When Trade Discourages Political Favoritism: Evidence from China

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Abstract

In developing countries, governments often distort resource allocation by protecting politically favored firms. If trade liberalization increases the cost of protection, it may discourage political favoritism and therefore improve allocative efficiency. By studying China's WTO accession, this paper empirically investigate if trade liberalization leads to the reallocation of market shares from politically favored but less productive firms to more productive ones. We find that trade liberalization induces a 2.5 percentage points decline in the output share of state-owned enterprises and reduces the standard deviation of Chinese manufacturing firm productivity by 1.4% between 2001 and 2005. The decline in SOE output share is driven by an increase in import competition and takes place at the extensive margin and through intra-industry reallocation of production. Interestingly, the likelihood of SOE exit is linked to political affiliation instead of performance: the SOEs affiliated to county and township governments were the worst hit while those affiliated to upper layers (central, provincial, and city) of the government were largely unaffected. Our results suggest that apart from the familiar sources of gains from trade, trade could also deliver welfare gains by reducing inefficiencies arising from the political economy.

Keywords: Trade liberalization; WTO; Difference-in-differences; State-owned enterprises; Gains from trade; Market distortion

JEL Codes: F14, O53, P31, P33

1 Introduction

Since Adam Smith and David Ricardo, economists have espoused the benefits of free trade. A brief aberration occurred in the late 1970s and early 1980s, when the New Trade Theory shows that in a world with market imperfections, trade barriers could in fact increase national welfare (e.g., Brander and Spencer 1982; Krugman 1982; Dixit 1984). However, as new research uncovers heretofore overlooked sources of gains from trade in recent years, there is a growing realization that the welfare gains from trade might have been underestimated after all (e.g., Melitz 2003; Lileeva and Trefler 2010; Melitz and Redding 2014).[1]

One previously overlooked source of trade gains is the increase in overall productivity when trade liberalization induces a reallocation of resources from less productive to more productive firms (Melitz, 2003; Melitz and Ottaviano, 2008). This channel through which trade enriches a nation appears to be particularly relevant to developing economies, where firms differ in productivities more than their counterparts in the developed world and there exists considerable room to improve allocative efficiency (Hsieh and Klenow, 2009; Pages, 2010). One factor that contributes to the greater dispersion of productivity in developing countries is government protection of inefficient firms. For instance, it is well-documented that state-owned enterprises (SOEs) in China enjoy favorable access to resources such as cheap credit and land,[2] even though they are less efficient than non-SOEs.[3] If the government displays favoritism toward some firms over others before trade liberalization, the cost of providing such support may increase when trade liberalization induces more market competition. Any subsequent withdrawal of political favoritism would improve resource allocation and generate producitivity gains. In this paper, we empirically investigate if there exist such gains from trade (generated through reducing political economy inefficiencies) by studying China's accession to the World Trade Organization. We examine if the event reduces the market share of the inefficient but politically favored SOEs.

Our analysis is based primarily upon the 1998–2005 Annual Survey of Industrial Firms (ASIF), the most comprehensive firm-level data in China. Replicating the strategy in Topalova (2007), we use China's accession to the WTO in December 2001 to conduct a difference-in-differences (DD) analysis on Chinese cities: our identification strategy exploits variations in city-level industrial composition, which generated differential trade shocks

[1] See Melitz and Trefler (2012) for a review.

[2] According to Liu and Zhou (2011), large and medium-sized non-SOEs face an average interest rate that is 6 percentage points higher than SOEs of corresponding size, whereas the average interest rate of small non-SOEs is 9 percentage points more than that of small SOEs.

[3] According to the Chinese Statistical Yearbook, the ROA of industrial SOEs was 3.0% in 2002, while the ROAs of foreign invested firms and domestic non-SOEs were 6.0% and 5.6% respectively. See also World Bank and Development Research Center of the State Council, P.R.C. (2012, chapter 3).

across cities after tariffs were lowered. This allows us to compare the SOE output and employment shares in cities that experienced larger degrees of trade liberalization with those that experienced smaller degrees of trade liberalization before and after China's WTO accession.

We find that trade liberalization significantly reduced both the output and employment shares of SOEs. In our preferred specification, trade liberalization induced a 2.48 percentage points decline in SOE output share between 2001 and 2005, or 16.4% of the actual decline observed during this period.[4] Based on the efficiency gain estimates calculated by Hsieh and Klenow (2009), we infer that trade liberalization through the WTO accession reduced the standard deviation of manufacturing firm productivity in China by 1.41%. While this reduction may appear modest, it is an additional welfare gain on top and above the traditional gains of trade arising from country differences and comparative advantage.

What drove the post-WTO accession contraction of SOE output and employment shares? Further investigation indicates that it was mainly driven by an increase in import competition instead of improved access to export markets or cheaper imported intermediate inputs. In addition, the contraction took place across a variety of industries and was not confined to the industries initially dominated by SOEs. Finally, like Brandt, Van Biesebroeck, Wang, and Zhang (2012), we find that the contraction occurred at the extensive margin (i.e., due to exit) instead of the intensive margin (i.e., due to surviving SOEs losing output share).

Interestingly, we find that SOEs affiliated to county and township governments were more likely to exit after China's WTO accession, while SOEs affiliated with higher levels of government (central, provincial, and city) were largely unaffected. In other words, the SOEs that exited the market after December 2001 were not the least productive ones—as existing theoretical models such as Melitz and Ottaviano (2008) would have predicted—but those with the weakest political backing. Since the fiscal health of higher level Chinese governments were far superior to that of the counties and townships,[5] this finding provides further evidence that the increased cost of supporting inefficient firms after China entered the WTO contributed to the observed decline in SOE output and employment shares. It also suggests that while trade liberalization induces productivity gains by making government support of inefficient firms more costly, such gains are made at the margin and some inefficiency is likely to persist as long as the government has the financial ability and political will to continue

[4]The city-level average output share of Chinese SOEs fell from 29.55% in 2001 to 14.42% in 2005. Besides trade liberalization, other factors that contributed to this decline include SOE reform and the relaxation of FDI regulations. See Section 3 for a detailed discussion.

[5]Local governments in China shoulder 80% of all public expenditure responsibilities but receive only 40% of the tax revenues (World Bank and Development Research Center of the State Council, P.R.C., 2012, Figure 0.8).

providing support.

Our work is related to several strands of the literature. First, there is a recent revival of interest in the sources and magnitude of gains from trade. In a much cited paper, Arkolakis, Costinot, and Rodríguez-Clare (2012) show that for a variety of trade models which satisfy the constant elasticity of substitution (CES) restriction, the gains from trade can be pinned down by two parameters: the share of expenditure on domestic goods (λ) and the elasticity of imports with respect to variable trade costs (ε). An implication of this result is that the gains from trade may be modest. Indeed, Eaton and Kortum (2002) estimate that the US would suffer a welfare loss of only 0.8% if it moves to autarky in manufactures. More recent studies have focussed on examining the pro-competitive effects of trade which are overlooked under the the CES restriction (e.g., de Blas and Russ 2010; Arkolakis, Costinot, Donaldson, and Rodríguez-Clare 2012; Edmond, Midrigan, and Xu 2012; Holmes, Hsu, and Lee 2013) and our paper is an effort in this direction.

