	Livestock farming	219.84	30.12	0.14	335.03	311.28	0.93
264	Manufacture of ceramic products	118.52	17.85	0.15	457.70	452.38	0.99
344	Manufacture of parts and accessories for motor vehicles	120.08	18.22	0.15	1294.49	974.04	0.75
159	Manufacture of beverages	78.54	12.83	0.16	967.28	860.62	0.89
15	Mixed farming: livestock and crops	329.40	55.24	0.17	294.88	241.72	0.82
361	Manufacture of furniture	152.57	28.70	0.19	462.69	421.59	0.91
289	Manufacture of other fabricated metal products	99.40	18.89	0.19	790.50	603.52	0.76
401	Production, collection and distribution of electricity	89.65	17.05	0.19	2300.71	1930.92	0.84
202	Manufacture of products of wood, cork, etc.	94.17	18.05	0.19	455.50	358.50	0.79
410	Collection, purification and distribution of water	74.86	14.37	0.19	1542.68	1567.44	1.02
Female							
181	Manufacture of wearing apparel, except fur apparel	88.86	343.21	3.86	470.75	323.92	0.69
523	Retail sale of textiles, clothing, footwear and leather goods	160.72	437.77	2.72	457.78	365.67	0.80
551	Hotels; camping sites and others	112.28	131.71	1.17	488.44	371.75	0.76
747	Cleaning activities	245.41	266.78	1.09	352.01	274.50	0.78
193	Manufacture of footwear	131.59	128.19	0.97	440.95	299.06	0.68
741	Legal, accounting, book-keeping and auditing activities	165.76	160.24	0.97	1594.02	825.95	0.52
552	Restaurants, bars and canteens	375.67	329.18	0.88	391.41	345.32	0.88
749	Business activities n.e.c.	462.17	395.54	0.86	683.94	636.79	0.93
514	Wholesale of household goods	74.13	63.00	0.85	742.67	630.64	0.85
652	Other financial intermediation	235.62	183.91	0.78	2658.40	2023.68	0.76
521	Non-specialized retail trade in stores	411.35	292.71	0.71	470.04	387.78	0.82
158	Manufacture of other food products	159.87	106.32	0.67	573.69	387.43	0.68
524	Other retail trade of new goods in specialized stores	891.63	539.50	0.61	495.56	435.48	0.88
522	Retail sale of food, beverages and tobacco in specialized stores	185.30	110.18	0.59	379.86	310.76	0.82
745	Labour recruitment and provision of personnel	306.77	175.03	0.57	498.86	443.89	0.89
221	Publishing	77.38	43.28	0.56	1288.18	1174.99	0.91
642	Telecommunications	83.82	45.23	0.54	2125.92	1414.91	0.67
151	Production and processing of meat, fish, fruit, vegetables, etc.	140.13	57.30	0.41	498.86	391.00	0.78
252	Manufacture of plastics products	142.87	54.12	0.38	791.50	521.85	0.66
519	Other wholesale	96.77	35.02	0.36	737.05	629.14	0.85

Notes: This table reports employment and mean earnings in year 2000 for workers in the 20 industries with the highest share of male workers and the 20 industries with the largest share of female workers (among the 50 largest industries in terms of employment). Industries are defined at the three-digit level. Employment is reported in thousands. Earnings are the mean of workers' average monthly earnings expressed in Reais of 2000.

Table 3: Descriptive Statistics; Employment and Wages in Male-Dominated and Female-Dominated Occupations.

