Online Appendices for "Margins of Labor Market Adjustment to Trade" by Rafael Dix-Carneiro and Brian K. Kovak

A Data and Definitions

A.1 Tariffs

Tariff data come from Kume et al. (2003), who report nominal tariffs and effective rates of protection from 1987 to 1998 using the Brazilian industry classification *Nível* 50. We aggregate these tariffs slightly to an industry classification that is consistent with the Demographic Census data used to construct local tariff shock measures. The classification is presented in Table A1. In aggregating, we weight each *Nível* 50 industry by its 1990 industry value added, as reported in IBGE National Accounts data. Figure A1 shows the evolution of nominal tariffs from 1987 to 1998 for the ten largest industries. The phases of Brazilian liberalization are visible (see Section 2 for a discussion and citations). Large nominal tariff cuts from 1987-1989 had little effect on protection, due to the presence of substantial nontariff barriers and tariff exemptions. In 1990, the majority of nontariff barriers and tariff exemptions were abolished, being replaced by tariffs providing equivalent protection; note the increase in tariffs in some industries in 1990. During liberalization, from 1990 to 1994, tariffs fell in all industries, then were relatively stable from 1995 onward.

In Section B.5 we calculate post-liberalization tariff changes using UNCTAD TRAINS and use these to control for tariff changes occurring after liberalization.

Table A1: Consistent Industry Classification Across Censuses and Tariff Data

Industry	Industry Name	Nivel 50	1970, 1980, 1991 Census (*atividade*)	2000, 2010 Census (*CNAE-Dom*)
1	Agriculture	1	011-037, 041, 042, 581	1101-1118, 1201-1209, 1300, 1401, 1402, 2001, 2002, 5001, 5002
2	Mineral Mining (except combustibles)	2	050, 053-059	12000, 13001, 13002, 14001-14004
3	Petroleum and Gas Extraction and Coal Mining	3	051-052	10000, 11000
4	Nonmetallic Mineral Goods Manufacturing	4	100	26010, 26091, 26092
5	Iron and Steel, Nonferrous, and Other Metal Production and Processing	5-7	110	27001-27003, 28001, 28002
8	Machinery, Equipment, Commercial Installation Manufacturing, and Tractor Manufacturing	8	120	29001
10	Electrical, Electronic, and Communication Equipment and Components Manufacturing	10-11	130	29002, 30000, 31001, 31002, 32000, 33003
12	Automobile, Transportation, and Vehicle Parts Manufacturing	12-13	140	34001-34003, 35010, 35020, 35030, 35090
14	Wood Products, Furniture Manufacturing, and Peat Production	14	150, 151, 160	20000, 36010
15	Paper Manufacturing, Publishing, and Printing	15	170, 290	21001, 21002, 22000
16	Rubber Product Manufacturing	16	180	25010
17	Chemical Product Manufacturing	17,19	200	23010, 23030, 23400, 24010, 24090
18	Petroleum Refining and Petrochemical Manufacturing	18	201, 202, 352, 477	23020
20	Pharmaceutical Products, Perfumes and Detergents Manufacturing	20	210, 220	24020, 24030
21	Plastics Products Manufacturing	21	230	25020
22	Textiles Manufacturing	22	240, 241	17001, 17002
23	Apparel and Apparel Accessories Manufacturing	23	250, 532	18001, 18002
24	Footwear and Leather and Hide Products Manufacturing	24	190, 251	19011, 19012, 19020
25	Food Processing (Coffee, Plant Products, Meat, Dairy, Sugar, Oils, Beverages, and Other)	25-31	260, 261, 270, 280	15010, 15021, 15022, 15030, 15041-15043, 15050, 16000
32	Miscellaneous Other Products Manufacturing	32	300	33001, 33002, 33004, 33005, 36090, 37000
91	Utilities	33	351, 353	40010, 40020, 41000
92	Construction	34	340, 524	45001-45005
93	Wholesale and Retail Trade	35	410-424, 582, 583	50010, 50030, 50040, 50050, 53010 ,53020, 53030, 53041, 53042, 53050, 53061-53068, 53070, 53080, 53090, 53101, 53102, 55020
94	Financial Institutions	38	451-453, 585, 612	65000, 66000, 67010, 67020
95	Real Estate and Corporate Services	40, 41	461-464, 543, 552, 571-578, 584, 589	63022, 70001, 71020, 72010, 74011, 74012, 74021, 74022, 74030, 74040, 74050, 74090, 92013, 92014, 92015, 92020
96	Transportation and Communications	36, 37	471-476, 481, 482, 588	60010, 60020, 60031, 60032, 60040, 60091, 60092, 61000, 62000, 63010, 63021, 64010, 64020, 91010
97	Private Services	39, 43	511, 512, 521-523, 525, 531, 533, 541, 542, 544, 545, 551, 577, 586, 587, 613-619, 622-624, 632, 901, 902	1500, 50020, 53111, 53112, 53113, 55010, 55030, 63030, 70002, 71010, 71030, 72020, 73000, 74060, 80011, 80012, 80090, 85011, 85012, 85013, 85020, 85030, 90000, 91020, 91091, 91092, 92011, 92012, 92030, 92040, 93010, 93020, 93030, 93091, 93092, 95000
98	Public Administration	42	354, 610, 611, 621, 631, 711-717, 721-727	75011-75017, 75020

Consistent industry classification used in generating local tariff shocks from *Nível* 50 tariff data in Kume et al. (2003) and Decennial Census data.

3

Figure A1: Tariffs - 1987-1998
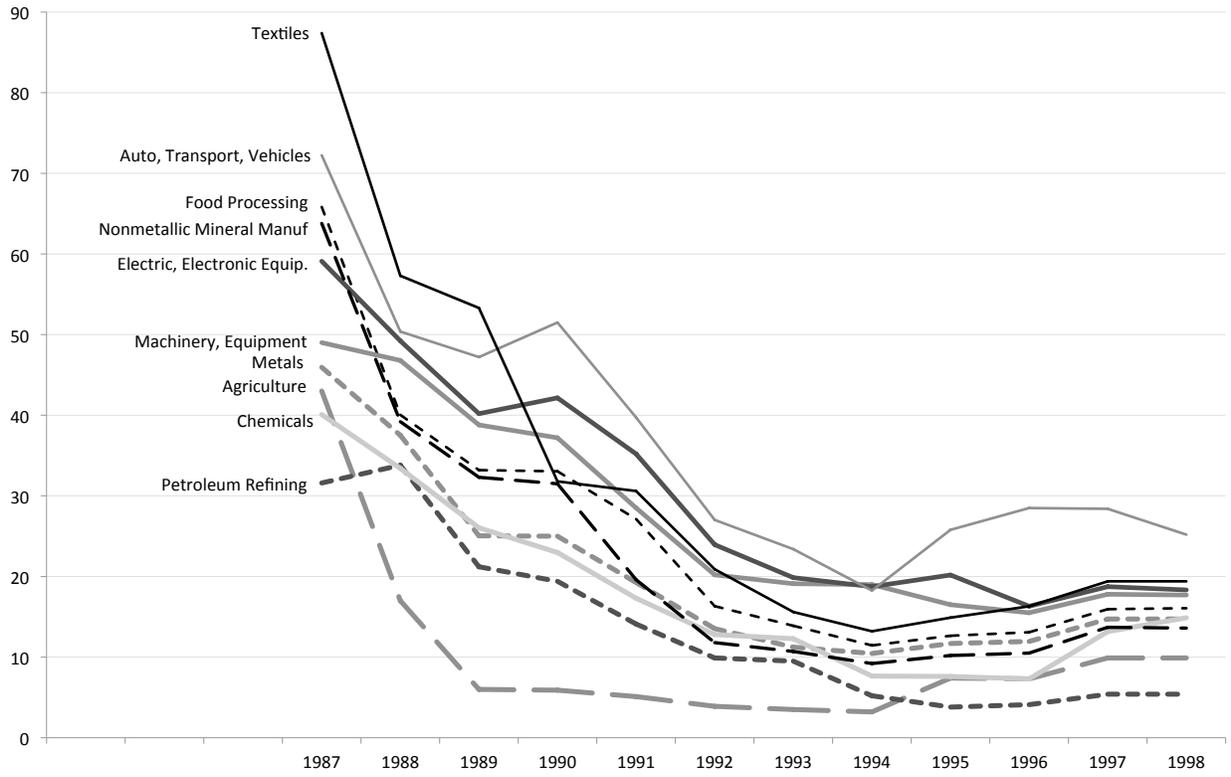
Nominal tariffs from Kume et al. (2003), aggregated to the industry classification presented in Table A1. The ten largest industries by 1990 value added are shown.

A.2 RAIS Data

The *Relação Anual de Informações Sociais* (RAIS) is a high quality census of the Brazilian formal labor market. Originally, RAIS was created as an operational tool for the Brazilian government to i) monitor the entry of foreign workers into the labor market; ii) oversee the records of the FGTS (*Fundo de Garantia do Tempo de Serviço*) program, a national benefits program consisting of employers' contributions to each of its employees; iii) provide information for administering several government benefits programs such as unemployment insurance; and iv) generate statistics regarding the formal labor market. Today it is the main tool used by the government to enable the payment of the "*abono salarial*" to eligible workers. This is a government program that pays one additional minimum wage at the end of the year to workers whose average monthly wage was not greater than two times the minimum wage, and whose job information was correctly declared in RAIS, among other minor requirements. Thus, workers have an incentive to ensure that their employer is filing the required information. Moreover, firms are required to file, and face fines until they do so. Together, these requirements ensure that the data in RAIS are accurate and complete.

Observations in the data are indexed by a worker ID number, the *Programa de Integração Social* (PIS), and an establishment registration number, the *Cadastro Nacional da Pessoa Jurídica* (CNPJ). Both of these identifiers are consistent over time, allowing one to track workers and establishments across years. Establishment industry is reported using the *Subsetor* IBGE classification, which includes 12 manufacturing industries, 2 primary industries, 11 nontradable industries, and 1 other/ignored.[42] Worker education is reported using the following 9 education categories (listing corresponding years of education in parentheses): illiterate (0), primary school dropout (1-3), primary school graduate (4), middle school dropout (5-7), middle school graduate (8), high school dropout (9-10), high school graduate (11), college dropout (12-14), and college graduate (≥ 15).

In each year, and for each job, RAIS reports average earnings throughout the year, and earnings in December.[43] We construct individual yearly earnings by multiplying average monthly earnings by the number of months employed in the year and then summing across employers.

A.3 Demographic Census

We utilize information from the long form of the Demographic Censuses (*Censo Demográfico*) for 1970, 1980, 1991, 2000, and 2010. The long form micro data reflect a 5 percent sample of the population in 1970, 1980, and 2010, a 5.8 percent sample in 1991, and a 6 percent sample in 2000. The primary benefit of the Census for our purposes is the ability to observe those outside formal employment, who are not present in the RAIS database.

Although our main analysis focuses on monthly earnings, following the information available in RAIS, the Census provides weekly hours information from 1991-2010, allowing us to calculate hourly wages as monthly earnings divided by 4.33 times weekly hours. Census results for monthly earnings and hourly wages are very similar. In 1970 and 1980, hours information is presented in 5 rough bins. Thus, when calculating pre-liberalization trends using data from 1970 and 1980, we use monthly earnings even when examining hourly wage outcomes.

---

[42]A less aggregate industry classification (CNAE) is available from 1994 onward, but we need a consistent classification from 1986-2010, so we use *Subsetor* IBGE.

[43]From 1994 onward, RAIS reports hours, making it possible to calculate hourly wages. However, since we need a consistent measure from 1986-2010, we focus on monthly earnings.

In 1991-2010, the Census asks whether each worker has a signed work card. This is the standard definition of formal employment, and is necessary for a worker to appear in the RAIS sample. Thus, we use this as our primary definition of formal employment. In 1980 and 1991, there is an alternative proxy for formal employment, reporting whether the worker's job includes contributions to the national social security system. When calculating pre-liberalization outcome trends for 1980-1991, we use this alternative measure to identify formally employed workers. The social security contributions proxy appears to be a good one; in 1991, when both measures are available, 95.9 percent of workers would be classified identically when using either measure. In 1970, there is no information on formality, so pre-liberalization outcome trends for 1970-1980 are calculated for all workers.

The definition of employment changes across Census years. In 1970 it includes those reporting working or looking for work during August 1970 (the questionnaire does not separately identify working vs. looking for work). In 1980 it includes those who report working during the year prior to September 1, 1980. In 1991 it includes those reporting working regularly or occasionally during the year prior to September 1, 1991. In 2000 and 2010 it includes those who report paid work, temporary leave, unpaid work, or cultivation for own consumption during the week of July 23-29 in 2000 and July 25-31 in 2010. Note that the employment concept changes substantially across years. This highlights yet another benefit of using RAIS as our primary data source, since the employment concept in RAIS is consistent throughout the sample. Yet, while the changes complicate the interpretation of Census-based employment rates over time, there is no reason to expect systematic differences across regions to result from the changing employment concept. Thus, our cross-region identification strategy should be valid when using the Census to measure employment in spite of these measurement issues.
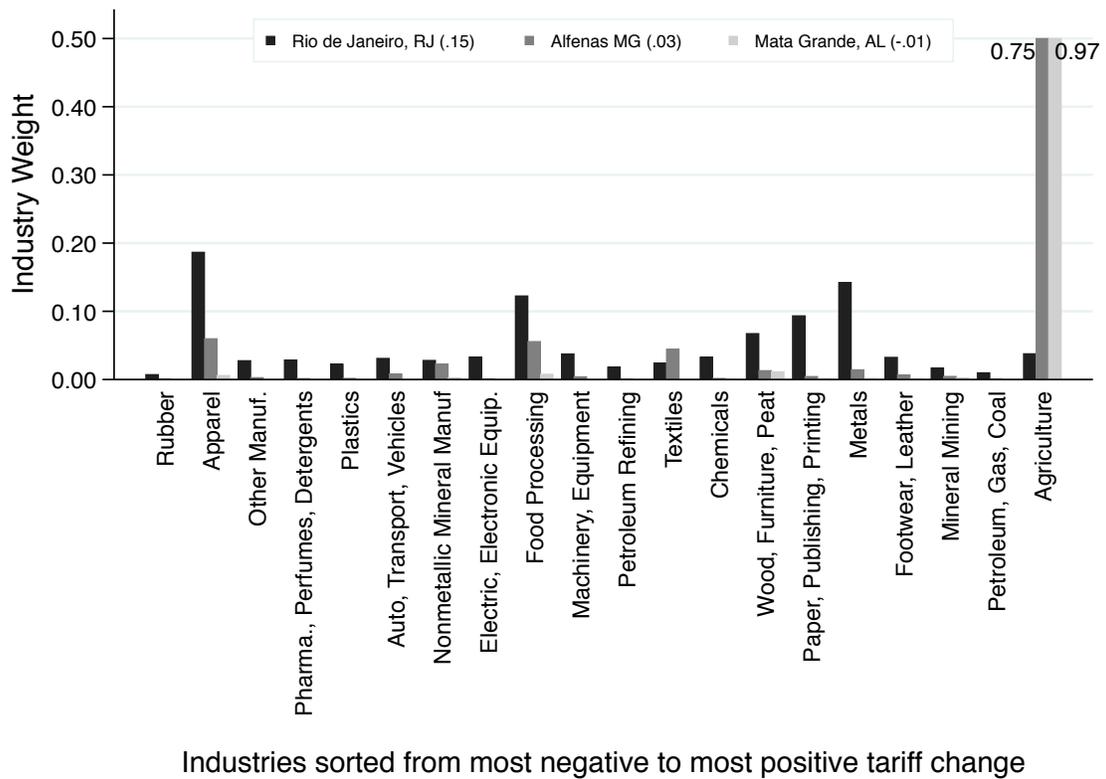
A.4   Regional Tariff Reductions

Regional tariff reductions, defined in (2), are constructed using information from various sources. Tariff changes come from Kume et al. (2003), and are aggregated from the *Nível* 50 level to the industry classification presented in Table A1 using 1990 value-added weights from the IBGE National Accounts. Figure 1 shows the resulting industry-level variation in tariff changes.

The weights, β_{ri} in (2) depend upon the initial regional industry distribution (λ_{ri}) and the specific-factor share in production (φ_i). We calculate the λ_{ri} using the 1991 Census. We use the Census because it provides a less aggregate industry definition than what is available in RAIS, and because the Census allows us to calculate weights that are representative of overall employment, rather than just formal employment. We calculate the φ_i using data from the Use Table of the 1990 National Accounts from IBGE. The table "*Componentes do Valor Adicionado*" provides the wagebill (*Remunerações*) and gross operating surplus (*Excedente Operacional Bruto Inclusive Rendimento de Autônomos*), which reflects the share of income earned by capital. We define φ_i as capital's share of the sum of these two components.

Because Brazilian local labor markets differ substantially in the industry distribution of their employment, the weights β_{ri} vary across regions. Figure A2 demonstrates how variation in industry mix leads to variation in RTR_r. The figure shows the initial industry distribution of employment for the regions facing the largest tariff reduction (Rio de Janeiro) the median tariff reduction (Alfenas in southwestern Minas Gerais state), and the smallest tariff reduction (actually a small increase, Mata Grande in northwest Alagoas state). The industries on the x-axis are sorted from the most

negative to the most positive tariff change. Rio de Janeiro has more weight on the left side of the diagram, by virtue of specializing in manufacturing, particularly in apparel and food processing industries, which faced quite large tariff reductions. Thus, its regional tariff reduction is quite large. Alfenas is a coffee growing and processing region, which also has some apparel employment, balancing the large tariff declines in apparel and food processing against the small tariff increase in agriculture. Mata Grande is located in a sparsely populated mountainous region, and is almost exclusively agricultural, leading it to experience a small tariff increase overall. Thus, although all regions faced the same set of tariff reductions across industries, variation in the industry distribution of employment in each region generates substantial variation in RTR_r.

Figure A2: Variation Underlying Regional Tariff Reduction

Industries sorted from most negative to most positive tariff change

Industry distribution of 1991 employment in the regions facing the largest (Rio de Janeiro, RJ), median (Alfenas, MG) and smallest (Mata Grande, AL) regional tariff reduction. Industries sorted from the most negative to the most positive tariff change (see Figure 1). More weight on the left side of the figure leads to a larger regional tariff reduction, and more weight on the right side leads to a smaller regional tariff reduction.

B Supplemental Empirical Results

B.1 Industry-Level Outcome Pre-Trends vs. Tariff Reductions

Along with regional variation in the industrial composition of employment, our analysis relies on variation in tariff cuts across industries. Here we analyze the relationship between tariff cuts during liberalization (1990-1995) and trends in industry wages and employment before liberalization, 1980-1991. We calculate these pre-liberalization outcome trends using the Demographic Census, to provide a longer pre-liberalization period than what is available in RAIS, which starts in 1986.

We implemented a variety of specifications, with results reported in Table B1. In all specifications, the independent variable is the proportional reduction in one plus the tariff rate.

$$-\Delta_{1990-95}\ln(1 + \tau_i)$$

In panels A-C the dependent variable is the change in log industry earnings. Panel A uses average log earnings; Panel B uses average log earnings residuals controlling for individual age, sex, education, and formal status; and Panel C uses average log earnings residuals controlling for these individual characteristics and region fixed effects. In Panel D, the dependent variable is the change in industry log employment. Column (1) weights industries equally, and presents standard errors based on pairwise bootstrap of the t-statistic, to improve small sample properties with only 20 tradable industry observations. Column (2) uses the same estimator, but drops agriculture. Column (3) uses heteroskedasticity weights and presents heteroskedasticity-robust standard errors, which are likely understated in this small sample (MacKinnon, 2011). Column (4) uses the same estimator, but drops agriculture. In all cases, the results should be seen primarily as suggestive, because the analysis uses only 19 or 20 observations.

Nearly all of the earnings estimates are positive, indicating larger tariff reductions in industries experiencing more positive wage growth prior to liberalization. The majority of the estimates are insignificantly different from zero, with the exception of weighted results in Panels A and B. These specifications heavily weight agriculture, which exhibited declining wages prior to liberalization and experienced essentially no tariff reductions during liberalization, driving the strong positive relationship. By dropping agriculture, Column (4) confirms that the significant relationship is driven by agriculture. The employment estimates are larger, and change sign across columns. Given the diversity of findings across earnings and employment specifications, this exercise is somewhat inconclusive. Tariff cuts may or may not have been substantially correlated with pre-liberalization outcome trends. These findings motivate us to control for pre-liberalization outcome trends whenever possible throughout the paper. This ensures that our results are robust to potential spurious correlation between liberalization-induced labor demand shocks and ongoing trends.