Our paper also makes contact with studies that investigate the mitigating effect of trade on export distortions (Khandelwal, Schott, and Wei, 2013), tax distortions (e.g., Konan and Maskus 2000), and labor market distortions (e.g. Krishna, Yavas, and Mukhopadhyay 2005 and Krishna and Yavas 2005). In particular, Khandelwal, Schott, and Wei (2013) find that upon the expiration of the Multifiber Arrangement (MFA) in 2005, new entrants in China—most of them non-SOEs—drove up the volume of Chinese textile and clothing exports while driving down their prices. According to their structural estimation, an improved allocation of export quotas accounts for 71% of China's overall gains from the expiration of MFA.

There is a growing literature looking at China's accession to the WTO and these studies overwhelmingly indicate that the benefits of WTO membership are positive for China. Chen, Ma, and Xu (2014) propose a generalized trade restrictiveness index and use it to confirm the WTO's effectiveness in removing tariff barriers in China, while Yu (2014) detects a positive impact of WTO-associated tariff reduction on the productivity of Chinese firms. Brandt, Van Biesebroeck, and Zhang (2012) document that between 1998 and 2007, the productivity of incumbent firms grew at a weighted average of 2.9%–8.0% annually. Exploring sectoral variations in tariff reduction upon the WTO accession, Brandt, Van Biesebroeck, Wang, and Zhang (2012) show that trade liberalization reduces firm prices and markups. Fan, Li, and Yeaple (2013) find that WTO accession led to an improvement in the quality of Chinese exports. According to Han, Liu, and Zhang (2012), China's WTO accession significantly increased its wage inequality but much of this effect was due to an increase in returns to education. Using cross-sectional and panel data, Lan and Li (2013) show that trade weakens nationalism in China.

Finally, our study contributes to the literature on SOEs in China. Song, Storesletten, and Zilibotti (2011) show that the presence of inefficient but politically favored SOEs helps create the puzzling coexistence of high returns on capital and a growing foreign surplus in China. Du, Lu, Tao, and Yu (2014) argue that SOEs are costly to the Chinese economy in at least two dimensions: not only do they have lower production efficiency, they also possess higher market power than non-SOEs. Li, Liu, and Wang (2012) find that the improved performance of SOEs in recent years is not driven by a genuine improvement in efficiency but by the consolidation of a vertical industry structure whereby the SOEs monopolize key upstream industries while the non-SOEs compete in downstream industries. Likewise, Tang, Wang, and Wang (2014) show that SOEs register significantly higher ratios of domestic value added in exports than foreign invested firms and large domestic non-SOEs and they attribute this finding to the vertical industry structure in China.

The rest of the paper is organized as follows. Section 2 discusses our estimation strategy in detail. In Section 3, we present our empirical findings and conduct robustness checks. Section 4 concludes.

2 Estimation Strategy

2.1 China's WTO Accession

In July 1986, China notified the GATT (the predecessor of the WTO) that it would like to resume its status as a GATT contracting party. Between 1987 and 1992, as China was debating the direction of its economic reform domestically, the return to GATT was suspended. The momentum resumed after Deng Xiaoping's southern tour speech in 1992, and in July 1995, China officially filed its application to join the WTO.

The pivotal part of China's WTO accession process involved bilateral negotiations between China and the existing members of the WTO. The first country that signed a bilateral WTO accession agreement with China was New Zealand (in August 1997) . The negotiation between China and the U.S. was the toughest. It took the two countries four years and 25 rounds of negotiation before an agreement was reached in November 1999. Subsequently, China reached agreements with 19 countries within half a year, including Canada in November 1999 and the European Union in May 2000. In September 2001, China concluded the agreement with Mexico, which marked the completion of negotiations with all WTO member countries. Finally, the WTO's Ministerial Conference approved by consensus the text of the agreement for China's entry into the WTO on November 10, 2001.

To illustrate its commitment to join the WTO, China cut tariffs substantially between 1992 and 1997. In 1992, China's (un-weighted) average tariff rate was as high as 42.9%.

Shortly after the GATT Uruguay round negotiations, China lowered tariffs from an average rate of 35% in 1994 to 17% in 1997. Tariff rates remained stable after 1997 until China officially joined the WTO on December 11, 2001. From 2002 onward, China took steps to fulfil her tariff reduction responsibility as a WTO member country. According to the accession agreement, China would fulfil its promised tariff cuts by 2004 (with a few exceptions to be completed by 2010) and the average tariff rates for agricultural and manufacturing products would be reduced to 15% and 8.9% respectively.

Figure 1 plots China's (un-weighted) average tariffs for the period 1996–2007. It shows that the tariff rates experienced a substantial drop in 1996. This was followed by a relatively stable period between 1997 and 2001 and another round of gradual cuts in 2002, before a steady state was reached in 2005. The un-weighted average tariff rate dropped from 15.3% in 2001 to 12.3% in 2004 while the weighted average tariff rate fell from 9.1% to 6.4%.

Furthermore, the dispersion of tariffs was significantly reduced after China's WTO accession. As shown in Figure 1, the ratio of tariffs at the 25th percentile over those at the 75th percentile experienced a sharp drop in 2002 and stabilized only after 2005. In Figure 2, we plot the relationship between tariff rates in 2001 and tariff rate changes between 2001 and 2005 across 3-digit industries (the unit which we use to construct the city-level exposure to trade liberalization; see Section 2.3 for details).[6] We observe a strong, positive correlation, implying that industries with higher tariffs before China's WTO accession experienced more tariff reduction after that. This is perhaps unsurprising since China was free to set different tariffs for different industries before 2001 and this freedom was lost when it became a WTO member and had to reduce tariff rates to the WTO-determined levels which are relatively uniform across products.

2.2 Data

The main dataset used in this study comes from the Annual Survey of Industrial Firms (ASIF), conducted by the National Bureau of Statistics (NBS) of China for the period of 1998–2005. It is the most comprehensive firm-level dataset in China.[7] The data contain all state-owned enterprises (SOEs) and non-SOEs with annual sales of five million RMB (around US$600,000) or more. The number of firms varies from over 140,000 in the late 1990s to

[6] We find similar patterns at the HS-6 product level (results available upon request).

[7] This dataset is noted for its representativeness because the firms sampled contribute the bulk of China's industrial value-added output. The dataset is used to calculate key national income accounting metrics (e.g., GDP) and other statistics published in China's official statistical yearbooks. This dataset is found to be reasonably accurate and reliable due to strict double-checking procedures in the data collection process (Cai and Liu, 2009). Thus, it has been widely used by economic researchers in recent years (Bai, Lu, and Tao 2009; Cai and Liu 2009; Lu, Lu, and Tao 2010; Brandt, Van Biesebroeck, and Zhang 2012).

over 243,000 in 2005, spanning all 31 provinces or province-level municipalities (covering 344 cities and 2,829 counties) and all manufacturing industries (29 two-digit, 164 three-digit and 464 four-digit industries).[8] The dataset provides detailed firm-level information, including firm name, industry affiliation, location, and all operation and performance items reported in accounting statements such as age, employment, capital, intermediate inputs, and ownership.

