FUNDAÇÃO GETULIO VARGAS
ESCOLA DE ECONOMIA DE SÃO PAULO

GUILHERME VERGARA MARÇAL DE FREITAS

HOW ARE ELECTIONS AFFECTED BY AN EXTERNAL SHOCK? THE 'CHINA SHOCK' IN BRAZILIAN POLITICS

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Dissertação apresentada à Escola de Economia de São Paulo como pré-requisito à obtenção de título de mestre em Economia de Empresas.

Orientador: Fernanda Gonçalves de La Fuente Estevan.

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Resumo

Este artigo explora o componente exógeno do crescente relacionamento comercial entre Brasil e China como um choque econômico na política brasileira entre 1998 e 2016. Usando dados do censo populacional para o Brasil, descobrimos que nas eleições para governadores, os partidos incumbentes se beneficiaram da crescente demanda chinesa por commodities, enquanto também foram prejudicados pelo aumento da concorrência com a alta importação de produtos manufaturados. Além disso, investigamos os efeitos do "Choque da China" nas eleições presidenciais, concluindo que ajudou, pelo menos em parte, a manutenção do Partido dos Trabalhadores (PT) na presidência, melhorando a parcela de votos da candidata do partido Dilma Rousseff. Este artigo também mostra os efeitos nas eleições municipais brasileiras. Apesar de ter pouca ou nenhuma responsabilidade no relacionamento comercial Brasil-China, os prefeitos em exercício ainda foram positivamente afetados por esse choque nas eleições de 2004. No entanto, nossos resultados são fortemente dependentes do ciclo eleitoral estudado, do nível de governo examinado e do tipo de candidato considerado.

Palavras-chave: Eleições; Comércio Internacional; Choques Econômicos e Eleições.

Abstract

This paper exploits the exogenous component of the rising Brazil-China commercial relationship as an economic shock on Brazilian politics between 1998 and 2016. Using census data for Brazil, we find that in gubernatorial elections, incumbent parties benefited from the growing Chinese demand for commodities, while also being harmed by rising import competition in manufacturing. Further, we investigate the effects of the 'China Shock' on presidential elections, concluding that it helped, at least partly, the maintenance of Brazilian Worker's Party in the presidency by improving the vote share of the party's candidate Dilma Rousseff. This paper also shows the effects on Brazilian mayoral elections. Despite having little to no responsibility on the Brazil-China commercial relationship, incumbent mayors were still positively affected by this shock in the 2004 elections. However, our results are strongly dependable on the electoral cycle studied, on the level of government examined, and on the type of candidate considered.

Keywords: Elections; International Trade; Economic Shocks and Elections.

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1 Introduction

A large part of the political economy literature considers economic circumstances to be a fundamental determinant of people's political preferences. In that regard, many studies have measured whether this assumption holds, exploring if different economic shocks are capable of changing voters' political views (e.g., Giuliano and Spilimbergo (2013), Hacker et al. (2013), Margalit (2013), Alesina and Ferrara (2005)). For instance, Costa et al. (2018) finds evidence that Brazilian regions more exposed to economic distress experienced a persistent rise in Pentecostal affiliation and in the vote share of candidates connected to Pentecostal churches in national legislative elections. Despite all these different contributions, it is still uncertain to what extent economic shocks affect election results and people's voting behavior as explored by Margalit (2019) and Martén (2019). Therefore, there is yet room to study the causal effects of economic shocks on election outcomes.

This paper contributes to the discussion about the causal linkage between individuals' economic situation and their electoral behavior by exploiting the political consequences of the local economic shock generated by the abrupt growth in the trade relationship between China and Brazil. In particular, we contribute in the sense of isolating and exploring the different impacts of a demand and of a supply shock in Brazilian elections. Brazil, like most countries, was deeply affected by the emergence of China in the global market. Throughout the 2000s, China quickly rose to a central position in global markets, effectively rearranging international trade.[1] Notably for Brazil, strengthening commercial bonds with China led to further specialization in services and export-oriented activities, such as the production of primary commodities, while manufacturing sectors faded in the face of increased competition from imports.[2] Hence, we expect that the demand shock originated from the Brazilian exports to China will impact incumbent candidates positively. In contrast, we expect that the supply shock originated from the Brazilian imports from China will negatively impact incumbent candidates, as a reaction to the deterioration of local manufacturing sectors.

To conduct this study, we use electoral data for mayoral, gubernatorial, and presi-

[1] Henceforth, we will refer to this emergence of China in the global market simply as the 'China shock'.
[2] As shown, e.g., in Mortatti et al. (2011).

dential elections at the municipality level spanning from 1998 to 2016 and contemplating eight different electoral cycles of four years each. As a measurement of this trade relationship impact, we construct two main variables of interest, one for the export demand shock and one for the import supply shock, both stemming from this rapid growth of the trade partnership between China and Brazil. Besides, we adopt the empirical strategy developed by Costa et al. (2016) since it allows us to better account for the particularities of the evolution of the Brazil-China trade relationship in the period.

Specifically, for every level of the executive power in Brazilian political system, we are interested in three political outcomes of interest: the change in the vote share of candidates from Brazilian Worker's Party (PT), the change in the vote share of candidates from the incumbent party and, finally, the change in the vote share of candidates from the Worker's Party national coalition.[3] In gubernatorial elections, we find that the impact of the import supply shock is more significant in magnitude than the export demand shock. Also, interestingly, we find evidence that the 'China shock' helped the opposition's parties in the 2002's gubernatorial elections, with a US$ 1000 import supply shock per worker being responsible for a 15.10 percentage points decrease of the vote share of the candidates from the incumbent parties, overcoming an increase of 4.39 percentage points of the incumbent parties promoted by the export demand shock. Further, when looking at the results for the Worker's Party, a traditionally left-wing party of Brazilian politics, we show that the two shock measurements considered acted in the opposite direction, with the export demand shock harming the vote share of its candidates and with the import supply shock improving it. Altogether, our results support the evidence that the positive income shock originated from the abrupt increase of Brazilian exports to China benefited incumbents and hurt left-wing parties in the 2002 governors' elections.

Moreover, we find evidence that the 'China shock' impacted Brazilian politics differently in terms of the period, significance and magnitude depending on the level of government studied and on the type of candidate considered, with earlier periods (i.e., those closer to the beginning of the China emergence in the global market) and incumbents being the most affected. Interestingly, we also find evidence that the 'China shock' helped, at least partly, on the transition of Brazilian presidency from PT's Luiz Inácio Lula da Silva (2003-2010) to PT's Dilma Rousseff (2011-2016) in the presidential election that took

[3] The reasoning behind the choice of these three variables is given in Section 3.2.

place in 2010 as we find a particular result of the export demand shock and the import supply shock walking in the same direction. A US$ 1000 import supply shock improved Dilma's vote share in 1.01 percentage points, while a US$ 1000 export demand shock also increased Dilma's vote share in 0.03 percentage point. This result suggests that our expectation of the import supply shock being harmful to the incumbent candidate may not hold for all cases.

Many papers have taken advantage of this rapid Chinese ascension in the global market event.[4] The reason behind it is that, as highlighted by Autor et al. (2016), the China emergence in the global market represents a 'rare opportunity' for empirical studies as it is a 'quasi-natural' experiment because of its unpredictability, expressiveness[5] and the only reason behind it being decisions of China's authorities.[6] The seminal paper by Autor et al. (2013) introduced the fundamental of the empirical methodology used in most of the 'China shock' literature. The idea consists in measuring the local labor market exposure to import competition as the change in Chinese import exposure per worker in a region, where imports are apportioned to the region according to its share of national industry employment. Using this methodology, Autor et al. (2013) showed that Chinese import competition had a significant negative effect on U.S. labor market outcomes. As explained above, in this paper, however, we follow much of the empirical strategy developed by Costa et al. (2016) to investigate and to obtain the causal effect that the 'China shock' had on Brazilian politics. The reason we opt to use this approach is based on the fact that Costa et al. (2016) adapted the methodology created by Autor et al. (2013) to Brazilian specificities, relying on an instrumental variable strategy that uses auxiliary regressions to 'clean out changes in prices and quantities at the global level.' We believe that this strategy further helps to treat the global emergence of China as an exogenous factor that was caused solely by China's internal decisions.

Autor et al. (2017) was the first to connect the 'China shock' to local electoral consequences. In particular, they borrow much of the empirical methodology from Autor et al. (2013) and Autor et al. (2014) to measure the shock experienced by a local labor

[4] Some examples are Iacovone et al. (2013), Bloom et al. (2015), Autor et al. (2013), Pierce and Schott (2016), Acemoglu et al. (2016), Autor et al. (2014), Galle et al. (2017), Caliendo et al. (2019), Dornelas and Chimeli (2019).

[5] China's share world manufacturing exports surged from 4.8% in 2000 to 15.1% in 2010, before reaching 18.3% in 2014.

[6] This idea will be further discussed in Section 4.

market as the average change in Chinese import penetration in that labor market's industries, weighted by each industry's share in that geographical unit's initial employment. Using a survey data from the Pew Research Center on the political beliefs of voting-age American adults on major issues in U.S. politics, the authors showed that U.S. counties with greater trade exposure shifted towards the Republican candidate in presidential elections and that this trade competition contributed to the polarization of the U.S. political landscape. Nevertheless, the literature that investigates the linkage between trade exposure and elections is very recent.[7] Therefore, there are many unanswered questions, especially on which levels the trade shock affects politics, the mechanisms behind it, and its evolution over time. Hence, this paper contributes directly to this literature, investigating which levels of government in Brazil were benefited/harmed by the economic impact derived from the 'China shock'.

Our work also relates to the branch of the economic voting literature that argues that the connection between incumbents' performance and voters' subjective well-being is likely to be highly random and, thus, incumbents often get rewarded or punished for events beyond their control. This idea has its main foundation in Archen and Bartels (2012),[8] where the authors claim that voters in the communities affected by a random event such as a dramatic series of shark attacks in New Jersey in 1916 significantly punished the incumbent president, Woodrow Wilson, at the polls.[9] Similarly, we find mixed results for the impact of the 'China shock' in mayoral elections, a local executive position that has little influence in the municipal economic performance and, as such, one might expect that voters do not benefit/harm local mayoral candidates following the 'China shock'. We show that we do not have significant impacts in all periods considered for mayoral candidates from the Worker's Party. Also, we find evidence that in the 2004 mayoral election, a US$ 1000 import supply shock per worker from China benefited the incumbent candidates in 11.41 percentage points, which corroborates in a manner to this literature's discussion.

This paper is organized as follows. Section 2 highlights some of the essential aspects of the Brazilian institutional background for this study. Section 3 describes the data sources

[7] Some examples of these studies are Autor et al. (2017), Blanchard et al. (2019), Che et al. (2016), Dippel et al. (2017), Dippel et al. (2015), Jensen et al. (2017), Ogeda (2020).

[8] And is corroborated in, e.g., Bagues and Esteve-Volart (2016).

[9] Importantly, Fowler and Hall (2018) puts into perspective a lot of Archen and Bartels (2012) findings, showing that there is little compelling evidence that shark attacks influence presidential elections. They conclude that any such effect—if one exists—is substantively negligible.

while also defining and providing descriptive statistics of our main variables of interest. Section 4 presents the empirical strategy, further arguing the exogenous characteristic of China's rapid ascension in the global market. Section 5 shows and discuss the main results, and Section 6 concludes.

2 Institutional Background

Brazilian elections occur every two years, alternating between national elections (president, governors, federal and states deputy and senators) and local elections (mayors and city councilors). All elected politicians have a four-year term, except for senators that are elected for an eight-year term. An important aspect of Brazilian politics for this work is that elections always take place in the final year of the term of the previously elected politician. For example, the election that selected a politician for a four-year term between 2003-2006 took place in 2002, while the next election that will select a candidate for a four-year term between 2007-2010 will take place in 2006, the last year in charge of the previously elected candidate.

