# Unproductive Exporters

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**Abstract**

Canonical trade models predict that only the most productive firms export, yet in developing economies a significant share of exporters are among the least productive. This paper shows these firms often sell almost exclusively abroad ("only-exporters"), a phenomenon that can mute or reverse expected productivity gains from trade. I establish three stylized facts using cross-country and Chinese firm-level data: (i) only-exporters comprise roughly one-fifth of all exporters; (ii) they emerge from large, low-income countries with intense domestic competition and serve smaller, richer, less competitive foreign markets; and (iii) they are among the least productive firms. A trade model with non-homothetic preferences rationalizes this with an "exporting to escape" mechanism: intense domestic competition or low local income pushes the least productive firms to serve more favorable foreign markets. Using China's WTO accession as a quasi-natural experiment, I show liberalization increased the prevalence and market share of these low-productivity firms. This reallocation toward the economy's least productive segment muted, and in some industries reversed, expected aggregate productivity gains. The findings show that trade integration's effects are conditional on country characteristics and can cause aggregate productivity and welfare to decouple.

**Keywords:** Only-Exporters, Non-Homothetic Preferences, Aggregate Productivity, Trade Liberalization

**JEL Codes:** F12, F14, O47

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# 1. Introduction

International trade is a principal engine of economic development, in part because it facilitates the reallocation of resources toward the most productive firms. Standard trade models predict that as trade costs fall, these highly productive firms, which serve both domestic and foreign markets, expand and drive gains in aggregate productivity (Melitz 2003). I show that in developing countries, however, a significant share of exporters serves the foreign market almost exclusively, and that these "only-exporters" are systematically among the least productive firms. Consequently, trade liberalization reallocates market share toward this less productive segment, thereby muting or even reversing the expected gains in aggregate productivity.

I begin by documenting a sharp asymmetry between the origin and destination countries of only-exporters. Drawing on Chinese firm-level panel and customs data and the World Bank Enterprise Surveys for 129 countries, I show that only-exporters are most prevalent in lower-income countries characterized by large, internationally well-integrated domestic markets. They tend to serve, however, foreign destinations with opposite characteristics: those that are richer, smaller, and less integrated. This mode of exporting is quantitatively significant: only-exporters constitute 19.6% of exporters in representative cross-country data, and 21% in China during the early 2000s, where they also accounted for 18.1% of the total export value.[1] A comparison of total factor productivity (TFP) estimated using established production function methodologies (e.g. Ackerberg et al. 2015), shows that firms that select into only-exporting are less productive than their peers serving the domestic market.

I analyze these empirical patterns through the lens of the theoretical framework of Melitz and Ottaviano (2008) and Ottaviano and Suverato (2024), to which I add a second source of firm heterogeneity besides marginal productivity to fully rationalize all firm types. I show that this framework, combining non-homothetic preferences with country asymmetries,

[1] Based on the World Bank Enterprise Surveys and the Chinese Annual Survey of Industrial Firms, respectively.

endogenously generates the observed patterns of only-exporting. Non-homothetic preferences generate a destination-specific choke price, a maximum price above which demand is zero. A firm can operate profitably only if its productivity is sufficient to set a price below this threshold, which is lower in high-competition or low-income countries. While this mechanism drives the primary sorting, I introduce an export customization cost to break the model's strict productivity hierarchy, allowing it to account for the empirically observed productivity overlap between firm types.

Only-exporters emergence through two "exporting to escape" channels, driven by a combination of domestic push and foreign pull factors. Low domestic income or intense competition acts as a push factor, rendering the home market unprofitable for the least productive firms. A low-income home market generates a low choke price that excludes domestic firms from serving price-sensitive consumers, while a large or highly integrated home market intensifies competition with the same effect. Consequently, these firms are pulled toward exclusively serving foreign markets that are richer, smaller, and less competitive, where a higher choke price makes survival feasible.

The model yields several novel predictions about the aggregate industry productivity effects of trade. A reduction in trade costs can trigger a reallocation of market share toward the least productive firms. This occurs on the extensive margin, as lower export thresholds facilitate the entry of low-productivity only-exporters, and on the intensive margin, where incomplete pass-through of cost savings shifts sales from more to less productive incumbent exporters. This combined reallocation can attenuate, or even reverse, any aggregate productivity improvments from trade. Consequently, the aggregate productivity effects of trade integration are conditional on the income and market structure of the trading partners, and can be negative for developing countries when integrating with richer markets. Despite this potentially adverse aggregate productivity effect, I show that in this setting trade liberalization remains unambiguously welfare-enhancing by increasing the variety of goods available to consumers.

To test the model's predictions, I provide new evidence on how trade liberalization affects firm composition and aggregate industry productivity by analyzing China's accession to the World Trade Organization (WTO) in 2001. As established by Pierce and Schott (2016), this event serves as a quasi-natural experiment where the primary channel of liberalization was a sharp decline in trade policy uncertainty, effectively lowering the expected trade costs for Chinese firms exporting to the United States. Following their identification strategy, I employ a difference-in-differences design with continuous treatment that exploits cross-industry variation in the magnitude of this uncertainty reduction. The analysis reveals that the liberalization increased the prevalence of only-exporters and reallocated market share toward this least productive segment. Consequently, this reduction in trade uncertainty did not yield the increase in aggregate industry productivity typically expected and in some industries even led to aggregate productivity declines.

I show that these results are robust to alternative explanations of only exporting and its productivity implications. First, I ensure that the findings are not an artifact of non-producing firms by removing wholesalers and export intermediaries before the analysis. Second, the documented patterns cannot be attributed to specific institutional features of the Chinese economy. The negative productivity premium associated with only-exporters is not driven by the activities of less productive, foreign-owned multinationals, as these are excluded from the primary sample. This exclusion also accounts for virtually all pure processing firms, which specialize in assembly for re-export and are often less productive.[2] Third, the analysis also considers the possibility that export-contingent subsidies in Special Economic Zones distort firm behavior, but the findings remain robust when controlling for a firm's location in these zones.

Finally, to assess the aggregate magnitude of the productivity effect and decompose its channels, I conduct a counterfactual exercise using a multi-sector version of the model. Simulating the reduction in trade uncertainty with the United States following China's WTO

[2] Using matched Chinese Firm and Customs data, I find that foreign-owned firms comprise 94% of pure processing exporters, the processing firm type that Dai et al. (2016) show to be systematically less productive.

accession, which is modeled as an ad-valorem equivalent trade cost reduction, the model predicts a net decline in China's aggregate manufacturing productivity of 0.15%. A decomposition of this result reveals that the negative effect is driven primarily by easier access to the US market, which lowers the export threshold and allows less productive firms to enter. This channel's impact is strong enough to outweigh the aggregate productivity increase from tougher entry in China's domestic market and other export destinations. Despite this negative productivity impact, liberalization was nonetheless welfare-improving due to an expansion in product variety. This finding highlights a central implication of the theoretical framework: aggregate productivity and welfare can decouple, demonstrating that a singular focus on productivity may be misleading when evaluating the gains from trade.