Our outcome variable concerns the comparative performance of SOEs and non-SOEs, which requires us to first identify SOEs in our sample. In the benchmark analysis, we follow the official definition of SOEs in the data. Specifically, according to the NBS categorization, SOEs correspond to three specific registered ownership types in our data: (a) code 110, state-owned enterprises; (b) code 141, state-associated enterprises; and (c) code 151, enterprise solely funded by the state. As a robustness check (Appendix Table, Column 1), we use an alternative definition of SOEs proposed by Hsieh and Song (2013), who classify a firm as a SOE if it satisfies one of the two following conditions: (a) the registered capital held directly by the state exceeds 50%; or (b) the ASIF data identifies the state as the controlling shareholder of the firm.

The dataset of Chinese tariffs is downloaded from the WTO website. Specifically, we use the *Tariff Download Facility* to obtain the standardized tariff statistics. For each product defined at the HS-6 digit level, the tariff data provide detailed information including the number of tariff lines, the average, minimum, and maximum ad valorem tariff duties. The tariff data is available for 1996, 1997 and 2001 (latest). As the WTO website does not provide tariff information for 1998–2000, we use the World Integrated Trade Solution website maintained by the World Bank to fill the void. Meanwhile, as different HS codes are used before and after 2002, we match the 1996 HS codes (used in the 1997–2001 tariff schedules) to the 2002 HS codes (used in the 2001–2006 tariff schedules) using the standard HS concordance table. Furthermore, as the ASIF data is classified at the industry-level, we need to aggregate tariffs from the HS-product level to the industry-level. To this end, we first match the HS classification to the Chinese Industrial Classification (CIC) using the concordance table from the National Bureau of Statistics of China.[9] Subsequently, we calculate the simple average tariff for each industry and each year.

[8] During the period sampled, there were some adjustments in China's administrative boundaries. In some cases, new counties were established. In others, existing counties were merged to form larger counties or cities. To maintain consistency in our coding of cities and counties, we use the 1999 National Standard (promulgated at the end of 1998 and known as the GB/T 2260-1999) as the benchmark codes and convert the regional codes of all firms to these benchmark codes. Separately, in 2003 a new classification system for industry codes (GB/T 4754-2002) replaced the old classification system (GB/T 4754-1994) in use from 1995 to 2002. To maintain consistency in our coding of industries for the entire period sampled (1998–2005), we convert the industry codes in the 1998–2002 data to the new classification system.

[9] We thank Yifan Zhang for sharing this concordance table.

Finally, in some parts of our analysis, we include several city-level characteristics based on the Chinese City Statistical Yearbook (multiple years). These variables include GDP, population, government consumption, vegetable consumption, dairy consumption, number of telephones, and number of colleges.

2.3 Estimation Specification

To examine the differential impacts of trade liberalization on SOEs and non-SOEs, we follow the locality-event difference-in-differences (DD) approach devised by Topalova (2007).[10] Specifically, because the geographic location of industrial activities varied across Chinese cities before China's WTO accession, the sudden tariff reduction upon accession generates differential impacts on the cities. This allows us to identify the effect of trade liberalization on SOEs.

We conduct the analysis at the city-level instead of the industry-level for two reasons. First, generally speaking, SOEs in China are affiliated to territorial administrative units (i.e. center, province, city, county, or township) instead of functional units (i.e. by ministry or industry). Second, a city-level analysis allows us to capture the general equilibrium effect of trade liberalization on SOEs activities, for example, trade liberalization may affect prices of local tradable and non-tradable goods as well as local wages and employment rates. In the latter part of the paper, we will look at whether the effect of trade liberalization comes from within-industry reallocation (i.e., a decline of SOEs activities within an industry) or cross-industry reallocation (i.e., a contraction of SOE-dominated industries relative to industries with smaller SOE presence).

The specification of our DD estimation is

$$y_{ct} = \alpha_c + \beta Tariff_{ct} + \mathbf{X}'_{ct}\gamma + (\mathbf{Z}_{i2001} \cdot Post02_t)' \cdot \theta + \lambda_{pt} + \varepsilon_{ct}, \tag{1}$$

where c and t represent city and year, respectively; and ε_{ct} is the error term. To deal with potential heteroskedasticity and serial autocorrelation, we cluster the standard errors at the city level (as recommended in Bertrand, Duflo, and Mullainathan 2004).[11]

α_c is the city fixed effect, controlling for all time-invariant differences across cities; λ_{pt} is the province-year fixed effect, controlling for all yearly shocks common to cities (such as busi-

[10] For studies applying this identification strategy, see Hasan, Mitra, and Ural (2007); Edmonds, Pavcnik, and Topalova (2010); McLaren and Hakobyan (2010); Topalova (2010); McCaig (2011); Hasan, Mitra, Ranjan, and Ahsan (2012); Autor, Dorn, and Hanson (2013). See Kovak (2013) for a micro-foundation of this identification strategy.

[11] We also use another approach devised by Bertrand, Duflo, and Mullainathan (2004), where we collapse the panel structure into two periods (i.e., one before and the other after China's WTO accession), and use the White-robust standard errors. We obtain similar results (see Appendix Table, Column 2).

ness cycles, macro policies, etc) and all provincial heterogeneity (including all time-invariant and time-varying characteristics); and $\mathbf{X}_{ct}$ is a vector of time-varying city characteristics (including GDP per capita and the share of government consumption) that are potentially correlated with both our outcome variable and the regressor of interest and are thus included to isolate the trade liberalization effect.

Our outcome variable, y_{ct}, measures the share of SOEs in city c at year t. In the benchmark analysis, we focus on the output share of SOEs over all firms instead of the employment share due to labor hoarding issues in SOEs. Nonetheless, using employment share as the outcome variable generates similar results (see Appendix Table, Column 3). There are three potential concerns with the SOE share measurement and it is worthwhile to discuss them upfront. First, the ASIF data is truncated as small non-SOEs (i.e., those with annual sales below 5 million RMB) are not sampled. Hence, if trade liberalization results in both small SOEs and non-SOEs exiting the market, we would mistakenly detect a stronger trade effect on SOEs than on non-SOEs due to the truncation nature of data. To address this measurement concern, as a robustness check we exclude SOEs with annual sales below 5 million RMB in our outcome variable (see Appendix Table, Column 4). Second, when calculating the output share of SOEs, we average over all firms including SOEs, domestic non-SOEs, and foreign-invested firms. It is possible that an observed fall in the output share of SOEs could be driven by a surge in the sales of foreign firms that is not at the expense of the SOEs. To address this potential concern, we conduct a robustness check that excludes the sales from foreign firms when calculating the output share of SOEs (see Appendix Table, Column 5). Third, when calculating the output share, we include output sold in the domestic market as well as output sold overseas. To the extent that tariff reduction affects mostly domestic competition, one may be concerned that the inclusion of foreign sales may potentially bias our results. As a robustness check, we exclude foreign sales in our outcome variable (see Appendix Table, Column 6).

The regressor of interest, $Tariff_{ct}$, captures the city-level exposure to trade liberalization. Specifically, it is measured as

$$Tariff_{ct} = \frac{\sum_i Output_{ic2001} \times Tariff_{i2001} \times Post02_t}{\sum_i Output_{ic2001}}, \tag{2}$$

where i represents the manufacturing industry; $Output_{ic2001}$ is the total output of industry i in city c in 2001; $Tariff_{i2001}$ is the import tariff rate of industry i in 2001; and $Post02_t$ indicates the period when China becomes a WTO member, taking the value of 1 for year 2002 or after, and 0 otherwise. As a robustness check, we replace $Tariff_{i2001}$ with the average tariff rate of industry i in 1997–2001 (i.e., $Tariff_{i1997-2001}$) and find similar results (see Appendix Table, Column 7).