In this study, we focus only on the elections for the executive positions of president, governors, and mayors. The reason we only work with elections for executive positions is based on two main arguments. First, we find it reasonable to assume that electors normally associate changes in incomes or economic scenarios to polices made by the executive power, subsequently benefiting/harming these politicians/parties in the coming elections. Second, the elections for Brazilian legislative power is significantly different from the executive power. In the elections for federal and state deputy, voters' votes do not go only to candidates, but to their parties or coalitions. So, the election of a deputy also depends on the votes obtained by his party group. It is the number of votes for each group that defines how many seats will fit each. From this definition, the seats obtained by the group are occupied by their most voted candidates. This system is called proportional. Unlike the majority system - which elects president, senators, and governors and is based solely on direct votes -, in the proportional election, well-voted candidates can be left out, while others with fewer votes manage to get elected. Hence, to avoid these distortions,[1] we chose to look only at elections for executive positions.

According to the Brazilian Constitution, a person can only run for re-election of an executive position once, making two terms of four-year each the maximum amount of time that can be occupied by the same candidate consecutively in any executive position.

[1] Indeed, in a proportional system, it is challenging to identify electoral punishments or electoral rewards.

Besides, in the Brazilian voting system, politicians are elected directly by the voters, with the candidate that obtains the simple majority of the total number of the valid votes being elected. Importantly, in presidential, gubernatorial and mayoral elections in cities greater than 200,000 inhabitants, there is the possibility of a second round if none of the candidates obtain more than half of the valid votes in the first round of the election.[2]

In Brazil, voting is mandatory for individuals between 18 and 70 years old, and optional for those between 16 and 18 and over 70 years old, with a small monetary penalty for citizens that do not attend. Given this mandatory characteristic, besides voting in a given candidate, an elector can void its vote or vote blank. Hence, a valid vote in Brazilian elections is defined as the vote given directly to a candidate. Thus, the total number of valid votes in a given municipality is defined as the total number of votes at this given municipality minus the total number of nulls and blank votes.

Our period of interest is between 1998 and 2016. Elections for president and governors took place in 1998, 2002, 2006, 2010 and 2014. Hence, we cover four electoral cycles of four-year each for these executive positions. Mayors' elections happened in the remaining electoral years of 2000, 2004, 2008, 2012 and 2016 and, thus, we also cover four electoral cycles of four-year each in this case.

Importantly, in most of the period of interest, there was a member from the Brazilian Worker's Party (PT) in the president's office, with Luiz Inácio Lula da Silva being the president from 2003 to 2010 and Dilma Rousseff from 2011 to 2016. The exception being from 1998 to 2002, when the president was Fernando Henrique Cardoso from the Brazilian Social Democracy Party (PSDB) and, thus, during this period, PT was an opposition party at the national level.

[2] Note that the 50 percent benchmark corresponds to the proportion of valid votes in the geographic unit of interest. Therefore, in mayoral elections, it refers to the total of valid votes in a given municipality, in the gubernatorial elections, to the total of valid votes in a given state and in the presidential election, to the total valid votes in the country.

3 Data and Summary Statistics

3.1 Data Sources

We obtain the vote share data at the municipality level for each candidate in the political cycle and political office of interest from the website of the Brazilian Superior Electoral Court (TSE).[1]

For our baseline specification, we use individual-level labor market and socioeconomic data from the long-form of the 2000 and 2010 Brazilian Demographic Census (*Censo Demográfico*), sourced from the Brazilian Institute of Geography and Statistics (IBGE). In this dataset, we obtain information about employment by industry in each municipality in Brazil.[2] As controls, we use population, GDP, the percentage of workers in manufacturing, the percentage of jobs in the agricultural sector, the percentage of college-educated individuals, and the percentage of white workers, all at the municipality level. Besides, we use a dummy indicating if that municipality is the capital of the state and a series of dummies for microregions[3], restricting the comparison of cities to those belonging to the same microregions. Thus, with these controls, we aim to take into consideration the geographic and cultural heterogeneity across the country. Our data sample contemplates all the 5,565 municipalities of Brazil.[4]

Our international trade source is the BACI database, maintained by the *Centre d'Etudes Prospectives et d'Informations Internationales* (CEPII). BACI presents the traded value and the weight of commodities classified following the Harmonized System codes (detailed up to 6 digits).[5] We use this information not only to characterize trade between Brazil and China but also for all countries that reported trade flows between 1998 and

[1] *Tribunal Superior Eleitoral* (www.tse.jus.br).

[2] Following IBGE's classification, we account for 22 business sectors in Brazil, such as agriculture, education, construction, and health.

[3] The microregion is a level of aggregation defined by IBGE by grouping Brazilian municipalities according to information on the integration of local economies. Following Costa et al. (2016), we interpret this geographical level as local labor markets.

[4] In the 2000 Brazilian Demographic Census, Brazil had 5,507 municipalities.

[5] The BACI database is based on the United Nations Commodity Trade Statistics Database (COMTRADE), contemplating 170 countries. The reason for using the BACI database rather than the COMTRADE database directly is that the latter can be problematic, as countries themselves report trade records.

2016 since our IV strategy requires us to run regressions for every country except Brazil. As the BACI database is denominated in thousands of current US dollars, we use the US GDP Deflator from the US Bureau of Economic Analysis to convert the trade values to US dollars of the year of control (2000 or 2010). We use 2000 as the control for the political cycles of 1998-2002 and 2002-2006 in the national elections and for 2000-2004 and 2004-2008 in the local elections. We use 2010 as the control for the remaining cycles of 2006-2010, 2008-2012, 2010-2014, and 2012-2016.

Given our empirical strategy, we need to classify employed individuals from the 2000 and 2010 census data and, also, the traded products between countries in 1998 to 2016 into business sectors. In the Brazilian census, individuals are already organized into 22 business sectors, such as agriculture, education, construction, and health. An essential aspect of this classification is that the majority them are service sectors that naturally do not compose the trade data between Brazil and the rest of the world. Taking this issue into consideration, we build a matching correspondence that assigns products in the trade data to the IBGE's business sectors. We are left with a total of 10 general traded good areas, including agriculture, manufacturing industry, and construction.[6]

3.2 Main variables and summary statistics

TSE defines the vote share of a given candidate c in a given municipality m at a given year t ($Y_{m,t}$) as follows:

$$Y_{m,t} = \frac{V_c}{V_m},$$

where V_c is the total number of votes in candidate c, and V_m is the total number of valid votes in municipality m. We compute $Y_{m,t}$ for each Brazilian municipality for the elections of the president, governors, and mayors to explore how China's exogenous income shock affects these different levels of political powers.

Since in most of the period of interest the president of Brazil was a member from the Worker's Party (PT) and since the exogenous income shock of interest is originated from a national level trade variable, we first consider how the vote share of PT's candidates in the elections for mayors, governors, and president reacted to the exogenous shock of

[6] The ten general traded good areas and the matching correspondence built can be seen in Table 6 in the Appendix. Also, Tables 7 and 8 in the Appendix show these sectors' size in terms of the Brazil-China trade relationship.

interest. With similar reasoning, we proceed to consider how candidates from all the parties from PT's national coalition in the presidential elections of 2002, 2006, 2010 and 2014 performed on the respective electoral cycles of mayors' and governors' elections.[7] Besides, following several studies[8], we also consider if incumbent candidates for mayors and governors benefit/harm from exogenous income shocks in the next elections.

Thus, given the definition and discussion above, our three political outcome variables of interest for the elections of mayors and governors[9] are:

1. Vote share from the candidates from Worker's Party (PT);
2. Vote share from the candidates from the incumbent political party;
3. Vote share from the candidates of PT's national coalition.

More precisely, we are interested in the variation of the vote share between the two elections in the electoral cycle considered. Therefore, we compute the difference between Y_{m,t_1}, and Y_{m,t_2} to obtain $\Delta Y_{m,\Delta t}$, where t_1 is the last year of the previous four-year political term, and t_2 is the final year of the four-year political term of interest.[10] Hence, we are using the difference in vote shares in each municipality m in Brazil as our dependent variable of interest.[11]

When considering mayors' elections, we restrict our sample only to municipalities that do not have a second round of votes, i.e., municipalities with less than 200,000 inhabitants or municipalities bigger than 200,000 inhabitants that had a candidate elected in the first round due to receiving more than 50% of the total number of valid votes.[12] Besides, we opt to give a value of 0 for the vote share of PT's, incumbent party, or a party member of PT's national coalition when there were no candidates from these parties in a given election in a given municipality. Indeed, De Magalhaes (2015) shows that the

[7] See Table 9 in the Appendix for details on PT national coalition parties in each electoral cycle.

[8] See, for example, Erikson (1971), Gelman and King (1990), Cox and Katz (1996), and De Magalhaes (2015).

[9] For the presidential elections, we only study the variation of the vote share from the candidate of the Worker's Party (PT).

[10] As explained in Section 2, elections in Brazil always take place at the final year of the previous elected politician four-year term.

[11] Notice that even if we are working with the difference in vote share as our dependent variable of interest, we are still able to talk about direct impacts in the vote share itself, since, in practice, it is as if we were fixing t_1 and seeing the impact of the 'China shock' in the vote share at the t_2's election.

[12] In gubernatorial and presidential elections, we consider the entire sample.

Table 1 – IS_m and XD_m summary statistics

	Average		25th percentile		75th percentile		Maximum Value	
	2000-2004	2010-2014	2000-2004	2010-2014	2000-2004	2010-2014	2000-2004	2010-2014
IS_m	US$ 24.67	US$ 75.25	US$ 10.25	US$ 42.89	US$ 28.73	US$ 94.29	US$ 447.59	US$ 362.58
XD_m	US$ 56.32	- US$ 31.74	US$ 32.97	- US$ 23.65	US$ 50.70	- US$ 0.69	US$ 1,313.63	US$ 53.27

Notes: Descriptive average statistics of IS_m and XD_m in the 2000-2004 and 2010-2014 electoral cycles. The first two columns show the average value of IS_m and XD_m, the 3rd and the 4th columns show the 25th percentile of IS_m and XD_m, the 5th and the 6th columns show the 75th percentile of IS_m and XD_m, while the last two columns show their maximum values. Values in 2000 or 2010 US dollars per worker. Sources: 2000 and 2010 Brazilian Census and BACI.

unconditional probability is more appropriate in countries such as Brazil, where rerunning for reelection is not so common, and the incumbency advantage is not so strong.[13] Hence, we claim that having no candidate is a consequence of a party's decision, and it can be interpreted as if they would have received a 0 percent vote share even in a scenario that they had competed. As an illustration, the results for $Y_{m,t}$ in the years of 2000 through 2016 for mayors' incumbent candidates can be seen in Figure 1.