My contribution to the literature is threefold: First, this paper contributes to our understanding of firm heterogeneity in trade (Bernard et al. 2007; Bernard et al. 2012) by examining the characteristics of firms that sell almost exclusively to foreign markets. While prior country-specific studies have noted the existence of these "only-exporters" (Lu et al. 2014; Liaqat and Hussain 2020; Mahakitsiri and Suwanprasert 2023), and more broadly documented a bimodal distribution of export intensity (Lu 2010; Defever and Riaño 2022), the key empirical contribution here is to show that the only-exporter mode of this distribution is comprised of firms with lower productivity than their domestic-selling peers. The theoretical analysis then rationalizes this negative selection with an "exporting to escape" mechanism derived from a model of non-homothetic preferences, following Melitz and Ottaviano (2008) and Ottaviano and Suverato (2024). This endogenous, market-driven explanation provides an alternative to CES frameworks that rely on exogenous firm-destination revenue or cost shocks to generate similar patterns (Defever and Riaño 2022; Gao and Tvede 2022). Unlike those models, the proposed mechanism also rationalizes key empirical patterns, such as the observed sorting by market size, which standard CES-based explanations cannot fully accommodate.[3]

[3]It is worth noting that a mostly standard CES based Melitz (2003) model can generally generate only-exporting without needing to impose exogenous firm-destination shifters like firm specific revenue or fixed

Second, I contribute to the literature on how trade liberalization affects industry productivity. While extensive research documents firm level productivity gains from various channels (see Shu and Steinwender (2019) for an overview), including import competition (Pavcnik 2002; Bernard et al. 2006; Eslava et al. 2013), access to higher-quality inputs (Amiti and Konings 2007; Topalova and Khandelwal 2011; Brandt et al. 2017), and export-induced investment (Lileeva and Trefler 2010; Bustos 2011), this paper identifies a between firm reallocational channel that can attenuate these gains. The central finding is that improved foreign market access can trigger an adverse compositional shift that harms aggregate productivity. Using China's accession to the WTO as a quasi-natural experiment and following the identification strategy of Pierce and Schott (2016) and Handley and Limão (2017), the evidence shows that easier access to the U.S. market provided an escape for the least productive Chinese firms from intense domestic competition. This liberalization led to a substantial increase in the prevalence and market share of low-productivity only-exporters. This reallocation of resources toward the bottom of the productivity distribution was substantial enough to offset other potential sources of gains, leading to muted or, in some industries, negative net effects on aggregate productivity. These results demonstrate that the productivity outcomes of trade policy are conditional on the relative income and market structures of the integrating partners, a finding particularly relevant for North-South trade integration.

Third, I contribute to our understanding of how trade integration affects aggregate productivity and allocative efficiency in developing economies. A central tenet of modern trade theory, following Melitz (2003) and Melitz and Trefler (2012), is that trade liberalization enhances industry productivity by reallocating market share toward the most efficient firms. A prominent literature in development economics, however, documents persistent resource misallocation that can decouple private profitability from social efficiency (Hsieh and Klenow 2009; Atkin and Donaldson 2022). This paper connects these two literatures by identifying a novel, demand-side channel through which trade liberalization itself can induce an adverse

cost shifters, as I show in Appendix B. However, a Melitz based explanation cannot fully match the observed empirical patterns.

reallocation of resources. Misallocation can emerge as an outcome of trade integration when low-income countries open up to richer foreign markets. This mechanism, driven by market structure and consumer preferences rather than a traditional market failure, explains how trade can systematically shift market share toward less productive firms, thereby muting or even reversing the expected gains in aggregate productivity.

The remainder of this paper is structured as follows. Section 2 outlines the data used, while Section 3 documents novel stylized facts about only-exporters. Section 4 then rationalizes these stylized facts in a model of trade with non-homothetic preferences. Section 5 shows the implications for the aggregate productivity gains from trade liberalization in the case of China's WTO accession and Section 6 quantifies these. Finally, Section 7 concludes.

# 2. Data

The empirical analysis combines three distinct datasets to construct a comprehensive picture of only-exporting. To establish the global prevalence of only-exporters and document their key characteristics across countries, this study draws on the World Bank's Enterprise Surveys for 129 countries between 2006 and 2022. The core of the analysis uses the Chinese Annual Survey of Industrial Firms (ASIF) from 1998 to 2007 to estimate firm-level productivity and test the model's predictions in the context of trade liberalization. To identify the specific foreign markets that only-exporters serve and to control for the confounding effects of processing trade, ASIF is matched with detailed Chinese customs data for four years.

## 2.1. World Bank Enterprise Survey

The analysis first uses the World Bank's Enterprise Surveys to provide a representative, cross-country foundation for understanding the characteristics of only-exporters.[4] These surveys are relatively small-scale repeated cross-sections but nationally representative, cap-

[4]Source: World Bank Enterprise Surveys, `www.enterprisesurveys.org`. For this analysis, I use the standardized dataset released on November 11, 2024.

turing information from business owners and managers across 150 countries. To enhance the dataset, I merge additional World Bank data on GDP per capita (at constant 2015 USD levels), exchange rates to USD, and population.

Given the focus on tradable goods, I exclude firms that are not classified as manufacturing. Sales quantities, originally reported in local currencies, are converted to USD for cross-country comparability. Since World Bank average yearly exchange rates to USD are only available through 2022, I exclude surveys conducted in later years. I remove respondents that are part of multi-plant firms as it is unclear to which unit financial statements refer to. Firms with zero or missing sales (8.5% of the sample), and missing values in export shares (1.1%), and ownership shares (1.1%) are also removed. The final dataset includes 129 countries, with survey samples spanning the years 2006 to 2022. This is not a panel, instead it is a repeated non-consecutive cross-section, with the average country being surveyed twice in the combined sample. On average there are 514.4 observations per country across all surveys. Summary statistics are reported in table A8 in Appendix A.4.1.

### 2.2. Chinese Annual Survey Of Industrial Firms

The Annual Survey of Industrial Firms (ASIF) covers all "above-scale" industrial firms and is conducted by the Chinese National Bureau of Statistics. Firms are considered "above-scale" if their annual revenue meets or exceeds 5 million RMB (approximately $700,000 at 2024 exchange rates), but state-owned enterprises are included regardless of size. Although ASIF is a sample rather than the universe of firms, it captures the vast majority of industrial activity, accounting for 71.2% of industrial employment, 90.7% of output, and 97.5% of exports relative to the 2004 Chinese Industrial Census (Brandt et al. 2012).

Each firm is assigned a unique identifier, enabling tracking over time. However, some firms are reassigned new identifiers across years due to mergers, acquisitions, restructuring, or other administrative changes. To address this issue and enhance the dataset's panel structure, I adopt the matching methodology proposed by Brandt et al. (2012).[5]

I remove industries outside the manufacturing sector, such as mining and oil refining. Additionally, I drop firms with missing or negative entries in employment, real intermediate inputs, real output, real capital stock, ownership type, wages and exports. Following Brandt et al. (2017), I further drop all firms with fewer than 8 employees as these fall under a different legal regime. I further remove firms that report an export to total sales ratio of greater than one. To address re-sellers or export intermediaries, additionally to dropping firms that do not report positive output, I also remove firms with a sales to output ratio of greater than two in any given year. Firms that switch their 2-digit industry code are also excluded as production functions are estimated at the 2-digit level, and the comparison of switchers is problematic. Lastly, I remove all foreign owned firms.[6]

To identify whether a firm is within a special economic zone (SEZ), I draw on data from Martin and Zhang (2021) who provide the centroid, type, and year of establishment of SEZs in China. I focus on trade related SEZs, in particular "Export Processing Zones", "Free Trade Zones", "Border Economic Cooperative Zones" and "Open Economic Areas". Lacking information on the precise boundaries of the SEZs, I determine a firm's SEZ status by proximity to the centroid. In particular, I label firms as being in a trade promoting SEZ if they are within 10 kilometers of the centroid. Lu et al. (2023) report that the average size of SEZs is 6.34 square kilometers, so that a 10 kilometer radius should capture the entire SEZ area in most cases. Data on firm location is derived from the firm's address using Baidu Map. Firms with missing coordinates, coordinates outside their reported prefecture, or high variance in coordinates over time are dropped. The final sample consist of 91,824 firms in 1998 and 212,370 firms in 2007 (61.2% and 68% of the original sample, respectively).

[5]The matching process involves five steps: First, firms are matched by their unique identifiers. Second, matching is performed based on firm names. In the third step I deviate from Brandt et al. (2012) who match firms only on their legal representative's name, and also include prefecture and industry codes. Fourth, firms are matched using phone numbers and prefecture codes. Finally, the fifth step uses a combination of founding year, 6-digit region code (at the county level), address, and primary product name to further refine matches.

[6]Hong Kong, Macau, and Taiwan are also classified as foreign ownership.

Summary statistics for the final sample are provided in Table A4 in the Appendix.

### 2.3. Chinese Customs Data

In addition to ASIF, I utilize Chinese Customs data for 2000, 2004, 2005 and 2007, which comprehensively cover the universe of import and export flows by Chinese firms.[7] Since the ASIF dataset lacks a unique identifier to directly link firms to the Customs data, I adopt the methodology of Yu and Tian (2012). This approach involves a two-step matching process: first, firms are matched based on their name and year; second, matching is refined using the zip code and the last seven digits of the firm's phone number.