There are two issues about our tariff measurement worth pointing out upfront. First, we use the interaction of tariffs in 2001 ($Tariff_{i2001}$) and the post-WTO accession indicator ($Post02_t$) instead of yearly tariffs ($Tariff_{it}$) as used in Topalova (2007) for three reasons: (a) since China released its schedule of tariff reduction upon WTO accession in 2002 and firms could exploit this information, $Tariff_{it}$ is less exogenous than $Tariff_{i2001} \times Post02_t$; (b) since industries with higher tariffs in 2001 experienced more tariff reduction upon WTO accession (as illustrated in Figure 2), $Tariff_{i2001} \times Post02_t$ allows us to capture the effects of differential tariff reductions; and (c) as elaborated in Liu and Trefler (2011), using the interaction between $Tariff_{i2001}$ and $Post02_t$ allows us to capture not only the realized effects of trade liberalization across the period of study, but also the effects of unrealized (but anticipated) tariff cuts scheduled to be phased out after 2005. This helps to ensure that we are not overestimating the effects of trade liberalization. Second, following Topalova (2007), we ignore the nontraded sectors when calculating city-level tariffs. Kovak (2013) gives a justification of using such nonscaled tariff measurement; it avoids the estimation bias coming from the assumption that nontraded prices are unaffected by trade liberalization.

$\mathbf{Z}_{c2001}$ represents determinants of the geographic distribution of industrial activities across Chinese cities in 2001. It is interacted with the post-WTO accession indicator ($Post02_t$) to control for the differential effects of these potential pre-existing differences between treatment and control groups on the SOE share (for a similar practice, see Gentzkow 2006). Ellison and Glaeser (1999) have characterized a list of determinants of geographic concentration, and we follow their approach closely by locating all determinants that they identified and are available in the Chinese City Statistical Yearbook. Specifically, we use the number of dairy consumption per capita, the number of vegetable consumption per capita, the number of telephones, and the number of universities in 2001 and measured in the logarithm form (except for the number of universities as many cities have no universities). Furthermore, we categorize cities into Northern cities (vs. Southern cities), coastal cities (vs. inland cities), and mountain cities (vs. plain cities) to control for any differential geographic impacts. In addition, we also include city-specific linear time trend (i.e., $\alpha_c \cdot t$) as a regressor to control for the underlying differences between our treatment and control groups in a restricted way, that is, under the assumption that these pre-existing city-level differences affect our outcome variable linearly with time.

We estimate equation (1) using first differences, which removes the city fixed effect and reduces the degree of serial autocorrelation, i.e., we estimate

$$\Delta y_{ct} = \beta \Delta Tariff_{ct} + \Delta \mathbf{X}'_{ct}\gamma + \Delta \left(\mathbf{Z}_{i2001} \cdot Post02_t\right)' \cdot \theta + \lambda_{pt} + \Delta\varepsilon_{ct}, \tag{3}$$

where Δ is the first-differenced operator, e.g., $\Delta y_{ct} = y_{ct} - y_{ct-1}$.

In addition, to provide further support on the validity of our DD specification, we conduct several robustness checks: the addition of controls for the geographic distribution of industrial activities; a flexible estimation to examine whether the treatment and control groups were comparable until the time of WTO accession; the addition of controls for other on-going policy reforms in the early 2000s (i.e., the SOE reform and the relaxation of FDI regulations); a placebo test using only the pre-WTO accession period data as in Topalova (2010); and a placebo test using the sample of pure exporters (those that exported 100% of their output and were therefore unaffected by tariff reduction). For details, see Sections 3.2.

3 Empirical Findings

The regression results of the DD specification (3) are reported in Column 1 of Table 1. We find that the coefficient estimate of our regressor of interest, $Tariff_{ct}$, is negative and statistically significant, suggesting that cities with higher effective tariffs in 2001 experienced a larger decline of SOE output share after 2002 than those with lower effective tariffs. Given that cities with higher tariffs in 2001 experienced more tariff reduction after 2002, these results imply that trade liberalization reduces SOEs activities.

3.1 Magnitude and Gains Calculation

To gauge the economic magnitude of our estimates, we conduct the following exercise. The mean values of city-level tariffs in 2001 and 2005 are 17.83% and 9.66% respectively. Hence, the predicted change in SOE output share from 2001 to 2005 is $-(17.83\% - 9.66\%) * 0.304 = -2.48\%$, where 0.304 is the coefficient estimate of interest (Table 1 column 2). Meanwhile, during the 2001–2005 period, the actual mean value of SOE output share fell from 29.55% to 14.42%. Hence, trade liberalization can account for $2.48\%/(29.55\% - 14.42\%) = 16.42\%$ of the total change in SOE output share.

Next, we employ the methodology developed by Hsieh and Klenow (2009) using the dispersion of revenue-based TFP as a proxy to capture market distortion. Applying the method to the ASIF data (the same data as ours), they find that the standard deviation of revenue-based TFP in China in 2001 is 0.68. We replicate their estimation specification at the city-level (instead of the industry-level) and find that every 1% decrease in the SOE output share is associated with a 0.57% decrease in the standard deviation of revenue-based TFP.

Since the reduction of tariffs from 2001 to 2005 led to a reduction of the SOE output share by 2.48%, we can infer that the standard deviation of revenue-based TFP is reduced by $2.48\% * 0.57 = 1.41\%$. In other words, the WTO-induced trade liberalization contributes to 1.41% reduction in allocative inefficiency.

3.2 Robustness Checks

In this sub-section, we report results of a battery of robustness checks on our aforementioned DD estimation.

Control for geographic distribution of industrial activities. One potential concern of our DD estimation is that the geographic distribution of industrial activities across Chinese cities in 2001 may not be random. If this is true, cities with different industrial structures (and hence facing different effective tariffs) might be systematically different before WTO accession and such pre-existing differences may generate the spurious negative relationship between trade liberalization and SOE output share in the post-WTO accession period. To address this concern, in Column 2 of Table 1, we include an interaction term comprising the post-WTO accession period indicator and the determinants of geographic concentration identified by Ellison and Glaeser (1999) where data are available. The coefficient estimate of our regressor of interest remains negative and statistically significant. In fact, the magnitude and statistical significance both increase, suggesting that any bias caused by these pre-existing differences has led to an underestimation of the effect of trade liberalization.

Flexible estimation of treatment effect parameters. To check the comparability between our treatment and control groups, we conduct a flexible estimation specification, that is, we replace the post-WTO accession period indicator ($Post02_t$) in the construction of city-level tariff variable with year dummies (λ_t), so that the regressor of interest becomes $\textbf{FlxTariff}_{ct} = \frac{\sum_i Output_{ic2001} \times Tariff_{i2001}}{\sum_i Output_{ic2001}} \times \lambda_t$. Figure 3 plots the estimated coefficients as well as the 95% confidence intervals from this exercise. It shows that in the pre-WTO accession period (1998–2001), our treatment and control groups have comparable time trends, as the coefficients stay relatively constant over time. This alleviates any concern that our treatment and control groups are *ex ante* incomparable and lends support to our DD identifying assumption. Meanwhile, there is a visible divergence between the two groups in their SOE output share trends after 2002, when China took steps to reduce its tariffs to honor its obligations to the WTO. The consistency in timing suggests that trade liberalization reduces the output share of SOEs.