To construct our two main right-hand-side variables capturing the import and export exposure of Brazil from the commercial relationship with China we closely follow Costa et al. (2016) and Autor et al. (2017):

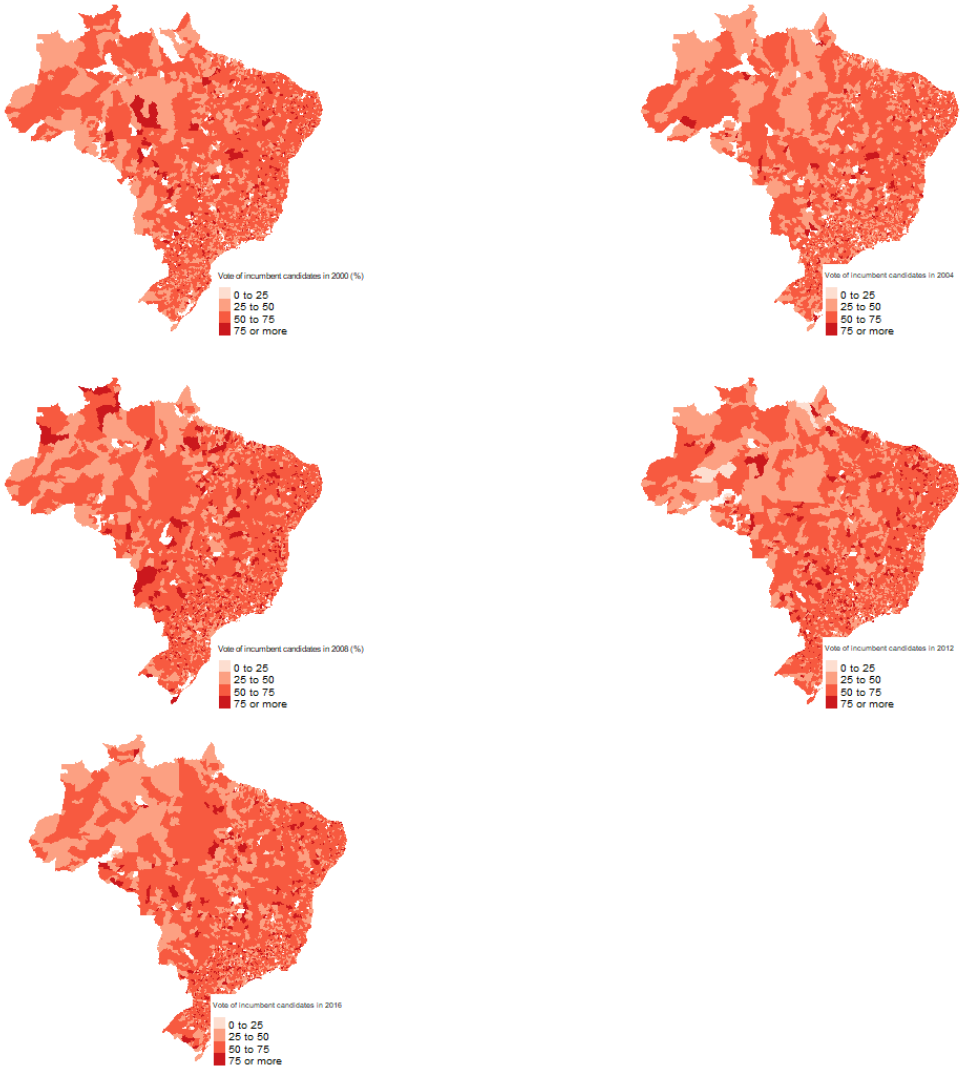
$$\mathrm{XD}_{m,\Delta t} = \sum_j \frac{L_{m,j,\tau}}{L_{B,j,\tau} L_{m,\tau}} \Delta X_{j,\Delta t}^{BRA \to CHN} \qquad [3.1]$$

$$\mathrm{IS}_{m,\Delta t} = \sum_j \frac{L_{m,j,\tau}}{L_{B,j,\tau} L_{m,\tau}} \Delta I_{j,\Delta t}^{CHN \to BRA}, \qquad [3.2]$$

where $\Delta X_{j,\Delta t}^{BRA \to CHN}$ is the change in exports from Brazil to China in industry j between the year t_1 and t_2 and $\Delta I_{j,\Delta t}^{CHN \to BRA}$ is the change in imports from China to Brazil in industry j between the year t_1 and t_2, where t_1 is the first year of the four-year electoral cycle of interest and t_2, the last one. $L_{m,j,\tau}$ is the size of the workforce in the work sector j in municipality m in the control year τ, where τ can be either 2000 or 2010, as explained above. $L_{B,j,\tau}$ is the size of the workforce in the work sector j in Brazil (B) in the control year τ and, lastly, $L_{m,\tau}$ is the total workforce of the municipality m in the control year τ. Both $\mathrm{XD}_{m,\Delta t}$, and $\mathrm{IS}_{m,\Delta t}$ are denominated in thousands of US dollars per worker.

[13] Interestingly, De Magalhaes (2015) also shows that, in Brazil, incumbent mayors either retire from politics fully, or they rerun. Also, they show that there is a low rate of reelection among incumbents in the Brazilian elections: only approximately 36% of incumbents win a second term.

Figure 1 – Mayors' elections: incumbent's vote share between 2000 and 2016



Notes: This figure displays the results for the vote share of mayors' candidates from incumbent parties from 2000 (top left) trough 2016 (bottom left). Darker reds indicate that the candidate from the incumbent party had a higher vote share in that municipality. This graph excludes municipalities with a population bigger or equal to 200,000 that did not elect a candidate in the elections' first turn.

Table 1 shows that the average Brazilian municipality received an import competition shock from China of US$ 24.67 per worker and an export demand shock of US$ 56.32 per worker in the 2000-2004 electoral cycle, while Figure 2 shows the dispersion of XD_m and IS_m for the same period at the municipality level. As shown, both shocks are highly skewed to the right, with the 25th percentile of XD_m being US$ 32.97 per worker and the 75th, US$ 50.70. Besides, IS_m has a lower magnitude for this 2000-2004 period, with the 25th percentile being equal to US$ 10.25 and the 75th, to US$ 28.73 per worker. The maximum values of XD_m and IS_m for the same political cycle are US$ 1313 and US$ 447, respectively.

Table 1 also shows the distribution of both XD_m and IS_m for the 2010-2014 cycle, while Figure 3 displays the histogram of both variables in this period. Interestingly, we notice that for this electoral cycle, the import supply shock is quite higher in magnitude, with the export demand shock being primarily negative at 2010-2014, with approximately 77% of its values being negative in this period.[14] This may be the result of the economic crisis that affected the Brazilian economy mainly during 2010-2016, and that had an impact on Brazilian competitiveness in the export sector. Hence, we observe that for the 2010-2014 period, we have an average negative export demand shock of - US$ 31.74 per worker and an average import supply shock of US$ 75.25 per worker. The 25th percentile of XD_m in this period is a shock of - US$ 23.65 per worker and the 75th, a shock of - US$ 0.69. While IS_m is much higher, with a 25th percentile of US$ 42.89 and a 75th percentile of US$ 94.29 per worker.

Table 2 displays the characteristics of municipalities in the top 25% of IS_m and XD_m in the 2000-2004 and 2010-2014 electoral cycles,[15] showing that the municipalities most exposed to the Chinese import supply shock tend to have lower proportions of workers engaged in agriculture and a higher percentage of workers in manufacturing for both control years as compared to the average municipality. Besides, for both periods shown, a larger municipality both in terms of population and in the absolute value of GDP

[14] Figures 7 through 10 in the Appendix shows that the only other case where this happens is in the 2012-2016 cycle, for both XD and IS.

[15] Notice that the summary statistics displayed are all obtained in the highlighted control year (2000 or 2010). However, as defined above, IS_m and XD_m can only be obtained at a given period of time. Hence, in the 3rd, 4th, 5th and 6th columns of Table 2 we show the average statistics of Brazilian municipalities in the 2000 and 2010 control years of the top quartile of IS_m and XD_m, calculated in the 2000-2004 electoral cycle for the 3rd and 5th columns and in the 2010-2014 electoral cycle for the 4th and 6th columns.

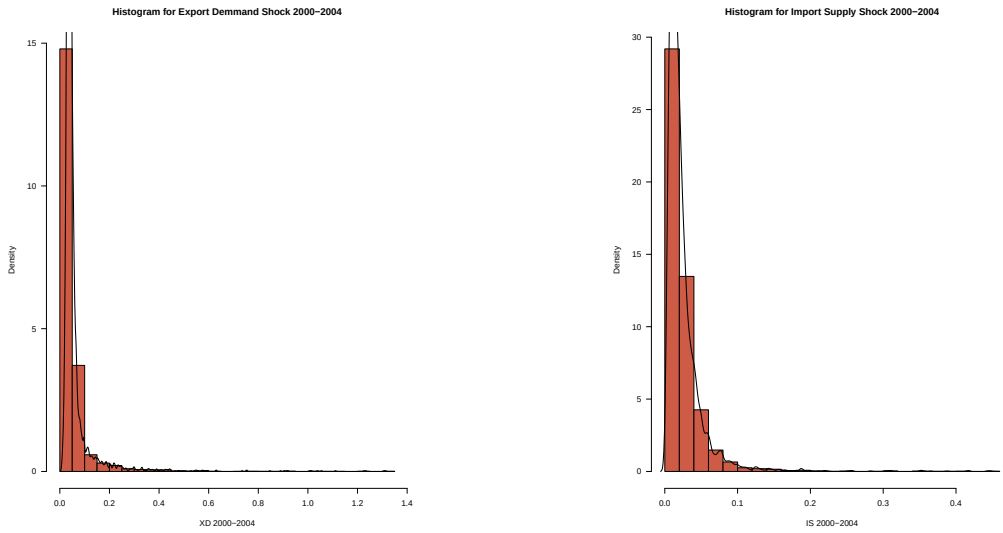


Figure 2 – Distribution of export demand shock measure (left) and import supply shock measure (right) for the electoral cycle of $2000 - 2004$*. The graph represents the histogram of municipality-level export demand shock* (XD_m) *and import supply shock* (IS_m)*, in thousands of US dollars per worker. Source: 2000 Brazilian Census and BACI.*

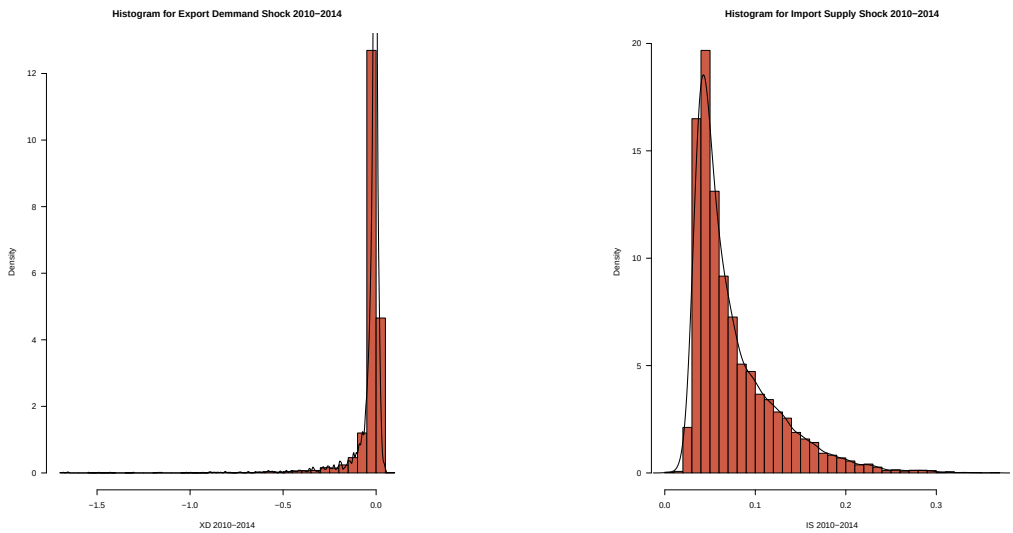


Figure 3 – Distribution of export demand shock measure (left) and import supply shock measure (right) for the electoral cycle of $2010 - 2014$*. The graph represents the histogram of municipality-level export demand shock* (XD_m) *and import supply shock* (IS_m)*, in thousands of US dollars per worker. Source: 2010 Brazilian Census and BACI.*

Table 2 – Brazilian municipalities summary statistics

	All municipalities		**Top quartile of IS_m**		**Top quartile of XD_m**	
	2000	2010	2000	2010	2000	2010
Population (thousands)	24.86	26.02	39.11	29.82	13.71	26.78
College (%)	1.01	4.67	1.33	6.19	0.93	4.47
White (%)	52.21	46.69	61.84	62.88	52.57	42.33
Manufacture (%)	4.99	10.10	10.66	22.69	7.49	11.51
Agriculture (%)	21.30	36.09	13.16	20.97	20.11	32.15
GDP (thousands of R$)	199.97	677.46	432.21	931.77	95.89	718.97

Notes: Descriptive average statistics of Brazilian municipalities in the 2000 and 2010 control years. The first two columns include all municipalities, the 3rd, and the 4th columns include only municipalities among the top 25% of IS_m calculated in the electoral cycles of 2000-2004 and 2010-2014, respectively. The last two columns include only municipalities among the top 25% of XD_m, also calculated in the electoral cycles of 2000-2004 and 2010-2014, respectively. Sources: 2000 and 2010 Brazilian Census and BACI.

in the respective control year tends to be more exposed to Chinese imports. On average, the municipalities most affected by the import supply shock have a higher percentage of white workers and more college-educated workers in the given control year.