Table B1: Pre-Liberalization Industry Trends - 1980-1991

1980-1991 change in log:	unweighted, bootstrapped	unweighted, bootstrapped, omitting agriculture	weighted	weighted, omitting agriculture
	(1)	(2)	(3)	(4)
Panel A: average earnings				
Industry tariff reduction	0.345	0.111	1.029***	0.510
	(0.322)	(0.354)	(0.139)	(0.582)
Panel B: earnings premia (with individual controls)				
Industry tariff reduction	0.203	-0.017	0.610***	-0.235
	(0.273)	(0.311)	(0.157)	(0.350)
Panel C: earnings premia (with individual and region controls)				
Industry tariff reduction	0.135	0.044	0.184	0.018
	(0.177)	(0.209)	(0.158)	(0.222)
Panel D: employment				
Industry tariff reduction	-1.624	-2.696**	0.687	-1.651
	(1.272)	(1.361)	(0.417)	(1.894)
Observations	20	19	20	19

Decennial Census data. 20 industry observations (19 omitting agriculture). See text for details of dependent and independent variable construction. Column (1) weights industries equally, and presents standard errors based on pairwise bootstrap of the t-statistic. Column (2) uses the same estimator as Column (1), but drops agriculture. Column (3) uses heteroskedasticity weights and presents heteroskedasticity-robust standard errors. Column (4) uses the same estimator as Column (3), but drops agriculture. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

B.2   Informal Sector Descriptives

The following results provide some descriptive evidence on the informal sector in Brazil. Informality is defined as working without a signed work card (*Carteira de Trabalho e Previdência Social*), which entitles workers to benefits and labor protections afforded them by the legal employment system. Table B2 shows that the overall rate of informality increased from 1991 to 2000, before decreasing substantially from 2000 to 2010. Rates of informality are highest in agriculture and much lower in manufacturing. Figure B1 breaks out informality rates in the manufacturing sector into individual industries. Figure B2 focuses on the year 2000 and shows the industry distribution of formal and informal employment. There is very substantial overlap in the industry distributions of formal and informal employment. The biggest differences occur in agriculture, which comprises a much larger share of informal employment, and food processing and metals, which comprise larger shares of formal employment. In contrast, the nontradable share is nearly identical for formal and informal employment. Figure B3 shows the industry distribution for informal employees and the self-employed, which together comprise overall informal employment. These distributions are quite similar, with the exception of agriculture, which makes up a larger share of self-employment, and nontraded employment, comprising a larger share of informal employees.

Table B2: Informal Share of Employment - 1991-2010

	1991	2000	2010
Overall	0.58	0.64	0.49
Agriculture	0.89	0.86	0.83
Mining	0.61	0.45	0.21
Manufacturing	0.28	0.39	0.29
Nontradable	0.55	0.64	0.48

Author's calculations using Brazilian Demographic Census data for workers age 18-64. Informality defined as employment without a signed work card.

Figure B1: Informal Share of Employment by Industry - 1991-2010
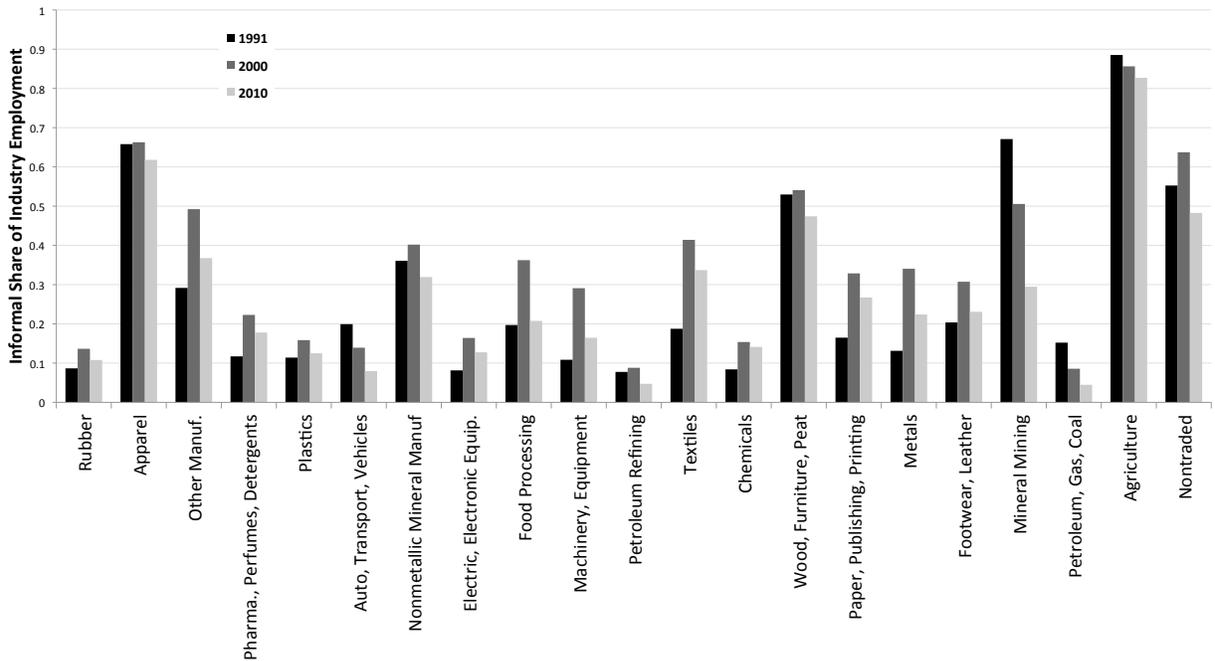
Authors' calculations using Brazilian Demographic Census data for workers age 18-64. Informality defined as employment without a signed work card. Industries sorted from most negative to most positive tariff change (with the exception of the nontraded sector).

Figure B2: Industry Distribution of Formal and Informal Employment - 2000

Authors' calculations using year 2000 Brazilian Demographic Census data for workers age 18-64. Informality defined as employment without a signed work card. Industries sorted from most negative to most positive tariff change (with the exception of the nontraded sector).

Figure B3: Industry Distribution of Informal Employees and Self-Employment - 2000
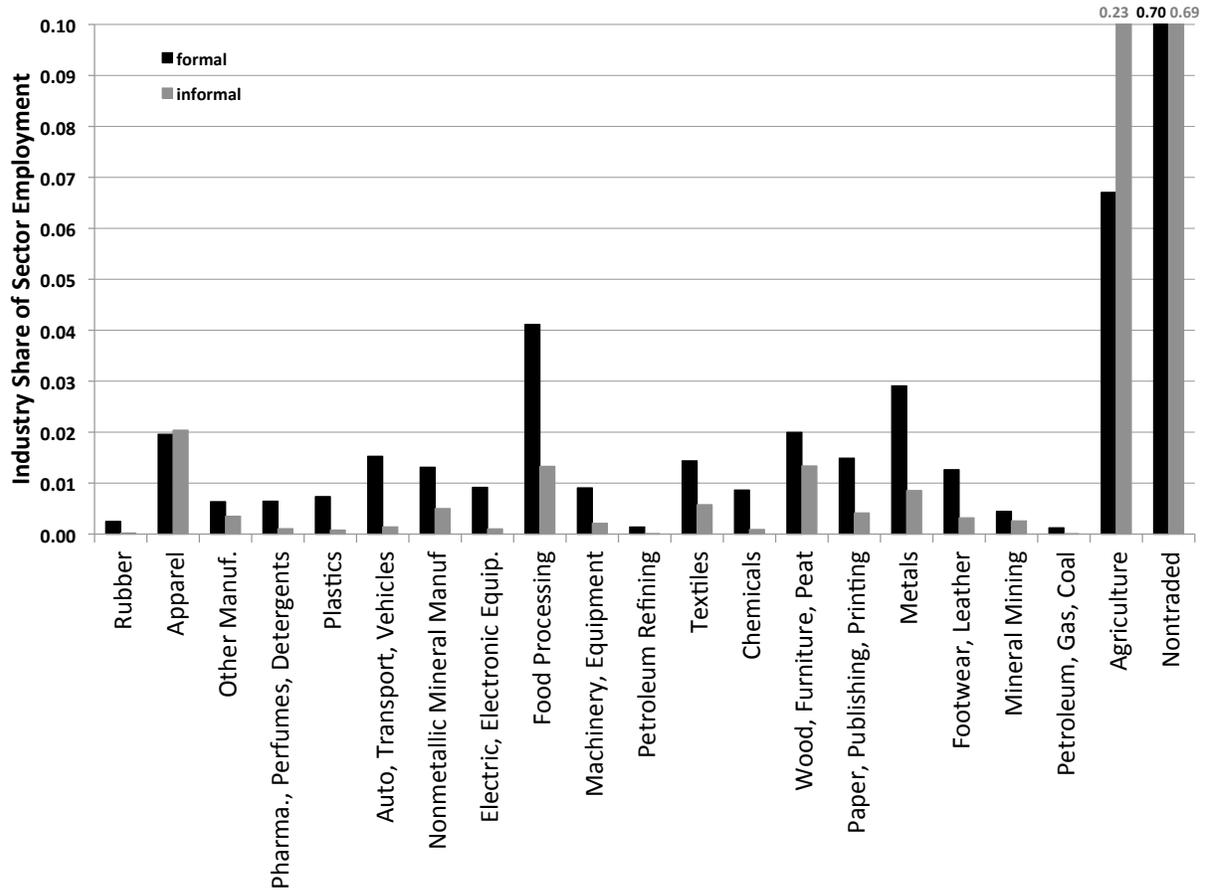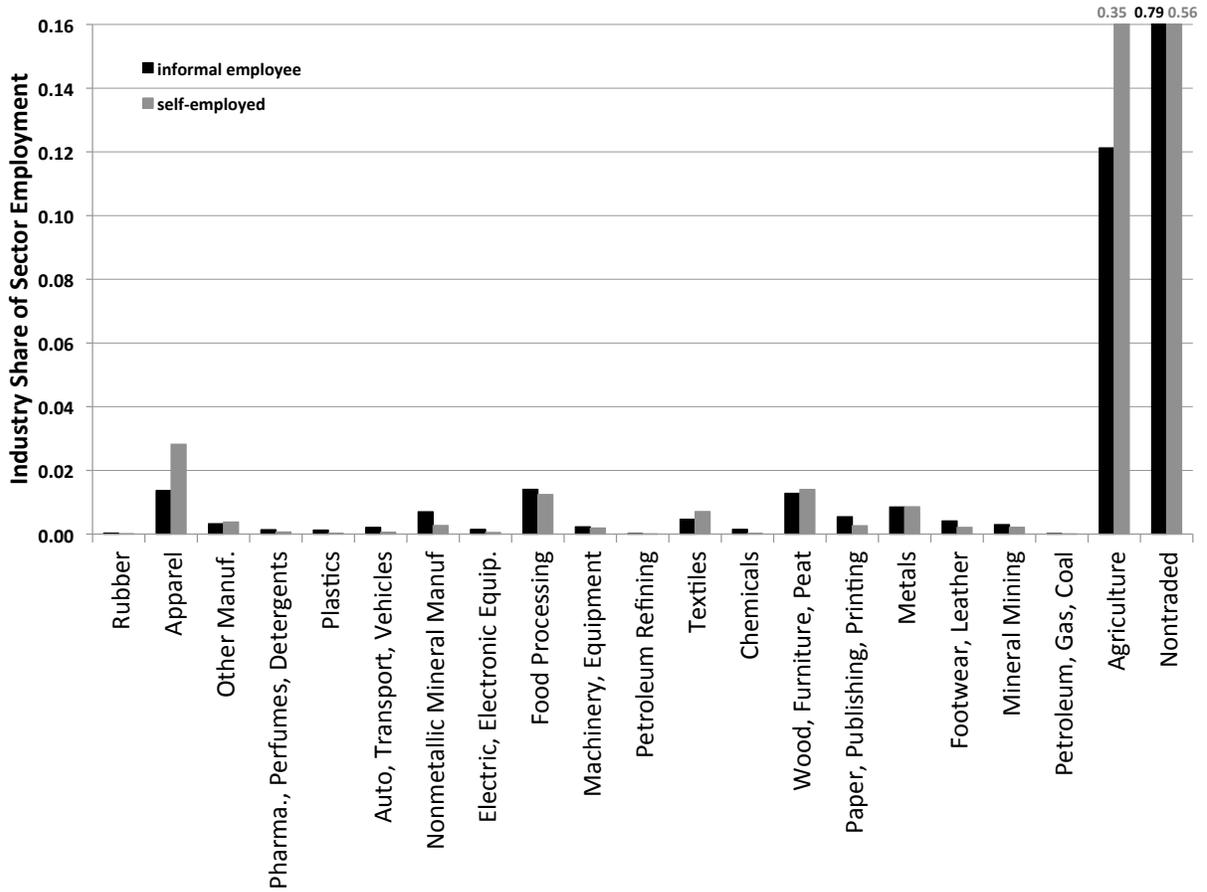

Authors' calculations using year 2000 Brazilian Demographic Census data for informal workers age 18-64. Informality defined as employment without a signed work card. Industries sorted from most negative to most positive tariff change (with the exception of the nontraded sector).

B.3 Additional Worker-Level Outcomes

This section presents supplementary results to complement those discussed in Section 5. Each figure presents estimates of θ_t from (3) for additional outcomes not discussed in the main text.

First, we present additional outcomes for the sample of workers initially employed in the formal tradable sector. Figure B4 examines the effects of regional tariff reductions on the share of the year formally employed.

$$\frac{Months_{it}}{12} \tag{10}$$

Workers initially employed in regions experiencing larger tariff reductions spend a smaller and smaller fraction of the year formally employed compared to workers initially employed in other regions. The largest effect, -0.55, appears in 2004, implying that on average a worker whose initial region faced a 10 percentage point larger tariff reduction spent 0.66 fewer months in formal employment. Figure B5 examines the effects of regional tariff reductions on average yearly earnings in the formal sector.

$$\frac{Earnings_{it}}{MeanEarnings_{i,1986-89}} \tag{11}$$

This measure is a yearly version of the cumulative measure in (5). The results in Figure B5 parallel those in Figure 5, with workers whose initial regions faced larger tariff reductions experience declining formal earnings compared to those in more favorably affected regions.

We then turn to the sample of workers initially employed in the formal nontradable sector. Figure B6 reports the effects of regional tariff reductions on the average number of months formally employed per year from 1990 to year t, as in (4). As with tradable sector workers, the effects are large and grow over time, but with somewhat smaller magnitudes than for tradable-sector workers. Figure B7 examines (10), the fraction of the year formally employed, again finding similar results. Figure B8 examines cumulative average earnings (5), finding results that parallel those for the tradable sector. Workers initially in harder-hit regions experience declining earnings compared to those initially in other regions. Figure B9 finds similar results for the yearly non-cumulative earnings measure in (11). Finally, Figure B10 examines the fraction of formally employed months in a new region, (6). As in the tradable sector, if anything, the negative point estimates imply that workers initially in regions facing larger tariff reductions were less likely to migrate to a formal job elsewhere than workers initially in more favorably affected regions.

Finally, we examine the effect of regional tariff reductions on the duration of workers' spells of non-employment. For computational tractability, we take a 5 percent sample of all individuals that appear in the RAIS data from 1986 to 2005. For these individuals, we construct a database of all non-formal spells, keeping in mind that a non-formal spell may include periods of informal employment and/or non-employment. For each spell, we record the start date, end date, and whether the spell was truncated by the end of our RAIS dataset in 2010. For all spell analyses, we include a variety controls. Individual-level controls include gender, age, education, firm tenure prior to separation, occupation prior to separation, and month of separation. Firm-level controls include employment and industry. Region-level controls include 1986-1989 formal earnings growth residuals after controlling for worker and industry composition in a Mincerian regression; 1986-1989 formal employment growth; 1986-1989 hazard rates from non-formality to formality; and 1986-1989 job accession failure rates at the 6 month, 1 year and 2 year marks.

We estimate a cox proportional hazards model relating the length of non-formal spells starting in

a particular year to the regional tariff reduction in the region where the spell originated. We estimate this model separately for spells starting in each year from 1991 to 2007. The analysis stops in 2007 to provide a few years during which spell lengths are observed before they become truncated at 2010. The estimates appear in Figure B11 indicating that hazard rates of transitioning back into formal status decline more in regions facing larger tariff reductions. This gap in hazard rates between regions facing larger vs. smaller tariff reductions grows from 1995 to 2000 and contracts a bit thereafter, although non-formal spells in harder-hit regions remain longer even in 2007. Figure B12 provides an alternative view of the same phenomenon, regressing an indicator for whether the non-formal spell was longer than one year on the regional tariff reduction in the region where the spell originated, including the same controls just discussed. The positive estimates after liberalization indicate that non-formal spells originating in regions facing larger tariff reductions were more likely to last at least one year than spells originating in more favorably affected regions. For example, coefficient of 0.46 in 2000 indicates that a region facing a 10 percentage point larger tariff decline, the fraction of non-formal spells lasting at least one year is larger by 0.046.

Figure B4: Fraction of the Year Formally Employed - Tradable Worker Sample - 1990-2010

Each point reflects an individual regression coefficient, $\hat{\theta}_t$, following (3), where the dependent variable is the share of the year formally employed in the year listed on the x-axis. The independent variable is the regional tariff reduction (RTR_r), defined in (2). Note that RTR_r always reflects tariff reductions from 1990-1995. The regressions include state fixed effects and extensive controls for worker, initial job, initial employer, and initial region characteristics (see text for details). Negative estimates imply that workers initially in regions facing larger tariff reductions spend a smaller share of the year formally employed than workers in other regions. The vertical bar indicates that liberalization began in 1990 and was complete by 1995. Dashed lines show 95 percent confidence intervals. Standard errors adjusted for 106 mesoregion clusters.

Figure B5: Average Yearly Earnings - Tradable Worker Sample - 1990-2010

Each point reflects an individual regression coefficient, $\hat{\theta}_t$, following (3), where the dependent variable is the average yearly earnings in the year listed on the x-axis, expressed as a multiple of the worker's pre-liberalization (1986-89) average yearly earnings. The independent variable is the regional tariff reduction (RTR_r), defined in (2). Note that RTR_r always reflects tariff reductions from 1990-1995. The regressions include state fixed effects and extensive controls for worker, initial job, initial employer, and initial region characteristics (see text for details). Negative estimates imply that workers initially in regions facing larger tariff reductions experience earnings reductions compared to workers in other regions. The vertical bar indicates that liberalization began in 1990 and was complete by 1995. Dashed lines show 95 percent confidence intervals. Standard errors adjusted for 106 mesoregion clusters.

Figure B6: Cumulative Average Months Formally Employed Per Year - Nontradable Worker Sample - 1990-2010

Each point reflects an individual regression coefficient, $\hat{\theta}_t$, following (3), where the dependent variable is the average months formally employed per year from 1990 to the year listed on the x-axis. The independent variable is the regional tariff reduction (RTR_r), defined in (2). Note that RTR_r always reflects tariff reductions from 1990-1995. The regressions include state fixed effects and extensive controls for worker, initial job, initial employer, and initial region characteristics (see text for details). Negative estimates imply that workers initially in regions facing larger tariff reductions spend a smaller average share of the relevant years formally employed than workers in other regions. The vertical bar indicates that liberalization began in 1990 and was complete by 1995. Dashed lines show 95 percent confidence intervals. Standard errors adjusted for 111 mesoregion clusters.

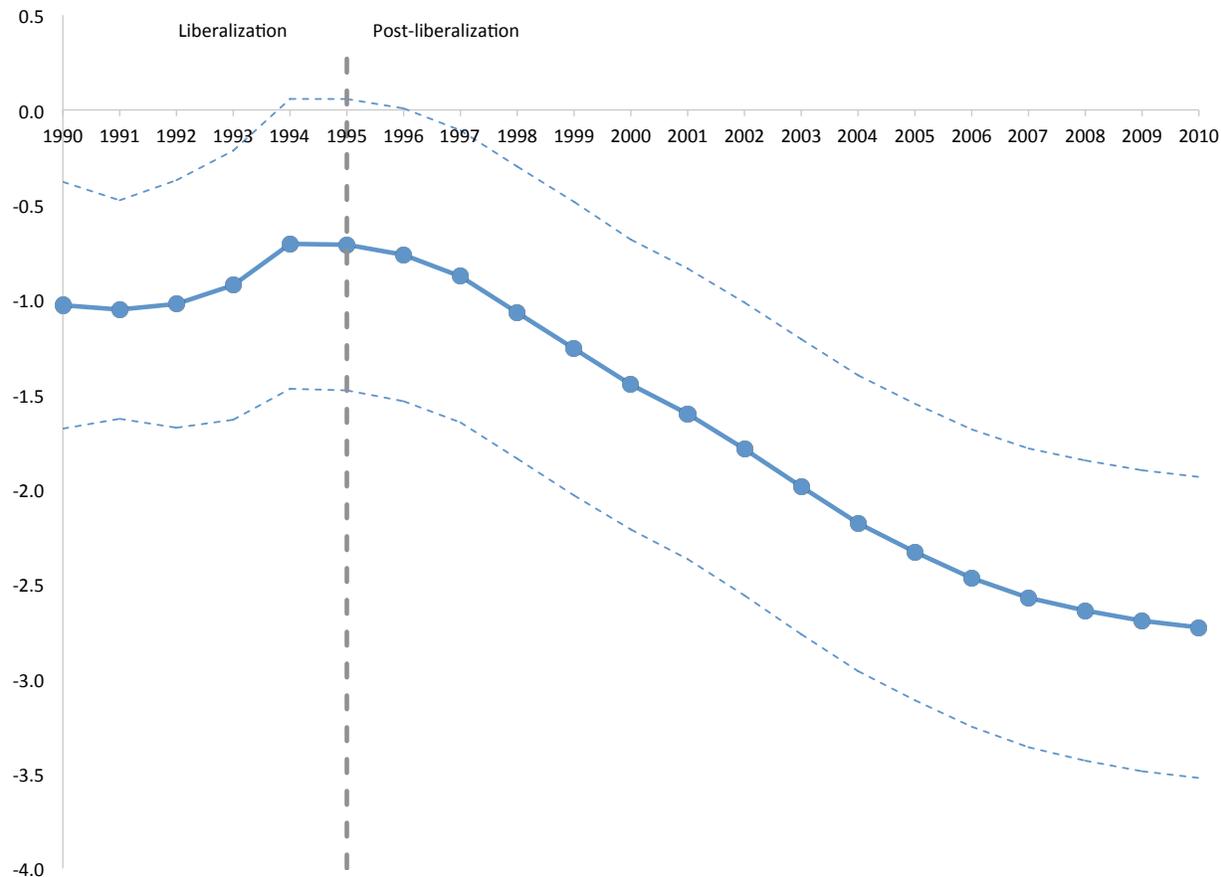Figure B7: Fraction of the Year Formally Employed - Nontradable Worker Sample - 1990-2010

Each point reflects an individual regression coefficient, $\hat{\theta}_t$, following (3), where the dependent variable is the share of the year formally employed in the year listed on the x-axis. The independent variable is the regional tariff reduction (RTR_r), defined in (2). Note that RTR_r always reflects tariff reductions from 1990-1995. The regressions include state fixed effects and extensive controls for worker, initial job, initial employer, and initial region characteristics (see text for details). Negative estimates imply that workers initially in regions facing larger tariff reductions spend a smaller share of the year formally employed than workers in other regions. The vertical bar indicates that liberalization began in 1990 and was complete by 1995. Dashed lines show 95 percent confidence intervals. Standard errors adjusted for 111 mesoregion clusters.