Occupation Code	Occupation Name	Employment Male	Employment Female	Employment Ratio	Earnings Male	Earnings Female	Earnings Ratio
Male							
954	Carpenters, joiners and parquetry workers	111.38	0.55	0.00	512.32	544.00	1.06
951	Bricklayers, stonemasons and tile setters	318.14	1.60	0.01	460.88	434.17	0.94
985	Motor vehicle drivers	966.56	6.14	0.01	638.82	553.06	0.87
843	Motor vehicle mechanics	145.78	1.07	0.01	620.63	518.04	0.83
845	Machinery fitters	167.25	1.30	0.01	929.33	709.09	0.76
855	Electrical wiremen	101.05	1.18	0.01	642.04	552.84	0.86
872	Welders and flame-cutters	107.25	1.29	0.01	727.01	587.25	0.81
989	Transport equipment operators n.e.c.	96.91	1.83	0.02	468.58	407.51	0.87
959	Construction workers n.e.c.	606.35	13.85	0.02	366.74	335.61	0.92
583	Security guards	485.76	14.86	0.03	551.33	520.75	0.94
811	Cabinet makers	95.74	6.43	0.07	388.07	293.65	0.76
701	Production supervisors	89.39	6.67	0.07	1547.66	976.00	0.63
34	Electrical and electronics engineering technicians	102.55	8.72	0.08	1592.22	1224.18	0.77
631	Field crop workers	281.12	30.10	0.11	310.78	260.37	0.84
551	Building caretakers	333.24	40.56	0.12	501.26	348.10	0.69
835	Machine-tool operators	114.81	16.44	0.14	815.06	595.67	0.73
360	Public transport dispatchers, collectors, etc.	174.91	25.68	0.15	485.21	434.40	0.90
969	Stationary engine and related equipment operators n.e.c.	119.26	18.31	0.15	731.03	486.51	0.67
621	General farm workers	434.32	66.82	0.15	267.15	224.29	0.84
391	Stock clerks	317.07	50.24	0.16	593.43	462.00	0.78
Female							
795	Sewers and embroiderers	26.17	292.70	11.18	290.26	292.21	1.01
321	Secretaries and keyboard-operating clerks	9.66	104.93	10.87	787.10	828.17	1.05
380	Telephone and telegraph operators	26.33	101.53	3.86	698.32	569.46	0.82
394	Receptionists and travel agency clerks	43.89	128.35	2.92	497.63	426.94	0.86
331	Bookkeepers and cashiers	140.15	327.57	2.34	922.54	549.25	0.60
540	Maids and related housekeeping service workers n.e.c.	37.98	67.52	1.78	367.16	317.63	0.87
531	Cooks	130.34	201.20	1.54	421.08	318.75	0.76
311	Administrative assistants n.e.c.	100.42	128.97	1.28	1048.31	902.67	0.86
393	Auxiliary clerks n.e.c.	480.75	596.99	1.24	908.61	703.61	0.77
802	Shoe cutters, lasters, sewers and related workers	113.65	117.78	1.04	385.35	285.41	0.74
552	Charworkers, cleaners and related workers	522.42	538.71	1.03	329.00	274.30	0.83
451	Salesmen, shop assistants and demonstrators	790.23	732.53	0.93	477.23	367.55	0.77
339	Bookkeepers, cashiers and related workers n.e.c.	57.61	49.21	0.85	1012.22	814.19	0.80
774	Food preservers	66.70	47.41	0.71	426.40	337.57	0.79
532	Waiters, bartenders and related workers	203.50	142.75	0.70	355.71	322.50	0.91
421	Sales supervisors	151.65	104.21	0.69	1114.89	722.38	0.65
342	Automatic data-processing machine operators	69.61	44.95	0.65	775.67	572.35	0.74
301	Intermediate administrative managers n.e.c.	82.74	44.49	0.54	1837.12	1381.94	0.75
903	Rubber and plastics product makers	94.58	49.01	0.52	547.81	371.70	0.68
399	Clerks not elsewhere classified	228.89	108.46	0.47	721.50	790.05	1.10