Regarding the Chinese export demand shock, Table 2 is quite contrasting between the Brazilian municipalities in its top quartile for both the 2000-2004 and 2010-2014 periods displayed. We have that for the 2000-2004 electoral cycle, the top 25% municipality in terms of exposure to the Chinese exports had a smaller population and GDP and a lower percentage of workers in agriculture when compared to the average Brazilian municipality in that period. Also, interestingly, this group of municipalities has a smaller percentage of college-educated workers.

On the other hand, for the 2010-2014 period, we have larger municipalities both in terms of population and total GDP when comparing both to the top quartile in 2000 and the average municipality in 2010, with the difference to 2000 being quite significant. Besides, for this 2010-2014 period, the top quartile of cities exposed to Chinese exports has a higher percentage of workers in the manufacturing sector when compared to both the average city of the period and the 2000 top quartile. Interestingly, in general terms, for both periods analyzed, we have that the top quartile of XD_m is more similar to the average Brazilian municipality than the top quartile of IS_m.

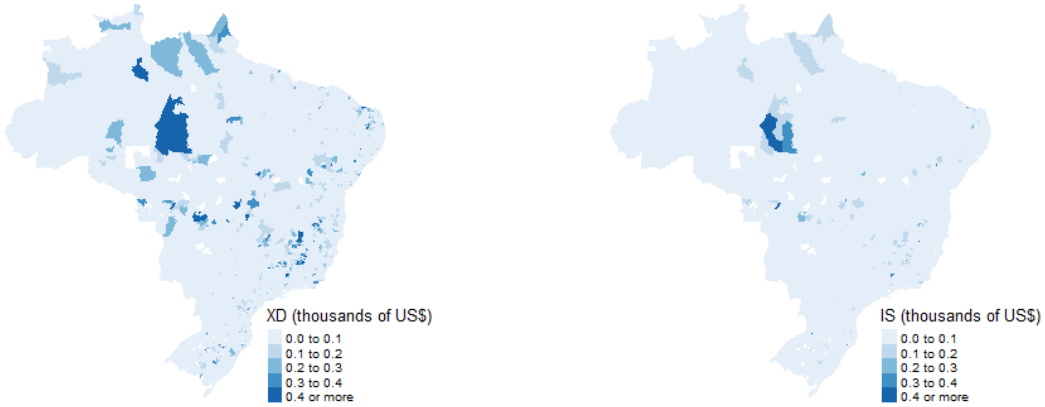


Figure 4 – Geographical distribution of export demand shock measure (left) and of import supply shock measure (right) for the electoral cycle of 2000-2004. Source: 2000 Brazilian Census and BACI.

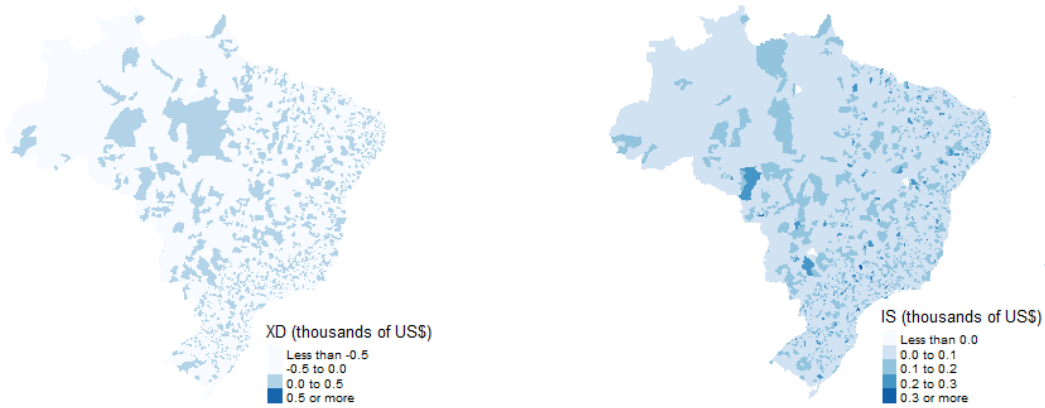


Figure 5 – Geographical distribution of export demand shock measure (left) and of import supply shock measure (right) or the electoral cycle of 2010-2014. Source: 2010 Brazilian Census and BACI.

Figures 4 and 5 show the geographical distribution of the Chinese import demand and export supply shocks in Brazil. We notice that for the 2000-2004 period, the cities most affected by both shocks are very similar. In contrast, for the 2010-2014 period, we have a noticeable difference in the most affected cities when compared to both the 2000-2004 cycle and between the two types of shocks in the 2010-2014 period, IS_m and XD_m. Interestingly, once again, the higher magnitude of the Chinese import supply shock for the 2010-2014 electoral cycle when compared to the export demand shock in the same cycle is quite visible.

4 Empirical Strategy

Autor et al. (2016) argues that the emergence of China as an important player in the global market provides a 'rare opportunity' for empirical studies on international trade. Their argument revolves around the claim that China's advance over global markets could be modeled as a 'quasi-natural experiment' to which the rest of the world was subject. They highlight three characteristics of China's economic growth and opening to trade that can justify treating it as an exogenous shock: firstly, it was unexpected, despite general awareness of the liberalization reforms being implemented in China after the 1980's. Secondly, it was largely driven by the reallocation of domestic production factors, as China accumulated idle capacity and room for productivity gains during its period as a closed economy. Finally, China's trade growth displayed an accentuated pattern: exports of manufactures and imports of raw materials, reflecting China's comparative advantages.

Essentially, Autor et al. (2016) argues that external factors had little to do with China's emergence in trade. In fact, the growth was essentially driven by its own internal factors, both political and economical. Once the country removed its restrictions to trade, it was able to fully explore its competitive advantages on the global market. Hence, one can say that no external factor can be accounted for influencing China's advance over international trade, allowing us to treat it as exogenous from the perspective of the rest of the world. Therefore, we can say that China rather 'broke into' foreign markets than was 'brought-in' by other countries. For the Brazil-China commercial relationship, it was no different. As Figure 6 shows, this commercial relationship grew considerably faster than the ones of Brazil with the rest of the world, both in terms of exports and imports.

With this context in mind, we can state our fundamental identification hypothesis: the change in income originated from the commercial relation between Brazil and China is exogenous from Brazilian politics at the local level. Further, we can propose the following causal channel: the rise in the commercial relation between Brazil and China brings a positive or negative income shock at the local level, which in turn promotes a change in voting patterns.

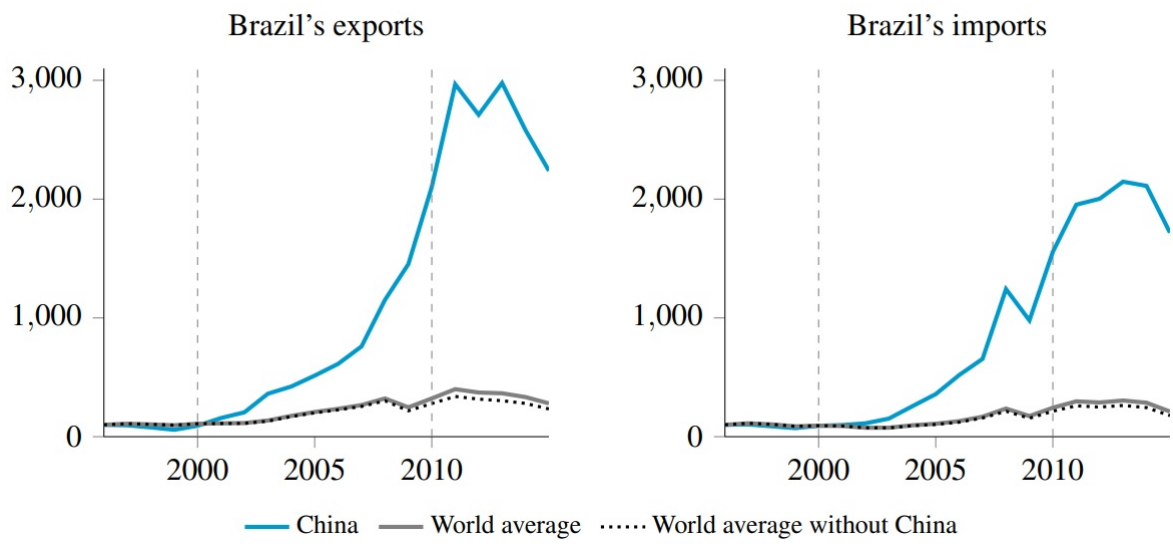


Figure 6 – Brazil-China trade relationship compared to the Brazil-World trade relationship. Source: Dornelas and Chimeli (2019).

To investigate this causal channel, we use the following main specification:

$$\Delta Y_{m,\Delta t} = \gamma_X \mathrm{XD}_{m,\Delta t} + \gamma_I \mathrm{IS}_{m,\Delta t} + Z'_{m,\tau}\beta + e_{m,\Delta t}, \qquad [4.1]$$

where $\Delta Y_{m,\Delta t}$ is the change in the vote share of one of the types of candidates described in Section 3.2 at a given municipality m and at a given period Δt , i.e., $(t_2 - t_1)$. $Z_{m,\tau}$ is the vector of municipality m controls calculated in the control year τ (population, GDP, percentage of workers in manufacturing, percentage of jobs in the agriculture sector, percentage of college-educated individuals, and percentage of white workers. Besides, we use a dummy indicating if that municipality is the state's capital and a series of dummies for microregions).

A possible concern is that the growth in the commercial relationship between Brazil and China can be due to supply/demand shocks in Brazil and changes in world prices and quantities, which would impact local voting decisions and invalidate our identification hypothesis. In particular, a key assumption underlying our approach is that the changes in the pattern of trade between China and these other countries are unrelated to Brazil-specific shocks. More specifically, given our main identification hypothesis, we are particularly interested in ensuring that this growth came mostly from the China side.

To address this possible endogeneity problem, we construct an instrumental variable approach following Costa et al. (2016) that considers changes in China's sector-level imports and exports relative to those of other countries excluding Brazil. The main effect of these

instrumental variables is to diminish the relative importance of high-growth sectors in which Brazil, at our period of interest, was not initially an exporter or an importer. As stated by Costa et al. (2016), this is possible since we are working with instruments that are constructed by multiplying Brazilian trade flows in the last year of the previously four-year political term t_1 by shocks in the form of growth rates from the China side (through the estimation of the coefficients $\hat{\psi}_{CHN,j,\Delta t}$ and $\hat{\delta}_{CHN,j,\Delta t}$ defined below). This is a different approach than the one used in, e.g., Autor et al. (2013) and Autor et al. (2017), where they simply used differences in the levels of trade between China and the rest of the world. Therefore, following Costa et al. (2016), we are able to increase the importance of the sectors of trade between China and Brazil that had its growth mainly due to a Chinese demand shock, while simultaneously diminishing the importance of sectors that Brazil increased its commercial relationship with China due to changes in world-level prices and quantities.