City-specific linear time trend. Although we have controlled for the post-WTO accession time trend of SOE output share generated by the pre-WTO accession determinants of geographic concentration, one may still be concerned over some unobserved city characteristics omitted from the equation, which could compromise the comparability between our treatment and control groups. To check whether our estimates are biased due to these unobserved city factors, we include the city-specific linear time trend, i.e., $\alpha_c \cdot t$ (in the first-differenced equation, $\alpha_c \cdot t$ collapes to α_c, i.e. the city fixed effects). This additional control would allow us to control for all unobserved city characteristics if these characteristics affect our outcome variable in the specification of a linear time trend. Regression results are reported in Column 1 of Table 2. Our regressor of interest remains negative and statistically significant, implying that our estimates are not driven by unobserved underlying city characteristics.

Control for other policy reforms. China adopted several reforms that overlapped with its WTO accession. First, in the early 2000s, it lifted some restrictions on FDI by increasing the number of industries that FDI is permitted and relaxing the constraints on local ownership requirement. To control for this reform, we add the number of foreign-invested firms (in logarithm) as a regressor in Column 2 of Table 2. Our trade liberalization effect remains robust.

Second, China initiated a round of SOE reform in the late 1990s, which was still ongoing in the early 2000s. To control for this, we conduct three exercises. First, we include the percentage of SOEs that were being privatized as an additional control in Column 3 of Table 2, and find that our findings remain robust. Second, we focus on a sub-sample of firms that did not experience a change in ownership status (i.e., they were either SOEs or non-SOEs throughout the period we study). We obtain similar results (reported in Column 4 of Table 2). Finally, we use the degree of privatization as the outcome variable in Column 5 of Table 2 and find that it is barely affected by trade liberalization.

Placebo test I: Pre-WTO accession period. As the first placebo test, we follow Topalova (2010) in looking at the effect of tariff changes on the SOE output share in the pre-WTO accession period (i.e., 1998–2001). Since the tariff schedule did not change significantly during this period, we expect a muted effect; otherwise, it may indicate the existence of some underlying confounding factors. As shown in Column 6 of Table 2, we indeed find that tariff changes have no significant effect on the SOE output share in the pre-WTO accession period.

Placebo test II: Sub-sample of pure exporters. In our data, there are firms exporting 100% of their outputs. Since these pure exporters are not affected by domestic competition, tariff reduction upon WTO accession shall have a limited effect on them. We report the regression results in Column 7 of Table 2. As expected, we find that the coefficient of $Tariff_{ct}$ is highly insignificant.

4 Mechanism

In the previous section, we establish that trade liberalization (induced by accession to the WTO) substantially reduced the output and employment shares of SOEs in China. To shed light on the underlying mechanisms, we first examine whether the effect of trade liberalization comes from the import competition channel, the exporting market access channel, or the imported intermediate inputs channel. Next, we investigate whether the decline in SOE activities is due to within-industry reallocation (i.e., decline of SOE output share within each industry) or cross-industry reallocation (i.e., the shrinkage of SOE-dominated industries). We then decompose the trade effect into the extensive (i.e., entry and exit) and intensive (i.e., output changes of surviving firms) margins. Finally, we investigate whether and how different SOEs respond to trade liberalization differently.

4.1 Import Competition, Export Market Access, Imported Inputs

The WTO pursues a multilateral and multidimensional agenda. As such, China's accession to the WTO involved not only China reducing its tariffs on manufactured imports, but also existing WTO member countries lowering their tariffs on Chinese exports. Furthermore, Chinese firms may also gain access to cheaper international inputs (see, e.g., Goldberg, Khandelwal, Pavcnik, and Topalova 2010). If China's export tariffs and input tariffs are perfectly correlated with its import tariffs (our regressor of interest), our aforementioned results should be interpreted as a general WTO effect instead of an import competition effect.

To differentiate these three channels (namely, increased import competition, better access to export markets, and cheaper imported intermediate inputs), we add as regressors China's export tariffs and input tariffs. Specifically, we measure the city-level exposure to export market by

$$Export\ Tariff_{ct}^{export} = \frac{\sum_i Output_{ic2001} \times Tariff_{i2001}^{external} \times Post02_t}{\sum_i Output_{ic2001}}, \tag{4}$$

where $Tariff_{i2001}^{external} = \sum_f Tariff_{fi2001} \times \frac{export_{fi2001}}{export_{i2001}}$; $Tariff_{fi2001}$ is foreign country f's tariffs on Chinese imports of industry i in 2001; $export_{fi2001}$ is Chinese total exports of industry i to foreign country f in 2001; and $export_{i2001}$ is Chinese total exports of industry i at 2001. Meanwhile, we measure the city-level exposure to imported intermediate inputs by

$$Input\ Tariff_{ct}^{input} = \frac{\sum_i Output_{ic2001} \times Tariff_{i2001}^{input} \times Post02_t}{\sum_i Output_{ic2001}}, \tag{5}$$

where $Tariff^{input}_{i2001} = \sum_k Tariff_{k2001} \times \omega_{ki}$ and ω_{ki} is the share of inputs from industry k used by industry i, based on the 1997 Chinese input-output table.

The regression results are reported in Columns 1-3 of Table 3. We find that neither export tariffs nor input tariffs are statistically significant. Furthermore, their magnitudes are very small, indicating that these two channels do not play important roles in our setting. Meanwhile, our main findings on the import tariffs remain robust to the addition of these controls, lending support to the argument of import competition.

As an additional check, we also investigate whether cities that experienced greater reductions in import tariffs also witnessed a larger increase in imports. Because many cities in our dataset report zero import values, to deal with potential estimation bias or sample selection bias, we use the Poisson pseudo maximum likelihood estimation devised by Silva and Tenreyro (2006). Specifically, we regress the level of imports on our regressor of interest (i.e., $Tariff_{ct}$) along with a set of city and year dummies and other time-varying controls using the Poisson estimation. The regression results are reported in Column 4 of Table 3. We find that imports increased in cities experiencing more tariff reduction, which supports the import competition argument.

4.2 Intra- vs. Inter-Industry Reallocation

The intensification of import competition may lead to a decline of SOE share within each industry (intra-industry reallocation) or a shrinkage of industries that are dominated by SOEs (inter-industry reallocation). Both effects would cause a decline of SOE share at the city level. In other words, our outcome variable, the change in output share of SOEs in city c at time t (y_{ct}), can be decomposed as

$$\begin{aligned}\Delta y_{ct} &= \sum_i \left(\Delta \frac{Output^{SOE}_{ict}}{\sum_i Output_{ict}} \right) = \sum_i (\Delta s_{ict} \omega_{ict}) \\ &= \underbrace{\sum_i \frac{\omega_{ict} + \omega_{ict-1}}{2} \triangle s^{SOE}_{ict}}_{intra-industry} + \underbrace{\sum_i \frac{s^{SOE}_{ict} + s^{SOE}_{ict-1}}{2} \triangle \omega_{ict}}_{inter-industry} \end{aligned} \tag{6}$$

where i denotes 4-digit industry; $s^{SOE}_{ict} \equiv \frac{Output^{SOE}_{ict}}{Output_{ict}}$ captures the output share of SOEs in industry i of city c at time t; and $\omega_{ict} \equiv \frac{Output_{ict}}{\sum_i Output_{ict}}$ represnts the share of industry i in city c at time t.