This procedure successfully identifies corresponding Customs data entries for 51% of all exporters in ASIF for the selected years, a rate consistent with those reported in other studies (Dai et al. 2016). Summary statistics for the matched and unmatched sample can be found in Table A7 in the Appendix. In general, firms in the matched sample are somewhat larger. A crucial step in the analysis is to focus exclusively on transactions classified under the "General Trade" regime, thereby removing all export flows related to processing trade. This distinction is methodologically important, as it isolates the behavior of firms making conventional export decisions from the potentially confounding dynamics of processing firms, which operate under a separate system. When working with ASIF sub-samples that are matched to Customs data, I retain all non-exporting firms but exclude exporting firms in ASIF that cannot be matched to the Customs records.

## 3. Empirical Regularities

A significant share of exporting firms derive virtually all their revenue from abroad, effectively forgoing their domestic market. I define only-exporters as firms whose export share in total

[7] These specific years were selected based on data availability. While Chinese Customs data is compiled annually from 2000, the dataset accessible to me is limited to 2000, 2004, 2005, and 2007.

sales is at least 95%.[8] As Figure 1 shows, this definition captures the peak of the bimodal distribution of export intensity. In contrast, normal exporters are defined as firms that export while also serving the domestic market, that is, those with an export share in total sales below 95% and above 0%.

**Stylized Fact 1.** *Approximately one-fifth of exporting firms sell almost exclusively to foreign markets.*

This pattern is widespread. Using this classification and the World Bank's Enterprise Surveys, I find that across 129 countries, only-exporters constitute 19.6% of all exporters. In China between 1998 and 2007, only-exporters made up 21% of all exporters, 3.4% of all firms, and accounted for 18.1% of the export value. Similar shares are found for China by Lu et al. (2014) and for Thailand by Mahakitsiri and Suwanprasert (2023), and are as high as 72.6% in Pakistan (Liaqat and Hussain 2020). It is also in line with the bimodal export share distribution documented by Defever and Riaño (2022).

In stark contrast, Eaton et al. (2011) note that only about 1.5% of French exporters do not serve the domestic market. Hence, a natural question that follows is what country characteristics correlate with the prevalence of only-exporters.

**Stylized Fact 2.** *Only-exporters commonly emerge in markets with intense competition and low incomes, and serve markets with the opposite characteristics.*

*a) Origin: Prevalent in large, internationally integrated, low-income countries.*

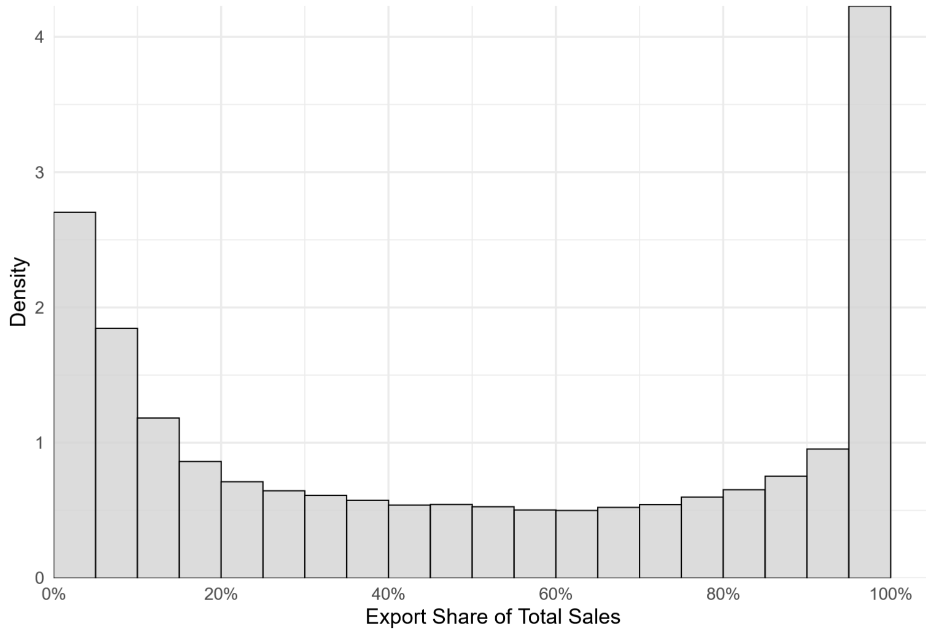
*b) Destination: Sell to smaller, less integrated, high-income countries.*

Two primary channels may drive the emergence of only-exporters. First, weak domestic demand due to low incomes may compel firms to seek consumers abroad. Second, intense domestic competition may make it unprofitable for certain firms to serve their home market,

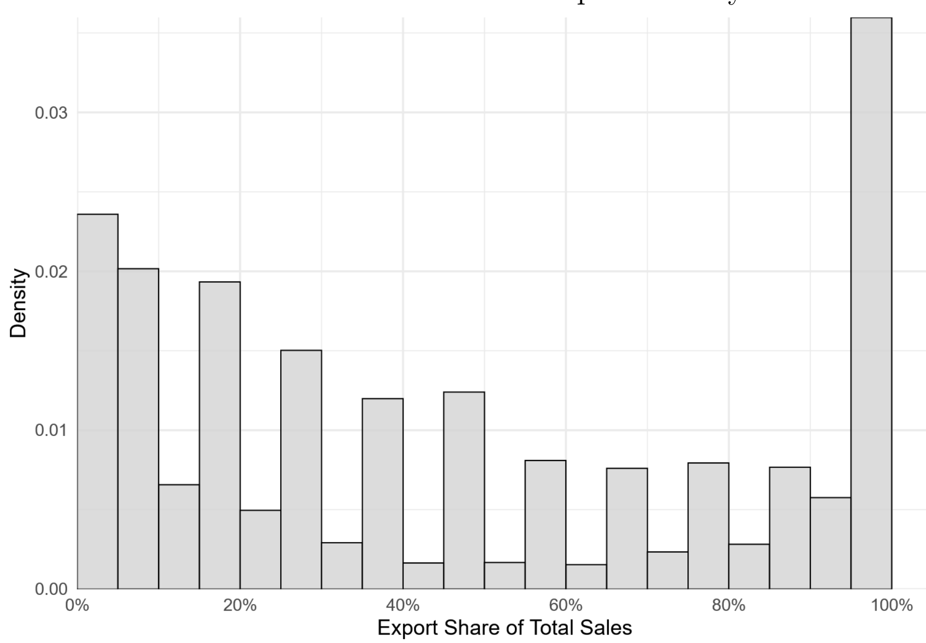
[8] A threshold of 95% is used instead of 100% to account for potential misclassifications due to typos or rounding errors and because this captures the majority of firms at the top of the export share in sales distribution. The results are robust to alternative thresholds ranging from 95% to 100%. A transition matrix for this definition can be found in Table A5 in the Appendix. Note that the majority of Only-Exporters transitioning to normal exporting do so by falling slightly below the threshold.

Figure 1: Density of Export Share of Total Sales

Panel A: Chinese Annual Survey of Industrial Firms




Panel B: World Bank Enterprise Survey

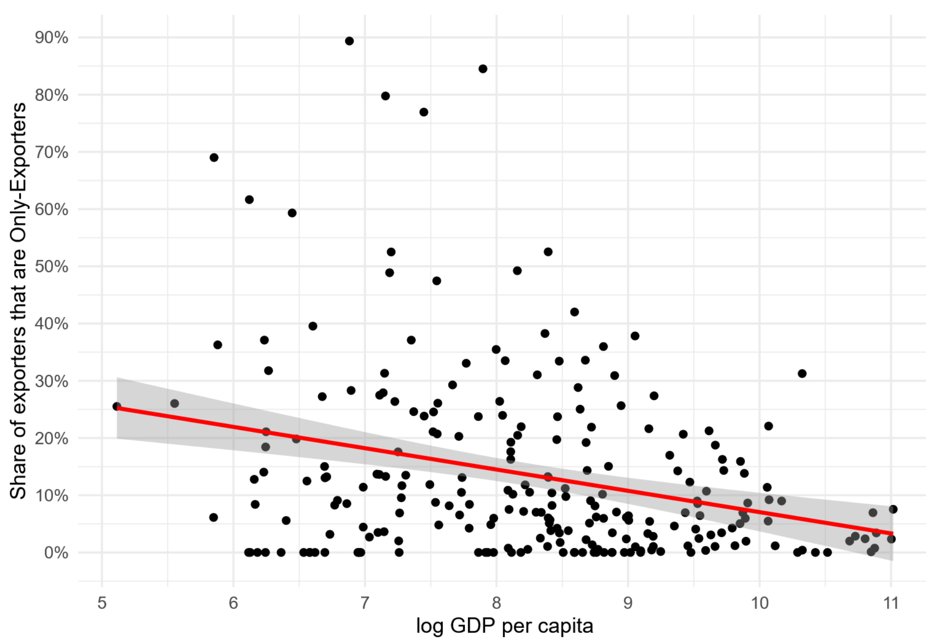



*Note:* Panel A data source: Chinese Annual Survey of Industrial Firms (1998-2007), limited to exporters. Panel B data source: World Bank Enterprise Surveys (2006-2022), limited to exporters.

pushing them to find a more benign environment elsewhere. The intensity of competition itself is shaped by two key factors: the size of the domestic market and its degree of international integration.