Hence, we define the instrumental variables for $\text{XD}_{m,\Delta t}$ and $\text{IS}_{m,\Delta t}$[1] as the product of the initial t_1 levels of trade ($X_{j,t_1}^{BRA\to CHN}$ and $I_{j,t_1}^{CHN\to BRA}$ below) and the fixed effects ($\hat{\psi}_{CHN,j,\Delta t}$ and $\hat{\delta}_{CHN,j,\Delta t}$ below) from a set of auxiliary regressions, while controlling for start-of-the-period conditions:

$$\text{XD}_{m,\Delta t}^{\text{IV}} = \sum_j \frac{L_{m,j,\tau}}{L_{B,j,\tau} L_{m,\tau}} X_{j,t_1}^{BRA\to CHN} \times \hat{\psi}_{CHN,j,\Delta t} \qquad [4.2]$$

$$\text{IS}_{m,\Delta t}^{\text{IV}} = \sum_j \frac{L_{m,j,\tau}}{L_{B,j,\tau} L_{m,\tau}} I_{j,t_1}^{CHN\to BRA} \times \hat{\delta}_{CHN,j,\Delta t} \qquad [4.3]$$

Finally, the coefficients $\hat{\psi}_{CHN,j,\Delta t}$ and $\hat{\delta}_{CHN,j,\Delta t}$ come from the following auxiliary regressions (that we run for every industry j):

$$\frac{\Delta I_{j,\Delta t}^{O\to c}}{I_{j,t_1}^{O\to c}} = \lambda_j + \psi_{CHN,j,\Delta t} \times \mathbb{1}_{\{c=China\}} + \nu_{jc}$$

$$\frac{\Delta X_{j,\Delta t}^{c\to O}}{X_{j,t_1}^{c\to O}} = \alpha_j + \delta_{CHN,j,\Delta t} \times \mathbb{1}_{\{c=China\}} + \mu_{jc},$$

where $\Delta I_{j,\Delta t}^{O\to c}$ is the change in the imports of country c from all countries other than Brazil in the period of the four-year political cycle of interest and $\Delta X_{j,\Delta t}^{c\to O}$ is the change in the exports of country c to all countries other than Brazil in the same period. $\mathbb{1}_{\{c=China\}}$ takes value 1 when country c is China and zero otherwise.[2]

[1] $\text{XD}_{m,\Delta t}$ and $\text{IS}_{m,\Delta t}$ seek to estimate the import and export exposure of Brazil from the commercial relationship with China and were defined respectively in Equations 3.1 and 3.2.

[2] Note that $\hat{\psi}_{CHN,j,\Delta t}$ relates to Chinese imports and, thus, to export-side shock for Brazil, while $\hat{\delta}_{CHN,j,\Delta t}$ relates to Chinese exports and thus to the import-side shock for Brazil.

Lastly, to account for potential spatial correlation in outcomes across neighboring municipalities, we cluster standard errors at the microregion level. Remarkably, Adão et al. (2019) proposes an alternative approach to estimate the standard-errors in shift-share regression designs. However, one of the fundamental assumptions of their method is that the number of economic sectors (industries) is infinite or very large, which makes such their approach not suitable for our study, given that we have a small number of industries.

5 Results

5.1 Gubernatorial Elections Results

We begin by looking at the results of Equation 4.1 for governors' elections. Table 3 shows the estimations for γ_X and γ_I in Equation 4.1 when using the three political outcomes of interest as the regressand for gubernatorial elections.

Column (1) displays the estimates for the difference in the vote share of PT's candidates. In Panel A of Table 3, we find a significant result in the first electoral cycle considered (1998-2002). Noticeably, this result's statistical significance disappears over time, suggesting that the 'China shock' effect may not be permanent in Brazilian politics at the local level. Interestingly, we find significant results in terms of magnitude for the PT's governors elections, with a US$ 1000 increase in imports from China being responsible for an impressive 19.07 percentage points increase in the vote share of a candidate from PT in the 2002 election, while the export demand shock being responsible for an also high impact in the election of PT's candidates, but in the opposite direction. A noticeable aspect of Table 3 is the relation between Columns (1) and (3). They have similar magnitudes and direction in the significant shock found in Panel A, indicating that the 'China shock similarly impacts these two types of candidates'. One possible reason for this result is the country's level aspect of this shock, which leads voters to associate it with national political agendas, and thus members of PT's national coalition parties are viewed in a similar way to Workers' Party members.

In Column (2) of Table 3, we have the results for governors' candidates from the incumbent's parties. Once again, we only have a statistically significant result for the first period displayed, 1998-2002. The 4.39 percentage points increase in the vote share of the candidates from the incumbent's parties in the 2002 election derived from a US$ 1000 per worker increase in the exports to China is in line with the result of an increase in wage found in Costa et al. (2016), although the period of this study being different. Nevertheless, we have an import demand shock impact in the opposite direction and with greater magnitude.

Table 3 – Results for Governors' Elections

	Executive Elections: Governors		
	(1)	(2)	(3)
Dep Var: $\Delta_{t_2-t_1}$Vote share	PT's candidates	Incumbent's candidates	PT's national coalition candidates
Panel A. $t_1 = 1998$; $t_2 = 2002$			
XD_m	-5.59***	4.39***	-7.57***
	(1.12)	(1.62)	(1.50)
IS_m	19.07***	-15.10***	25.92***
	(3.90)	(5.61)	(5.21)
Panel B. $t_1 = 2002$; $t_2 = 2006$			
XD_m	-0.80	2.55	-0.48
	(1.10)	(2.20)	(0.75)
IS_m	-17.84	54.86	-10.52
	(23.88)	(48.66)	(16.30)
Panel C. $t_1 = 2006$; $t_2 = 2010$			
XD_m	0.02	0.01	-0.07*
	(0.01)	(0.02)	(0.04)
IS_m	0.67	-0.10	-2.40
	(0.49)	(0.69)	(1.48)
Panel D. $t_1 = 2010$; $t_2 = 2014$			
XD_m	-20.25	8.66	-26.69
	(13.50)	(9.17)	(20.36)
IS_m	216.09	-92.47	284.44
	(144.13)	(97.79)	(217.26)

*Notes: This table displays the estimated effects of Chinese imports and exports shocks on differences of vote share for governors in the elections cycles of 1998-2002 trough 2010-2014. In all regressions, we used the following controls at the municipality level: population, GDP, percentage of workers in manufacturing, percentage of jobs in the agriculture sector, percentage of college-educated workers, and percentage of white workers. Besides, we use a dummy indicating if that municipality is the capital of the state and a series of dummies for microregions. Column (1) displays the results for changes in the vote share of PT's candidates, column (2) for changes in the vote share of incumbent parties' candidates and column (3) for changes in the vote share of candidates from PT's national coalition parties that are evidenced in Table 9 in the Appendix. Sources: 2000 and 2010 Brazilian Census, BACI, and TSE. Standard errors in parentheses adjusted for all Brazilian microregions. Significant at the * 10% level, ** 5% level and *** 1% level.*

A fundamental aspect of the results presented in Panel A of Table 3 is PT's situation on a country's level. In the 1998-2002 electoral cycle, PT was an opposition party in the national level, contrary to all the remaining electoral cycles considered, displayed in Panels B through D. This is especially noticeable because of the directions of the impacts of both shocks in all three political outcomes of interest displayed in Panel A. In Columns (1) and (3), respectively showing the results for the PT's candidates and the candidate of the parties from PT's national coalition, we have a negative impact in the vote share from the export demand shock and a positive impact in vote share from the import supply shock. In contrast, in Column (2), which shows the results for the incumbent's candidates, we have a positive impact from the XD_m variable and a negative impact from the IS_m variable.

These results suggest that for the governors' elections in the 1998-2002 political cycle, the 'China shock' had opposite impacts for the incumbent and opposition parties. If we further consider the magnitude of these impacts, with the import supply shock, originated from rising import competition in manufacturing being always significantly greater, our results suggest that the 'China shock' helped the opposition's candidates and harmed the incumbent's candidates in this political cycle for the gubernatorial elections since this is the direction in which the import supply shock moves.

The results above, although impressive in magnitude, are expected in direction. The import supply shock from China is mainly concentrated in manufactured products and, as so, has as a primary consequence the deterioration of the local manufacturing sectors. As this is the case, one might find it reasonable to assume that local voters would harm incumbent candidates in favor of opposition parties' candidates as a punishment for this negative impact. On the other direction, the export demand shock from China is mainly derived from growing Chinese demand for Brazilian commodities and, thus, generates a positive income shock, as shown by Costa et al. (2016). In this sense, one might expect that voters benefit the incumbent parties in elections as a reward for this positive impact.

5.2 Presidential Elections Results

We now present the results of our Equation 4.1 model for presidential elections. Table 4 displays these results for the difference in the vote share of PT's candidates. Interestingly and contrary to the results presented in Table 3, we do not have a significant result in the first period considered, from 1998 to 2002. This is especially important given the above discussion of the impact of the 'China shock' in the difference in vote share of incumbent's and opposition's parties in the 1998-2002 period, as Table 4 suggests that in the presidential election level, we do not have a significant impact for both shocks displayed. A result that shows that our estimation is sensitive to the type of executive political position considered.

Panel C of Table 4 presents the single significant result found for the presidential elections of PT's candidates. We have that a US$ 1000 per worker rise in exports to China increased the vote share of the PT candidate in 0.03 percentage point in the 2010 national

Table 4 – Results for President's Elections

Executive Elections: President	
	(1)
Dep Var: $\Delta_{t_2-t_1}$Vote share	PT's candidates
Panel A. $t_1 = 1998$; $t_2 = 2002$	
XD_m	-3.25
	(5.66)
IS_m	10.98
	(19.57)
Panel B. $t_1 = 2002$; $t_2 = 2006$	
XD_m	0.62
	(0.91)
IS_m	13.45
	(19.87)
Panel C. $t_1 = 2006$; $t_2 = 2010$	
XD_m	0.03***
	(0.01)
IS_m	1.01***
	(0.27)
Panel D. $t_1 = 2010$; $t_2 = 2014$	
XD_m	2.38
	(5.79)
IS_m	-25.48
	(61.80)

*Notes: This table displays the estimated effects of Chinese imports and exports shocks on differences of vote share for president in the elections cycles of 1998-2002 trough 2010-2014. In all regressions, we used the following controls at the municipality level: population, GDP, percentage of workers in manufacturing, percentage of jobs in the agriculture sector, percentage of college-educated workers, and percentage of white workers. Besides, we use a dummy indicating if that municipality is the capital of the state and a series of dummies for microregions. Column (1) displays the results for changes in the vote share of PT's candidates, column (2) for changes in the vote share of incumbent parties' candidates and column (3) for changes in the vote share of candidates from PT's national coalition parties that are evidenced in Table 9 in the Appendix. Sources: 2000 and 2010 Brazilian Census, BACI, and TSE. Standard errors in parentheses adjusted for all Brazilian microregions. Significant at the * 10% level, ** 5% level and *** 1% level.*

elections, while a US$ 1000 per worker rise in imports from China also increased the vote share of the PT candidate in the 2010 election, with a magnitude of 1.01 percentage point. These results are especially impressive, mainly because of two aspects. First, we have that both shocks, the export demand, and the import supply, are going in the same direction in terms of impacting the PT's candidate election, a statistically significant result that we did not have previously for the gubernatorial elections. This result is puzzling mainly because the XD_m and the IS_m variables represent, respectively, a demand and a supply shock and, therefore, we expect them to walk in opposite directions. Given the already cited result of Costa et al. (2016) evidencing that the export demand shock raised wages in the 2000-2010 period, we find it reasonable to conclude that this shock, represented by the XD_m variable, benefits the incumbent candidate and, thus, must indicate that a US$ 1000 per worker rise in exports to China helped the PT's candidate in the 2010 presidential elections. On the other hand, given the opposite nature of the source of both shocks cited, we expected the rise in import competition supply shock to go in the opposite direction, an expectation that is not corroborated by the results found on Table 4.[1] Second, the 2010 election was an import transition moment for the Worker's Party as the second term of Luiz Inácio Lula da Silva was in its last year, and, thus,[2] PT needed to find a different political figure for the presidential elections. What the results in Table 4 suggest is that the 'China's shock' helped, at least partly, the success of this power transition promoted by the Workers' Party, helping to elect then party candidate Dilma Rousseff, Lula's successor.