Hence, $\Delta y^{intra}_{ct} = \sum_i \frac{\omega_{ict}+\omega_{ict-1}}{2} \triangle s^{SOE}_{ict}$ captures the resource reallocation from SOEs to non-SOEs within an industry; and $\Delta y^{inter}_{ct} = \sum_i \frac{s^{SOE}_{ict}+s^{SOE}_{ict-1}}{2} \triangle \omega_{ict}$ captures the resource reallocation from one industry to another. To disentangle the intra- and inter-industry effects of trade liberalization, we conduct two more regressions using Δy_{ct}^{intra} and Δy_{ct}^{inter} as the respective outcome variables.

The regression results are reported in Table 4. We find that trade liberalization upon the WTO accession has both negative and statistically significant effects on intra-industry (in Column 1) and inter-industry (in Column 2) resource reallocation, but the former has a much bigger magnitude than the latter. These results imply that the decline in the SOE output share detected previously is mainly driven by the decline of SOE output share within each industry, whereas across industries there is some evidence that the output of industries with a strong SOE presence prior to China's WTO accession decreased after that.

4.3 Extensive vs. Intensive Margins

We use the growth accounting method to examine the extensive and intensive margin effects of trade liberalization on the output share of SOEs. Specifically, we make two changes to the output share measurement in the baseline equation (3): first, we use the ratio of total SOE output over the total non-SOE output in city c at year t (in logarithm) as the outcome variable (i.e., $\log \frac{Q_{c,t}^{SOE}}{Q_{c,t}^{nonSOE}}$); and second, we look at the change over two time points, 2001 (one year before the WTO accession) and 2005 (four years after the WTO accession and the last year in our sample period), to capture the overall effect:

$$\Delta_{t=2001:2005} \log \frac{Q_{c,t}^{SOE}}{Q_{c,t}^{nonSOE}} = \frac{\Delta_{t=2001:2005} Q_{c,t}^{SOE}}{Q_{c,2001}^{SOE}} - \frac{\Delta_{t=2001:2005} Q_{c,t}^{nonSOE}}{Q_{c,2001}^{nonSOE}}. \tag{7}$$

Meanwhile, for each group (i.e., SOEs and non-SOEs), the 5-year change in total output can be further decomposed into two parts: change in output of surviving firms and change in output due to entry and exit, i.e.,

$$\Delta_{t=2001:2005} Q_{c,t}^{j} = \Delta_{t=2001:2005} Q_{c,t}^{j,surviving} + \left(Q_{c,2005}^{j,entry} - Q_{c,2001}^{j,exit} \right), \tag{8}$$

where $j \in \{SOE, nonSOE\}$.

Combining equations (7)-(8), we have

$$\Delta_{t=2001:2005} \ln \frac{Q_{c,t}^{SOE}}{Q_{c,t}^{nonSOE}} = \underbrace{\frac{\Delta_{t=2001:2005} Q_{c,t}^{SOE,surviving}}{Q_{c,2001}^{SOE}} - \frac{\Delta_{t=2001:2005} Q_{c,t}^{nonSOE,surviving}}{Q_{c,2001}^{nonSOE}}}_{Intensive\ Margin} + \underbrace{\frac{Q_{c,2005}^{SOE,entry} - Q_{c,2001}^{SOE,exit}}{Q_{c,2001}^{SOE}} - \frac{Q_{c,2005}^{nonSOE,entry} - Q_{c,2001}^{nonSOE,exit}}{Q_{c,2001}^{nonSOE}}}_{Extensive\ Margin}. \quad (9)$$

Table 5 shows that from 2001 to 2005, the total output of SOEs increased 2.51% from 1,514 billion RMB to 1,552 billion RMB, whereas the total output of non-SOEs increased 148.65% from 6,676 billion RMB to 16,600 billion RMB. This shows that the relative importance of SOEs declined in the post-WTO accession period and is consistent with our empirical findings.

More interestingly, the total output of surviving SOEs actually increased by 230 billion RMB from 2001 to 2005, contributing to 605.3% of the output gain of all SOEs that existed in 2001. However, because there were more exits than entries of SOEs in these five years, the extensive margin effect led to a gross output loss of 191 billion RMB, which implies that the net SOE output gain is only less than 40 billion RMB. Correspondingly, for non-SOEs, the intensive and extensive margins contribute 42.1% and 57.9% to their net output gain respectively. These numbers suggest that the decline in SOE output share is driven by entry and exit (or the extensive margin effect) instead of a substantial contraction of output among surviving firms (or the intensive margin effect).

To further investigate the effect of trade liberalization on the external and internal margins of SOE output share, we run two regressions similar to the regression in equation (3). First, we specify the intensive margin effect by

$$\Delta \ln \frac{Q_{c,t}^{SOE,surviving}}{Q_{c,t}^{nonSOE,surviving}} = \beta \Delta Tariff_{ct} + \Delta \mathbf{X}'_{ct}\gamma + \Delta \left(\mathbf{Z}_{i2001} \cdot Post02_t\right)' \cdot \theta + \lambda_{pt} + \Delta\varepsilon_{ct}, \quad (10)$$

where $t \in \{2001, 2005\}$. Next, the specification for the extensive margin effect is given by

$$\Delta m_{ct} = \beta \Delta Tariff_{ct} + \Delta \mathbf{X}'_{ct}\gamma + \Delta \left(\mathbf{Z}_{i2001} \cdot Post02_t\right)' \cdot \theta + \lambda_{pt} + \Delta\varepsilon_{ct}, \quad (11)$$

where $\Delta m_{ct} = \frac{Q_{c,2005}^{SOE,entry} - Q_{c,2001}^{SOE,exit}}{Q_{c,2001}^{SOE}} - \frac{Q_{c,2005}^{nonSOE,entry} - Q_{c,2001}^{nonSOE,exit}}{Q_{c,2001}^{nonSOE}}$.

The regression results are reported in Table 6. Column 1 shows that the intensive margin effect of trade liberalization on the SOE output share is highly insignificant, while the extensive margin effect (Column 2) is significant and economically meaningful.

In summary, we find that the decline in the SOE output share after China's WTO accession is primarily caused by the exit of SOEs instead of a reduction in the output of surviving SOEs. These results are in line with Brandt, Van Biesebroeck, Wang, and Zhang (2012), who also look at the episode of China's WTO accession and find that much of the sectoral productivity gains take place at the extensive margin.

4.4 Heterogeneous Response of SOEs

Building on the finding that much of the trade liberalization effect happens at the extensive margin, we further investigate if there are any common characteristics among the SOEs that exited the market.