A firm's ability to enter and operate profitably in its domestic market is shaped by local conditions. The first of these is domestic income. Low per capita income translates into weak domestic demand, creating an environment where it is difficult for some firms to find it profitable to sell at home. This relationship is supported by the evidence in Figure 2, which shows that a lower GDP per capita is correlated with a higher share of firms that do not serve their domestic market.

Figure 2: Only-Exporter Share and GDP per Capita




*Note:* Data source: World Bank Enterprise Surveys between 2006 and 2022 limited to manufacturing firms.

The second key condition is the intensity of domestic competition, for which market size is a primary determinant. The effect of market size is theoretically ambiguous due to competing mechanisms. In trade models with CES demand systems, demand for a given variety is scaled by domestic expenditure; a larger market, and hence greater expenditure, may therefore make it easier for firms to enter domestically. Conversely, as shown by Melitz and Ottaviano (2008), a larger domestic market may also increase competition, making it harder for firms to serve their own market.

A country's degree of international integration provides another channel affecting domestic competition. A more open economy faces greater competitive pressure from foreign producers in the home market. This increased competition can further reduce domestic profits, making it more challenging for firms to serve their local consumers.

To explore these channels, I run a regression at the origin country level $i$ using data from the World Bank Enterprise Survey aggregated to the survey (country-year) level. The specification is as follows:

$$S_{it}^{OX} = \beta_1 \log(Y_{it}) + \beta_2 \log(L_{it}) + \beta_3 \lambda_{it}^{ii} + \varepsilon_{it} \tag{1}$$

where $S_{it}^{OX}$ is the share of exporters that only export ($OX$) in origin $i$ at time $t$.[9] $Y_{it}$ denotes GDP per capita, $L_{it}$ population, and $\lambda_{it}^{ii}$ the own trade share in origin $i$ at time $t$. The own trade share, defined as $1 - Import\ Share\ of\ GDP$, captures the international market integration of the country.

Both market size ($L_{it}$) and integration ($\lambda_{it}^{ii}$) serve as measures of specific factors that influence the overall intensity of competition. To validate this interpretation, an alternative specification includes a more direct, summary measure of the competitive pressure firms face. This measure, $High\ Competition\ Share$, is derived from the World Bank Enterprise Survey and captures the share of firms that report facing five or more competitors in their main market.[10]

[9] Note that on average I have two surveys and hence two years per country in the World Bank Enterprise Survey, though these are not consecutive and different countries are surveyed at different points in time between 2006 and 2022. I do not control for time fixed effects as the set of countries per year changes, which time fixed effects would conflate.

[10] "Five or more competitors" is the highest possible answer. This measure is preferable to other distributional measures of competition like the Herfindahl-Index as it lets the firms define their own market. This has two advantages. First, I do not have to define the market as a 2-digit ISIC level industries (the most disaggregated level consistently available in the survey), for each of which in any case I only observe a small subset of firms, making it difficult to draw conclusions on the distribution of sales. Second, even if I defined the market at the industry level, it would only capture sales from domestic firms, not from foreign exporters.

The results, displayed in Panel A of Table 1, lend support to these hypotheses. Only-exporters are significantly more prevalent in countries with lower incomes, confirming that weak domestic demand pushes firms to seek consumers abroad. Furthermore, the positive and significant coefficient on population indicates that larger domestic markets are associated with a greater competition and hence a greater share of firms forgoing domestic sales. Similarly, more internationally integrated markets, indicated by a lower own trade share, also exhibit a higher prevalence of only-exporters. This competition-based explanation is reinforced by the results from the alternative specification, which show that a higher share of firms reporting intense competition is strongly correlated with a larger share of only-exporters.

Table 1: Only-Exporter Share and Country Characteristics

| | Panel A: Origin Only-Exporter Share of Exporters | | Panel B: Destination Only-Exporter = 1 | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| log GDP pc | -0.040*** | -0.033*** | 0.005*** | 0.005*** |
| | (0.011) | (0.011) | (0.001) | (0.001) |
| log Population | 0.024** | 0.019* | -0.006*** | -0.007*** |
| | (0.010) | (0.011) | (0.001) | (0.001) |
| Own Trade Share | -0.191** | -0.160** | 0.021*** | 0.023*** |
| | (0.080) | (0.064) | (0.003) | (0.003) |
| High Competition Share | | 0.160** | | -0.016* |
| | | (0.080) | | (0.009) |
| Num.Obs. | 242 | 170 | 397580 | 278387 |
| R2 | 0.130 | 0.152 | 0.202 | 0.208 |

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Panel A: Each observation is the aggregate of one World Bank Enterprise Survey (country-year). Standard Errors are clustered at the origin country level, all regressors refer to origin country characteristics. The outcome is the share of exporters that only export, ranging between 0 and 1. Panel B: Uses Chinese Customs data at the firm-destination-year level. Standard errors are clusterd at the destination level. The outcome is a dummy indicating whether the combination is being served by an only-exporter. All columns control for 4-digit industry, year, ownership type and Special Economic Zone fixed effects. All other regressors refer to the destination country. The drop in observation in columns 2 and 4 occurs because the measure of KL (Capital to Labor) ratio and the measure of competition are only available for a subset of countries.

The analysis so far has established the origin-country characteristics that explain why a firm might not serve its domestic market. The emergence of only-exporters, however, requires a second condition to be met: the firm must find it profitable to enter a foreign market.

This decision is driven by the "pull" factors of potential destinations. It follows that firms unable to operate profitably at home would seek out foreign markets with the opposite characteristics: higher income, which implies stronger demand, and a more benign competitive environment, characterized by smaller market size and lower international integration.

To test this, I use Chinese Customs data matched to the Annual Survey of Industrial firms for the years 2000, 2004, 2005 and 2007. The customs data are set to only include transactions classified as "General Trade" to avoid capturing processing trade, which falls under a special regime. The observation is at the firm-destination-year level, and the outcome is a binary variable taking one when the pair is being served by an only-exporter.

$$D^{OX}_{nfit} = \beta_1 \log(Y_{nt}) + \beta_2 \log(L_{nt}) + \beta_3 \lambda^{nn}_{nt} + X_{ft}\gamma + \alpha_i + \eta_t + \varepsilon_{nfit} \tag{2}$$

Where $D^{OX}_{nfit}$ is an indicator taking one when firm $f$ serving destination $n$ at time $t$ is an only-exporter ($OX$). $Y_{nt}$ denotes GDP per capita, $L_{nt}$ population, and $\lambda^{nn}_{nt}$ the own trade share in destination $n$ at time $t$. $X_{ft}$ captures firm specific ownership type and special economic zone fixed effects, while $\alpha_i$ controls for 4-digit industry fixed effects and $\eta_t$ for time fixed effects. In a second specification, I additionally include the same measure of the destination's competitive pressure as used in the origin specification 1.