The results presented in this section are unexpected, principally when compared to the ones found in Section 5.1. Interestingly, we do not have the previous pattern of a significant result in the first period and the subsequent disappearance of the 'China shock' impact, having instead only statistically significant results in the third period considered. Also, we have accordance with the directions between both statistically significant shocks studied, suggesting that for the 2006-2010 electoral cycle in the presidential elections, the 'China shock' had an unambiguous effect of helping to elect the PT's candidate. This result is especially perplexing because of the opposite nature of these two shocks. Altogether, our results in this section confirm that the magnitude, direction, and significance of this

[1] A possible mechanism behind this result is that the high flow of imported manufactured products from China made the consumption bundle in Brazil cheaper, due to the high relative competitiveness of the Chinese industry. As a result, the average Brazilian purchasing power increased, making him benefit the incumbent candidate (in this case, the Workers' Party) in the next election.

[2] As explained in Section 2.

exogenous shock in Brazilian elections depends on the period, the type of candidate, and the type of political power considered.

5.3 Mayoral Elections Results

We finally proceed to exam the impact of the 'China shock' on the Brazilian mayoral elections. Table 5 presents the estimates from Equation 4.1 using the difference in vote share as the electoral outcome. Column (1) reports the estimates for the PT's candidates. We notice that we do not have a significant result for either of the electoral cycles considered, suggesting that the 'China shock' did not have an impact on the electoral trajectory of the party's candidates at the mayoral level. This is somewhat an unexpected result since Figure 11 in the Appendix shows that we have a significant change in the number of municipalities controlled by the party throughout this period and one might think that an exogenous income shock such as the one studied here would have an impact in local politics, as shown in Autor et al. (2017).

The 'China shock' is derived from a trade relationship at the national level, so it might be a strong assumption to assume that it would impact a local executive position such as the mayor. Still, we examine the impact of the 'China shock' on Brazilian mayoral elections, based on reasoning similar to Archen and Bartels (2012) and Bagues and Esteve-Volart (2016). They show that the connection between incumbents' performance and voters' response at the polls is likely to be highly random and, thus, incumbents often get affected for events beyond their control. Therefore, even conceding that it is a strong assumption to assume that voters relate international commercial performance to mayors' actions, we still find it worth analyzing this level of executive power elections.

Indeed, if we look at Column (2) that displays the estimates for the main specification at the mayoral level, now with the difference in the vote share for incumbent candidates as the electoral outcome of interest, we will find an effect of the 'China shock' that is considerable for the first period shown. Remarkably, according to the estimates displayed in Panel A of Column (2), a US$ 1000 export demand shock per worker diminishes the difference in vote share in 3.69 percentage points, thus negatively impacting the election of incumbent candidates in the 2004 election. Also in Panel A of Column (2), we have that a US$ 1000 per worker raise in imports to China increases the difference in vote share

Table 5 – Results for Mayors' Elections

	Executive Elections: Mayors		
	(1)	(2)	(3)
Dep Var: $\Delta_{t_2-t_1}$ Vote share	PT's candidates	Incumbent's candidates	PT's national coalition candidates
Panel A. $t_1 = 2000$; $t_2 = 2004$			
XD_m	-0.89	-3.69*	0.37
	(1.04)	(1.95)	(1.74)
IS_m	2.83	11.41*	-1.22
	(3.29)	(6.16)	(5.47)
Panel B. $t_1 = 2004$; $t_2 = 2008$			
XD_m	0.15	-0.11	0.12
	(0.13)	(0.20)	(0.14)
IS_m	19.40	-15.71	15.67
	(16.65)	(26.76)	(18.71)
Panel C. $t_1 = 2008$; $t_2 = 2012$			
XD_m	0.01	-0.13	-0.28
	(0.13)	(0.18)	(0.34)
IS_m	-0.06	-1.80	-4.18
	(1.93)	(2.64)	(4.98)
Panel D. $t_1 = 2012$; $t_2 = 2016$			
XD_m	0.02	0.02	0.01
	(0.01)	(0.02)	(0.03)
IS_m	0.76	0.46	-1.97
	(0.79)	(1.14)	(2.56)

*Notes: This table displays the estimated effects of Chinese imports and exports shocks on differences of vote share for mayors in the elections cycles of 2000-2004 trough 2012-2016. In all regressions, we used the following controls at the municipality level: population, GDP, percentage of workers in manufacturing, percentage of jobs in the agriculture sector, percentage of college-educated workers, and percentage of white workers. Besides, we use a dummy indicating if that municipality is the capital of the state and a series of dummies for microregions. Column (1) displays the results for changes in the vote share of PT's candidates, column (2) for changes in the vote share of incumbent parties' candidates and column (3) for changes in the vote share of candidates from PT's national coalition parties that are evidenced in Table 9 in the Appendix. Sources: 2000 and 2010 Brazilian Census, BACI, and TSE. Standard errors in parentheses adjusted for all Brazilian microregions. Significant at the * 10% level, ** 5% level and *** 1% level.*

in 11.41 percentage points, thus acting in the opposite direction of the export demand shock, positively impacting the incumbent candidates in the 2004 election. Therefore, the results for this specification indicate that, in the 2000-2004 electoral cycle, mayoral candidates from the incumbent parties were both positively and negatively affected by the 'China shock.' Moreover, we have that the significance of the effect displayed in Column (2) disappears over time, again evidencing that the impact of the 'China shock' was not permanent. Further, we have a different direction of the impact for both export demand and import supply shocks than the ones found in Table 3 for the same political outcome variable of interest, suggesting different impacts of this shock depending on the level of executive political power considered.

The findings above are unexpected, both in terms of the magnitude and the direction of the coefficients. Given that the export demand shock from China (represented by the XD_m variable) raised wages in the 2000-2010 period (Costa et al. (2016)), one would expect a positive impact in the vote share of incumbent's candidates, as it is reasonable to assume that a voter would benefit the politician in power given the rise in wages. Besides, the difference in magnitude between both shocks is also noticeable, with the import supply shock appearing to have a greater impact in local Brazilian politics and in the opposite direction, which is also unexpected since Costa et al. (2016) shows that there was no statistically significant effect of the import supply shock in local wages.

In Column (3), we use as the political outcome of interest the difference in vote share of candidates from the parties that are members from the PT's 2002 national coalition (the list of the members from PT's national coalition is displayed in Table 9 in the Appendix). In terms of statistical significance, we have that these candidates, as also was the case for PT's candidates, were not affected by the 'China shock.' Given that these parties are aligned to PT on the national level, one might expect that these two groups of candidates are somewhat similarly (not) affected by the 'China shock.'

Noticeably, Table 5 is also very heterogeneous in both terms of magnitude and direction of the impacts of both import supply and export demand shocks. It is not clear how the 'China shock' impacts mayoral elections through time and what are the directions of these shocks in terms of changes in vote shares for the types of candidates displayed in Columns (1), (2) and (3). The possible reasoning behind these scattered results is the mechanism proposed here. As discussed above, it might be a strong hypothesis to assume that voters can see the income gains or losses originating from the trade relationship with China as a direct result from local politics and, an even stronger hypothesis, to assume that they not only make this connection but are also able to benefit/harm local politicians on the mayoral elections significantly. Therefore, a heterogeneous group of estimates might be the reasonably expected result in this section, after all. That is, despite finding a scenario of statistically significant impact in Panel A of Table 5, we find evidence that, for the 'China shock' in Brazilian mayoral elections, we do not have the type of imprecise electoral connection as the one proposed by Archen and Bartels (2012).

6 Conclusion

This paper examines the effects of the economic shock induced by the rapid ascension of the Brazil-China commercial relationship, considering the emergence of China in Brazilian trades as an exogenous factor. Using the methodology proposed by Costa et al. (2016), we use a set of auxiliary regressions and an instrumental variable approach to construct two variables to measure this Brazilian exposure to China's emergence in the global market and estimate the effect of these variables on some electoral outcomes. The results indicate that the variable associated with the import supply shock of the Brazil-China commercial relationship has a more significant impact on Brazilian electoral outcomes. Also, we find that our results are very dependable on the level of government studied, on the type of candidate considered, and on the period studied. More interestingly, we find evidence that the exogenous shock considered played a factor in the transition of the Brazilian presidency from PT's Luiz Inácio Lula da Silva (2003-2010) to PT's Dilma Rousseff (2011-2016).

This paper contributes to the literature in two main dimensions. First, it sheds light on the long term impact of the 'China shock' in Brazilian politics, suggesting that the impact dissipates trough time in mayoral and gubernatorial elections, while significantly impacting presidential elections only in a particular scenario of recent Brazilian politics. Second, this article corroborates with the recent, but rapidly growing, literature that investigates the relationship between commercial exposure and electoral results. More specifically, it corroborates with the already significant 'China shock' literature that considers the emergence of China on the global market as an exogenous shock for the other countries, taking advantage of this 'quasi-natural' experiment.

We also believe that there are many ways to enrich the present work further. An understanding of the mechanisms behind the voting change decision as a result of the 'China shock' is necessary, while a better study on which determinants of each region of Brazil are causing the shock of China to have a heterogeneous impact across the country would also be an essential addition. Furthermore, understanding the extent to which the 'China shock' is responsible for ideological changes in the Brazilian electorate and,

consequently, in Brazilian politicians, similar to Autor et al. (2017), would be a considerable contribution to this article. Finally, a significant limitation here is the lack of a theoretical model that sustains the idea that an exogenous national trade shock is capable of changing the income at the individual level and, consequently, impacting local political and electoral decisions.

Bibliography

Acemoglu, D., D. Autor, D. Dorn, G. H. Hanson, and B. Price (2016). Import competition and the great us employment sag of the 2000s. *Journal of Labor Economics 34*(S1), S141–S198.

Adão, R., M. Kolesár, and E. Morales (2019, 08). Shift-Share Designs: Theory and Inference*. *The Quarterly Journal of Economics 134*(4), 1949–2010.

Alesina, A. and E. L. Ferrara (2005). Preferences for redistribution in the land of opportunities. *Journal of Public Economics 89*(5), 897 – 931.

Archen, C. H. and L. M. Bartels (2012, March). Blind retrospection:why shark attacks are bad for democracy. Working paper 5-2013, Center for the Study of Democratic Institutions, Vanderbilt University.

Autor, D., D. Dorn, and G. Hanson (2016, 02). The china shock: Learning from labor market adjustment to large changes in trade. *Annual Review of Economics 8*, 205–240.

Autor, D., D. Dorn, G. Hanson, and K. Majlesi (2017, December). Importing political polarization? the electoral consequences of rising trade exposure. Working Paper 22637, National Bureau of Economic Research.

Autor, D. H., D. Dorn, and G. H. Hanson (2013, October). The china syndrome: Local labor market effects of import competition in the united states. *American Economic Review 103*(6), 2121–68.

Autor, D. H., D. Dorn, G. H. Hanson, and J. Song (2014). Trade Adjustment: Worker-Level Evidence. *The Quarterly Journal of Economics 129*(4), 1799–1860.

Bagues, M. and B. Esteve-Volart (2016). Politicians' luck of the draw: Evidence from the spanish christmas lottery. *Journal of Political Economy 124*(5), 1269–1294.

Blanchard, E. J., C. P. Bown, and D. Chor (2019, November). Did trump's trade war impact the 2018 election? Working Paper 26434, National Bureau of Economic Research.

Bloom, N., M. Draca, and J. Van Reenen (2015, 09). Trade Induced Technical Change? The Impact of Chinese Imports on Innovation, IT and Productivity. *The Review of Economic Studies 83*(1), 87–117.

Caliendo, L., M. Dvorkin, and F. Parro (2019). Trade and labor market dynamics: General equilibrium analysis of the china trade shock. *Econometrica 87*(3), 741–835.

Che, Y., Y. Lu, J. R. Pierce, P. K. Schott, and Z. Tao (2016, April). Does trade liberalization with china influence u.s. elections? Working Paper 22178, National Bureau of Economic Research.

Costa, F., J. Garred, and J. P. Pessoa (2016). Winners and losers from a commodities-for-manufactures trade boom. *Journal of International Economics 102*, 50 – 69.

Costa, F. J. M. d., A. Marcantonio Junior, and R. R. d. Castro (2018, December). Stop suffering! Economic downturns and pentecostal upsurge. FGV EPGE Economics Working Papers (Ensaios Economicos da EPGE) 804, EPGE Brazilian School of Economics and Finance - FGV EPGE (Brazil).