Productivity difference. We start with the differential exit rates of SOEs at different productivity levels. Accordng to the firm heterogeneity literature (e.g., Melitz 2003), trade liberalization drives out the least productive firms as import competition raises the survival threshold. To test this hypothesis, we first divide SOEs into four quantiles (i.e., Top 25%, 25%-50%, 50%-75%, and bottom 25%) based on their productivity levels in 2001, which are estimated using the method devised in Olley and Pakes (1996). Next, we calculate the exit rate from 2001 to 2005 for each quantile and each city: $Exit_{q,c} \equiv \frac{\Delta_{t=2001:2005}N_{q,c,t}}{N_{q,c,2001}}$, where q denotes the productivity quantile in 2001. The regression specification is

$$Exit_{q,c} = \beta_q \Delta Tariff_{ct} + \Delta \mathbf{X}'_{ct}\gamma + \Delta \left(\mathbf{Z}_{i2001} \cdot Post02_t\right)' \cdot \theta + \lambda_{pt} + \Delta\varepsilon_{ct}, \tag{12}$$

where β_q is the coefficients for different quantiles. To further capture the city-specific differential time trend between 2001 and 2005, we include two additional controls: the entry rate for SOEs and the exit rate for non-SOEs.

The regression results are shown in Column 1 of Table 7. We find that all four estimated coefficients are positive, suggesting that trade liberalization increases the exit rate. However, only one of the estimates is statistically significant. In terms of magnitude, we find that the coefficient estimate for the top 25% category is smaller than the one for the 25%-50% category, which is in turn smaller than the coefficient for the 50%-75% category. These are consistent with the firm heterogeneity literature's argument that less productive firms are more likely to exit the market after trade liberalization.

Surprisingly, however, the estimated coefficient for the bottom 25% category is found to be the smallest, suggesting that the weakest SOEs have the highest probability to survive increased import competition upon the WTO accession. One plausible explanation is that the weakest SOEs (in terms of productivity) continued to enjoy government protection in the post-WTO accession period and thus were largely shield from the increasingly fierce import competition. To explore this possibility, we further investigate the differential exit rates among SOEs affiliated to different layers of the Chinese government.

Affiliation difference. In China, different SOEs are administered by different layers of the government: the central government, provinces, cities, counties, and townships. One expects that SOEs administered by higher level governments would enjoy more protection than those administered by lower level governments for at least two reasons: (a) higher level governments have more decision power given the top-down nature of Chinese politics; (b) lower level governments in China have been encountering structural fiscal problems since the 1994 fiscal reform (World Bank and Development Research Center of the State Council, P.R.C., 2012). As such, we use the affiliation of a SOE as a proxy for the degree of government protection it received and investigate whether SOEs administrated by different levels of the Chinese government responded to WTO accession differently. Based on the information of SOE affiliation in 2001, we classified the SOEs into three categories, SOEs under the administration of above city-level governments (i.e., central and provincial governments), SOEs under the administration of the city government, and SOEs under the administration of below city-level governments (i.e., county and township governments). We then calculate the exit rate of SOEs for each of these three categories and each city from 2001 to 2005: $Exit_{a,c} \equiv \frac{\Delta_{t=2001:2005} N_{a,c,t}}{N_{q,c,2001}}$, where a denotes the SOE affiliation category. The regression specification is

$$Exit_{a,c} = \beta_a \Delta Tariff_{ct} + \Delta \mathbf{X}'_{ct}\gamma + \Delta \left(\mathbf{Z}_{i2001} \cdot Post02_t\right)' \cdot \theta + \lambda_{pt} + \Delta\varepsilon_{ct}, \qquad (13)$$

where β_a is the coefficient for category a. To further capture the city-specific differential time trend between 2001 and 2005, we include two additional controls, the entry rate for SOEs and the exit rate for non-SOEs.

Regression results are reported in Column 2 of Table 7. We find that the estimated coefficient on SOEs affiliated to below city-level administration is positive and statistically significant, implying that trade liberalization induced the exit of SOEs in this category. Meanwhile, the estimated coefficients on SOEs in the other two categories are negative and insignificant, indicating that these SOEs were barely affected by trade liberalization.

How do we reconcile the results in Columns 1-2 of Table 7? Table 8 provides the breakdown of SOE productivity quantile (as defined in Column 1) by affiliation (as defined in Column 2). Interestingly, we find that the weakest SOEs (in terms of productivity in 2001) were most likely to be administered by the central, provincial, or city governments.

In sum, these results suggest that the aberration in the differential exit rates across productivity quantiles is driven by differential levels of government protection. They also indicate that although trade liberalization led to the reallocation of resources from inefficient

SOEs to efficient non-SOEs, it does not completely eliminate the existing distortions and some (perhaps substantial) deadweight loss continue to exist in the post-WTO accession period.

5 Conclusion

In this paper, we study how China's accession to the WTO impact the market share of inefficient but politically favored SOEs. We find that tariff reductions following China's WTO accession led to a decline in the SOE output share. This result is robust to a variety of robustness checks. In our preferred specification, China's WTO accession led to a 2.5 percentage points decline in the SOE output share, which corresponds to a 1.4% reduction in the standard deviation of manufacturing firm productivity in China. Given the general lack of competitiveness of Chinese SOEs, we interpret the reduction in their output share and the subsequent narrowing of productivity dispersion among the remaining firms as an improvement of allocative efficiency.

We further verify that the post-WTO accession contraction of SOE output share was driven by increased import competition instead of improved access to overseas markets or cheaper imported intermediate goods. The SOE output share decline was broad-based and not limited to selected industries where the SOEs were dominant.

Importantly, we find that the SOE output share decline took place at the extensive margin and it was the exit of SOEs affiliated to the lowest levels of government (counties and townships) that drove the decline. By contrast, SOEs affiliated to the central, provincial, and city governments were barely affected even though many of the least productive manufacturing firms in China belonged to this group. This shows that while trade discourages political favoritism and improves resource allocation, the welfare gains are made only at the margin and some inefficiency is likely to persist as long as the government has the financial ability to pay for its support of inefficient enterprises. In other words, trade mitigates but does not solve the problem. Another way of interpreting this finding is to think of trade as a catalyst that lessens existing political distortion of resource allocation. The effect of this catalyst strengthens as the government's ability to provide discriminatory treatment weakens.

Our findings contribute to the literature by identifying another channel (the improvement in resource allocation in the presence of political economy distortions) through which trade benefits a nation. With regard to China, now the world's biggest trading nation, we find that different layers of the Chinese government responded differently to WTO accession: some increased their support to the SOEs under their watch while others withdrew theirs.

Given the central and complex role that the state plays in China's economic development, our findings suggest that it is useful and perhaps even important to treat the Chinese state as a agglomeration of component parts instead of a unitary government when studying its decisions and performance in international trade.

References

Arkolakis, C., A. Costinot, D. Donaldson, and A. Rodríguez-Clare (2012). The elusive pro-competitive effects of trade. Mimeo.

Arkolakis, C., A. Costinot, and A. Rodríguez-Clare (2012). New trade models, same old gains? *American Economic Review 102*(1), 94–130.

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

Bai, C.-E., J. Lu, and Z. Tao (2009). How does privatization work in China? *Journal of Comparative Economics 37*(3), 453–470.

Bertrand, M., E. Duflo, and S. Mullainathan (2004). How much should we trust differences-in-differences estimates? *Quarterly Journal of Economics 119*(1), 249–275.

Brander, J. A. and B. J. Spencer (1982). Tariff protection and imperfect competition. In H. Kierzkowski (Ed.), *Monopolistic Competition in International Trade*, pp. 194–206. Oxford: Oxford University Press.

Brandt, L., J. Van Biesebroeck, L. Wang, and Y. Zhang (2012). The impact of entry into WTO on Chinese enterprise productivity. CEPR Discussion Paper #9166.