The results, presented in Panel B of Table 1, confirm this pattern of market selection. Only-exporters are significantly more likely to serve destinations with higher per capita incomes, smaller populations, and a lower degree of trade integration. This is further corroborated by the direct measure of competition, which indicates that only-exporters tend to avoid destinations where a high share of firms report facing intense competition. This evidence provides strong support for the hypothesis that only-exporters arise from a specific combination of push and pull forces: the push from an unprofitable domestic environment, characterized by low incomes and intense competition, is met by the pull of more favorable foreign markets, which offer an escape from these tough conditions at home.

The importance of domestic competition is also evident at the industry level within China. Additional results displayed in Table A3 in Appendix A.3 show that only-exporters are significantly more prevalent in industries that are less concentrated, as measured by the Herfindahl-Hirschman Index. That these firms are also more common in less capital-intensive and less sophisticated sectors further downstream in the value chain is consistent with this competition-based explanation.

A firm's ability to profitably serve any market ultimately depends on how demand compares to its marginal cost. I now turn from the market environment to the firm's own characteristics, focusing on productivity as the key determinant of its marginal cost, to understand which firms select into only-exporting.

**Stylized Fact 3.** *Only-exporters are less productive than normal exporters and non-exporters.*

To explore how only-exporters differ from other firms, I begin with a broad, cross-country analysis using the World Bank Enterprise Survey. I estimate the following regression specification:

$$y_f = \beta_{NX} D_f^{NX} + \beta_{OX} D_f^{OX} + \alpha_i + \gamma X_f + \eta_{ct} + \varepsilon_f \tag{3}$$

Where $f$ indicates a firm, $t$ indicates time, and $D_f^{NX}$ and $D_f^{OX}$ are binary variables indicating normal exporters ($NX$) and only-exporters ($OX$), respectively. $\alpha_i$ controls for time invariant 2-digit industry fixed effects, and $X_f$ for firm level ownership type shares. Crucially, as firms are sampled from different countries at potentially different points in time, $\eta_{ct}$ controls for sample fixed effects (country $c$ and year $t$), ensuring that comparisons are across firms within sample. The outcome variable $y_f$ for a given firm is either log sales, log employment, or log labor productivity, defined as sales per worker.

The results, presented in Table 2, show that while both only-exporters and normal exporters are larger than non-exporters in sales and employment, a clear distinction emerges in their productivity. Consistent with the well-documented exporter productivity premium, normal exporters are significantly more productive than non-exporters (Bernard et al. 2012).

In contrast, only-exporters are significantly less productive than both normal exporters and non-exporters. This finding suggests that the standard exporter productivity premium masks significant heterogeneity, with the least productive firms self-selecting into a model of exclusive exporting. Reinforcing the “escaping competition” mechanism identified in Stylized Fact 2, only-exporters also report facing significantly less competition in their main market, which is the export market. This firm-level behavior provides direct support for the idea that these firms select into destinations with a more benign competitive environment than that faced by other firms at home.

Table 2: Only-Exporter Characteristics across Countries

| | log Sales | log Employment | log LP | Competition |
|---|---|---|---|---|
| Normal Exporter | 0.852*** | 0.699*** | 0.153*** | 0.039 |
| | (0.066) | (0.040) | (0.049) | (0.051) |
| Only-Exporter | 0.752*** | 0.813*** | -0.063* | -0.262*** |
| | (0.207) | (0.197) | (0.034) | (0.091) |
| Num.Obs. | 69690 | 69690 | 69690 | 46927 |
| R2 | 0.545 | 0.272 | 0.619 | 0.513 |

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors are clustered at the country level. All columns control for the share of state and foreign capital as well as 2-digit ISIC industry and country-year (sample) fixed effects. Labor productivity is defined as the total sales (in USD) over workers. Competition is a dummy whether a firm reports more than 5 competitors in its main output market. Varying number of observations are due to differences in missings in the individual variables.

While this cross-country evidence is suggestive, labor productivity can be an imperfect measure as it may confound differences in capital intensity and potential endogeneity in input choices. To provide a more robust test, I leverage the panel structure of the Chinese Annual Survey of Industrial Firms to estimate total factor productivity (TFP).

I estimate a revenue based TFP measure as the residual of a production function. In particular, I follow the control function approach of De Loecker and Warzynski (2012) and Ackerberg et al. (2015).[11] For each two digit sector, I separately estimate a Cobb-Douglas

[11] The estimated measure is a revenue-based TFP (TFPR), which conflates a firm’s physical productivity (TFPQ) with its relative prices (Foster et al. 2008). While the model predicts these two components are positively correlated (equation 9), the critical identification question is whether this price effect masks an opposing trend in unobserved physical productivity. For the results to be spurious, only-exporters would need to be more physically productive (higher TFPQ) than other firms but charge such disproportionately

gross-output production function while explicitly allowing exporting to enter the process governing the productivity evolution, as recommended by De Loecker (2013). A detailed description of the procedure is provided in Appendix A.1. An alternative measure of TFP uses cost shares as a proxy for output elasticities under the assumption of constant-returns-to-scale production functions, following the approach of Syverson (2004). Here production functions are defined at the 4-digit industry level.

Using these TFP estimates as the primary outcome variables, I estimate the following specification for the Chinese firm-level panel to compare productivity across firm types:

$$y_{ft} = \beta_{NX} D_{ft}^{NX} + \beta_{OX} D_{ft}^{OX} + \gamma X_{ft} + \alpha_i + \kappa_p + \eta_t + \varepsilon_{ft} \tag{4}$$

where $f$ indicates a firm, $t$ indicates time, and $D_{ft}^{NX}$ and $D_{ft}^{OX}$ are binary variables indicating normal exporters ($NX$) and only-exporters ($OX$), respectively. $\alpha_i$ controls for time invariant 4-digit industry fixed effects. $\gamma_{ft}$ controls for characteristics that can vary across firms and time, in particular firm ownership type and whether a firm is in a trade promoting special economic zone (SEZ). Lastly, $\kappa_p$ and $\eta_t$ control for province and year fixed effects.

The results, shown in Table 3, confirm and reinforce the patterns found in the World Bank data. Both exporter types are again larger than non-exporters in sales and employment, but the crucial distinction lies in productivity. Only-exporters are significantly less productive than both normal exporters and non-exporters, confirming the previous result. On average, only-exporters exhibit about 2.4% lower Total Factor Productivity than non-exporters within the same industry.

The finding that only-exporters are the least productive firms is robust to several alternative explanations. A primary concern, particularly in the Chinese context, is that the results are driven by processing trade, where firms import inputs duty-free for re-export and are often less productive (Dai et al. 2016). This issue is addressed by excluding foreign-owned

low prices that their TFPR is ultimately lower. This alternative is economically implausible; a firm with high physical efficiency that also sets low prices should be highly competitive, yet the central observation is that these firms are unable to survive in their domestic market.

Table 3: Only-Exporter Characteristics in China

| | Sales | Employees | LP | TFP (ACF) | TFP (C) |
|---|---|---|---|---|---|
| Normal Exporter | 0.921*** | 0.828*** | 0.038*** | 0.003** | -0.003*** |
| | (0.007) | (0.006) | (0.004) | (0.001) | (0.001) |
| Only-Exporter | 0.348*** | 0.472*** | -0.173*** | -0.024*** | -0.022*** |
| | (0.008) | (0.008) | (0.006) | (0.002) | (0.001) |
| Num.Obs. | 1279170 | 1279170 | 1273426 | 1273426 | 1273426 |
| R2 | 0.242 | 0.259 | 0.323 | 0.776 | 0.287 |

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard Errors are clustered at the firm level. All outcomes are in logs. All columns control for year, province, 4-digit industry, ownership type fixed effects, and SEZ status. Column 1 reports total sales, Column 2 total employees. Column 3 reports labor productivity (Value Added per Worker). Column 4 displays results from TFP estimated using the proxy variable approach as in De Loecker and Warzynski (2012) - Ackerberg et al. (2016) method using Gross-Output Cobb-Douglas production function. Column 5 constructs TFP using cost-shares as output elasticities and assuming a constant returns to scale Cobb-Douglas production function at the 4-digit industry level.

firms, a step that removes virtually all pure processing traders, and by restricting customs data analyses to “General Trade” transactions.[12] The negative productivity premium also holds when controlling for a firm’s location within a Special Economic Zone, ruling out distortions from export-contingent subsidies (for a discussion of export subsidies, see Defever and Riaño 2017). Further analysis, detailed in the Appendix A.2, confirms that the results are not driven by non-producing export intermediaries, differential reporting of informal sales, or operational constraints, and explores product quality differences.