Cox, G. W. and J. N. Katz (1996). Why did the incumbency advantage in u.s. house elections grow? *American Journal of Political Science 40*(2), 478–497.

De Magalhaes, L. (2015). Incumbency effects in a comparative perspective: Evidence from brazilian mayoral elections. *Political Analysis 23*(1), 113–126.

Dippel, C., R. Gold, and S. Heblich (2015). Globalization and its (dis-) content: Trade shocks and voting behavior. Technical report, National Bureau of Economic Research.

Dippel, C., R. Gold, S. Heblich, and R. Pinto (2017, March). Instrumental variables and causal mechanisms: Unpacking the effect of trade on workers and voters. Working Paper 23209, National Bureau of Economic Research.

Dornelas, V. and A. B. Chimeli (2019, August). China shock: environmental impacts in Brazil. Working Papers, Department of Economics 2019-29, University of São Paulo (FEA-USP).

Erikson, R. S. (1971). The advantage of incumbency in congressional elections. *Polity 3*(3), 395–405.

Fowler, A. and A. B. Hall (2018). Do shark attacks influence presidential elections? reassessing a prominent finding on voter competence. *The Journal of Politics 80*(4), 1423–1437.

Galle, S., A. Rodríguez-Clare, and M. Yi (2017, August). Slicing the pie: Quantifying the aggregate and distributional effects of trade. Working Paper 23737, National Bureau of Economic Research.

Gelman, A. and G. King (1990, November). Estimating incumbency advantage without bias. *American Journal of Political Science 34*, 1142–1164.

Giuliano, P. and A. Spilimbergo (2013, 11). Growing up in a Recession. *The Review of Economic Studies 81*(2), 787–817.

Hacker, J. S., P. Rehm, and M. Schlesinger (2013). The insecure american: Economic experiences, financial worries, and policy attitudes. *Perspectives on Politics 11*(1), 23–49.

Iacovone, L., F. Rauch, and L. A. Winters (2013). Trade as an engine of creative destruction: Mexican experience with chinese competition. *Journal of International Economics 89*(2), 379 – 392.

Jensen, J. B., D. P. Quinn, and S. Weymouth (2017). Winners and losers in international trade: The effects on us presidential voting. *International Organization 71*(3), 423–457.

Margalit, Y. (2013). Explaining social policy preferences: Evidence from the great recession. *American Political Science Review 107*(1), 80–103.

Margalit, Y. (2019). Political responses to economic shocks. *Annual Review of Political Science 22*(1), 277–295.

Martén, L. (2019). Demand for redistribution: Individuals' responses to economic setbacks. *The Scandinavian Journal of Economics 121*(1), 225–242.

Mortatti, C. M., S. H. G. d. Miranda, and M. R. P. Bacchi (2011, 06). Determinantes do comércio Brasil-China de commodities e produtos industriais: uma aplicação VECM. *Economia Aplicada 15*, 311 – 335.

Ogeda, P. M. (2020). The effects of economic shocks on voters' political behavior. Master's thesis, FGV EESP - Escola de Economia de São Paulo.

Pierce, J. R. and P. K. Schott (2016, July). The surprisingly swift decline of us manufacturing employment. *American Economic Review 106*(7), 1632–62.

APPENDIX

Table 6 – The ten general traded good areas and matching correspondence (Appendix)

Sector j	Examples of Products
Agriculture, livestock, forest production and fishing	Meat, live animals, soya beans, corn, oil seeds
Arts, culture and sports	Music instruments, video games, sports equipment
Communication	Radio, television and communication equipment in general
Construction	Cranes, elevator, heavy machinery in general
Defense and social security	Military weapons and ammunition
Extractive industries	Petroleum, gases, stones and ores in general
Healthcare	Medical equipment
Manufacturing industries	Chemical products, textile industry and other manufactured products
Waste management and decontamination activities	Residual products in general
Transport	Vehicles parts in general, such as airplanes, railways, cars

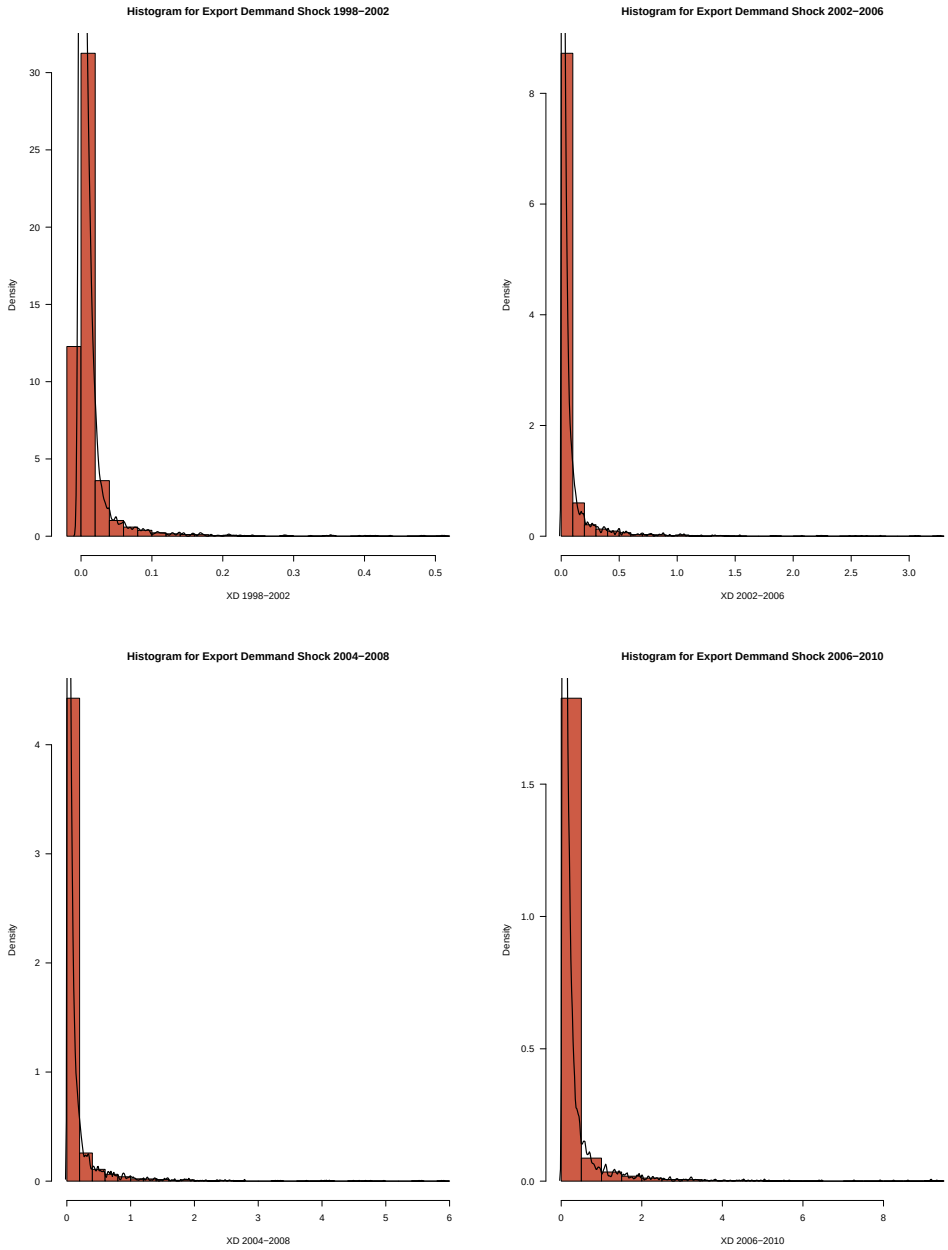
Notes: This table displays all ten sector j and some examples of products that integrate each one of them.

Table 7 – Percentage of Brazilian exports to China per sector (Appendix)

Sector j	Percentage of Brazilian Exports to China				
	2000	2004	2008	2012	2016
Agriculture, livestock, forest production, fishing and aquaculture	17.50%	22.33%	13.10%	8.42%	13.57%
Arts, culture and sports	0.02%	0.00%	0.00%	0.00%	0.01%
Communication	0.01%	0.02%	0.00%	0.00%	0.00%
Construction	0.03%	0.10%	0.14%	0.07%	0.01%
Defense and social security	0.00%	0.00%	0.00%	0.00%	0.00%
Extractive industries	42.99%	38.56%	65.80%	73.34%	61.05%
Healthcare	0.08%	0.03%	0.02%	0.11%	0.05%
Manufacturing industries	32.03%	33.02%	18.34%	14.52%	23.39%
Sewage, waste management and decontamination activities	0.00%	0.00%	0.00%	0.00%	0.00%
Transport	7.09%	5.68%	2.55%	3.52%	1.89%

Notes: This table displays the percentage of Brazilian exports to China in the years of 2000, 2004, 2008, 2012 and 2016. The numbers are approximated.

Figure 7 – Histograms for the XD variable (Appendix)



Notes: This figure displays the export demand shock variable's histograms for the political cycles of (from left to right): $1998 - 2002$, $2002 - 2006$, $2004 - 2008$ *and* $2006 - 2010$. *The graph represents the histogram of municipality-level export demand shock* (XD_m) *in thousands of US dollars per worker. Source: 2000 and 2010 Brazilian Census and BACI.*

Table 8 – Percentage of Brazilian imports from China per sector (Appendix)

Sector j	**Percentage of Brazilian Imports from China**				
	2000	2004	2008	2012	2016
Agriculture, livestock, forest production, fishing and aquaculture	2.21%	1.45%	4.46%	2.99%	5.39%
Arts, culture and sports	1.90%	0.72%	0.85%	1.15%	0.08%
Communication	4.85%	7.47%	3.42%	2.28%	1.87%
Construction	1.29%	0.11%	1.91%	3.04%	2.38%
Defense and social security	0.00%	0.00%	0.00%	0.01%	0.02%
Extractive industries	7.31%	14.09%	4.44%	0.89%	0.76%
Healthcare	0.58%	0.43%	0.90%	1.11%	1.54%
Manufacturing industries	80.32%	73.15%	80.40%	83.35%	79.73%
Sewage, waste management and decontamination activities	0.00%	0.00%	0.00%	0.00%	0.00%
Transport	1.51%	2.56%	3.60%	5.13%	7.48%

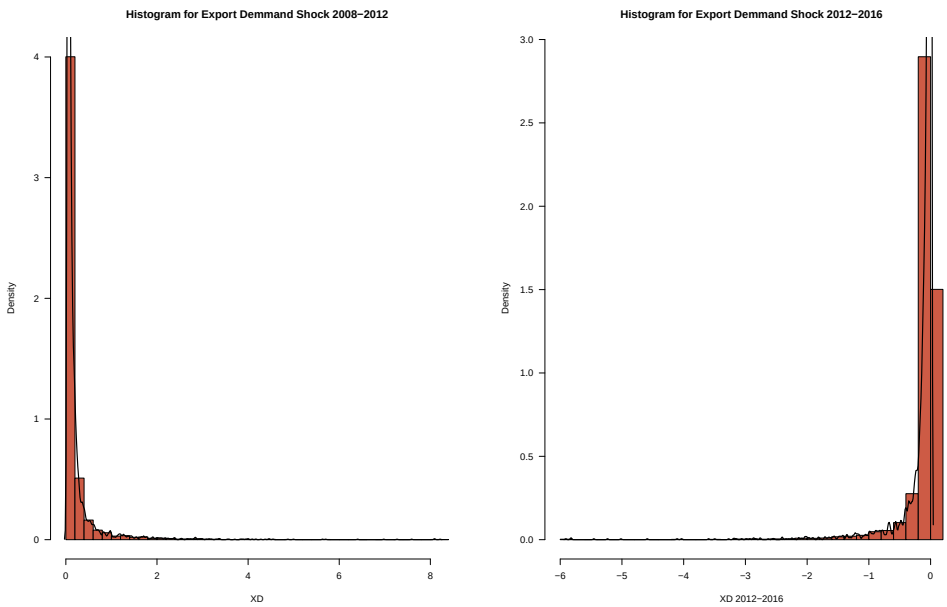
Notes: This table displays the percentage of Brazilian imports from China in the years of 2000, 2004, 2008, 2012 and 2016. The numbers are approximated.