Brandt, L., J. Van Biesebroeck, and Y. Zhang (2012). Creative accounting or creative destruction? Firm-level productivity growth in Chinese manufacturing. *Journal of Development Economics 97*(2), 339–351.

Cai, H. and Q. Liu (2009). Competition and corporate tax avoidance: Evidence from Chinese industrial firms. *Economic Journal 119*(537), 764–795.

Chen, B., H. Ma, and Y. Xu (2014). Measuring China's trade liberalization: A generalized measure of trade restrictiveness index. *Journal of Comparative Economics*. Forthcoming.

de Blas, B. and K. N. Russ (2010). Understanding markups in the open economy under Bertrand competition. NBER Working Paper #16587.

Dixit, A. (1984). International trade policy for oligopolistic industries. *Economic Journal 94*, 1–16.

Du, J., Y. Lu, Z. Tao, and L. Yu (2014). Do domestic and foreign exporters differ in learning by exporting? Evidence from China. *China Economic Review*. Forthcoming.

Eaton, J. and S. Kortum (2002). Technology, geography, and trade. *Econometrica 70*(5), 1741–79.

Edmond, C., V. Midrigan, and D. Y. Xu (2012). Competition, markups, and the gains from international trade. NBER Working Paper #18041.

Edmonds, E. V., N. Pavcnik, and P. Topalova (2010). Trade adjustment and human capital investments: Evidence from Indian tariff reform. *American Economic Journal: Applied Economics 2*(4), 42–75.

Ellison, G. and E. L. Glaeser (1999). The geographic concentration of industry: Does natural advantage explain agglomeration? *American Economic Review 89*(2), 311–316.

Fan, H., Y. A. Li, and S. R. Yeaple (2013). Trade liberalization, quality, and export prices. Available at SSRN: http://ssrn.com/abstract=2352155.

Gentzkow, M. (2006). Television and voter turnout. *Quarterly Journal of Economics 121*(3), 931–972.

Goldberg, P. K., A. K. Khandelwal, N. Pavcnik, and P. Topalova (2010). Imported intermediate inputs and domestic product growth: Evidence from India. *Quarterly Journal of Economics 125*(4), 1727–67.

Han, J., R. Liu, and J. Zhang (2012). Globalization and wage inequality: Evidence from urban China. *Journal of International Economics 87*(2), 288–297.

Hasan, R., D. Mitra, P. Ranjan, and R. N. Ahsan (2012). Trade liberalization and unemployment: Theory and evidence from India. *Journal of Development Economics 97*(2), 269–280.

Hasan, R., D. Mitra, and B. P. Ural (2007). Trade liberalization, labor-market institutions and poverty reduction: Evidence from Indian states. *India Policy Forum 3*, 71–122.

Holmes, T. J., W.-T. Hsu, and S. Lee (2013). Allocative efficiency, mark-ups, and the welfare gains from trade. NBER Working Paper #19273.

Hsieh, C.-T. and P. J. Klenow (2009). Misallocation and manufacturing TFP in China and India. *Quarterly Journal of Economics 124*(4), 1403–1448.

Hsieh, C.-T. and Z. Song (2013). Grasp the large, let go of the small: The transformation of the state sector in China. Mimeo.

Khandelwal, A. K., P. K. Schott, and S.-J. Wei (2013). Trade liberalization and embedded institutional reform: Evidence from Chinese exporters. *American Economic Review 103*(6), 2169–95.

Konan, D. E. and K. E. Maskus (2000). Joint trade liberalization and tax reform in a small open economy: the case of Egypt. *Journal of Development Economics 61*(2), 365–392.

Kovak, B. K. (2013). Regional effects of trade reform: What is the correct measure of liberalization? *American Economic Review 103*(5), 1960–76.

Krishna, K. M. and C. Yavas (2005). When trade hurts: Consumption, indivisibilities and labor market distortion. *Journal of International Economics 67*(2), 413–427.

Krishna, K. M., C. Yavas, and W. Mukhopadhyay (2005). Trade with labor market distortions and heterogeneous labor: Why trade can hurt? In G. S. Heiduk and K. yiu Wong (Eds.), *WTO and World Trade: Challenges in a New Era*, pp. 291–336. Heidelberg: Physica-Verlag.

Krugman, P. (1982). Import protection as export promotion: International competition in the presence of oligopoly and economies of scale. In H. Kierzkowski (Ed.), *Monopolistic Competition in International Trade*, pp. 180–193. Oxford: Oxford University Press.

Lan, X. and B. Li (2013). The economics of nationalism. Mimeo.

Li, X., X. Liu, and Y. Wang (2012). A model of China's state capitalism. Available at SSRN: http://ssrn.com/abstract=2061521.

Lileeva, A. and D. Trefler (2010). Improved access to foreign markets raises plant-level productivity... for some plants. *Quarterly Journal of Economics 125*(3), 1051–99.

Liu, R. and D. Trefler (2011). A sorted tale of globalization: White collar jobs and the rise of service offshoring. NBER Working Paper #17559.

Lu, J., Y. Lu, and Z. Tao (2010). Exporting behavior of foreign affiliates: Theory and evidence. *Journal of International Economics 81*(2), 197–205.

McCaig, B. (2011). Exporting out of poverty: Provincial poverty in Vietnam and U.S. market access. *Journal of International Economics 85*(1), 102–113.

McLaren, J. and S. Hakobyan (2010). Looking for local labor market effects of NAFTA. NBER Working Paper #16535.

Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica 71*(6), 1695–1725.

Melitz, M. J. and G. I. P. Ottaviano (2008). Market size, trade, and productivity. *Review of Economic Studies 75*(1), 295–316.

Melitz, M. J. and S. J. Redding (2014). Missing gains from trade? *American Economic Review Papers and Proceedings*. Forthcoming.

Melitz, M. J. and D. Trefler (2012). Gains from trade when firms matter. *Journal of Economic Perspectives 26*(2), 91–118.

Olley, G. S. and A. Pakes (1996). The dynamics of productivity in the telecommunications equipment industry. *Econometrica 64*(6), 1263–1297.

Pages, C. (Ed.) (2010). *The Age of Productivity: Transforming Economies from the Bottom Up*. New York: Palgrave Macmillan.

Silva, J. S. and S. Tenreyro (2006). The log of gravity. *Review of Economics and Statistics 88*(4), 641–658.

Song, Z., K. Storesletten, and F. Zilibotti (2011). Growing like China. *American Economic Review 101*(1), 196–233.

Tang, H., F. Wang, and Z. Wang (2014). The domestic segment of global supply chains in China under state capitalism. CESifo Working Paper Series No. 4797. Available at SSRN: http://ssrn.com/abstract=2445382.

Topalova, P. (2007). Trade liberalization, poverty and inequality: evidence from Indian districts. In *Globalization and Poverty*, pp. 291–336. Chicago: University of Chicago Press.

Topalova, P. (2010). Factor immobility and regional impacts of trade liberalization: Evidence on poverty from India. *American Economic Journal: Applied Economics 2*(4), 1–41.

World Bank and Development Research Center of the State Council, P.R.C. (2012). *China 2030: Building a Modern, Harmonious, and Creative High-Income Society*. Washington, DC: World Bank.

Yu, M. (2014). Processing trade, tariff reductions and firm productivity: Evidence from Chinese firms. *Economic Journal*. Forthcoming.