# 4. Theory

This Section presents a theoretical framework to rationalize the empirical regularities documented in Section 3. The model explains why a significant share of exporters, particularly in developing economies, serve almost exclusively foreign markets; why these “only-exporters” are typically less productive than their domestic-selling counterparts; and why they emerge from large, low-income countries to serve smaller, high-income destinations. The core intuition is that low-productivity firms are pushed out of their domestic market by low local

[12] Using the matched Chinese customs data for 2000, 2004, 2005, and 2007 where processing trade can be identified, I find that 94.8% of pure processing firms are foreign-owned.

incomes or intense competition. They are thus compelled to serve exclusively foreign markets that offer higher purchasing power and a less competitive environment.

To formalize this intuition, the analysis adapts the theoretical framework of Melitz and Ottaviano (2008) and Ottaviano and Suverato (2024) by introducing an export customization cost as a second source of firm heterogeneity. The baseline framework provides the two key ingredients needed to rationalize the observed patterns. First, non-homothetic preferences generate a destination-specific choke price, which makes market entry sensitive to local purchasing power and competition. Second, asymmetries in country size and income are essential for generating the cross-country sorting. While these mechanisms drive the primary sorting, the export customization cost is introduced to break the model's strict productivity hierarchy.

### 4.1. Set-Up

**Consumers** There are $n \in N$ countries endowed with an exogenous measure of identical workers and consumers $L_n$. Let $n$ denote an importer and $i$ denote an exporter. Following Ottaviano and Suverato (2024), preferences are quadratic over varieties $\omega \in [0, M_{ni}]$ which enter symmetrically into their utility function as follows:

$$U_n = \sum_i^N \int_0^{M_{ni}} \alpha q_{ni}^c(\omega) - \frac{\gamma}{2} q_{ni}^c(\omega)^2 d\omega \tag{5}$$

where $q_{ni}(\omega)$ is individual consumption of variety $\omega$ from country $i$ in country $n$, $\alpha > 0$ is a demand shifter and $\gamma > 0$ gives the degree of product differentiation between varieties.

This utility function yields a linear demand function for each variety variety $\omega$ from $i$ consumed in $n$:

$$q_{ni}^c(\omega) = \frac{\alpha}{\gamma} - \frac{\alpha M_n - \gamma Q_n}{\gamma \tilde{P}_n} p_{ni}(\omega) \tag{6}$$

where $\tilde{P}_n = \sum_i \int_0^{M_{ni}} p_{ni}(\omega) d\omega$ is an aggregate price statistic and $Q_n = \sum_i \int_0^{M_{ni}} q_{ni}^c(\omega) d\omega$ is an aggregate quantity statistic. $M_n = \sum_i M_{ni}$ is the mass of firms serving market $n$.

The proportion of income spent on different varieties changes with income, and there may be some varieties for which in equilibrium demand is zero. In particular, consumers only have positive demand for a variety $\omega$ if the price $p_{ni}(\omega)$ is below the choke price $\hat{p}_{ni} = \hat{p}_n$. Hence the price $p_{ni}(\omega)$ for which consumer demand is zero, $q^c_{ni}(\omega) = 0$, gives the choke price:

$$\hat{p}_n = \frac{\alpha \tilde{P}_n}{\alpha M_n - \gamma Q_n} \tag{7}$$

A firm can only successfully enter a market $n$ if it can profitably charge a price below the choke price $\hat{p}_n$. The choke price is lower if the environment in market $n$ is more competitive (a low aggregate price statistic $\tilde{P}_n$ or a large mass of competing varieties $M_n$).

**Firms** On the supply side, the model assumes a static environment with monopolistic competition. Each firm produces a single variety $\omega$ using only labor, which is supplied inelastically. A measure of potential entrants $J_i$ in country $i$ pays a sunk entry cost $F$ upon which it learns its marginal cost draw.

To be a successful entrant in $i$, a firm must be able to at least cover its marginal cost of serving any market $n$, which may, but does not have to be, its domestic market $i$. Consequently, the marginal firm in $i$ serving market $n$ will be the one whose marginal cost just equals the choke price $\hat{p}_n$ in market $n$. Firms that cannot cover their marginal cost freely exit.

The marginal cost of serving market $n$ from country $i$ has three components. First, firms have a constant returns to scale technology $x(\phi) = \phi l$, where $l$ is labor and $\phi$ is the firm's productivity draw from a distribution $G_i(\phi)$ with support $[b_i, \infty)$. Second, accessing foreign markets incurs a standard iceberg trade cost $\tau_{ni} \geq 1$, with $\tau_{ii} = 1, \forall i$. Third, to capture other costs of selling abroad, the model includes an export customization cost, $c^x_{ni} \geq 1$, with $c^x_{ii} = 1$. This cost reflects the need to adapt products to foreign tastes and standards, a requirement consistent with the empirical finding that exporters are more likely to hold international quality certifications (see Table A2 in the Appendix). This cost is firm-specific, unknown prior to entry, and drawn from a distribution $H(c^x_{ni})$ with support $[1, \infty)$. There is no additional fixed cost to enter market $n$; rather, as long as a firm can at least recover its marginal cost it will serve market $n$.

As a second source of heterogeneity, the export customization cost $c^x_{ni}$ breaks the strict productivity based market selection hierarchy, allowing for the overlapping productivity distributions between exporters and non-exporters observed in the data (e.g., Eaton et al. 2011). However, since it only increases the cost of exporting, this mechanism cannot explain the existence of only-exporters.

Since I assume a symmetric equilibrium, all firms with the same marginal productivity $\phi$ and export customization cost $c^x_{ni}$ charge the same price. Henceforth, I will index varieties by their pair $(\phi, c^x_{ni})$. Firms choose a price for each market to maximize profits. The profit maximization problem is

$$\max_{p_{ni}(\phi, c^x_{ni}) \geq 0} \quad \sum_{n}^{N} p_{ni}(\phi, c^x_{ni}) q_{ni}(\phi, c^x_{ni}) - \frac{\tau_{ni} c^x_{ni} w_i}{\phi} q_{ni}(\phi, c^x_{ni})$$

Plugging demand $q_{ni}(\phi, c^x_{ni})$, which is the product of individual demand $q^c_{ni}(\phi, c^x_{ni})$ 6 and the measure of consumers $L_n$ into the first order condition yields the optimal pricing rule

$$p_{ni}(\phi, c^x_{ni}) = \frac{1}{2} \left( \frac{\alpha \tilde{P}_n}{\alpha M_n - \gamma Q_n} + \frac{\tau_{ni} c^x_{ni} w_i}{\phi} \right)$$

The price is a simple average of the market-specific choke price, $\hat{p}_n$, and the marginal cost of serving $n$. This immediatley reveals that the marginal firm, whose marginal cost just equals the choke price, will set its price equal to the choke price. This defines the cut-off productivity $\phi^*_{ni}(c^x_{ni})$ of a firm in $i$ selling to $n$ as the productivity of the marginal firm:

$$\phi^*_{ni}(c^x_{ni}) = \frac{\alpha M_n - \gamma Q_n}{\alpha \tilde{P}_n} \tau_{ni} c^x_{ni} w_i \tag{8}$$

Note that $\phi^*_{ni}(c^x_{ni}) = \phi^*_{ni} c^x_{ni}$, where $\phi^*_{ni}$ denotes the productivity threshold net of the export customization cost $c^x_{ni}$. Substituting expression 8 back into the pricing rule above yields

$$p_{ni}(\phi, c^x_{ni}) = \underbrace{\frac{1}{2}\left(1 + \frac{\phi}{\phi^*_{ni}(c^x_{ni})}\right)}_{\text{markup}} \underbrace{\frac{\tau_{ni} c^x_{ni} w_i}{\phi}}_{\text{marginal cost}} \tag{9}$$

The pricing rule equation 9 satisfies Marshall's Second Law of Demand which implies that firms with higher productivity $\phi$ charge higher markups. Markups further vary with the cut-off productivity $\phi^*_{ni}$, which is an equilibrium object that depends on market conditions in $n$.