Table 9 – PT's national coalition (Appendix)

Election	**Name of PT's National Coalition**	**Members of PT's National Coalition**
2002	*Lula Presidente*	PT, PL, PCdoB, PMN, PCB
2006	*A Força do Povo*	PT, PRB, PCdoB
2010	*Para o Brasil seguir mudando*	PT, PMDB, PDT, PCdoB, PSB, PR, PRB, PSC, PTC, PTN
2014	*Com a Força do Povo*	PT, PMDB, PSD, PP, PR, PDT, PRB, PROS, PCdoB

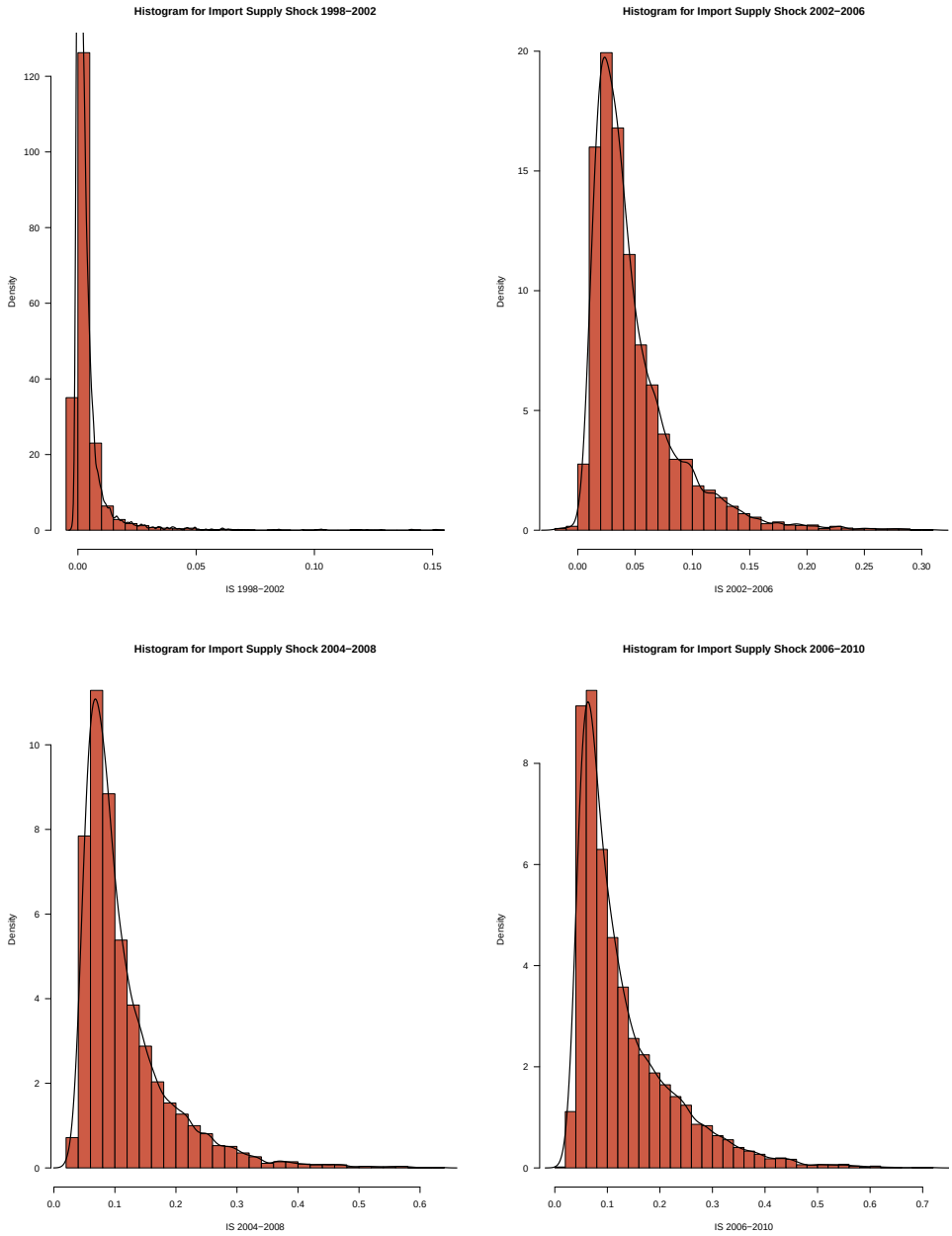
Notes: This table displays the name and the members of PT's national coalition for the presidential elections of 2002, 2006, 2010 *and* 2014.

Figure 8 – Histograms for the XD variable (Appendix)



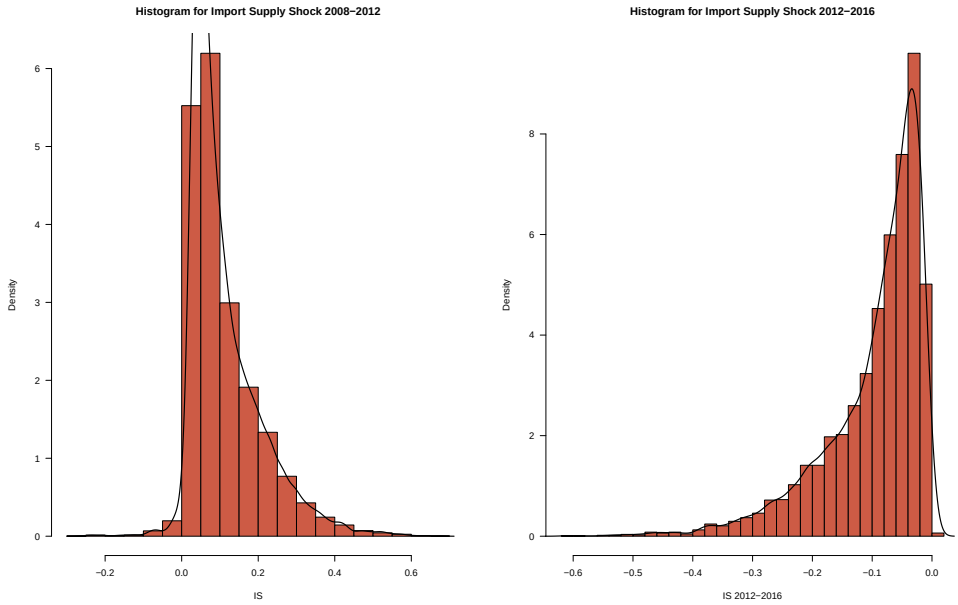
Notes: This figure displays the export demand shock variable's histograms for the political cycles of (from left to right): $2008 - 2012$, *and* $2012 - 2016$. *The graph represents the histogram of the municipality-level export demand shock* (XD_m) *in thousands of US dollars per worker. Source: 2010 Brazilian Census and BACI.*

Figure 9 – Histograms for the IS variable (Appendix)



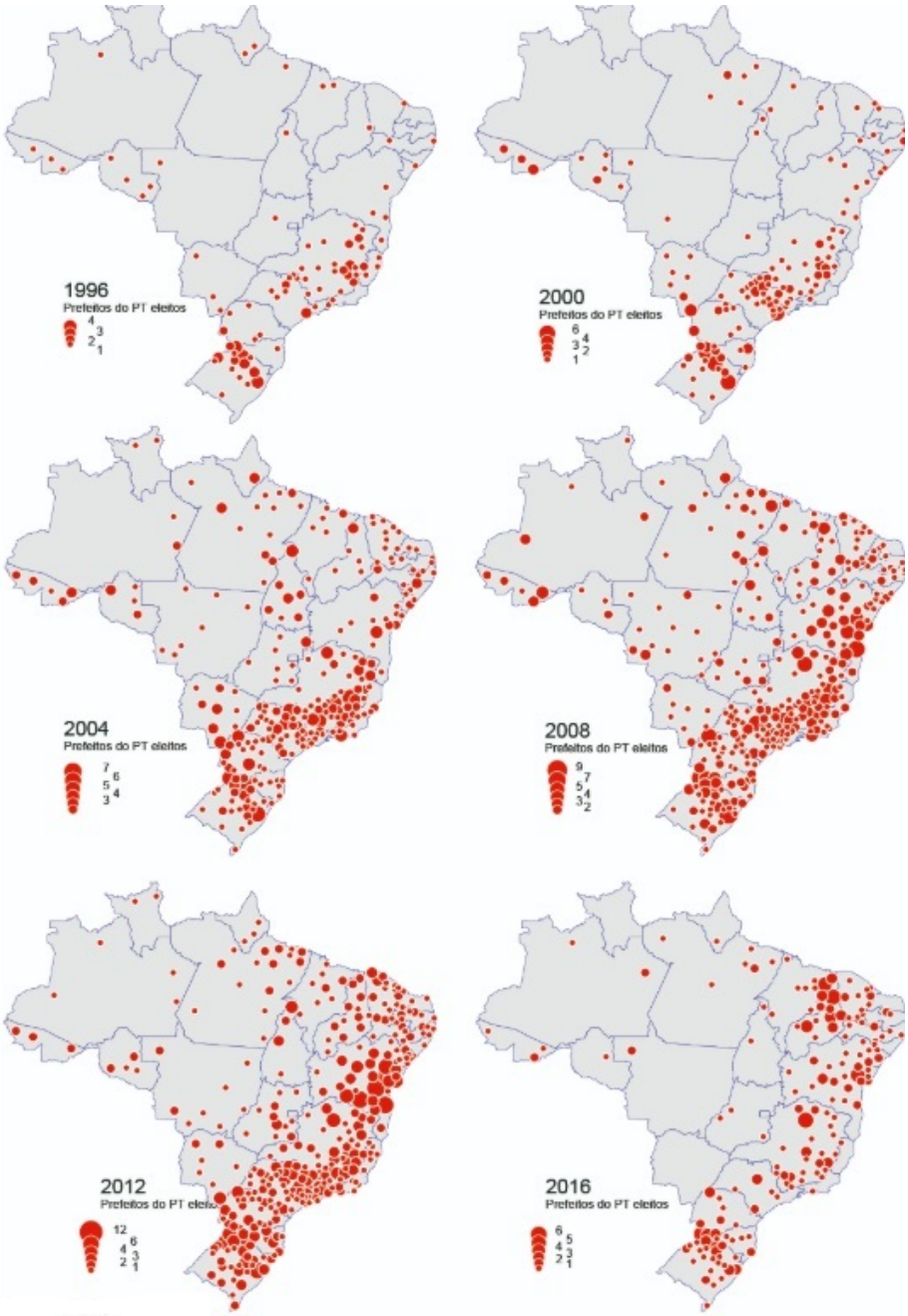
Notes: This figure displays the import supply shock variable's histograms for the political cycles of (from left to right): $1998 - 2002$, $2002 - 2006$, $2004 - 2008$, *and* $2006 - 2010$. *The graph represents the histogram of the municipality-level import supply shock* (IS_m) *in thousands of US dollars per worker. Source: 2000 and 2010 Brazilian Census and BACI.*

Figure 10 – Histograms for the IS variable (Appendix)



Notes: This figure displays the import supply shock variable's histograms for the political cycles of (from left to right): $2008 - 2012$ *and* $2012 - 2016$*. The graph represents the histogram of municipality-level import supply shock* (IS_m) *in thousands of US dollars per worker. Source: 2010 Brazilian Census and BACI.*

Figure 11 – Evolution of PT's mayors (Appendix)



Notes: This figure displays the evolution of the number of municipalities with PT's mayors in the period of interest. Bigger cycles indicates that more municipalities in that area were on PT's control. Source: Confins: Revista Franco-Brasileira de Geografia.