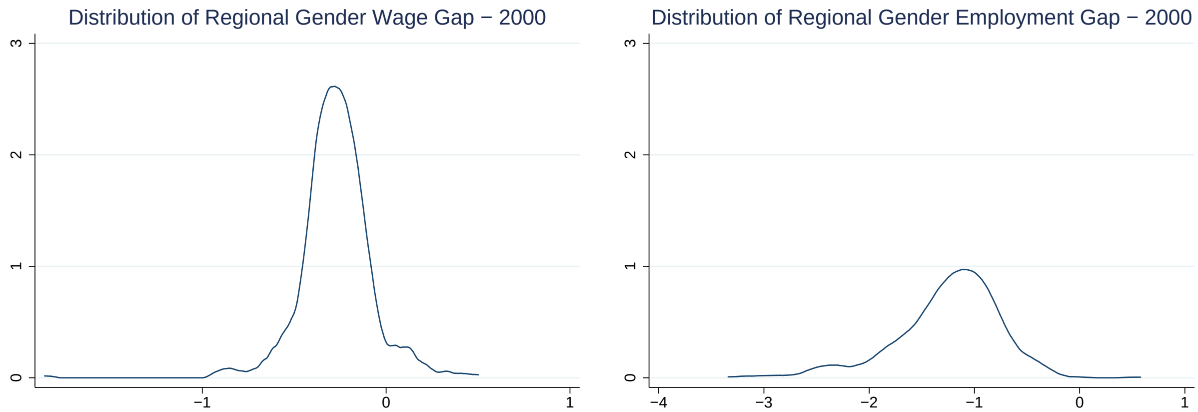
Notes: This table reports employment and mean earnings in year 2000 for workers in the 20 occupations with the highest share of male workers and the 20 occupations with the largest share of female workers (among the 50 largest occupations in terms of employment). Occupations are defined at the three-digit level. Employment is reported in thousands. Earnings are the mean of workers' average monthly earnings expressed in Reais of 2000.

TABLE 4: OAXACA-BLINDER DECOMPOSITION OF THE GENDER WAGE GAP.

	2000	2010	CHANGE	CHANGE (% OF DIFFERENCE)
Predicted - Female	5.943	6.735	0.792	
Predicted - Male	6.156	6.975	0.819	
Predicted - Difference	-0.212	-0.240	-0.027	1.000
Explained - Total	-0.055	-0.094	-0.039	1.429
Explained - Industry	-0.054	-0.092	-0.038	1.382
Explained - Occupation	-0.050	-0.032	0.018	-0.665
Explained - Educational Att.	0.067	0.049	-0.017	0.637
Explained - Age	-0.018	-0.020	-0.002	0.075
Unexplained - Total	-0.179	-0.182	-0.002	0.090
Unexplained - Industry	-0.000	-0.004	-0.004	0.131
Unexplained - Occupation	0.014	-0.001	-0.015	0.539
Unexplained - Educational Att.	0.000	-0.004	-0.005	0.170
Unexplained - Age	0.009	0.013	0.004	-0.156
Unexplained - Intercept	-0.202	-0.186	0.016	-0.594
Interaction - Total	0.022	0.036	0.014	-0.520
Interaction - Industry	0.021	0.031	0.010	-0.356
Interaction - Occupation	0.012	0.006	-0.006	0.217
Interaction - Educational Att.	-0.016	-0.007	0.009	-0.339
Interaction - Age	0.005	0.006	0.001	-0.042

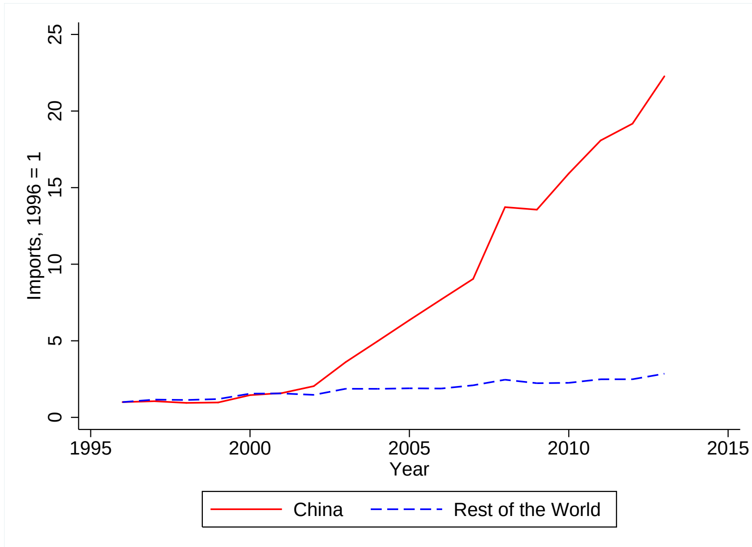
NOTES: This table reports the results of the Oaxaca-Blinder decomposition in equation (1), which decomposes the gender wage gap into "explained", "unexplained", and "interaction" terms. The first two columns correspond to the cross-sections in years 2000 and 2010. The third column corresponds to the difference between the first two columns. The last column indicates the fraction of the change over time in the gender wage gap (the difference in row 3) accounted for by each component. Figures are based on a 20 percent random national sample.