Figure B8: Cumulative Average Earnings - Nontradable Worker Sample - 1990-2010

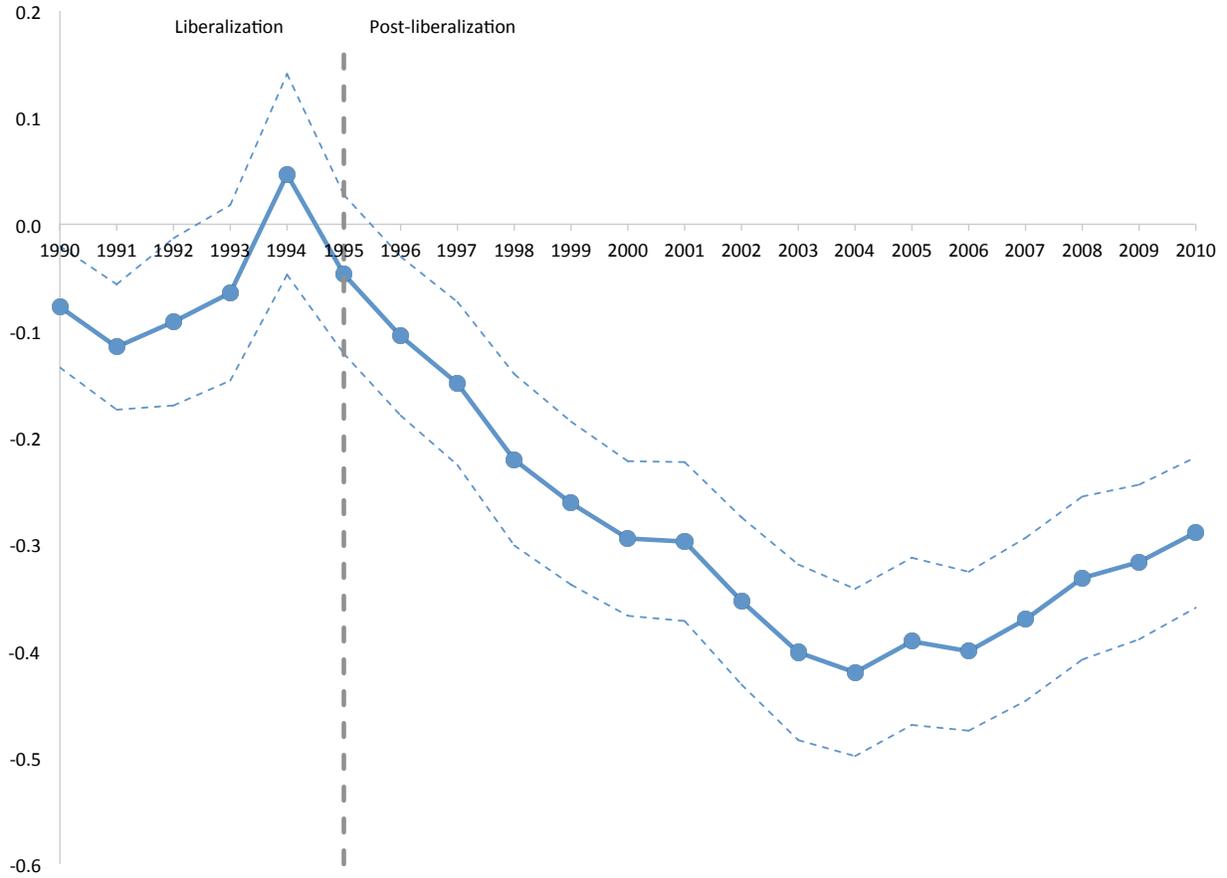
Each point reflects an individual regression coefficient, $\hat{\theta}_t$, following (3), where the dependent variable is the average yearly earnings from 1990 to the year listed on the x-axis, expressed as a multiple of the worker's pre-liberalization (1986-89) average yearly earnings. The independent variable is the regional tariff reduction (RTR_r), defined in (2). Note that RTR_r always reflects tariff reductions from 1990-1995. The regressions include state fixed effects and extensive controls for worker, initial job, initial employer, and initial region characteristics (see text for details). Negative estimates imply that workers initially in regions facing larger tariff reductions experience earnings reductions compared to workers in other regions. The vertical bar indicates that liberalization began in 1990 and was complete by 1995. Dashed lines show 95 percent confidence intervals. Standard errors adjusted for 111 mesoregion clusters.

Figure B9: Average Yearly Earnings - Nontradable Worker Sample - 1990-2010

Each point reflects an individual regression coefficient, $\hat{\theta}_t$, following (3), where the dependent variable is the average yearly earnings in the year listed on the x-axis, expressed as a multiple of the worker's pre-liberalization (1986-89) average yearly earnings. The independent variable is the regional tariff reduction (RTR_r), defined in (2). Note that RTR_r always reflects tariff reductions from 1990-1995. The regressions include state fixed effects and extensive controls for worker, initial job, initial employer, and initial region characteristics (see text for details). Negative estimates imply that workers initially in regions facing larger tariff reductions experience earnings reductions compared to workers in other regions. The vertical bar indicates that liberalization began in 1990 and was complete by 1995. Dashed lines show 95 percent confidence intervals. Standard errors adjusted for 111 mesoregion clusters.

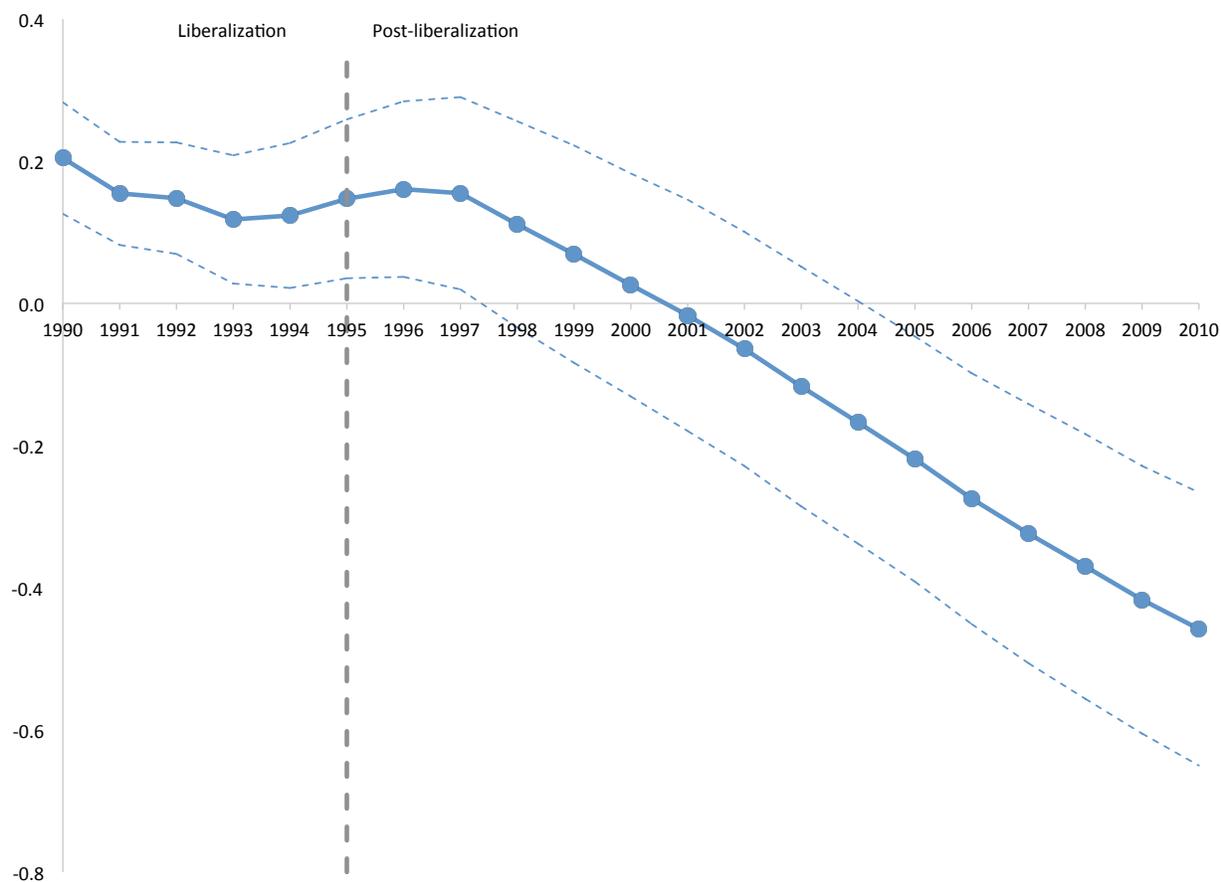Figure B10: Fraction of Formally Employed Months in a New Region - Nontradable Worker Sample - 1990-2010
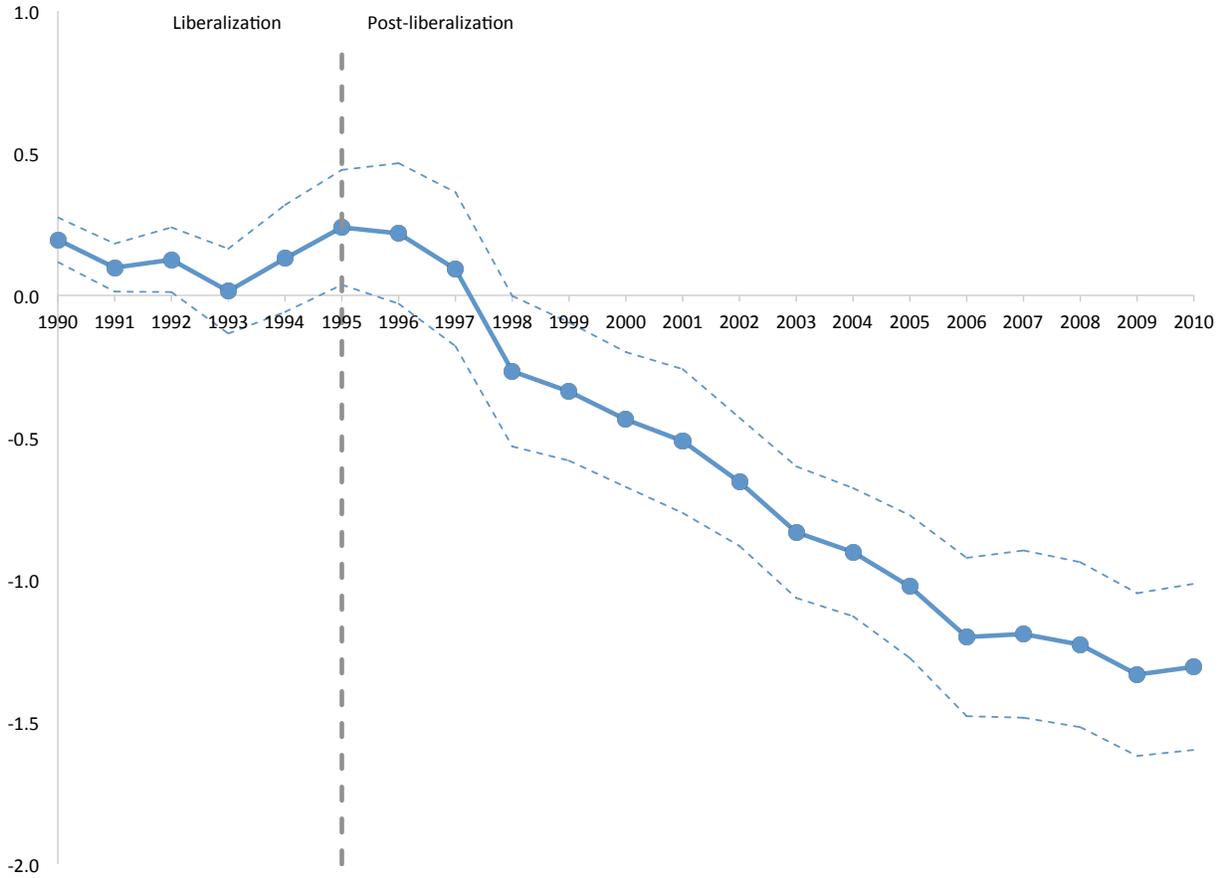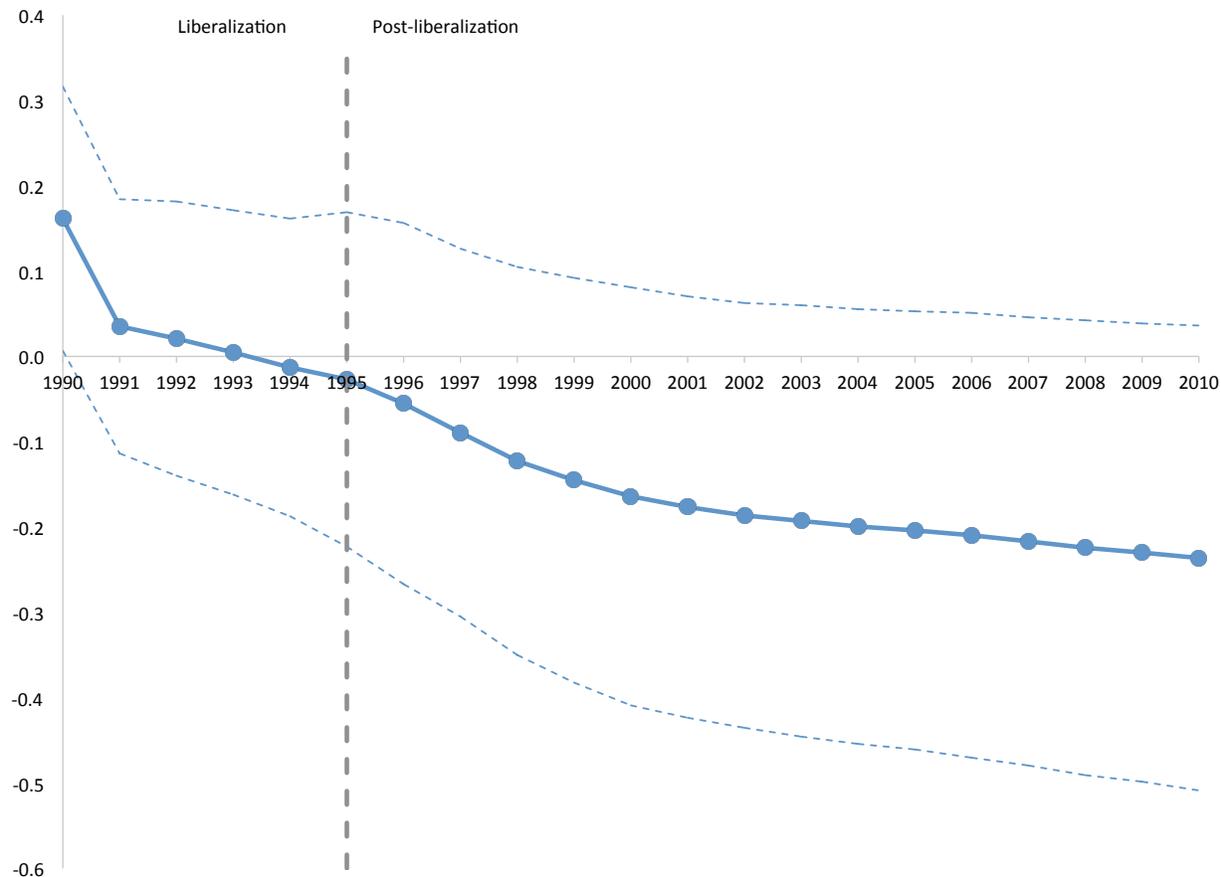

Each point reflects an individual regression coefficient, $\hat{\theta}_t$, following (3), where the dependent variable is the fraction of formally employed months in the year listed on the x-axis spent outside the initial region. The independent variable is the regional tariff reduction (RTR_r), defined in (2). Note that RTR_r always reflects tariff reductions from 1990-1995. The regressions include state fixed effects and extensive controls for worker, initial job, initial employer, and initial region characteristics (see text for details). Negative estimates imply that workers initially in regions facing larger tariff reductions spend a smaller share of their formal employment outside the initial region than did workers in other regions. The vertical bar indicates that liberalization began in 1990 and was complete by 1995. Dashed lines show 95 percent confidence intervals. Standard errors adjusted for 111 mesoregion clusters.

Figure B11: Nonformal Spell Analysis - Cox Proportional Hazard of Transition from Non-Formality to Formal Employment - 1990-2007
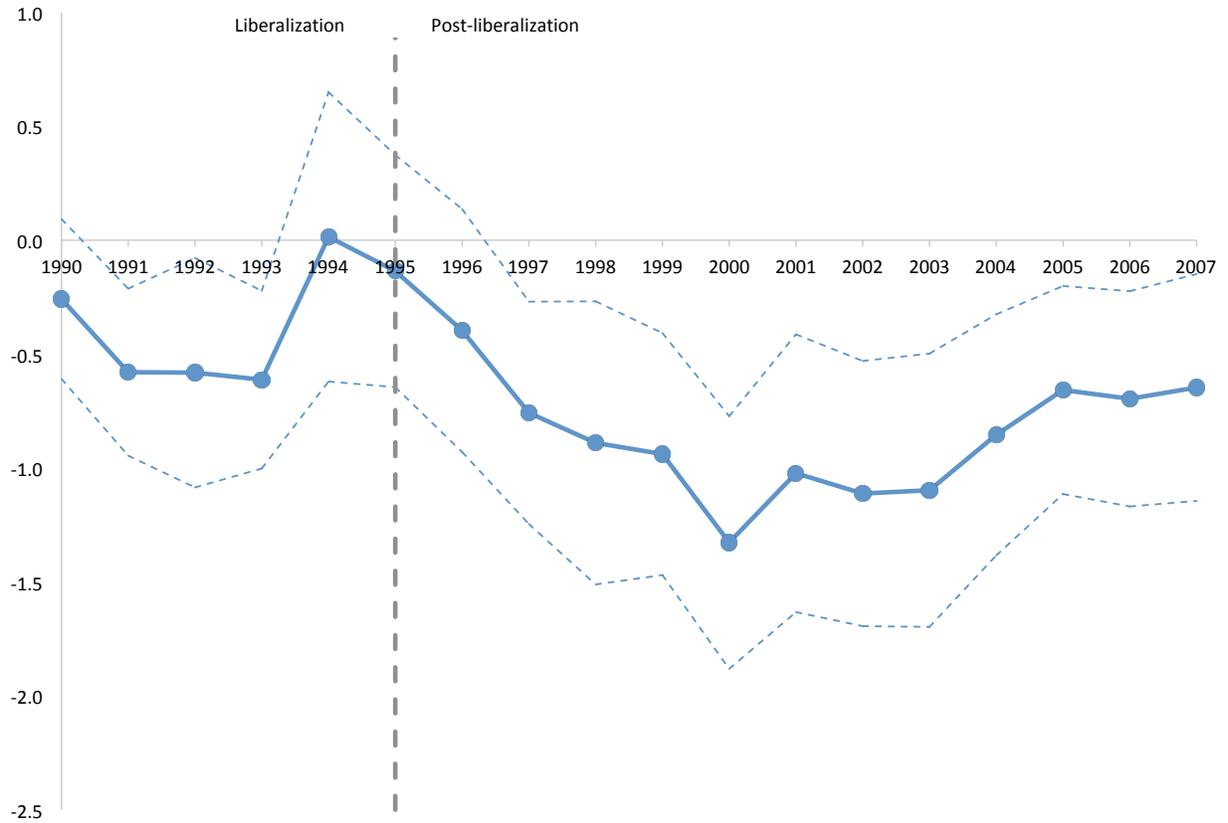
Each point reflects an individual regression coefficient from a Cox proportional hazard model relating non-formal spell durations to regional tariff reductions (RTR_r), defined in (2), for the region in which the spell began. Note that RTR_r always reflects tariff reductions from 1990-1995. The regressions include extensive controls, described in the text. Negative estimates imply that hazard rates of transitioning back to formal status (i.e. ending a non-formal spell) are lower for spells beginning in regions facing larger tariff reductions. The vertical bar indicates that liberalization began in 1990 and was complete by 1995. Dashed lines show 95 percent confidence intervals. Standard errors clustered at the mesoregion level.