The pricing rule equation 9 in combination with individual demand equation 6 can be used to express aggregate firm demand in terms of the ratio between the productivity threshold and the firm's marginal productivity

$$q_{ni}(\phi, c^x_{ni}) = \frac{1}{2}\frac{\alpha}{\gamma}\left(1 - \frac{\phi^*_{ni}(c_x)}{\phi}\right) L_n$$

Consequently, all firm level performance measures can be expressed in terms of the ratio of a firm's productivity to the cut-off productivity, $\phi/\phi^*_{ni}$, conditional on the export customization cost $c^x_{ni}$.

## 4.2. Equilibrium And Market Selection

To derive a tractable solution, I assume that firm productivity, $\phi$, and the export customization cost, $c^x_{ni}$, are drawn from independent Pareto distributions. Specifically, for any country $i$, the cumulative distribution function (CDF) for productivity $\phi$ is given by:

$$G_i(\phi) = 1 - (b_i/\phi)^\theta \quad \text{for } \phi \in [b_i, \infty)$$

where $b_i$ is the lower bound of the productivity distribution and $\theta > 1$ is the shape parameter, which governs productivity heterogeneity and also determines the trade elasticity. The CDF for the export customization cost is:

$$H(c_{ni}^x) = 1 - (c_{ni}^x)^{-\eta} \quad \text{for } c_{ni}^x \in [1, \infty)$$

where $\eta > 1$ is the shape parameter for the cost distribution and $c_{ii}^x = 1$ by definition.

Solving the model's full general equilibrium allocation $\{w_i, \lambda_{ni}, \phi_{ni}^*\}$ given the primitives $\{b_i, L_i, \tau_{ni}\}$ and parameters $\{\theta, \eta, \alpha, \gamma, F\}$ yields analytical expressions for the key outcomes that govern market selection.[13] The net productivity cutoff, $\phi_{ni}^*$, which is the minimum productivity a firm from country $i$ must have to serve market $n$ (net of the customization cost), is given by:

$$\phi_{ni}^* = \left[\frac{\eta\alpha}{2\gamma(\theta+1)(\theta+2)(\eta+\theta)Fw_n} \sum_k L_k \left(\frac{b_k}{\tau_{nk}w_k}\right)^\theta\right]^{\frac{1}{\theta+1}} \tau_{ni}w_i$$

This parametrization also yields the typical gravity expression for trade shares, where the share of country $n$'s expenditure on goods from country $i$, $\lambda_{ni}$, is:

$$\lambda_{ni} = \frac{L_i b_i^\theta (\tau_{ni}w_i)^{-\theta}}{\sum_k L_k b_k^\theta (\tau_{nk}w_k)^{-\theta}} \tag{10}$$

Using the expression for trade shares equation 10, the productivity cutoff can be expressed more intuitively in terms of observable statistics. Specifically, the denominator of the trade share expression can be related to the destination's domestic trade share, $\lambda_{nn}$, allowing the net productivity cutoff $\phi_{ni}^*$ to be written as:

$$\phi_{ni}^* = \left[\chi \frac{L_n b_n^\theta}{\lambda_{nn}}\right]^{\frac{1}{\theta+1}} \tau_{ni} \frac{w_i}{w_n} \tag{11}$$

where $\chi$ is a composite of constant parameters. This expression reveals that the minimum required productivity to enter market $n$ depends on two main forces. The first is the compet-

[13] A detailed set-up and derivation of the equilibrium can be found in Appendix B.

itive environment in the destination market, which is summarized by its size ($L_n$), technology level ($b_n$), and domestic trade share ($\lambda_{nn}$). A larger, more technologically advanced, or more open market (lower $\lambda_{nn}$) is tougher to enter, raising the required productivity cutoff. The second force is the relative affordability of goods from country $i$ in market $n$, captured by the term $\tau_{ni}(w_i/w_n)$. This term weighs the supply cost from the origin country ($\tau_{ni}w_i$) against the income level of the destination country ($w_n$). Consequently, while higher trade costs or origin wages make entry more difficult, a higher wage in the destination market lowers the productivity threshold, as greater purchasing power in market $n$ can sustain a broader set of firms.

As in other non-homothetic frameworks such as Simonovska (2015), Jung et al. (2019), and Ottaviano and Suverato (2024), market selection is driven by the demand side. Because the marginal utility of consumption is bounded, a firm can only serve a market if it is productive enough to set a price below the destination specific choke price. This diverges from standard models where selection depends on covering a fixed entry cost. For a given marginal cost $\frac{w_i c^x_{ni} \tau_{ni}}{\phi}$, a firm's ability to serve market $n$ depends entirely on the conditions in that market. As a result, it is possible for a firm to find it profitable to export to a foreign market, but not to sell in its own domestic market.

### 4.3. Only-Exporters

The model's core mechanisms provide a unified explanation for the three stylized facts from Section 3. As established, it is possible for firms to export while not serving the domestic market they originate from, which provides a theoretical foundation for their prevalence as documented in Stylized Fact 1. The following proposition formalizes the condition under which only-exporters exist.

**Proposition 1.** *Only-exporters, firms from country $i$ that serve a foreign market $n$ but not their domestic market, exist if the export productivity threshold is lower than the domestic* *productivity threshold, $\phi^*_{ni} \leq \phi^*_{ii}$. This condition holds when:*

$$\tau_{ni}\frac{w_i}{w_n} \leq \left[\frac{L_i b_i^\theta}{L_n b_n^\theta}\frac{\lambda_{nn}}{\lambda_{ii}}\right]^{\frac{1}{\theta+1}} \tag{12}$$

This inequality provides a direct theoretical basis for the patterns observed in Stylized Fact 2. The left-hand side, $\tau_{ni}(w_i/w_n)$, represents a relative affordability channel. A firm from a low-income country ($w_i$) finds it easier to serve a high-income foreign market ($w_n$) because greater purchasing power in the destination can sustain a broader range of firms, thus lowering the entry threshold. The right-hand side represents a competition channel. A large, highly integrated domestic market (high $L_i$, low $\lambda_{ii}$) fosters intense competition, raising the domestic productivity cutoff $\phi^*_{ii}$. Conversely, a smaller, less integrated foreign market (low $L_n$, high $\lambda_{nn}$) presents a less competitive environment and a lower entry threshold. Together, these channels explain why only-exporters typically emerge from large, low-income countries to serve smaller, richer destinations.

When this condition is met, the model generates a distinct sorting of firms based on productivity, providing a direct explanation for the negative productivity premium observed in the data.

**Proposition 2.** *When $\phi^*_{ni} \leq \phi^*_{ii}$, firms sort into distinct types based on their productivity draw $\phi$ for a given export customization cost $c^x_{ni}$:*

1. *Normal Exporters: The most productive firms ($\phi > \phi^*_{ii}$) are profitable in both the domestic market and the foreign market.*

2. *Non-Exporters: Firms with productivity $\phi > \phi^*_{ii}$ may serve only the domestic market if they draw a high export customization cost, $c^x_{ni}$, making exporting unprofitable despite their higher efficiency.*

3. *Only-Exporters: The least productive firms ($\phi^*_{ni} \leq \phi < \phi^*_{ii}$), unable to serve the domestic market but able to enter the foreign market given a sufficiently low export cus-*

*tomization cost,* $c^x_{ni}$.

This sorting mechanism endogenously selects only-exporters as the least productive group, rationalizing their negative productivity premium (Stylized Fact 3). They are less productive than both normal exporters and non-exporters because they cannot meet the higher productivity requirement for domestic survival, and survive by exporting to foreign markets. Conversely, when the condition in Proposition 1 does not hold ($\phi^*_{ni} > \phi^*_{ii}$), a scenario more likely for developed economies, the model predicts the standard sorting pattern where only the most productive firms overcome the higher export threshold, consistent with the conventional exporter productivity premium.

### 4.4. Trade Liberalization

A key insight from trade models with heterogeneous firms is that trade liberalization typically boosts aggregate productivity by reallocating market share toward the most efficient firms. However, this outcome can be reversed when selection is driven by income and competition differences. If firms from a low-income, competitive country primarily export to richer, less competitive markets, it is the least productive firms that may exclusively serve the export market. In this scenario, reducing trade costs can lower aggregate productivity.