Figure 1: Regional Distribution of Employment and Wage Gaps.



Notes: This figure plots kernel density estimates of the regional distribution of the gender wage gap and gender employment gap defined as the difference in log earnings or log employment between female and male workers in each of 558 microregions in 2000.

Figure 2: Brazilian Imports from China and from the World.



Notes: This figure shows the evolution over time of Brazil's imports from China (red) and from the rest of the world (blue) from 1996 to 2013. Both series are normalized to 1 in 1996.

Table 5: Regional Exposure to Growth in Import Competition from China: Summary Statistics.

Mean	10th. pctile.	25th. pctile.	50th pctile.	75th pctile.	90th pctile.
0.296	0.0169	0.0469	0.152	0.372	0.720

Notes: This table reports summary statistics of (1000 times) the measure of growth in regional exposure to Chinese import competition (ΔIP_r) defined in equation (2).

Table 6: Impact of Trade Exposure on Earnings and Employment of Male and Female Workers.

		Earnings		Employment	
		2SLS	OLS	2SLS	OLS
Overall		-29.74***	-27.40***	-38.68	-46.08
		(6.6327)	(7.2554)	(26.864)	(35.791)
	[p25-p75]	-0.0096***	-0.0089***	-0.0125	-0.0149
Male		-32.39***	-29.06***	-37.78	-44.53
		(5.9848)	(7.2836)	(25.126)	(32.882)
	[p25-p75]	-0.0105***	-0.0094***	-0.0122	-0.0144
Female		-1.160	-0.680	-37.65	-32.91
		(4.0127)	(5.0086)	(57.078)	(64.111)
	[p25-p75]	-0.0003	-0.0002	-0.0121	-0.0106

Notes: This table reports the results of the 2SLS and OLS estimation of equation (4). The dependent variables in the first, second, and third rows correspond to monthly earnings averaged across both male and female workers, only male workers, and only female workers in each region. I report coefficients and standard errors followed by normalized coefficients reflecting the difference in the dependent variable associated with moving from the 25th to the 75th percentiles of trade exposure. The number of observations is N = 558 corresponding to the number of microregions. Standard errors are clustered by states (27). ***, **, and * denote statistical significance at a 1, 5 and 10 percent confidence level.

Table 7: Impact of Trade Exposure on the Components of the Oaxaca-Blinder Decomposition of the Gender Wage Gap.

	2SLS	OLS
Wage Gap	37.788 ***	36.263 ***
	(7.521)	(8.192)
[p25-p75]	0.01241 ***	0.01191 ***
Explained	31.805 ***	30.316 ***
	(4.368)	(5.006)
[p25-p75]	0.01044 ***	0.00995 ***
Unexplained	-0.486	-1.073
	(6.099)	(6.983)
[p25-p75]	-0.00016	-0.00035
Interaction	6.470	7.020
	(9.136)	(9.113)
[p25-p75]	0.00212	0.00230

Notes: This table reports the results of the 2SLS and OLS estimation of equation (4). The dependent variables in each row are the following components of the Oaxaca-Blinder decomposition in equation (1). The first row corresponds to the left-hand side of the decomposition. The second, third, and fourth rows correspond to the change in the "explained", "unexplained", and "interaction" terms. I report coefficients and standard errors followed by normalized coefficients reflecting the difference in the dependent variable associated with moving from the 25th to the 75th percentiles of trade exposure. The number of observations is N = 558 corresponding to the number of microregions. Standard errors are clustered by states (27). ***, **, and * denote statistical significance at a 1, 5 and 10 percent confidence level.

Table 8: Impact of Trade Exposure on the Components of the "Explained" Term in the Oaxaca-Blinder Decomposition of the Gender Wage Gap.