Figure B12: Share of Non-Formal Spells Lasting at Least One Year - 1990-2007

Each point reflects an individual regression coefficient, where the dependent variable is an indicator for non-formal spells lasting at least one year, among spells beginning in the year listed on the x-axis. The independent variable is the regional tariff reduction (RTR_r), defined in (2). Note that RTR_r always reflects tariff reductions from 1990-1995. The regressions include extensive controls, described in the text. Positive estimates imply that non-formal spells originating in regions facing larger tariff reductions were more likely to last at least one year than spells originating in more favorably affected regions. The vertical bar indicates that liberalization began in 1990 and was complete by 1995. Dashed lines show 95 percent confidence intervals. Standard errors clustered at the mesoregion level.

B.4   Worker-Level Subsamples

Tables B3 and B4 present worker-level employment results for different subsamples of our worker panels, in order to get a sense for potential heterogeneity among workers with different initial characteristics just before liberalization. Note that the theoretical framework underlying our analysis assumes homogenous labor, so these results are merely suggestive. See Dix-Carneiro and Kovak (2015) for an analysis of the regional effects of liberalization with two worker types.

In both tables B3 and B4, Panel B restricts the sample to include only workers with strong labor force attachment prior to liberalization, i.e. at least 36 months of formal employment during January 1986 - December 1989. Panel C further restricts the sample to require at least 42 months of formal employment during the same time period. Panels D and E split the sample by education level – those with a high school degree or more in Panel D and those with less than a high school degree in Panel E. Panels F and G split the sample by age – those age 25-34 on December 31, 1989 in Panel F and those age 35-44 in Panel G.

In none of these subsamples are the results substantially different from those in the main specification, including the full sample. We had anticipated potentially weaker effects on those strongly attached to the formal labor market and larger effects on older and less educated workers, but do not find significant differences across these groups.

Table B3: Cumulative Average Months Formally Employed Per Year - Subsamples - Tradable Worker Sample - 1995, 2000, 2005, 2010

Cumulative Average Months Formally Employed Per Year	1990-1995 (1)	1990-2000 (2)	1990-2005 (3)	1990-2010 (4)
Panel A: Main specification				
Regional tariff reduction (RTR)	-1.362**	-2.65***	-4.026***	-4.675***
	(0.591)	(0.688)	(0.751)	(0.777)
Panel B: Attached (≥36 months formally employed during Jan 1986 - Dec 1989)				
Regional tariff reduction (RTR)	-1.889***	-3.172***	-4.531***	-5.122***
	(0.597)	(0.688)	(0.754)	(0.775)
Panel C: Strongly attached (≥42 months formally employed during Jan 1986 - Dec 1989)				
Regional tariff reduction (RTR)	-1.735***	-3.092***	-4.422***	-5.017***
	(0.628)	(0.711)	(0.767)	(0.778)
Panel D: More educated (high school degree or more)				
Regional tariff reduction (RTR)	-2.312***	-3.119***	-4.051***	-4.608***
	(0.758)	(0.800)	(0.850)	(0.862)
Panel E: Less educated (less than high school)				
Regional tariff reduction (RTR)	-1.158*	-2.492***	-3.934***	-4.598***
	(0.642)	(0.771)	(0.834)	(0.862)
Panel F: Younger (age 25-34 on Dec 31, 1989)				
Regional tariff reduction (RTR)	-1.238*	-2.300***	-3.561***	-4.285***
	(0.639)	(0.734)	(0.784)	(0.799)
Panel G: Older (age 35-44 on Dec 31, 1989)				
Regional tariff reduction (RTR)	-1.004	-2.534***	-4.030***	-4.536***
	(0.621)	(0.764)	(0.809)	(0.806)
State fixed effects (26)	✓	✓	✓	✓

The dependent variable is the average months formally employed per year from 1990 to the year listed in the column heading. Note that RTR_r always reflects tariff reductions from 1990-1995. Panel A replicates the results shown in Figure 3 for the relevant years. Subsequent panels show results for various worker subsamples, described in the panel headings. Observations: Panel A: 585,078, Panel B: 417,908, Panel C: 351,482, Panel D: 126,560, Panel E: 458,514, Panel F: 364,392, Panel G: 220,686. The regressions include state fixed effects and extensive controls for worker, initial job, initial employer, and initial region characteristics (see text for details). Negative estimates imply that workers initially in regions facing larger tariff reductions spend a smaller average share of the relevant years formally employed than workers in other regions. Standard errors clustered at the mesoregion level. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

Table B4: Cumulative Average Months Formally Employed Per Year - Subsamples - Nontradable Worker Sample - 1995, 2000, 2005, 2010

| Cumulative Average Months Formally Employed | 1990-1995 | 1990-2000 | 1990-2005 | 1990-2010 |
Per Year	(1)	(2)	(3)	(4)
Panel A: Main specification				
Regional tariff reduction (RTR)	-0.711*	-1.448***	-2.331***	-2.729***
	(0.392)	(0.390)	(0.399)	(0.405)
Panel B: Attached (≥36 months formally employed during Jan 1986 - Dec 1989)				
Regional tariff reduction (RTR)	-0.513	-1.289***	-2.117***	-2.442***
	(0.403)	(0.389)	(0.396)	(0.400)
Panel C: Strongly attached (≥42 months formally employed during Jan 1986 - Dec 1989)				
Regional tariff reduction (RTR)	-0.160	-0.978**	-1.779***	-2.093***
	(0.419)	(0.395)	(0.403)	(0.412)
Panel D: More educated (high school degree or more)				
Regional tariff reduction (RTR)	-1.176***	-1.973***	-2.681***	-2.964***
	(0.385)	(0.364)	(0.346)	(0.338)
Panel E: Less educated (less than high school)				
Regional tariff reduction (RTR)	-0.549	-1.131**	-2.027***	-2.454***
	(0.468)	(0.486)	(0.504)	(0.516)
Panel F: Younger (age 25-34 on Dec 31, 1989)				
Regional tariff reduction (RTR)	-0.723**	-1.410***	-2.359***	-2.870***
	(0.356)	(0.381)	(0.409)	(0.430)
Panel G: Older (age 35-44 on Dec 31, 1989)				
Regional tariff reduction (RTR)	-0.379	-1.140**	-1.874***	-2.069***
	(0.493)	(0.457)	(0.449)	(0.442)
State fixed effects (26)	✓	✓	✓	✓

The dependent variable is the average months formally employed per year from 1990 to the year listed in the column heading. Note that RTR_r always reflects tariff reductions from 1990-1995. Panel A replicates the results shown in Figure B6 for the relevant years. Subsequent panels show results for various worker subsamples, described in the panel headings. Observations: Panel A: 973,703, Panel B: 656,177, Panel C: 537,122, Panel D: 363,418, Panel E: 610,285, Panel F: 609,013, Panel G: 364,690. The regressions include state fixed effects and extensive controls for worker, initial job, initial employer, and initial region characteristics (see text for details). Negative estimates imply that workers initially in regions facing larger tariff reductions spend a smaller average share of the relevant years formally employed than workers in other regions. Standard errors clustered at the mesoregion level. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

B.5 Worker-Level Robustness

Tables B5 - B12 present robustness tests for the earnings and employment effects in the tradable and nontradable worker samples. Tables B5 and B6 correspond to Figure 3, Tables B7 and B8 correspond to Figure B6, Tables B9 and B9 correspond to Figure 5, and Tables B11 and B12 correspond to Figure B8. In each table, Panel A replicates the findings in the main specification for 1995, 2000, 2005, and 2010.

Panel B calculates RTR_r using effective rates of protection rather than nominal tariffs. Effective rates of protection capture the overall effect of liberalization on producers in a given industry, accounting for tariff changes on industry inputs and outputs. Kume et al. (2003) provide effective rates of protection along with the nominal tariffs used in our main analysis. The magnitude of the changes in effective rates of protection is larger than for nominal tariffs, so the associated regression coefficients are smaller by roughly the same proportion. Panel C estimates (3) without controlling for fixed effects reflecting the worker's initial industry of employment prior to liberalization. Panel D omits both initial industry and initial occupation fixed effects.

The remaining panels control for salient shocks to the Brazilian labor market that occurred after liberalization. Panel E controls for tariff changes occurring after liberalization. We calculate post-liberalization regional tariff reductions as in (2), but use tariff reductions between 1995 and year $t > 1995$. Because the Kume et al. (2003) data end in 1998, we use UNCTAD TRAINS to construct post-liberalization tariff reductions. The TRAINS data are reported by 6-digit HS codes. In order to maintain as much industry variation as possible, we created an industry mapping from HS codes to Census industry codes, which yields 44 consistently identifiable tradable industries. This provides more industry detail than the main industry definition in Table A1.

Panel F controls for changes in real exchange rates. We construct regional real exchange rate shocks as follows. We begin with real exchange rates between Brazil and its trading partners, calculated from Revision 7.1 of the Penn World Tables. We then calculate each country's 1989 shares of Brazil's imports and exports in each industry using Comtrade. As with post-liberalization tariff changes, we use the industry definition mapping from HS codes to Census industries. Industry-specific real exchange rates are weighted averages of country-specific real exchange rates, weighting either by the 1989 import share or export share. We define industry-level real exchange rate shocks as the change in log industry real exchange rate from 1990 to each subsequent year. Finally we create regional real exchange rate shocks as weighted averages of industry real exchange rate shocks, where the region's industry weights are given by the 1991 industry distribution of employment.

Substantial privatization in Brazil began in 1991 with the administration of President Collor, but significantly increased during President Cardoso's administration (1995-2002). Beginning in 1995, the RAIS data allow us to identify as state-owned any firm at least partly owned by the government. In panel G, we control for the 1995 share of regional employment in state-owned firms, while in panel H we control for the change in state-owned firm employment share from 1995 to each subsequent year t.

We also address the possibility that government development policies may have been correlated with regional tariff reductions in a way that confounds our results. Since 1989, the Brazilian government has specifically directed regional development funds toward states in the North, Northeast, and Center-West regions (Resende, 2013). Because our specifications include state fixed-effects, our estimates are not affected by comparisons across states inside vs. outside these targeted regions. Additionally, Panel I omits the targeted regions from the sample of labor markets, showing that

our results remain even when omitting regions subject to targeted regional development funding.

Regional development funds are not the only sources of funding for lagging regions. The Brazilian Development Bank (BNDES) also offers loans at below market rates to companies of any size and sector in all Brazilian regions. However, while agriculture is the focus of the regional development funds, BNDES loans are primarily directed toward large-scale industrial and infrastructure projects (Resende, 2013). We do not have information on BNDES loans by region, so we are unable to generate a control for BNDES loans. However, Figure B13 shows that, with the exception of a spike in 2002-2004, the share of BNDES loans devoted to agriculture remains relatively constant at 6-8 percent over time. This rules out a potential concern in which loans were increasingly directed toward agriculturally intensive regions facing smaller tariff reductions, explaining the growing effects of regional tariff reductions. Given that the focus of BNDES loans is not agriculture and that the evolution of loans to agriculture is approximately constant between 1995 and 2010 (apart from the 2002-2004 peak), it is likely that BNDES subsidies, if anything, attenuated the effects we estimate.

Panel J controls for commodity price changes, which is particularly important later in our sample, given the commodity-intensive nature of Brazilian output and the substantial increase in commodity prices beginning in 2004. We calculate commodity price changes using the IMF Primary Commodity Price Series, which allows us to measure prices for 19 separate commodities. We calculate the change in log price index from 1991 to each subsequent year for each IMF commodity and then generate regional weighted averages of these price changes, where weights reflect the relevant commodity's share of regional employment in 1991. Appendix B.8.4 in Dix-Carneiro and Kovak (2017) presents extensive detail on the commodity price boom and the IMF data underlying this commodity price change control.

To rule our a broad array of concerns related to agriculture and mining, Panels K and L omit workers initially in regions in which agriculture and mining accounted for a large share of initial employment. Panel K omits regions above the median value for agriculture/mining share of employment and Panel L omits those above the 25th percentile, keeping only the quartile of regions with the least dependence upon agriculture and mining.

During the 2000s, the Cerrado region in central Brazil experienced a huge increase in agricultural output, largely due to new crop varieties and mechanized farming techniques (Economist, 2010; Bustos et al., 2016). Since agriculture faced a small tariff increase during trade liberalization, the growth of the Cerrado and agricultural mechanization more generally could potentially confound the relationship between regional tariff reductions and employment and earnings outcomes. We address this and related concerns in Panels M-S. Panel M omits microregions that overlap with the Cerrado in whole or in part; these regions are shown in Figure B14, generated using data from the Brazilian Ministry of Environment. We then utilize data from the Brazilian Agricultural Census for 1985 and 2006 to identify regions with the largest increases in activity associated with the crops experiencing substantial technical change (corn, cotton, and soy) or with large observed increases in agricultural mechanization.[44] Panel N omits regions with above-median growth in area under cultivation for corn, cotton, and soy, as a share of total area. Panel O implements the same restriction with respect to growth in crop output value relative to initial regional GDP. Finally, Panels P through S omit regions with above-median increases in the number of tractors, planters, harvesters, or plows per hectare, directly omitting regions with substantial increases in agricultural

---

[44]Thanks to Dimitri Szerman for help with the Agricultural Census data.

mechanization.

Finally, Table B13 presents additional robustness tests, adding controls for each worker's initial (1989) log formal sector earnings and the share of the period 1986-89 in which the worker was formally employed. We include both of these controls when studying months formally employed in Panels A and B. Because we measure worker earnings as a multiple of initial pre-liberalization earnings in Panels C and D, we omit the initial earnings controls in those regressions.

For all of these robustness tests, our main results are confirmed. The regional effects of liberalization on formal earnings and employment grow substantially over time, and in most cases the magnitudes remain quite similar to those in our main specifications. Thus, neither the measurement and specification choices considered here nor the extensive set of post-liberalization shocks we control for drives our results.

Table B5: Cumulative Average Months Formally Employed Per Year - Robustness - Tradable Worker Sample - 1995, 2000, 2005, 2010 - Part 1

Cumulative Average Months Formally Employed Per Year	1990-1995 (1)	1990-2000 (2)	1990-2005 (3)	1990-2010 (4)
Panel A: Main specification				
Regional tariff reduction (RTR)	-1.362**	-2.65***	-4.026***	-4.675***
	(0.591)	(0.688)	(0.751)	(0.777)
Panel B: RTR using effective rates of protection				
Regional tariff reduction (RTR)	-1.046***	-1.692***	-2.462***	-2.832***
	(0.389)	(0.440)	(0.492)	(0.510)
Panel C: Omitting initial industry fixed effects				
Regional tariff reduction (RTR)	-1.592***	-3.021***	-4.449***	-5.144***
	(0.564)	(0.679)	(0.758)	(0.791)
Panel D: Omitting initial industry and occupation fixed effects				
Regional tariff reduction (RTR)	-1.134*	-3.000***	-4.785***	-5.651***
	(0.574)	(0.732)	(0.842)	(0.887)
Panel E: Post-liberalization tariff reductions				
Regional tariff reduction (RTR)	-1.362**	-2.649***	-3.669***	-5.119***
	(0.591)	(0.696)	(0.798)	(0.921)
Post-liberalization (1995 to t) regional tariff reductions	n/a	11.591	13.346	5.211
		(13.534)	(14.702)	(4.572)
Panel F: Exchange rates				
Regional tariff reduction (RTR)	-1.365**	-2.127***	-3.506***	-5.031***
	(0.659)	(0.705)	(0.796)	(0.881)
Import-weighted real exchange rate	0.277	0.855*	-2.413	-0.267
	(0.381)	(0.467)	(1.633)	(0.725)
Export-weighted real exchange rate	-1.013	-3.995***	0.972	-1.070
	(0.949)	(1.259)	(1.520)	(1.153)
Panel G: Privatization: initial state-owned employment share				
Regional tariff reduction (RTR)	-1.359*	-2.477***	-3.748***	-4.402***
	(0.708)	(0.771)	(0.823)	(0.839)
State-owned share of 1995 employment	-0.007	-0.455	-0.731	-0.717
	(0.755)	(0.618)	(0.592)	(0.573)
Panel H: Privatization: change in state-owned employment share, 1995 to t				
Regional tariff reduction (RTR)	-1.362**	-2.618***	-3.901***	-4.493***
	(0.591)	(0.731)	(0.831)	(0.854)
Change in state-owned employment share	n/a	0.138	0.525	0.637
		(0.780)	(0.869)	(0.789)
Panel I: South and Southeast regions only				
Regional tariff reduction (RTR)	-2.163***	-3.498***	-4.914***	-5.577***
	(0.732)	(0.833)	(0.891)	(0.923)
State fixed effects (26)	✓	✓	✓	✓

The dependent variable is the average months formally employed per year from 1990 to the year listed in the column heading. Note that RTR_r always reflects tariff reductions from 1990-1995. Panel A replicates the results shown in Figure 3 for the relevant years. Subsequent panels show robustness tests, described in the text. The regressions include state fixed effects and extensive controls for worker, initial job, initial employer, and initial region characteristics (see text for details). Negative estimates imply that workers initially in regions facing larger tariff reductions spend a smaller average share of the relevant years formally employed than workers in other regions. Standard errors clustered at the mesoregion level.

Table B6: Cumulative Average Months Formally Employed Per Year - Robustness - Tradable Worker Sample - 1995, 2000, 2005, 2010 - Part 2

Cumulative Average Months Formally Employed Per Year	1990-1995 (1)	1990-2000 (2)	1990-2005 (3)	1990-2010 (4)
Panel J: Commodity price change controls				
Regional tariff reduction (RTR)	-0.831	-3.358***	-3.913***	-6.909***
	(0.685)	(0.974)	(0.779)	(1.646)
Regional commodity price changes	1.570*	1.031	-1.012	-1.526*
	(0.812)	(0.844)	(1.469)	(0.829)
Panel K: Below-median agriculture/mining employment share				
Regional tariff reduction (RTR)	-2.348***	-3.688***	-5.161***	-5.847***
	(0.676)	(0.784)	(0.853)	(0.881)
Panel L: Bottom quartile agriculture/mining employment share				
Regional tariff reduction (RTR)	-2.905**	-4.271***	-6.035***	-7.026***
	(1.254)	(1.329)	(1.326)	(1.326)
Panel M: Omitting Cerrado regions				
Regional tariff reduction (RTR)	-0.698	-2.184***	-3.574***	-4.267***
	(0.595)	(0.548)	(0.525)	(0.532)
Panel N: Below-median growth in mechanized crop area (corn, cotton, soy)				
Regional tariff reduction (RTR)	-1.143	-2.013*	-2.950***	-3.448***
	(0.932)	(1.013)	(0.964)	(0.957)
Panel O: Below-median growth in mechanized crop value (corn, cotton, soy)				
Regional tariff reduction (RTR)	-0.196	-1.046	-2.317***	-2.954***
	(0.730)	(0.691)	(0.687)	(0.696)
Panel P: Below-median growth in number of tractors				
Regional tariff reduction (RTR)	-0.835	-2.009**	-3.392***	-4.138***
	(0.970)	(0.889)	(0.900)	(0.922)
Panel Q: Below-median growth in number of planters				
Regional tariff reduction (RTR)	-0.980	-1.552**	-2.499***	-3.028***
	(0.684)	(0.650)	(0.652)	(0.666)
Panel R: Below-median growth in number of harvesters				
Regional tariff reduction (RTR)	-0.275	-1.070	-2.284***	-2.942***
	(0.868)	(0.798)	(0.775)	(0.794)
Panel S: Below-median growth in number of plows				
Regional tariff reduction (RTR)	-1.566	-2.218**	-3.265***	-3.900***
	(0.940)	(0.974)	(0.991)	(1.027)
State fixed effects (26)	✓	✓	✓	✓

The dependent variable is the average months formally employed per year from 1990 to the year listed in the column heading. Note that RTR_r always reflects tariff reductions from 1990-1995. Panels show robustness tests, described in the text. The regressions include state fixed effects and extensive controls for worker, initial job, initial employer, and initial region characteristics (see text for details). Negative estimates imply that workers initially in regions facing larger tariff reductions spend a smaller average share of the relevant years formally employed than workers in other regions. Standard errors clustered at the mesoregion level.

Table B7: Cumulative Average Months Formally Employed Per Year - Robustness - Nontradable Worker Sample - 1995, 2000, 2005, 2010 - Part 1

Cumulative Average Months Formally Employed Per Year	1990-1995 (1)	1990-2000 (2)	1990-2005 (3)	1990-2010 (4)
Panel A: Main specification				
Regional tariff reduction (RTR)	-0.711*	-1.448***	-2.331***	-2.729***
	(0.392)	(0.390)	(0.399)	(0.405)
Panel B: RTR using effective rates of protection				
Regional tariff reduction (RTR)	-0.414*	-0.908***	-1.480***	-1.733***
	(0.244)	(0.251)	(0.258)	(0.261)
Panel C: Omitting initial industry fixed effects				
Regional tariff reduction (RTR)	-0.859**	-1.472***	-2.237***	-2.524***
	(0.413)	(0.408)	(0.416)	(0.421)
Panel D: Omitting initial industry and occupation fixed effects				
Regional tariff reduction (RTR)	-1.023**	-1.752***	-2.656***	-2.969***
	(0.421)	(0.436)	(0.463)	(0.477)
Panel E: Post-liberalization tariff reductions				
Regional tariff reduction (RTR)	-0.711*	-1.455***	-2.154***	-2.868***
	(0.392)	(0.391)	(0.490)	(0.439)
Post-liberalization (1995 to t) regional tariff reductions	n/a	5.955	5.940	1.557
		(7.941)	(8.939)	(1.855)
Panel F: Exchange rates				
Regional tariff reduction (RTR)	-1.043**	-1.509***	-2.634***	-3.468***
	(0.404)	(0.413)	(0.431)	(0.443)
Import-weighted real exchange rate	0.042	0.210	-0.799	-0.696**
	(0.220)	(0.346)	(1.018)	(0.328)
Export-weighted real exchange rate	-2.004***	-2.856**	-2.125*	-1.725***
	(0.506)	(1.116)	(1.277)	(0.589)
Panel G: Privatization: initial state-owned employment share				
Regional tariff reduction (RTR)	-1.188***	-1.864***	-2.620***	-2.944***
	(0.379)	(0.414)	(0.456)	(0.466)
State-owned share of 1995 employment	1.382***	1.203**	0.836	0.621
	(0.460)	(0.521)	(0.526)	(0.502)
Panel H: Privatization: change in state-owned employment share, 1995 to t				
Regional tariff reduction (RTR)	-0.711*	-1.690***	-2.610***	-2.924***
	(0.392)	(0.402)	(0.431)	(0.448)
Change in state-owned employment share	n/a	-1.253**	-1.226**	-0.785
		(0.601)	(0.570)	(0.553)
Panel I: South and Southeast regions only				
Regional tariff reduction (RTR)	-1.117**	-1.926***	-2.877***	-3.249***
	(0.533)	(0.542)	(0.559)	(0.577)
State fixed effects (26)	✓	✓	✓	✓

The dependent variable is the average months formally employed per year from 1990 to the year listed in the column heading. Note that RTR_r always reflects tariff reductions from 1990-1995. Panel A replicates the results shown in Figure B6 for the relevant years. Subsequent panels show robustness tests, described in the text. The regressions include state fixed effects and extensive controls for worker, initial job, initial employer, and initial region characteristics (see text for details). Negative estimates imply that workers initially in regions facing larger tariff reductions spend a smaller average share of the relevant years formally employed than workers in other regions. Standard errors clustered at the mesoregion level.

Table B8: Cumulative Average Months Formally Employed Per Year - Robustness - Nontradable Worker Sample - 1995, 2000, 2005, 2010 - Part 2

Cumulative Average Months Formally Employed Per Year	1990-1995 (1)	1990-2000 (2)	1990-2005 (3)	1990-2010 (4)
Panel J: Commodity price change controls				
Regional tariff reduction (RTR)	-0.396	-1.179	-2.276***	-2.863**
	(0.537)	(0.734)	(0.412)	(1.173)
Regional commodity price changes	0.940	-0.418	-0.832	-0.094
	(0.692)	(0.849)	(0.987)	(0.683)
Panel K: Below-median agriculture/mining employment share				
Regional tariff reduction (RTR)	-1.160**	-1.937***	-2.893***	-3.327***
	(0.519)	(0.520)	(0.528)	(0.540)
Panel L: Bottom quartile agriculture/mining employment share				
Regional tariff reduction (RTR)	-0.468	-1.379	-2.554**	-3.112**
	(1.225)	(1.224)	(1.206)	(1.178)
Panel M: Omitting Cerrado regions				
Regional tariff reduction (RTR)	-0.546	-1.018**	-1.812***	-2.190***
	(0.467)	(0.413)	(0.385)	(0.388)
Panel N: Below-median growth in mechanized crop area (corn, cotton, soy)				
Regional tariff reduction (RTR)	-1.263**	-2.204***	-2.996***	-3.233***
	(0.566)	(0.483)	(0.453)	(0.436)
Panel O: Below-median growth in mechanized crop value (corn, cotton, soy)				
Regional tariff reduction (RTR)	-0.452	-1.197***	-1.919***	-2.170***
	(0.284)	(0.342)	(0.384)	(0.396)
Panel P: Below-median growth in number of tractors				
Regional tariff reduction (RTR)	-0.318	-0.725	-1.274**	-1.602***
	(0.589)	(0.599)	(0.609)	(0.599)
Panel Q: Below-median growth in number of planters				
Regional tariff reduction (RTR)	-1.000***	-1.544***	-2.198***	-2.453***
	(0.376)	(0.364)	(0.406)	(0.436)
Panel R: Below-median growth in number of harvesters				
Regional tariff reduction (RTR)	-1.312***	-1.513***	-1.897***	-1.999***
	(0.419)	(0.417)	(0.461)	(0.490)
Panel S: Below-median growth in number of plows				
Regional tariff reduction (RTR)	-0.520	-1.104	-1.656**	-1.836**
	(0.757)	(0.798)	(0.824)	(0.818)
State fixed effects (26)	✓	✓	✓	✓

The dependent variable is the average months formally employed per year from 1990 to the year listed in the column heading. Note that RTR_r always reflects tariff reductions from 1990-1995. Panels show robustness tests, described in the text. The regressions include state fixed effects and extensive controls for worker, initial job, initial employer, and initial region characteristics (see text for details). Negative estimates imply that workers initially in regions facing larger tariff reductions spend a smaller average share of the relevant years formally employed than workers in other regions. Standard errors clustered at the mesoregion level.

Table B9: Cumulative Average Earnings - Robustness - Tradable Worker Sample - 1990, 2000, 2005, 2010 - Part 1

Cumulative Average Earnings	1990-1995	1990-2000	1990-2005	1990-2010
	(1)	(2)	(3)	(4)
Panel A: Main specification				
Regional tariff reduction (RTR)	-0.097	-0.282***	-0.578***	-0.850***
	(0.080)	(0.105)	(0.104)	(0.110)
Panel B: RTR using effective rates of protection				
Regional tariff reduction (RTR)	-0.073	-0.160**	-0.325***	-0.487***
	(0.047)	(0.067)	(0.077)	(0.085)
Panel C: Omitting initial industry fixed effects				
Regional tariff reduction (RTR)	-0.070	-0.297**	-0.606***	-0.897***
	(0.093)	(0.115)	(0.114)	(0.121)
Panel D: Omitting initial industry and occupation fixed effects				
Regional tariff reduction (RTR)	-0.035	-0.278**	-0.622***	-0.941***
	(0.105)	(0.124)	(0.120)	(0.126)
Panel E: Post-liberalization tariff reductions				
Regional tariff reduction (RTR)	-0.097	-0.282***	-0.548***	-0.801***
	(0.080)	(0.102)	(0.117)	(0.119)
Post-liberalization (1995 to t) regional	n/a	-1.002	1.092	-0.580
tariff reductions		(2.691)	(2.647)	(0.579)
Panel F: Exchange rates				
Regional tariff reduction (RTR)	-0.110	-0.158*	-0.560***	-0.888***
	(0.083)	(0.084)	(0.103)	(0.109)
Import-weighted real exchange rate	0.072	0.203**	-0.184	-0.057
	(0.052)	(0.079)	(0.211)	(0.076)
Export-weighted real exchange rate	-0.360***	-0.684***	-0.072	-0.084
	(0.111)	(0.197)	(0.206)	(0.178)
Panel G: Privatization: initial state-owned employment share				
Regional tariff reduction (RTR)	-0.084	-0.262**	-0.547***	-0.819***
	(0.092)	(0.120)	(0.126)	(0.135)
State-owned share of 1995 employment	-0.032	-0.052	-0.079	-0.081
	(0.135)	(0.143)	(0.139)	(0.139)
Panel H: Privatization: change in state-owned employment share, 1995 to t				
Regional tariff reduction (RTR)	-0.097	-0.282**	-0.559***	-0.804***
	(0.080)	(0.111)	(0.123)	(0.135)
Change in state-owned employment share	n/a	-0.001	0.076	0.162
		(0.157)	(0.164)	(0.175)
Panel I: South and Southeast regions only				
Regional tariff reduction (RTR)	-0.123	-0.302**	-0.631***	-0.941***
	(0.090)	(0.123)	(0.123)	(0.132)
State fixed effects (26)	✓	✓	✓	✓

The dependent variable is the average yearly earnings from 1990 to the year listed in the column heading, expressed as a multiple of the worker's pre-liberalization (1986-89) average yearly earnings. Note that RTR_r always reflects tariff reductions from 1990-1995. Panel A replicates the results shown in Figure 5 for the relevant years. Subsequent panels show robustness tests, described in the text. The regressions include state fixed effects and extensive controls for worker, initial job, initial employer, and initial region characteristics (see text for details). Negative estimates imply that workers initially in regions facing larger tariff reductions experience earnings reductions compared to workers in other regions. Standard errors clustered at the mesoregion level.

Table B10: Cumulative Average Earnings - Robustness - Tradable Worker Sample - 1990, 2000, 2005, 2010 - Part 2

Cumulative Average Earnings	1990-1995	1990-2000	1990-2005	1990-2010
	(1)	(2)	(3)	(4)
Panel J: Commodity price change controls				
Regional tariff reduction (RTR)	-0.019	-0.229*	-0.538***	-0.804***
	(0.101)	(0.119)	(0.099)	(0.254)
Regional commodity price changes	0.230	-0.077	-0.352	0.031
	(0.170)	(0.171)	(0.218)	(0.174)
Panel K: Below-median agriculture/mining employment share				
Regional tariff reduction (RTR)	-0.131	-0.321***	-0.641***	-0.942***
	(0.086)	(0.115)	(0.116)	(0.125)
Panel L: Bottom quartile agriculture/mining employment share				
Regional tariff reduction (RTR)	0.031	-0.063	-0.438**	-0.847***
	(0.134)	(0.166)	(0.170)	(0.186)
Panel M: Omitting Cerrado regions				
Regional tariff reduction (RTR)	-0.049	-0.298**	-0.610***	-0.895***
	(0.126)	(0.144)	(0.129)	(0.125)
Panel N: Below-median growth in mechanized crop area (corn, cotton, soy)				
Regional tariff reduction (RTR)	-0.262	-0.373	-0.567**	-0.764***
	(0.183)	(0.247)	(0.234)	(0.229)
Panel O: Below-median growth in mechanized crop value (corn, cotton, soy)				
Regional tariff reduction (RTR)	0.005	-0.106	-0.360***	-0.608***
	(0.102)	(0.121)	(0.123)	(0.131)
Panel P: Below-median growth in number of tractors				
Regional tariff reduction (RTR)	-0.061	-0.256*	-0.552***	-0.855***
	(0.125)	(0.138)	(0.151)	(0.170)
Panel Q: Below-median growth in number of planters				
Regional tariff reduction (RTR)	-0.165*	-0.250***	-0.482***	-0.727***
	(0.083)	(0.094)	(0.103)	(0.116)
Panel R: Below-median growth in number of harvesters				
Regional tariff reduction (RTR)	-0.173*	-0.311***	-0.547***	-0.798***
	(0.100)	(0.118)	(0.130)	(0.144)
Panel S: Below-median growth in number of plows				
Regional tariff reduction (RTR)	-0.084	-0.192	-0.414**	-0.670***
	(0.124)	(0.158)	(0.175)	(0.191)
State fixed effects (26)	✓	✓	✓	✓

The dependent variable is the average yearly earnings from 1990 to the year listed in the column heading, expressed as a multiple of the worker's pre-liberalization (1986-89) average yearly earnings. Note that RTR_r always reflects tariff reductions from 1990-1995. Panels show robustness tests, described in the text. The regressions include state fixed effects and extensive controls for worker, initial job, initial employer, and initial region characteristics (see text for details). Negative estimates imply that workers initially in regions facing larger tariff reductions experience earnings reductions compared to workers in other regions. Standard errors clustered at the mesoregion level.

Table B11: Cumulative Average Earnings - Robustness - Nontradable Worker Sample - 1990, 2000, 2005, 2010 - Part 1

Cumulative Average Earnings	1990-1995	1990-2000	1990-2005	1990-2010
	(1)	(2)	(3)	(4)
Panel A: Main specification				
Regional tariff reduction (RTR)	0.147**	0.026	-0.219**	-0.458***
	(0.057)	(0.080)	(0.088)	(0.098)
Panel B: RTR using effective rates of protection				
Regional tariff reduction (RTR)	0.098***	0.021	-0.135**	-0.286***
	(0.037)	(0.051)	(0.056)	(0.063)
Panel C: Omitting initial industry fixed effects				
Regional tariff reduction (RTR)	0.104*	0.003	-0.217**	-0.423***
	(0.061)	(0.087)	(0.096)	(0.105)
Panel D: Omitting initial industry and occupation fixed effects				
Regional tariff reduction (RTR)	0.092	-0.027	-0.272***	-0.494***
	(0.060)	(0.087)	(0.097)	(0.109)
Panel E: Post-liberalization tariff reductions				
Regional tariff reduction (RTR)	0.147**	0.025	-0.282**	-0.430***
	(0.057)	(0.080)	(0.118)	(0.108)
Post-liberalization (1995 to t) regional	n/a	0.360	-2.099	-0.312
tariff reductions		(1.800)	(2.772)	(0.599)
Panel F: Exchange rates				
Regional tariff reduction (RTR)	0.139**	0.048	-0.209**	-0.549***
	(0.065)	(0.092)	(0.098)	(0.100)
Import-weighted real exchange rate	0.044	0.044	-0.024	-0.033
	(0.034)	(0.060)	(0.199)	(0.079)
Export-weighted real exchange rate	-0.175**	-0.102	0.034	-0.270*
	(0.078)	(0.181)	(0.297)	(0.144)
Panel G: Privatization: initial state-owned employment share				
Regional tariff reduction (RTR)	0.052	-0.094	-0.326***	-0.566***
	(0.052)	(0.083)	(0.099)	(0.110)
State-owned share of 1995 employment	0.277***	0.346***	0.310**	0.313**
	(0.080)	(0.114)	(0.126)	(0.136)
Panel H: Privatization: change in state-owned employment share, 1995 to t				
Regional tariff reduction (RTR)	0.147**	-0.044	-0.305***	-0.534***
	(0.057)	(0.078)	(0.090)	(0.103)
Change in state-owned employment share	n/a	-0.362***	-0.381***	-0.307**
		(0.113)	(0.131)	(0.140)
Panel I: South and Southeast regions only				
Regional tariff reduction (RTR)	0.116	-0.027	-0.289**	-0.523***
	(0.075)	(0.111)	(0.121)	(0.134)
State fixed effects (26)	✓	✓	✓	✓

The dependent variable is the average yearly earnings from 1990 to the year listed in the column heading, expressed as a multiple of the worker's pre-liberalization (1986-89) average yearly earnings. Note that RTR_r always reflects tariff reductions from 1990-1995. Panel A replicates the results shown in Figure B8 for the relevant years. Subsequent panels show robustness tests, described in the text. The regressions include state fixed effects and extensive controls for worker, initial job, initial employer, and initial region characteristics (see text for details). Negative estimates imply that workers initially in regions facing larger tariff reductions experience earnings reductions compared to workers in other regions. Standard errors clustered at the mesoregion level.

Table B12: Cumulative Average Earnings - Robustness - Nontradable Worker Sample - 1990, 2000, 2005, 2010 - Part 2

Cumulative Average Earnings	1990-1995	1990-2000	1990-2005	1990-2010
	(1)	(2)	(3)	(4)
Panel J: Commodity price change controls				
Regional tariff reduction (RTR)	0.166**	-0.104	-0.237***	-0.568**
	(0.066)	(0.139)	(0.088)	(0.264)
Regional commodity price changes	0.055	0.201	0.271	-0.077
	(0.098)	(0.153)	(0.236)	(0.143)
Panel K: Below-median agriculture/mining employment share				
Regional tariff reduction (RTR)	0.086	-0.086	-0.361***	-0.621***
	(0.069)	(0.107)	(0.118)	(0.133)
Panel L: Bottom quartile agriculture/mining employment share				
Regional tariff reduction (RTR)	0.204	-0.004	-0.311	-0.623***
	(0.128)	(0.191)	(0.204)	(0.231)
Panel M: Omitting Cerrado regions				
Regional tariff reduction (RTR)	0.176**	0.105	-0.130	-0.359***
	(0.077)	(0.096)	(0.102)	(0.113)
Panel N: Below-median growth in mechanized crop area (corn, cotton, soy)				
Regional tariff reduction (RTR)	0.004	-0.148	-0.380***	-0.596***
	(0.081)	(0.102)	(0.111)	(0.110)
Panel O: Below-median growth in mechanized crop value (corn, cotton, soy)				
Regional tariff reduction (RTR)	0.088*	-0.054	-0.278***	-0.498***
	(0.048)	(0.072)	(0.086)	(0.093)
Panel P: Below-median growth in number of tractors				
Regional tariff reduction (RTR)	0.105	0.027	-0.168	-0.384***
	(0.093)	(0.110)	(0.123)	(0.137)
Panel Q: Below-median growth in number of planters				
Regional tariff reduction (RTR)	0.059	-0.019	-0.243**	-0.463***
	(0.057)	(0.079)	(0.094)	(0.101)
Panel R: Below-median growth in number of harvesters				
Regional tariff reduction (RTR)	-0.027	-0.094	-0.281**	-0.468***
	(0.058)	(0.088)	(0.115)	(0.127)
Panel S: Below-median growth in number of plows				
Regional tariff reduction (RTR)	-0.022	-0.171	-0.399**	-0.599***
	(0.111)	(0.145)	(0.175)	(0.195)
State fixed effects (26)	✓	✓	✓	✓

The dependent variable is the average yearly earnings from 1990 to the year listed in the column heading, expressed as a multiple of the worker's pre-liberalization (1986-89) average yearly earnings. Note that RTR_r always reflects tariff reductions from 1990-1995. Panels show robustness tests, described in the text. The regressions include state fixed effects and extensive controls for worker, initial job, initial employer, and initial region characteristics (see text for details). Negative estimates imply that workers initially in regions facing larger tariff reductions experience earnings reductions compared to workers in other regions. Standard errors clustered at the mesoregion level.

Table B13: Months Formally Employed and Earnings - Additional Controls - 1990, 2000, 2005, 2010

	1990-1995	1990-2000	1990-2005	1990-2010
	(1)	(2)	(3)	(4)

Dependent Variable: Cumulative Avg. Months Formally Employed Per Year

Panel A: Tradable Sample

Regional tariff reduction (RTR)	-2.330***	-3.195***	-4.303***	-4.790***
	(0.578)	(0.633)	(0.678)	(0.696)
Initial log earnings (1989)	0.064***	-0.105***	-0.200***	-0.246***
	(0.016)	(0.021)	(0.021)	(0.023)
Share of 1986-89 formally employed	3.743***	3.979***	3.953***	3.808***
	(0.078)	(0.085)	(0.081)	(0.080)

Panel B: Nontradable Sample

Regional tariff reduction (RTR)	-1.879***	-2.399***	-3.072***	-3.330***
	(0.432)	(0.424)	(0.421)	(0.418)
Initial log earnings (1989)	0.235***	0.116***	0.013	-0.046**
	(0.023)	(0.019)	(0.019)	(0.018)
Share of 1986-89 formally employed	3.486***	3.700***	3.760***	3.704***
	(0.062)	(0.058)	(0.060)	(0.062)

Dependent Variable: Cumulative Avg. Earnings

Panel C: Tradable Sample

Regional tariff reduction (RTR)	-0.148*	-0.341***	-0.635***	-0.905***
	(0.081)	(0.105)	(0.104)	(0.109)
Share of 1986-89 formally employed	0.245***	0.281***	0.274***	0.260***
	(0.009)	(0.011)	(0.011)	(0.012)

Panel D: Nontradable Sample

Regional tariff reduction (RTR)	0.091	-0.043	-0.287***	-0.525***
	(0.056)	(0.081)	(0.089)	(0.099)
Share of 1986-89 formally employed	0.296***	0.363***	0.361***	0.353***
	(0.007)	(0.009)	(0.010)	(0.012)

State fixed effects (26)	✓	✓	✓	✓

In Panels A and B, the dependent variable is the average months formally employed per year from 1990 to the year listed in the column heading. In Panels C and D, the dependent variable is the average yearly earnings from 1990 to the year listed in the column heading, expressed as a multiple of the worker's pre-liberalization (1986-89) average yearly earnings. Because the dependent variable in Panels C and D includes initial earnings, we do not include initial earnings controls in these panels. Note that RTR_r always reflects tariff reductions from 1990-1995. Panels show robustness tests, described in the text. The regressions include state fixed effects and extensive controls for worker, initial job, initial employer, and initial region characteristics (see text for details), along with the additional controls shown in the table. Standard errors clustered at the mesoregion level.