	2SLS	OLS
Explained	31.805 ***	30.316 ***
	(4.368)	(5.006)
[p25-p75]	0.01044 ***	0.00995 ***
Explained - Industry	6.842 *	5.679
	(4.125)	(4.165)
[p25-p75]	0.00225 *	0.00186
Explained - Occupation	15.253 ***	15.227 ***
	(4.543)	(5.402)
[p25-p75]	0.00501 ***	0.00500 ***
Explained - Educational Attainment	4.375	4.920 *
	(2.765)	(2.779)
[p25-p75]	0.00144	0.00162 *
Explained - Age	5.335 ***	4.491 **
	(1.674)	(1.803)
[p25-p75]	0.00175 ***	0.00147 **

Notes: This table reports the results of the 2SLS and OLS estimation of equation (4). The dependent variables in each row are the following components of the Oaxaca-Blinder decomposition in equation (1). The first row corresponds to the change in the "explained" term of the decomposition (already reported in the second row of table 7). The second, third, fourth, and fifth rows correspond to the subset of the change in the "explained" term associated to industry, occupation, educational attainment, and age. I report coefficients and standard errors followed by normalized coefficients reflecting the difference in the dependent variable associated with moving from the 25th to the 75th percentiles of trade exposure. The number of observations is N = 558 corresponding to the number of microregions. Standard errors are clustered by states (27). ***, **, and * denote statistical significance at a 1, 5 and 10 percent confidence level.

Table 9: Impact of Trade Exposure on the Components of the "Explained" Term in the Oaxaca - Blinder Decomposition of the Gender Wage Gap ; Change in Quantities vs. Change in Returns.

	Change in X 's		Change in β 's		Overall	
	2SLS	OLS	2SLS	OLS	2SLS	OLS
Explained	17.702 ***	18.296 ***	14.102 **	12.019 *	31.804 ***	30.316 ***
	(6.816)	(6.824)	(6.671)	(6.202)	(4.367)	(5.006)
[p25-p75]	.00581 ***	.00600 ***	.00463 **	.00394 *	.01044 ***	.00995 ***
Explained - Industry	3.8240	3.7716	3.0182	1.9074	6.8422 *	5.6790
	(4.015)	(4.255)	(6.307)	(6.223)	(4.124)	(4.165)
[p25-p75]	.00125	.00123	.00099	.00062	.00224 *	.00186
Explained - Occupation	6.1149 ***	7.0146 ***	9.1375 ***	8.2119 **	15.252 ***	15.226 ***
	(1.984)	(2.130)	(3.191)	(3.875)	(4.543)	(5.401)
[p25-p75]	.00200 ***	.00230 ***	.00300 ***	.00269 **	.00500 ***	.00499 ***
Explained - Educational Attainment	3.0608	3.5397	1.3143	1.3799	4.3751	4.9197 *
	(2.566)	(2.500)	(1.199)	(1.076)	(2.765)	(2.778)
[p25-p75]	.00100	.00116	.00043	.00045	.00143	.00161 *
Explained - Age	4.7022 ***	3.9704 **	.63246 **	.52050 **	5.3346 ***	4.4909 **
	(1.529)	(1.651)	(.2486)	(.2268)	(1.674)	(1.802)
[p25-p75]	.00154 ***	.00130 **	.00020 **	.00017 **	.00175 ***	.00147 **

Notes: This table reports the results of the 2SLS and OLS estimation of equation (4). The dependent variables in each row are the following components of the Oaxaca-Blinder decomposition in equation (1). The first row corresponds to the change in the "explained" term of the decomposition (already reported in the second row of table 8). The second, third, fourth, and fifth rows correspond to the subset of the change in the "explained" term associated to industry, occupation, educational attainment, and age. Each of these is decomposed into changes in quantities (first two columns, corresponding to the first term in equation 8) and changes in "returns" or coefficients (second two columns, coresponding to the second term in equation 8). I report coefficients and standard errors followed by normalized coefficients reflecting the difference in the dependent variable associated with moving from the 25th to the 75th percentiles of trade exposure. The number of observations is N = 558 corresponding to the number of microregions. Standard errors are clustered by states (27). ***, **, and * denote statistical significance at a 1, 5 and 10 percent confidence level.