Figure B13: Agriculture Share of BNDES Lending
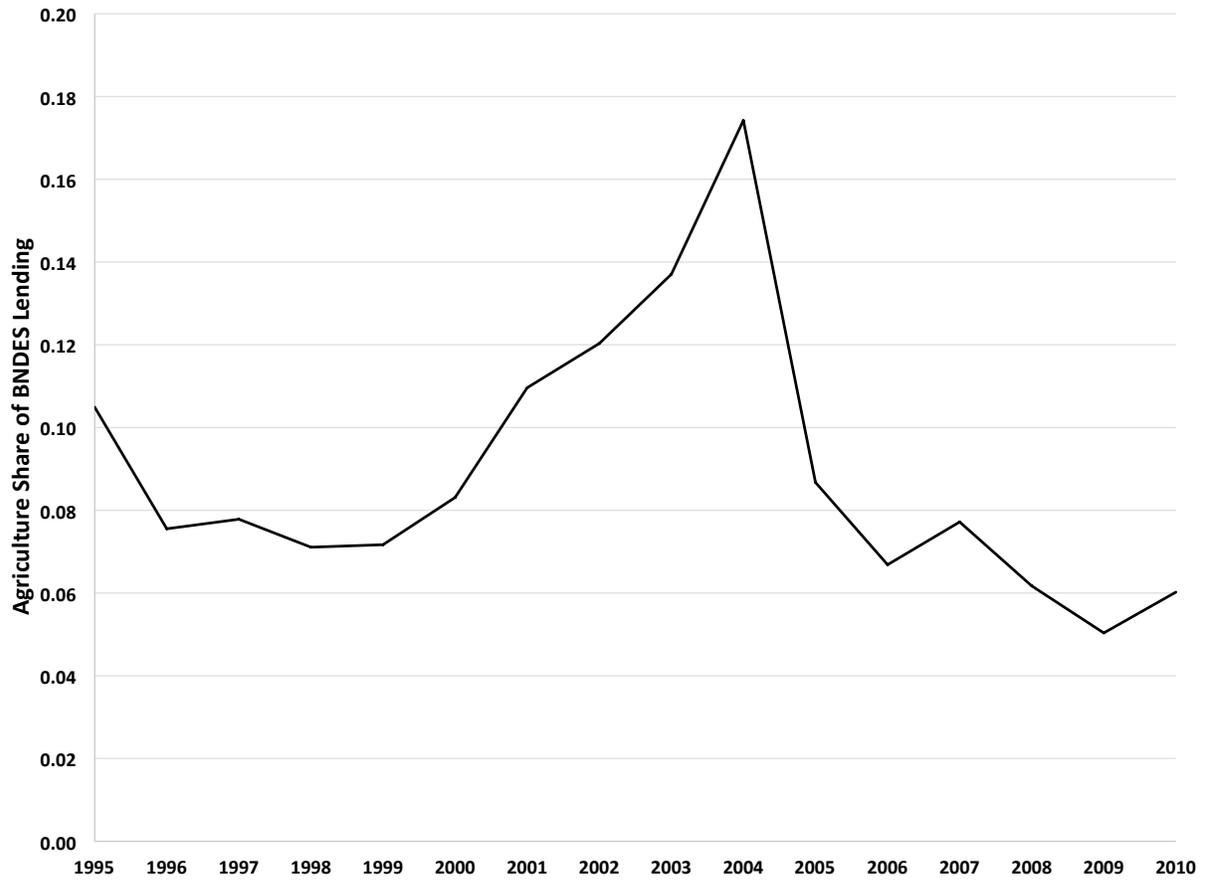
Share of Brazilian Development Bank (BNDES) lending (*desembolsos*) in agriculture industries. Data source: `https://www.bndes.gov.br/wps/portal/site/home/transparencia/estatisticas-desempenho/desembolsos`

Figure B14: Cerrado Regions

The dashed black line represents the boundary of the Cerrado, based on biome maps provided by the Brazilian Ministry of Environment (MMA) and IBGE. Microregions overlapping with the Cerrado are shown in light blue.

B.6 Regional Labor Market Structure

B.6.1 Informal Employee and Self-Employment

Table B14 splits informal employment (in Panel B of Table 5) into informal employee and self-employed status. These results are merely suggestive, as the prevalence of independent contractors blurs the distinction between informal employment and self-employment, and for practical purposes self-employment is often similar to informal employment in that workers often do not enjoy government mandated benefits such as job security, employer social security contributions, etc. The medium-run increase in informality reflects an increase in the share of informal employees, while the long-run effect reflects increased self-employment.[45] This pattern suggests that after long non-employed spells, workers have few traditional employment options and instead pursue self-employment. The availability of an informal option may therefore help mitigate long-run employment losses in harder hit regions. Understanding this interaction between trade policy and labor market policies relating to informality is an important topic for future work (c.f. Dix-Carneiro et al. (2018)).

---

[45]de Paula and Scheinkman (2010) present convincing evidence for a mechanism in which increased informality begets more informality in the presence of value-added taxes (VAT). Because purchases from informal firms do not generate VAT credits, buyers have an incentive to become informal when more of their suppliers are informal. However, since the long-run increase in informality that we document reflects primarily self-employment, it is unlikely to be driven by this mechanism.

Table B14: Employment Category Shares of Regional Working-Age Population - 2000, 2010

	1991-2000			1991-2010		
Change in share:	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Informal employee						
Regional Tariff Reduction *(RTR)*	0.297***	0.268***	0.312***	-0.032	0.039	0.033
	(0.031)	(0.035)	(0.037)	(0.071)	(0.094)	(0.090)
Informal employee share pre-trend (80-91)	-0.096**		-0.112***	0.082		0.015
	(0.038)		(0.041)	(0.099)		(0.091)
Not-employed share pre-trend (70-80)		-0.003	0.046		0.199**	0.192**
		(0.053)	(0.056)		(0.093)	(0.084)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.538	0.526	0.540	0.552	0.562	0.562
Panel B: Self-employed						
Regional Tariff Reduction *(RTR)*	-0.098**	-0.084**	-0.071*	0.428***	0.371***	0.402***
	(0.045)	(0.037)	(0.040)	(0.068)	(0.075)	(0.080)
Self-employed share pre-trend (80-91)	-0.058		-0.107*	-0.325***		-0.280**
	(0.067)		(0.060)	(0.081)		(0.106)
Not-employed share pre-trend (70-80)		0.083	0.121**		-0.209***	-0.110
		(0.060)	(0.061)		(0.075)	(0.093)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.180	0.186	0.198	0.660	0.644	0.664

Decennial Census data. Positive (negative) coefficient estimates for the regional tariff reduction (RTR) imply larger increases (decreases) in the relevant employment category share in regions facing larger tariff reductions. Panels A and B split informal employment (in Panel B of Table 5) into informal employees and the self-employed. Changes in employment shares are calculated controlling for regional worker composition (see text for details). Pre-trends computed for 1980-1991 and 1970-1980 periods. Due to a lack of information on informality in the 1970 Census, the 1980-1970 pre-trends always refer to the non-employed share. 405 microregion observations. Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in the relevant employment share. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

B.6.2 Robustness

Tables B15 and B16 implement extensive robustness tests for the regional labor market structure analysis in Table 5. The controls and subsamples correspond to those discussed in the worker-level robustness analysis in Appendix B.5, so we refer the reader to that section for details on control construction and subsample definitions. The result in Table 5 are robust to the wide variety of alternative measurement strategies, post-liberalization economic shocks, and sample restrictions presented in Tables B15 and B16. We continue to find that non-employment and informal employment grow more in regions facing larger tariff reductions in the short run, but that the non-employment effect disappears in the long run while the informal effect grows, suggesting long-run shifts from non-employment to informal employment.

Table B17 estimates a version of the regional labor market structure analysis in Table 5, following a consistent cohort of workers over time, those age 25-43 in 1989. This analysis reinforces our interpretation of Table 5 as implying that many workers transition to informal employment following long periods of non-employment. The results for informal workers, including informal employees and the self-employed, are very similar to those in Table 5, indicating that these results are not driven by worker entry and exit from the working-age population over time. The long-run not-employed share responds somewhat differently for this cohort than for the working-age population as a whole. While the not-employed share response decreases substantially between 2000 to 2010 for the consistent cohort (Table B17), it disappears completely for the overall working-age population (Table 5). Thus, while many non-employed workers in the cohort appear to find informal employment in the long run, accounting for the large increase in the informal share effect and the decrease in the non-employed share effect, some of the even larger decline in the non-employed effect in Table 5 reflects worker entry and exit from the working-age population. Note also that in Table 5, the sum of non-employed and informal effects is roughly constant over time, while the sum of these effects grows over time for the consistent cohort in B17. The cohort pattern is more in line with the growing worker-level formal employment effects in Figures 3 and B6.

Table B18 examines the relationship between pre-liberalization changes in employment category shares and regional tariff reductions (RTR_r) during liberalization. Note that our main results in Table 5 control for these pre-liberalization changes, but we present these results for completeness. We find that for regions that would later face larger tariff reductions, the not-employed share of the working-age population decreased more during the 1970s and increased more during the 1980s than in regions facing smaller tariff reductions. Due to the lack of information on informality in the 1970 Census, we can only examine the informal share of working-age population during 1980-1991. This share was increasing more during the 1980s in regions that faced larger tariff reductions during liberalization. These significant pre-liberalization relationships motivate our inclusion of pre-liberalization trend controls in Table 5. That said, Table B19 shows that the non-employed and informal results in Table 5 are very similar even when omitting the pre-liberalization trend controls.

Table B15: Employment Category Shares of Regional Working-Age Population - Robustness - 2000, 2010 - Part 1

Change in share:	Not-employed		Informal	
	1991-2000	1991-2010	1991-2000	1991-2010
	(1)	(2)	(3)	(4)
Panel A: Main specification				
Regional Tariff Reduction *(RTR)*	0.301***	-0.023	0.213***	0.528***
	(0.043)	(0.058)	(0.053)	(0.077)
Panel B: RTR using effective rates of protection				
Regional Tariff Reduction *(RTR)*	0.202***	-0.009	0.131***	0.331***
	(0.028)	(0.037)	(0.034)	(0.048)
Panel C:Post-liberalization tariff reductions				
Regional Tariff Reduction *(RTR)*	0.300***	0.045	0.217***	0.577***
	(0.044)	(0.059)	(0.052)	(0.090)
Post-liberalization (1995 to t) regional	-0.230	-0.677**	-0.812	-0.534
tariff reductions	(0.794)	(0.260)	(0.847)	(0.349)
Panel D: Exchange rates				
Regional Tariff Reduction *(RTR)*	0.266***	-0.021	0.239***	0.552***
	(0.054)	(0.062)	(0.060)	(0.084)
Import-weighted real exchange rate	-0.063*	0.007	0.0260	0.117*
	(0.035)	(0.031)	(0.029)	(0.067)
Export-weighted real exchange rate	0.009	-0.003	0.005	-0.036
	(0.085)	(0.038)	(0.083)	(0.063)
Panel E: Privatization: initial state-owned employment share				
Regional Tariff Reduction *(RTR)*	0.300***	-0.030	0.209***	0.525***
	(0.042)	(0.057)	(0.054)	(0.077)
State-owned share of 1995 employment	0.005	0.041	0.024	0.020
	(0.026)	(0.032)	(0.026)	(0.027)
Panel F: Privatization: change in state-owned employment share, 1995 to t				
Regional Tariff Reduction *(RTR)*	0.300***	-0.023	0.213***	0.528***
	(0.043)	(0.057)	(0.054)	(0.077)
Change in state-owned employment share	-0.003	0.000	-0.004	-0.000
	(0.029)	(0.039)	(0.029)	(0.029)
Panel G: South and Southeast regions only (208 obs)				
Regional Tariff Reduction *(RTR)*	0.316***	0.0902	0.356***	0.658***
	(0.072)	(0.064)	(0.070)	(0.117)
Not-employed share pre-trend (80-91)	✓	✓		
Informal share pre-trend (80-91)			✓	✓
Not-employed share pre-trend (70-80)	✓	✓	✓	✓
State fixed effects (26)	✓	✓	✓	✓

Decennial Census data. Positive (negative) coefficient estimates for the regional tariff reduction (RTR) imply larger increases (decreases) in the relevant employment category share in regions facing larger tariff reductions. The informal share in Columns (3) and (4) covers both informal employees and the self-employed. Changes in employment shares are calculated controlling for regional worker composition (see text for details). Pre-trends computed for 1980-1991 and 1970-1980 periods. Due to a lack of information on informality in the 1970 Census, the 1980-1970 pre-trends always refer to the non-employed share. 405 microregion observations unless otherwise specified. Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in the relevant employment share. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

Table B16: Employment Category Shares of Regional Working-Age Population - Robustness - 2000, 2010 - Part 2

Change in share:	Not-employed		Informal	
	1991-2000	1991-2010	1991-2000	1991-2010
	(1)	(2)	(3)	(4)
Panel H: Commodity price change controls				
Regional Tariff Reduction *(RTR)*	0.413***	0.0619	0.153**	0.582***
	(0.068)	(0.068)	(0.063)	(0.11)
Regional commodity price changes	-0.164**	0.054	0.106*	0.035
	(0.078)	(0.047)	(0.062)	(0.084)
Panel I: Below-median agriculture/mining employment share (202 obs)				
Regional Tariff Reduction *(RTR)*	0.315***	0.101*	0.270***	0.584***
	(0.054)	(0.053)	(0.061)	(0.085)
Panel J: Bottom quartile agriculture/mining employment share (101 obs)				
Regional Tariff Reduction *(RTR)*	0.218**	0.038	0.226*	0.589***
	(0.106)	(0.105)	(0.114)	(0.143)
Panel K: Omitting Cerrado regions (283 obs)				
Regional Tariff Reduction *(RTR)*	0.326***	0.002	0.165***	0.456***
	(0.046)	(0.057)	(0.059)	(0.083)
Panel L: Below-median growth in mechanized crop area (corn, cotton, soy) (198 obs)				
Regional Tariff Reduction *(RTR)*	0.272***	-0.099	0.287***	0.615***
	(0.087)	(0.097)	(0.090)	(0.136)
Panel M: Below-median growth in mechanized crop value (corn, cotton, soy) (198 obs)				
Regional Tariff Reduction *(RTR)*	0.318***	-0.082	0.171***	0.424***
	(0.053)	(0.069)	(0.055)	(0.069)
Panel N: Below-median growth in number of tractors (198 obs)				
Regional Tariff Reduction *(RTR)*	0.232***	-0.127	0.187**	0.456***
	(0.056)	(0.101)	(0.077)	(0.106)
Panel O: Below-median growth in number of planters (198 obs)				
Regional Tariff Reduction *(RTR)*	0.218***	-0.042	0.379***	0.590***
	(0.069)	(0.088)	(0.062)	(0.121)
Panel P: Below-median growth in number of harvesters (191 obs)				
Regional Tariff Reduction *(RTR)*	0.226***	-0.136	0.279***	0.585***
	(0.056)	(0.093)	(0.072)	(0.133)
Panel Q: Below-median growth in number of plows (198 obs)				
Regional Tariff Reduction *(RTR)*	0.215***	-0.068	0.353***	0.673***
	(0.044)	(0.083)	(0.075)	(0.130)
Not-employed share pre-trend (80-91)	✓	✓		
Informal share pre-trend (80-91)			✓	✓
Not-employed share pre-trend (70-80)	✓	✓	✓	✓
State fixed effects (26)	✓	✓	✓	✓

Decennial Census data. Positive (negative) coefficient estimates for the regional tariff reduction (RTR) imply larger increases (decreases) in the relevant employment category share in regions facing larger tariff reductions. The informal share in Columns (3) and (4) covers both informal employees and the self-employed. Changes in employment shares are calculated controlling for regional worker composition (see text for details). Pre-trends computed for 1980-1991 and 1970-1980 periods. Due to a lack of information on informality in the 1970 Census, the 1980-1970 pre-trends always refer to the non-employed share. 405 microregion observations unless otherwise specified. Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in the relevant employment share. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

Table B17: Employment Category Shares of Regional Working-Age Population, Following a Consistent Cohort - 2000, 2010

Change in share:	1991-2000			1991-2010		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Not-employed						
Regional Tariff Reduction *(RTR)*	0.524***	0.535***	0.529***	0.367***	0.366***	0.372***
	(0.054)	(0.053)	(0.054)	(0.063)	(0.064)	(0.064)
Not-employed share pre-trend (80-91)	0.019		0.068	-0.100**		-0.063
	(0.044)		(0.058)	(0.046)		(0.047)
Not-employed share pre-trend (70-80)		0.015	0.068		0.100**	0.051
		(0.046)	(0.057)		(0.046)	(0.047)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.466	0.466	0.468	0.473	0.472	0.474
Panel B: Informal						
Regional Tariff Reduction *(RTR)*	0.156**	0.144**	0.182**	0.582***	0.525***	0.614***
	(0.067)	(0.070)	(0.075)	(0.079)	(0.089)	(0.090)
Informal share pre-trend (80-91)	-0.056		-0.089*	-0.166***		-0.207***
	(0.036)		(0.050)	(0.048)		(0.059)
Not-employed share pre-trend (70-80)		-0.008	0.061		-0.086	0.075
		(0.043)	(0.062)		(0.071)	(0.079)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.207	0.202	0.209	0.465	0.446	0.467
Panel C: Informal employee						
Regional Tariff Reduction *(RTR)*	0.526***	0.444***	0.538***	0.141	0.105	0.182
	(0.044)	(0.043)	(0.048)	(0.110)	(0.130)	(0.127)
Informal employee share pre-trend (80-91)	-0.228***		-0.239***	-0.159		-0.197*
	(0.058)		(0.064)	(0.100)		(0.101)
Not-employed share pre-trend (70-80)		-0.080	0.027		0.006	0.094
		(0.063)	(0.067)		(0.105)	(0.097)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.545	0.498	0.546	0.476	0.467	0.479
Panel D: Self-employed						
Regional Tariff Reduction *(RTR)*	-0.330***	-0.299***	-0.291***	0.430***	0.419***	0.434***
	(0.071)	(0.068)	(0.069)	(0.089)	(0.110)	(0.104)
Self-employed share pre-trend (80-91)	-0.124*		-0.168**	-0.305***		-0.309***
	(0.064)		(0.064)	(0.076)		(0.095)
Not-employed share pre-trend (70-80)		0.071	0.126**		-0.089	0.013
		(0.056)	(0.062)		(0.079)	(0.087)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.326	0.318	0.338	0.633	0.604	0.633

Decennial Census data. Positive (negative) coefficient estimates for the regional tariff reduction (RTR) imply larger increases (decreases) in the relevant employment category share in regions facing larger tariff reductions. The informal share in Panel B covers both informal employees and the self-employed, shown separately in Panels B and C, respectively. Changes in employment shares are calculated controlling for regional worker composition (see text for details). The analysis follows a consistent cohort of workers who were age 27-45 in 1991, 36-54 in 2000, and 46-64 in 2010. Pre-trends computed for 1980-1991 and 1970-1980 periods. Due to a lack of information on informality in the 1970 Census, the 1980-1970 pre-trends always refer to the non-employed share. 405 microregion observations. Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in the relevant employment share. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

Table B18: Employment Category Shares Pre-Trends

Change in share:	1980-1991	1970-1980
Panel A: Not-employed		
Regional Tariff Reduction *(RTR)*	0.330***	-0.212***
	(0.068)	(0.072)
State fixed effects (26)	✓	✓
R-squared	0.431	0.314
Panel B: Informal		
Regional Tariff Reduction *(RTR)*	0.295***	n/a
	(0.082)	
State fixed effects (26)	✓	
R-squared	0.383	

Decennial Census data. Positive (negative) coefficient estimates for the regional tariff reduction (RTR) imply larger increases (decreases) in the relevant employment category share during the pre-liberalization period listed in the column heading in regions facing larger tariff reductions. Changes in employment shares are calculated controlling for regional worker composition (see text for details). Due to a lack of information on informality in the 1970 Census, we only examine 1980-1970 pre-trends for the non-employed share. 405 microregion observations. Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in the relevant employment share. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

Table B19: Employment Category Shares of Regional Working-Age Population - 2000, 2010 - without Pre-Liberalization Trend Controls

Change in share:	1991-2000	1991-2010
Panel A: Not-employed		
Regional Tariff Reduction *(RTR)*	0.313***	-0.049
	(0.038)	(0.053)
State fixed effects (26)	✓	✓
R-squared	0.478	0.581
Panel B: Informal		
Regional Tariff Reduction *(RTR)*	0.175***	0.463***
	(0.045)	(0.063)
State fixed effects (26)	✓	✓
R-squared	0.328	0.559

Decennial Census data. Positive (negative) coefficient estimates for the regional tariff reduction (RTR) imply larger increases (decreases) in the relevant employment category share in regions facing larger tariff reductions. Changes in employment shares are calculated controlling for regional worker composition (see text for details). Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in the relevant employment share. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

B.6.3 Results by Education Level

Tables B20 and B21 present versions of the regional labor market structure analysis in Table 5 separately by education level. Table B20 presents results for workers with a high school degree or more, and Table B21 presents results for workers with less than a high school degree. All results are similar across the two education groups.

Table B20: Employment Category Shares of More Educated Regional Working-Age Population - 2000, 2010

Change in share:	1991-2000			1991-2010		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Not-employed						
Regional Tariff Reduction *(RTR)*	0.206***	0.230***	0.232***	-0.043	-0.019	-0.020
	(0.031)	(0.033)	(0.034)	(0.051)	(0.063)	(0.060)
Not-employed share pre-trend (80-91)	-0.027		-0.022	0.008		0.016
	(0.050)		(0.047)	(0.084)		(0.083)
Not-employed share pre-trend (70-80)		0.100**	0.100**		0.088	0.089
		(0.043)	(0.044)		(0.061)	(0.062)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.508	0.526	0.526	0.580	0.586	0.586
Panel B: Informal						
Regional Tariff Reduction *(RTR)*	0.097**	0.109**	0.098*	0.433***	0.437***	0.415***
	(0.048)	(0.048)	(0.050)	(0.086)	(0.086)	(0.088)
Informal share pre-trend (80-91)	-0.0915		-0.092	-0.187**		-0.172**
	(0.065)		(0.064)	(0.087)		(0.084)
Not-employed share pre-trend (70-80)		-0.003	0.003		-0.094*	-0.082*
		(0.033)	(0.031)		(0.052)	(0.047)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.465	0.461	0.465	0.622	0.619	0.625
Panel C: Informal employee						
Regional Tariff Reduction *(RTR)*	0.047	0.057	0.052	0.219***	0.211***	0.202**
	(0.047)	(0.051)	(0.052)	(0.074)	(0.075)	(0.077)
Informal employee share pre-trend (80-91)	-0.121		-0.126*	-0.248***		-0.231**
	(0.074)		(0.072)	(0.091)		(0.088)
Not-employed share pre-trend (70-80)		0.009	0.018		-0.089*	-0.073
		(0.040)	(0.039)		(0.049)	(0.047)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.507	0.502	0.507	0.641	0.636	0.644
Panel D: Self-employed						
Regional Tariff Reduction *(RTR)*	0.037**	0.045**	0.035*	0.180***	0.202***	0.180***
	(0.017)	(0.017)	(0.018)	(0.020)	(0.023)	(0.021)
Self-employed share pre-trend (80-91)	-0.169***		-0.170***	-0.324***		-0.324***
	(0.056)		(0.055)	(0.062)		(0.062)
Not-employed share pre-trend (70-80)		-0.005	-0.008		0.007	0.003
		(0.017)	(0.017)		(0.018)	(0.016)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.288	0.249	0.288	0.495	0.413	0.495

Decennial Census data. Sample restricted to more educated working-age individuals, those with a high school degree or more. Positive (negative) coefficient estimates for the regional tariff reduction (RTR) imply larger increases (decreases) in the relevant employment category share in regions facing larger tariff reductions. The informal share in Panel B covers both informal employees and the self-employed, shown separately in Panels B and C, respectively. Changes in employment shares are calculated controlling for regional worker composition (see text for details). Pre-trends computed for 1980-1991 and 1970-1980 periods. Due to a lack of information on informality in the 1970 Census, the 1980-1970 pre-trends always refer to the non-employed share. 405 microregion observations. Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in the relevant employment share. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

Table B21: Employment Category Shares of Less Educated Regional Working-Age Population - 2000, 2010

Change in share:	1991-2000			1991-2010		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Not-employed						
Regional Tariff Reduction *(RTR)*	0.370***	0.382***	0.370***	0.015	-0.001	0.014
	(0.053)	(0.050)	(0.053)	(0.058)	(0.060)	(0.058)
Not-employed share pre-trend (80-91)	0.056		0.061	-0.082*		-0.087
	(0.046)		(0.062)	(0.047)		(0.067)
Not-employed share pre-trend (70-80)		-0.035	0.009		0.056	-0.007
		(0.046)	(0.061)		(0.045)	(0.063)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.487	0.485	0.487	0.519	0.516	0.519
Panel B: Informal						
Regional Tariff Reduction *(RTR)*	0.182***	0.213***	0.238***	0.424***	0.401***	0.450***
	(0.062)	(0.057)	(0.068)	(0.069)	(0.077)	(0.083)
Informal share pre-trend (80-91)	0.020		-0.046	-0.062		-0.092
	(0.039)		(0.047)	(0.054)		(0.069)
Not-employed share pre-trend (70-80)		0.088*	0.128**		-0.020	0.060
		(0.046)	(0.061)		(0.050)	(0.061)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.321	0.328	0.330	0.442	0.439	0.443
Panel C: Informal employee						
Regional Tariff Reduction *(RTR)*	0.482***	0.418***	0.508***	-0.127	-0.052	-0.040
	(0.037)	(0.037)	(0.042)	(0.084)	(0.097)	(0.100)
Informal employee share pre-trend (80-91)	-0.157***		-0.180***	0.053		-0.025
	(0.037)		(0.037)	(0.110)		(0.108)
Not-employed share pre-trend (70-80)		-0.025	0.061		0.199**	0.211***
		(0.056)	(0.058)		(0.088)	(0.078)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.657	0.632	0.660	0.549	0.560	0.560
Panel D: Self-employed						
Regional Tariff Reduction *(RTR)*	-0.232***	-0.203***	-0.190***	0.467***	0.408***	0.439***
	(0.055)	(0.046)	(0.048)	(0.069)	(0.076)	(0.076)
Self-employed share pre-trend (80-91)	-0.046		-0.111**	-0.359***		-0.318***
	(0.064)		(0.054)	(0.073)		(0.105)
Not-employed share pre-trend (70-80)		0.126*	0.168**		-0.226***	-0.107
		(0.065)	(0.069)		(0.068)	(0.089)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.232	0.247	0.257	0.680	0.658	0.683

Decennial Census data. Sample restricted to less educated working-age individuals, those with less than a high school degree. Positive (negative) coefficient estimates for the regional tariff reduction (RTR) imply larger increases (decreases) in the relevant employment category share in regions facing larger tariff reductions. The informal share in Panel B covers both informal employees and the self-employed, shown separately in Panels B and C, respectively. Changes in employment shares are calculated controlling for regional worker composition (see text for details). Pre-trends computed for 1980-1991 and 1970-1980 periods. Due to a lack of information on informality in the 1970 Census, the 1980-1970 pre-trends always refer to the non-employed share. 405 microregion observations. Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in the relevant employment share. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

B.7 Regional Earnings

B.7.1 Robustness

In this section, we present various robustness tests for the regional earnings analysis in Table 6. The controls and subsamples in Tables B22 and B23 correspond to those discussed in the worker-level robustness analysis in Appendix B.5, so we refer the reader to that section for details on control construction and subsample definitions. In contrast to all of the other results in the main text, the earnings results in Table 6 exhibit some substantial differences across the various robustness tests. In our main specification, we find that regions facing larger tariff reductions exhibit larger informal earnings declines in the medium run, but that relative informal earnings recover in the long run. This result is particularly surprising, since it contrasts sharply with earnings results in the formal sector, in which the regional effects of liberalization grow over time. However, this surprising result is not robust to a number of the sample restrictions shown in Tables B22 and B23. Specifically, when restricting attention to the South and Southeast regions (panel G) or regions with minimal agricultural/mining employment (panels I and J), we find roughly constant or increasing effects on informal earnings over time. This lack of robustness in the informal earnings results suggests that the puzzle raised by the results in Table 6 may not be a robust finding and may be driven by other phenomena that we are unable to control for given only repeated cross-sections from Census data. We encourage future work on this topic.

Table B24 uses an alternative measure of the regional earnings premium for informal workers and for all workers. The regional earnings premium in Table 6 reflects average regional log earnings, controlling for 5 age bins, a gender indicator, and indicators for individual years of education. These controls are needed to net out any changes in worker composition, since we can not follow individual workers over time in the Census data. In Table B24, we additionally control for industry fixed effects. This approach nets out the national direct effect of liberalization in a worker's industry, instead restricting attention to the effects of liberalization on regional equilibrium earnings (Hakobyan and McLaren, 2016; Acemoglu et al., 2016). When netting out these direct industry effects, the significant negative earnings effects in Table 6 disappear, with Table B24 finding much smaller, and generally insignificant results. Note that Dix-Carneiro and Kovak (2017) control for industry fixed effects when calculating regional earnings premia, so the informal earnings results presented there are quite similar to those in Table B24.

Tables B25 and B26 further investigate the implications of controlling for worker composition when calculating regional earnings premia. Panel A of both tables replicates the main results from Table 6, for comparison. Panel B calculates regional earnings premia controlling for additional worker-level observable characteristics: an indicator for urban residence, 4 race indicators, and a married indicator. Panel C includes these additional controls, and pairwise interactions between all of the observable characteristics included in Panel B. For both informal earnings in Table B25 and overall earnings in Table B26, these more detailed earnings premium controls have little effect on our conclusions. We still find a lack of robust long-run effect of liberalization on regional informal earnings and reasonably consistently sized effects on overall regional earnings over time, as in the main specifications.

The consistency across panels of tables B25 and B26 helps ameliorate concerns regarding worker selection on unobservables in the Census data. Since the results are consistent when sequentially controlling for more detailed and flexible observable worker characteristics, we are more confident that the results would be similarly robust to controlling for unobservable characteristics. To rein-

force this conclusion, Table B27 reports earnings results for a consistent cohort of workers across Census years, those age 25-43 in 1989. These individuals remain of working age throughout our sample period. The results are very similar to those in Table 6, indicating that the results are not driven by changes in the working-age population over time.

Table B28 examines changes in regional hourly wages rather than monthly earnings. This analysis gives us a sense for whether the earnings changes are primarily due to changes in hours worked or changes hourly wages. Recall that continuous hours measures are unavailable prior to 1991, so the pre-liberalization trend controls still utilize earnings rather than wages. The wage results in Table B28 are very similar to the earnings results in Table 6, indicating that the earnings changes primarily reflect changes in hourly wages rather than changes in hours worked.

Table B29 examines changes in real regional earnings, calculated using a regional price index following Moretti (2013). He calculates local price indexes for the U.S. using the change in monthly rents for 2 or 3 bedroom apartments. We adjust this approach to the Brazilian context in a few ways. First, we focus on 1 or 2 bedroom apartments, which are far more common in the Brazilian setting, accounting for more than 85 percent of the stock of rental units in 1991 and 2010. Many Brazilian cities include favelas with somewhat improvised structures, and rural areas often feature less formal dwellings. We restrict the sample to include only units with modern construction materials (masonry or wood framing), with at least one bathroom, and with modern sanitation (sewer or septic tank). These restrictions allow us to avoid comparing modern apartments to informal dwellings. Using this sample of apartments, we calculate the change in log average monthly rent in each region. A few very sparsely populated microregions do not have observations for any rental units satisfying these characteristics in either 1991 or 2010, so we have rent indexes for 389 microregions in our sample. Because the 2000 Brazilian Census omits rental information, we can only calculate local rental values in 1991 and 2010.

We then need to transform the change in rental prices into a regional price index. Given the cross-sectional nature of our analysis, we only need to be concerned with prices that vary at the local level, i.e. nontradables, since tradable goods prices move together across regions, and thus do not affect this exercise. Using local Consumer Price Indexes produced by the Bureau of Labor Statistics for 23 U.S. metropolitan areas, Moretti (2013) shows that, as expected, local non-housing nontradables' prices move with local rental prices. He estimates a slope of 0.35 for the effect of housing prices on non-housing nontradables' prices. The Brazilian Consumer Price Index (*Índices de Preços ao Consumidor* - IPC) system reports that in 2002-03, housing's share of consumption was 16.24 percent and that the share for other nontradable goods was 39.94 percent (IBGE, 2005). Together, these figures imply that the effective weight on housing prices in the consumer price index is $0.1624 + 0.3994 \cdot 0.35 = 0.3022$. Our local price deflator is therefore 0.3022 times the change in log rental prices in the region.

Table B29 relates the change in regional earnings premium minus the local price deflator to the regional tariff reduction. Since local prices fall more in regions facing larger tariff reductions, the point estimates in Table B29 are more positive than those in Table 6. In fact, the point estimates for informal earnings, in Panel A, become positive, though they can not be statistically distinguished from zero. The overall earnings estimates, in Panel B, are also no longer statistically different from zero, though they remain negative. As with the nominal earnings results in Table 6, the real earnings results in the informal sector contrast sharply with those in the formal sector, documented in Dix-Carneiro and Kovak (2017). However, bear in mind that the robustness tests in Tables B22 and B23 showed that this pattern is not as robust to various controls and sample restrictions as

55

the other results in the paper.

Table B22: Regional Informal and Overall Earnings Premia - Robustness - 2000, 2010 - Part 1

Change in log earnings premia:	Informal		Overall	
	1991-2000	1991-2010	1991-2000	1991-2010
	(1)	(2)	(3)	(4)
Panel A: Main specification				
Regional Tariff Reduction *(RTR)*	-0.433***	-0.021	-0.495***	-0.535**
	(0.156)	(0.234)	(0.136)	(0.206)
Panel B: RTR using effective rates of protection				
Regional Tariff Reduction *(RTR)*	-0.275***	-0.006	-0.300***	-0.313**
	(0.101)	(0.143)	(0.089)	(0.122)
Panel C:Post-liberalization tariff reductions				
Regional Tariff Reduction *(RTR)*	-0.434***	-0.348	-0.493***	-0.742***
	(0.161)	(0.276)	(0.133)	(0.256)
Post-liberalization (1995 to t) regional	-1.543	3.336**	0.622	2.416*
tariff reductions	(2.479)	(1.564)	(2.189)	(1.417)
Panel D: Exchange rates				
Regional Tariff Reduction *(RTR)*	-0.534***	-0.347	-0.562***	-0.832***
	(0.164)	(0.233)	(0.142)	(0.214)
Import-weighted real exchange rate	-0.007	0.041	0.003	0.084
	(0.083)	(0.129)	(0.069)	(0.118)
Export-weighted real exchange rate	-0.595**	-0.712***	-0.542***	-0.813***
	(0.229)	(0.125)	(0.189)	(0.156)
Panel E: Privatization: initial state-owned employment share				
Regional Tariff Reduction *(RTR)*	-0.429***	-0.004	-0.493***	-0.518**
	(0.155)	(0.230)	(0.136)	(0.212)
State-owned share of 1995 employment	-0.049	-0.256**	-0.019	-0.164
	(0.079)	(0.101)	(0.088)	(0.115)
Panel F: Privatization: change in state-owned employment share, 1995 to t				
Regional Tariff Reduction *(RTR)*	-0.433***	-0.008	-0.495***	-0.525**
	(0.156)	(0.234)	(0.137)	(0.212)
Change in state-owned employment share	0.0219	0.170*	-0.011	0.106
	(0.089)	(0.095)	(0.094)	(0.120)
Panel G: South and Southeast regions only (208 obs)				
Regional Tariff Reduction *(RTR)*	-0.691***	-0.650**	-0.707***	-1.165***
	(0.173)	(0.274)	(0.152)	(0.244)
Informal earnings pre-trend (80-91)	✓	✓		
Overall earnings pre-trend (80-91)			✓	✓
Overall earnings pre-trend (70-80)	✓	✓	✓	✓
State fixed effects (26)	✓	✓	✓	✓

Decennial Census data. Negative coefficient estimates for the regional tariff reduction (RTR) imply larger decreases in earnings in regions facing larger tariff reductions. Regional earnings premia are calculated controlling for regional worker composition (see text for details). Panel A replicates results from the main specification in Table 6, while additional panels present robustness tests, described in the text. Pre-trends computed for 1980-1991 and 1970-1980 periods. Due to a lack of information on informality in the 1970 Census, the 1980-1970 pre-trends always refer to overall earnings. 405 microregion observations unless otherwise noted. Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in earnings premium. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

Table B23: Regional Informal and Overall Earnings Premia - Robustness - 2000, 2010 - Part 2

Change in log earnings premia:	Informal		Overall	
	1991-2000	1991-2010	1991-2000	1991-2010
	(1)	(2)	(3)	(4)
Panel H: Commodity price change controls				
Regional Tariff Reduction *(RTR)*	-0.291	-0.163	-0.377**	-0.880**
	(0.184)	(0.349)	(0.154)	(0.363)
Regional commodity price changes	-0.233	-0.096	-0.188	-0.233
	(0.154)	(0.152)	(0.150)	(0.159)
Panel I: Below-median agriculture/mining employment share (202 obs)				
Regional Tariff Reduction *(RTR)*	-0.697***	-0.745***	-0.782***	-1.279***
	(0.149)	(0.253)	(0.122)	(0.259)
Panel J: Bottom quartile agriculture/mining employment share (101 obs)				
Regional Tariff Reduction *(RTR)*	-0.777***	-1.442***	-0.886***	-1.999***
	(0.256)	(0.377)	(0.235)	(0.439)
Panel K: Omitting Cerrado regions (283 obs)				
Regional Tariff Reduction *(RTR)*	-0.299	0.166	-0.419**	-0.315
	(0.199)	(0.272)	(0.171)	(0.209)
Panel L: Below-median growth in mechanized crop area (corn, cotton, soy) (198 obs)				
Regional Tariff Reduction *(RTR)*	-0.389	0.078	-0.551**	-0.661**
	(0.310)	(0.359)	(0.215)	(0.252)
Panel M: Below-median growth in mechanized crop value (corn, cotton, soy) (198 obs)				
Regional Tariff Reduction *(RTR)*	-0.306	0.275	-0.561***	-0.445*
	(0.235)	(0.294)	(0.186)	(0.243)
Panel N: Below-median growth in number of tractors (198 obs)				
Regional Tariff Reduction *(RTR)*	-0.279	0.0913	-0.490**	-0.582**
	(0.223)	(0.263)	(0.204)	(0.232)
Panel O: Below-median growth in number of planters (198 obs)				
Regional Tariff Reduction *(RTR)*	-0.616***	-0.325*	-0.695***	-0.894***
	(0.180)	(0.174)	(0.163)	(0.202)
Panel P: Below-median growth in number of harvesters (191 obs)				
Regional Tariff Reduction *(RTR)*	-0.344**	0.000	-0.596***	-0.700***
	(0.156)	(0.250)	(0.147)	(0.263)
Panel Q: Below-median growth in number of plows (198 obs)				
Regional Tariff Reduction *(RTR)*	-0.492**	-0.204	-0.621***	-0.839***
	(0.226)	(0.279)	(0.231)	(0.292)
Informal earnings pre-trend (80-91)	✓	✓		
Overall earnings pre-trend (80-91)			✓	✓
Overall earnings pre-trend (70-80)	✓	✓	✓	✓
State fixed effects (26)	✓	✓	✓	✓

Decennial Census data. Negative coefficient estimates for the regional tariff reduction (RTR) imply larger decreases in earnings in regions facing larger tariff reductions. Regional earnings premia are calculated controlling for regional worker composition (see text for details). Panels present robustness tests, described in the text. Pre-trends computed for 1980-1991 and 1970-1980 periods. Due to a lack of information on informality in the 1970 Census, the 1980-1970 pre-trends always refer to overall earnings. 405 microregion observations unless otherwise noted. Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in earnings premium. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

Table B24: Regional Informal and Overall Earnings Premia Controlling for Industry Fixed Effects - 2000, 2010

Change in log earnings premia:	1991-2000			1991-2010		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Informal						
Regional tariff reduction (RTR)	0.057	-0.147	0.054	0.190	-0.143	0.170
	(0.153)	(0.151)	(0.161)	(0.237)	(0.272)	(0.229)
Informal earnings pre-trend (80-91)	-0.170***		-0.170***	-0.256***		-0.258***
	(0.050)		(0.049)	(0.087)		(0.085)
Overall earnings pre-trend (70-80)		0.014	-0.003		0.002	-0.025
		(0.061)	(0.058)		(0.101)	(0.097)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.668	0.650	0.668	0.696	0.677	0.696
Panel B: Overall						
Regional tariff reduction (RTR)	0.010	-0.305**	-0.086	0.192	-0.288	0.062
	(0.122)	(0.134)	(0.139)	(0.217)	(0.253)	(0.198)
Overall earnings pre-trend (80-91)	-0.229***		-0.232***	-0.356***		-0.359***
	(0.055)		(0.053)	(0.092)		(0.086)
Overall earnings pre-trend (70-80)		-0.098*	-0.105*		-0.141	-0.150
		(0.056)	(0.053)		(0.102)	(0.098)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.708	0.684	0.714	0.689	0.660	0.695

Decennial Census data. Negative (positive) coefficient estimates for the regional tariff reduction (RTR) imply larger decreases (increases) in earnings in regions facing larger tariff reductions. Regional earnings premia are calculated controlling for regional worker composition and for industry fixed effects (see text for details). Panel A examines earnings for informal workers only, while Panel B examines earnings for all workers, including both formal and informal. Pre-trends computed for 1980-1991 and 1970-1980 periods. Due to a lack of information on informality in the 1970 Census, the 1980-1970 pre-trends always refer to overall earnings. 405 microregion observations. Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in the relevant employment $\times$ sector share. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

Table B25: Regional Informal Earnings Premia with Detailed Worker Controls - 2000, 2010

	1991-2000			1991-2010		
Change in log informal earnings premia:	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Main controls						
Regional tariff reduction (RTR)	-0.432***	-0.636***	-0.433***	-0.015	-0.307	-0.021
	(0.148)	(0.144)	(0.156)	(0.251)	(0.262)	(0.234)
Informal earnings pre-trend (80-91)	-0.163***		-0.163***	-0.222**		-0.222**
	(0.049)		(0.048)	(0.089)		(0.089)
Overall earnings pre-trend (70-80)		0.008	-0.001		0.006	-0.006
		(0.055)	(0.054)		(0.093)	(0.092)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.699	0.683	0.699	0.697	0.684	0.697
Panel B: Detailed controls						
Regional tariff reduction (RTR)	-0.206	-0.452***	-0.230	0.076	-0.271	0.050
	(0.138)	(0.135)	(0.142)	(0.227)	(0.248)	(0.208)
Informal earnings pre-trend (80-91)	-0.175***		-0.177***	-0.248***		-0.250***
	(0.046)		(0.045)	(0.076)		(0.075)
Overall earnings pre-trend (70-80)		-0.015	-0.026		-0.015	-0.030
		(0.052)	(0.051)		(0.088)	(0.088)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.669	0.648	0.669	0.702	0.683	0.702
Panel C: Detailed controls with interactions						
Regional tariff reduction (RTR)	-0.203	-0.448***	-0.229	0.102	-0.256	0.072
	(0.135)	(0.132)	(0.138)	(0.214)	(0.240)	(0.200)
Informal earnings pre-trend (80-91)	-0.179***		-0.181***	-0.263***		-0.265***
	(0.044)		(0.044)	(0.072)		(0.071)
Overall earnings pre-trend (70-80)		-0.017	-0.090		-0.018	-0.037
		(0.049)	(0.048)		(0.082)	(0.080)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.659	0.636	0.659	0.699	0.676	0.700

Decennial Census data. Negative (positive) coefficient estimates for the regional tariff reduction (RTR) imply larger decreases (increases) in informal earnings in regions facing larger tariff reductions. Regional earnings premia are calculated controlling for regional worker composition. Panel A uses the worker controls used in the main specifications (Table 6): 5 age-range indicators, sex, and year of education indicators. Panel B includes these controls, and adds an urban indicator, a married indicator, and 4 race indicators. Panel C included all of these controls and pairwise interactions. See text for more detail. Pre-trends computed for 1980-1991 and 1970-1980 periods. Due to a lack of information on informality in the 1970 Census, the 1980-1970 pre-trends always refer to overall earnings. 405 microregion observations. Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in the relevant employment × sector share. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

Table B26: Regional Overall Earnings Premia with Detailed Worker Controls - 2000, 2010

Change in log overall earnings premia:	1991-2000			1991-2010		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Main controls						
Regional tariff reduction (RTR)	-0.392***	-0.718***	-0.495***	-0.405*	-0.874***	-0.535**
	(0.119)	(0.132)	(0.136)	(0.237)	(0.254)	(0.206)
Overall earnings pre-trend (80-91)	-0.224***		-0.224***	-0.332***		-0.332***
	(0.0553)		(0.0529)	(0.0883)		(0.0840)
Overall earnings pre-trend (70-80)		-0.102*	-0.102*		-0.137	-0.137
		(0.0529)	(0.0524)		(0.0983)	(0.0984)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.738	0.719	0.743	0.718	0.697	0.722
Panel B: Detailed controls						
Regional tariff reduction (RTR)	-0.224*	-0.570***	-0.336***	-0.322	-0.796***	-0.456**
	(0.115)	(0.122)	(0.127)	(0.232)	(0.245)	(0.201)
Overall earnings pre-trend (80-91)	-0.233***		-0.233***	-0.330***		-0.330***
	(0.0535)		(0.0516)	(0.0808)		(0.0763)
Overall earnings pre-trend (70-80)		-0.114**	-0.114**		-0.144	-0.144
		(0.0501)	(0.0493)		(0.0951)	(0.0948)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.707	0.684	0.714	0.707	0.684	0.713
Panel C: Detailed controls with interactions						
Regional tariff reduction (RTR)	-0.208*	-0.557***	-0.318**	-0.289	-0.776***	-0.425**
	(0.119)	(0.123)	(0.129)	(0.228)	(0.244)	(0.206)
Overall earnings pre-trend (80-91)	-0.236***		-0.237***	-0.339***		-0.342***
	(0.0520)		(0.0499)	(0.0767)		(0.0718)
Overall earnings pre-trend (70-80)		-0.118**	-0.121**		-0.153*	-0.158*
		(0.0485)	(0.0467)		(0.0867)	(0.0846)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.688	0.663	0.697	0.699	0.673	0.706

Decennial Census data. Negative (positive) coefficient estimates for the regional tariff reduction (RTR) imply larger decreases (increases) in overall earnings in regions facing larger tariff reductions. Regional earnings premia are calculated controlling for regional worker composition. Panel A uses the worker controls used in the main specifications (Table 6): 5 age-range indicators, sex, and year of education indicators. Panel B includes these controls, and adds an urban indicator, a married indicator, and 4 race indicators. Panel C included all of these controls and pairwise interactions. See text for more detail. Pre-trends computed for 1980-1991 and 1970-1980 periods. 405 microregion observations. Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in the relevant employment × sector share. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

Table B27: Regional Informal Earnings Premia Following Consistent Cohort - 2000, 2010

Change in log informal earnings premia:	1991-2000			1991-2010		
	(1)	(2)	(3)	(4)	(5)	(6)
Regional tariff reduction (RTR)	-0.365**	-0.797***	-0.412**	0.067	-0.508	0.014
	(0.165)	(0.181)	(0.165)	(0.308)	(0.358)	(0.306)
Informal earnings pre-trend (80-91)	-0.285***		-0.297***	-0.389***		-0.405***
	(0.044)		(0.043)	(0.071)		(0.069)
Overall earnings pre-trend (70-80)		-0.052	-0.096		-0.053	-0.115
		(0.067)	(0.063)		(0.111)	(0.102)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.593	0.540	0.598	0.623	0.573	0.626

Decennial Census data. Negative (positive) coefficient estimates for the regional tariff reduction (RTR) imply larger decreases (increases) in informal earnings in regions facing larger tariff reductions. Regional earnings premia are calculated controlling for regional worker composition and following a consistent cohort of workers who were age 27-45 in 1991, 36-54 in 2000, and 46-64 in 2010. Pre-trends computed for 1980-1991 and 1970-1980 periods. Due to a lack of information on informality in the 1970 Census, the 1980-1970 pre-trends always refer to overall earnings. 405 microregion observations. Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in the relevant employment $\times$ sector share. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

Table B28: Regional Informal and Overall Wage Premia - 2000, 2010

Change in log wage premia:	1991-2000			1991-2010		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Informal						
Regional tariff reduction (RTR)	-0.493***	-0.783***	-0.507***	0.385	-0.095	0.321
	(0.144)	(0.139)	(0.148)	(0.239)	(0.270)	(0.227)
Informal earnings pre-trend (80-91)	-0.218***		-0.218***	-0.313***		-0.316***
	(0.050)		(0.050)	(0.086)		(0.085)
Overall earnings pre-trend (70-80)		-0.003	-0.014		-0.056	-0.072
		(0.056)	(0.055)		(0.084)	(0.080)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.715	0.690	0.715	0.676	0.646	0.677
Panel B: Overall						
Regional tariff reduction (RTR)	-0.434***	-0.808***	-0.537***	-0.069	-0.664**	-0.249
	(0.118)	(0.134)	(0.131)	(0.229)	(0.268)	(0.213)
Overall earnings pre-trend (80-91)	-0.269***		-0.269***	-0.400***		-0.400***
	(0.057)		(0.054)	(0.088)		(0.081)
Overall earnings pre-trend (70-80)		-0.103*	-0.103*		-0.195**	-0.194**
		(0.056)	(0.055)		(0.088)	(0.083)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.740	0.711	0.745	0.698	0.665	0.708

Decennial Census data. Negative coefficient estimates for the regional tariff reduction (RTR) imply larger decreases in wages in regions facing larger tariff reductions. Regional wage premia are calculated controlling for regional worker composition (see text for details). Panel A examines wages for informal workers only, while Panel B examines wages for all workers, including both formal and informal. Pre-trends computed for 1980-1991 and 1970-1980 periods. Due to a lack of continuous hours information in the 1970 and 1980 Censuses, pre-trends are based on monthly earnings rather than hourly wages. Due to a lack of information on informality in the 1970 Census, the 1980-1970 pre-trends always refer to overall earnings. 405 microregion observations. Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in the relevant employment × sector share. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

Table B29: Regional Informal and Overall Real Earnings Premia - 2000, 2010

Change in log real earnings premia:	1991-2010		
	(1)	(2)	(3)
Panel A: Informal			
Regional tariff reduction (RTR)	0.364	0.243	0.405
	(0.329)	(0.335)	(0.313)
Informal earnings pre-trend (80-91)	-0.127		-0.125
	(0.087)		(0.089)
Overall earnings pre-trend (70-80)		0.051	0.045
		(0.101)	(0.101)
State fixed effects (26)	✓	✓	✓
R-squared	0.600	0.596	0.600
Panel B: Overall			
Regional tariff reduction (RTR)	-0.082	-0.384	-0.178
	(0.309)	(0.319)	(0.285)
Overall earnings pre-trend (80-91)	-0.200**		-0.200**
	(0.094)		(0.090)
Overall earnings pre-trend (70-80)		-0.100	-0.099
		(0.109)	(0.108)
State fixed effects (26)	✓	✓	✓
R-squared	0.598	0.591	0.600

Decennial Census data. Negative (positive) coefficient estimates for the regional tariff reduction (RTR) imply larger decreases (increases) in earnings in regions facing larger tariff reductions. Regional earnings premia are calculated controlling for regional worker composition and are adjusted for a regional price index calculated following Moretti (2013) (see text for details). Panel A examines earnings for informal workers only, while Panel B examines earnings for all workers, including both formal and informal. Pre-trends computed for 1980-1991 and 1970-1980 periods. Due to a lack of information on informality in the 1970 Census, the 1980-1970 pre-trends always refer to overall earnings. 389 microregion observations. Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in the relevant employment × sector share. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

B.7.2 Results by Education Level

Tables B30 and B31 present earnings results for informal and all workers, separately by education level. Table B30 restricts attention to workers with a high school degree or more, and finds somewhat larger earnings effects for these workers than for less skilled workers, those with less than a high school degree, in Table B31. Note that the theoretical framework underlying our analysis assumes homogenous labor, so these results are merely suggestive. See Dix-Carneiro and Kovak (2015) for an analysis of the regional effects of liberalization with two worker types.

Table B30: Regional Informal and Overall Earnings Premia for More Educated Workers - 2000, 2010

Change in log earnings premia:	1991-2000			1991-2010		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Informal						
Regional tariff reduction (RTR)	-0.773***	-0.864***	-0.750***	-0.585***	-0.687***	-0.537***
	(0.129)	(0.115)	(0.127)	(0.163)	(0.184)	(0.168)
Informal earnings pre-trend (80-91)	-0.081		-0.098*	-0.095		-0.129**
	(0.052)		(0.053)	(0.058)		(0.059)
Overall earnings pre-trend (70-80)		-0.069	-0.086		-0.143***	-0.167***
		(0.063)	(0.062)		(0.053)	(0.053)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.739	0.738	0.743	0.752	0.756	0.760
Panel B: Overall						
Regional tariff reduction (RTR)	-0.627***	-0.820***	-0.598***	-0.867***	-1.076***	-0.811***
	(0.137)	(0.121)	(0.131)	(0.173)	(0.208)	(0.198)
Overall earnings pre-trend (80-91)	-0.222**		-0.250***	-0.249***		-0.298***
	(0.084)		(0.077)	(0.085)		(0.073)
Overall earnings pre-trend (70-80)		-0.155***	-0.179***		-0.274***	-0.303***
		(0.053)	(0.050)		(0.057)	(0.058)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.771	0.768	0.789	0.805	0.814	0.828

Decennial Census data. Sample restricted to more educated working-age individuals, those with a high school degree or more. Negative coefficient estimates for the regional tariff reduction (RTR) imply larger decreases in earnings in regions facing larger tariff reductions. Regional earnings premia are calculated controlling for regional worker composition (see text for details). Panel A examines earnings for informal workers only, while Panel B examines earnings for all workers, including both formal and informal. Pre-trends computed for 1980-1991 and 1970-1980 periods. Due to a lack of information on informality in the 1970 Census, the 1980-1970 pre-trends always refer to overall earnings. 405 microregion observations. Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in the relevant employment × sector share. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

Table B31: Regional Informal and Overall Earnings Premia for Less Educated Workers - 2000, 2010

Change in log earnings premia:	1991-2000			1991-2010		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Informal						
Regional tariff reduction (RTR)	-0.309*	-0.554***	-0.317*	0.286	-0.062	0.291
	(0.174)	(0.164)	(0.181)	(0.305)	(0.308)	(0.273)
Informal earnings pre-trend (80-91)	-0.185***		-0.185***	-0.266***		-0.266***
	(0.051)		(0.049)	(0.089)		(0.087)
Overall earnings pre-trend (70-80)		0.003	-0.008		0.022	0.005
		(0.063	(0.061)		(0.111)	(0.110)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.678	0.659	0.678	0.692	0.675	0.692
Panel B: Overall						
Regional tariff reduction (RTR)	-0.226	-0.590***	-0.335**	-0.089	-0.570*	-0.165
	(0.144)	(0.151)	(0.161)	(0.312)	(0.309)	(0.254)
Overall earnings pre-trend (80-91)	-0.246***		-0.246***	-0.372***		-0.372***
	(0.054)		(0.052)	(0.091)		(0.090)
Overall earnings pre-trend (70-80)		-0.097	-0.096		-0.075	-0.071
		(0.064)	(0.062)		(0.125)	(0.122)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.702	0.675	0.706	0.662	0.631	0.664

Decennial Census data. Sample restricted to less educated working-age individuals, those with a high school degree or more. Negative coefficient estimates for the regional tariff reduction (RTR) imply larger decreases in earnings in regions facing larger tariff reductions. Regional earnings premia are calculated controlling for regional worker composition (see text for details). Panel A examines earnings for informal workers only, while Panel B examines earnings for all workers, including both formal and informal. Pre-trends computed for 1980-1991 and 1970-1980 periods. Due to a lack of information on informality in the 1970 Census, the 1980-1970 pre-trends always refer to overall earnings. 405 microregion observations. Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in the relevant employment × sector share. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

B.7.3 Regional Informal Employee and Self-Employed Earnings

Table B32 breaks down the informal earnings results in Panel A of Table 6 into those for informal employees and the self-employed, which together comprise the informal sector. The estimates are less consistent across pre-trend specifications than those in the main text, but one interesting observation is that the recovery in informal wages in harder hit places that occurs by 2010 appears primarily among the self-employed. See Appendix B.2 for more detail on the informal sector and on the industry distribution of informal employees and the self-employed.

Table B32: Regional Informal Employee and Self-Employed Earnings Premia - 2000, 2010

Change in log earnings premia:	1991-2000			1991-2010		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Informal employees						
Regional tariff reduction (RTR)	-0.516***	-0.715***	-0.583***	-0.321	-0.556**	-0.417**
	(0.127)	(0.124)	(0.134)	(0.241)	(0.212)	(0.210)
Informal employee earnings pre-trend (80-91)	-0.117**		-0.118***	-0.117		-0.120
	(0.045)		(0.044)	(0.077)		(0.075)
Overall earnings pre-trend (70-80)		-0.063	-0.066		-0.096	-0.100
		(0.045)	(0.049)		(0.078)	(0.080)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.704	0.698	0.706	0.661	0.659	0.664
Panel B: Self-employed						
Regional tariff reduction (RTR)	-0.181	-0.535***	-0.142	0.541**	0.037	0.612**
	(0.186)	(0.199)	(0.195)	(0.250)	(0.361)	(0.269)
Self-employed earnings pre-trend (80-91)	-0.285***		-0.283***	-0.403***		-0.399***
	(0.055)		(0.056)	(0.092)		(0.093)
Overall earnings pre-trend (70-80)		0.067	0.043		0.113	0.083
		(0.078)	(0.069)		(0.124)	(0.115)
State fixed effects (26)	✓	✓	✓	✓	✓	✓
R-squared	0.682	0.637	0.682	0.728	0.689	0.729

Decennial Census data. Negative coefficient estimates for the regional tariff reduction (RTR) imply larger decreases in earnings in regions facing larger tariff reductions. Regional earnings premia are calculated controlling for regional worker composition (see text for details). Panel A examines earnings for informal employees only, while Panel B examines earnings for self-employed workers. Pre-trends computed for 1980-1991 and 1970-1980 periods. Due to a lack of information on informality in the 1970 Census, the 1980-1970 pre-trends always refer to overall earnings. 405 microregion observations. Standard errors (in parentheses) adjusted for 90 mesoregion clusters. Weighted by the inverse of the squared standard error of the estimated change in the relevant employment × sector share. *** Significant at the 1 percent, ** 5 percent, * 10 percent level.

B.8 Regional Summary Descriptives by Regional Tariff Reduction

Table B33 shows regional summary statistics separately for regions facing larger and smaller regional tariff reductions (RTR_r). This table shows that the qualitative patterns we document in our main analyses are generally visible in the raw summary statistics.

Table B33: Regional Summary Statistics by Above or Below Median Regional Tariff Reduction

	1991		2000		2010	
	mean	std. dev.	mean	std. dev.	mean	std. dev.
Panel A: Above Median Shock ($RTR \geq 0.033$)						
Shares of Working-Age Population						
Not-employed	0.379	0.039	0.388	0.053	0.326	0.062
Informal	0.362	0.083	0.385	0.067	0.322	0.062
Informal employee	0.210	0.057	0.218	0.040	0.176	0.044
Self-employed	0.152	0.052	0.167	0.051	0.145	0.031
Shares of Employment						
Formal tradable	0.167	0.094	0.140	0.072	0.159	0.078
Formal nontradable	0.249	0.084	0.228	0.075	0.357	0.087
Informal tradable	0.244	0.149	0.197	0.119	0.153	0.103
Informal nontradable	0.341	0.072	0.435	0.073	0.330	0.057
Average informal earnings (in 2010 R$)	974	394	1202	403	1111	343
Average overall earnings (in 2010 R$)	914	324	1104	334	1132	293
Observations		203		203		203
Panel B: Below Median Shock ($RTR < 0.033$)						
Shares of Working-Age Population						
Not-employed	0.414	0.046	0.410	0.062	0.385	0.078
Informal	0.474	0.055	0.484	0.065	0.419	0.059
Informal employee	0.240	0.063	0.223	0.051	0.256	0.050
Self-employed	0.234	0.085	0.261	0.084	0.163	0.046
Shares of Employment						
Formal tradable	0.056	0.052	0.063	0.053	0.083	0.067
Formal nontradable	0.132	0.056	0.114	0.049	0.226	0.064
Informal tradable	0.544	0.121	0.451	0.123	0.365	0.119
Informal nontradable	0.267	0.065	0.371	0.069	0.326	0.055
Average informal earnings (in 2010 R$)	488	202	680	285	668	270
Average overall earnings (in 2010 R$)	501	190	674	243	744	229
Observations		202		202		202

Decennial Census data. Reports unweighted means and standard deviations across time-consistent microregions. Panel A shows descriptives for regions with above median regional tariff reductions (RTR_r), while Panel B applies to regions with below median tariff reductions. All monetary values reported in 2010 R$. In Dec 31, 2010, a US dollar was worth 1.66 Brazilian Reais.

References

Daron Acemoglu, David Autor, David Dorn, Gordon H. Hanson, and Brendan Price. Import competition and the great us employment sag of the 2000s. *Journal of Labor Economics*, 34(S1): S141–S198, January 2016.

Paula Bustos, Bruno Caprettini, and Jacopo Ponticelli. Agricultural productivity and structural transformation. evidence from brazil. *American Economic Review*, 106(6):1320–1365, 2016.

Áureo de Paula and José A. Scheinkman. Value-added taxes, chain effects, and informality. *American Economic Journal: Macroeconomics*, 2:195–221, 2010.

Rafael Dix-Carneiro and Brian K. Kovak. Trade liberalization and the skill premium: A local labor markets approach. *American Economic Review - Papers and Proceedings*, 105(5):551–557, 2015.

Rafael Dix-Carneiro and Brian K. Kovak. Trade liberalization and regional dynamics. *American Economic Review*, 107(10):1908–2946, 2017.

Rafael Dix-Carneiro, Pinelopi Koujianou Goldberg, Costas Meghir, and Gabriel Ulyssea. Trade and informality in the presence of labor market frictions and regulations. *Unpublished*, 2018.

Economist. The miracle of the cerrado. *The Economist*, August 28 2010.

Shushanik Hakobyan and John McLaren. Looking for local labor market effects of nafta. *Review of Economics and Statistics*, 98(4):728–741, 2016.

IBGE. *Sistema Nacional de Índices de Preços ao Consumidor*, volume 34 of *Série Relatórios Metodológicos*. Instituto Brasileiro de Geografia e Estatística, 2005.

Honório Kume, Guida Piani, and Carlos Frederico Bráz de Souza. A política brasileira de importação no período 1987-1998: Descrição e avaliação. In Carlos Henrique Corseuil and Honorio Kume, editors, *A Abertura Comercial Brasileira nos Anos 1990: Impactos Sobre Emprego e Salário*, chapter 1, pages 1–37. MTE/IPEA, Rio de Janiero, 2003.

James G. MacKinnon. Thirty years of heteroskedasticity-robust inference. *Queen's Economics Department Working Paper*, (1268), 2011.

Enrico Moretti. Real wage inequality. *American Economic Journal: Applied Economics*, 5(1): 65–103, 2013.

Guilherme Mendes Resende. Regional development policy in brazil: a review of evaluation literature. *Revista do Desenvolvimento Regional*, 18(3):202–225, 2013.