This Section formalizes this argument with three propositions that describe the effects of a decline in variable trade costs ($\tau_{ni}$). First, a reduction in variable trade costs $\tau_{ni}$ generally makes exporting more accessible, lowering the productivity required for a firm to enter the foreign market.

**Proposition 3.** *A fall in the variable trade cost,* $\tau_{ni}$*, reduces the export productivity threshold,* $\phi^*_{ni}$ *but increases the domestic productivity threshold,* $\phi^*_{ii}$*. (Proof: See appendix B.2.1)*

While this result is standard, it generates important extensive margin implications when the only-exporter condition ($\phi^*_{ni} \leq \phi^*_{ii}$) holds. The lower export threshold ($\phi^*_{ni}$) allows a new firms to enter at the bottom of the productivity distribution. Since the domestic threshold simultaneously rises, these new entrants are necessarily only-exporters. Trade liberalization therefore facilitates the survival of firms in $i$ that were previously too unproductive to serve any market.

**Proposition 4.** *A fall in the variable trade cost, $\tau_{ni}$, reallocates market share among incumbent exporters from high-productivity exporters to low-productivity exporters. (Proof: See appendix B.2.2)*

Beyond the extensive margin, a reduction in trade costs also reallocates market share among incumbent exporters. This reallocation occurs because the pass-through of cost reductions is inversely related to productivity. The marginal exporter, who operates with no markup, passes the full cost savings on to consumers. More productive firms, in contrast, charge higher markups and pass through the cost reduction incompletely. Consequently, the export sales of less productive firms grow faster than those of their more productive counterparts. This implies a reallocation of market share toward the bottom of the exporter productivity distribution and provides a testable prediction: following trade liberalization, the market share of only-exporters should increase.

These two effects, new, low-productivity entrants and a market share shift towards less efficient incumbents, combine to impact the average productivity of all firms in the exporting country. Due to the assumption of a Pareto distributed productivity draws, average productivity for the subset of firms from $i$ that sell to country $n$ is proportional to the productivity cutoff, $\phi^*_{ni}$.

$$\bar{\phi}_{ni} = E[\phi|\phi \geq \phi^*_{ni} c^x_{ni}] = \frac{\theta}{\theta - 1}\frac{\eta + \theta}{\eta + \theta - 1}\phi^*_{ni}$$

Aggregate productivity, $\bar{\phi}_i$, is the weighted average of productivity across all markets served by firms from country $i$, including its domestic market. This is given by:

$$\bar{\phi}_i = \frac{\sum_n M_{ni}\bar{\phi}_{ni}}{\sum_n M_{ni}} = \frac{\theta}{\theta - 1}\frac{\theta + \eta}{\theta + \eta - 1}\frac{\sum_n (\phi^*_{ni})^{1-\theta}}{\sum_n (\phi^*_{ni})^{-\theta}} \tag{13}$$

where $M_{ni}$ is the mass of firms from $i$ serving market $n$. In the special case without export customization costs, two countries $N = 2$, and $\phi^*_{ni} \leq \phi^*_{ii}$, aggregate productivity would be directly proportional to the lowest productivity cutoff, the export cut-off. In this case a reduction in trade cost $\tau_{ni}$ would unambiguously decrease aggregate productivity. With an export customization cost and multiple countries, however, the relationship is more complex, leading to the following proposition.

**Proposition 5.** *If firms from country i face lower domestic incomes and tougher competition relative to n such that $\phi^*_{ni} \leq \phi^*_{ii}$, a fall in the variable trade cost, $\tau_{ni}$, attenuates any increase in the exporting country's aggregate productivity ($\bar{\phi}_i$) and can cause a net decline.*

A decline in variable trade costs, $\tau_{ni}$, triggers two opposing effects on productivity thresholds. First, it lowers the export cutoff, $\phi^*_{ni}$, allowing new less productive firms from country $i$ to enter the foreign market $n$. Second, it raises the domestic cutoff, $\phi^*_{ii}$, through intensified competition, forcing the least productive non-exporters to exit.

When the only-exporter condition $\phi^*_{ni} \leq \phi^*_{ii}$ holds, the marginal exporter is already less productive than the marginal domestic firm. Trade liberalization consequently induces entry at the low end of the productivity distribution via the export channel. This influx of low-productivity exporters creates a compositional shift that reduces the average productivity of all firms from country $i$. This negative effect can counteract, or even dominate, any productivity gains from the exit of the least efficient domestic firms.

In a multi-country setting, the net impact is further complicated by general equilibrium adjustments. A bilateral trade liberalization between countries $i$ and $n$ alters their relative wages. This change, in turn, affects the productivity cutoffs for all other export destinations, which may rise or fall depending on the direction of the wage adjustment. These indirect effects introduce additional channels that can either amplify or dampen the change in aggregate productivity. The ultimate impact on $\bar{\phi}_i$ is therefore ambiguous and becomes an empirical question. Section 6 will consider the quantitative magnitude of these effects in a multi-country general equilibrium setting.

### 4.5. Welfare

To assess the welfare implications of trade, I derive an expression for the indirect utility of the representative consumer in country $n$. Aggregate welfare, $W_n$, is defined as the sum of the indirect sub-utilities obtained from all consumed varieties. The utility from any single variety is a function of the firm's productivity $\phi$ relative to the relevant market cutoff, $\phi^*_{ni}$. Integrating the sub-utility over the joint distribution of productivity and export customization costs for all successful firms leads to a decomposition of the unconditional expected utility per potential variety, $\bar{u}_{ni}$, into two components: the probability of successful entry and the expected utility conditional on successful entry. The unconditional expected sub-utility per potential variety is:

$$\bar{u}_{ni} = \underbrace{\left(\frac{b_i}{\phi^*_{ni}}\right)^{\theta} \frac{\eta}{\eta+\theta}}_{\text{Probability of Successful Entry}} \times \underbrace{\frac{\alpha^2}{4\gamma} \frac{2\theta+3}{(\theta+1)(\theta+2)}}_{\text{Expected Utility Conditional on Entry}}$$

A key result from this derivation is that the expected utility conditional on a firm successfully entering is a constant. This outcome arises from the interplay between the quadratic utility function and the Pareto distribution of firm productivity. The quadratic preferences imply that the sub-utility derived from any variety can be expressed as a function of the firm's performance relative to the market cutoff, $\phi/\phi^*_{ni}$. The Pareto assumption, due to its scale-free property, ensures that the distribution of this relative productivity for all successful firms is independent of the cutoff value itself. Consequently, when integrating to find the expected conditional utility, the result is a constant that does not depend on $\phi^*_{ni}$. This effectively neutralizes any welfare effects from changes in the composition of producers, as the average utility derived from the pool of successful entrants remains unchanged even when the entry threshold shifts.

Aggregate welfare in country $n$ is the sum of these expected utilities across the measure of all potential entrants from all countries $i$. Substituting the expression for $\bar{u}_{ni}$ and simplifying using the equilibrium relationship between the productivity cutoff $\phi^*_{ni}$ and the domestic trade share $\lambda_{nn}$ yields the final expression for welfare:

$$W_n = \xi \left[ \chi^{-\theta} \frac{L_n b_n^\theta}{\lambda_{nn}} \right]^{\frac{1}{\theta+1}}$$

where $\xi$ is a composite of constant parameters. This final expression reveals that welfare is proportional to the domestic productivity cutoff, $\phi^*_{ii}$, and hence that the gains from trade can be summarized by two sufficient statistics: the domestic trade share, $\lambda_{nn}$, and the trade elasticity, which in this framework is given by the Pareto shape parameter $\theta$. This result aligns the model with the findings of Arkolakis et al. (2012), showing that despite different micro-foundations, the aggregate welfare implications are remarkably similar to a broad class of trade models. As demonstrated by Ottaviano and Suverato (2024), this model with non-homothetic preferences falls into the class of models analyzed by Arkolakis et al. (2019), where these two statistics are sufficient to quantify the welfare gains from trade.

The result that the combination of Pareto distributed productivity and quadratic preferences neutralizes the composition margin implies that all welfare effects are mediated through changes in the number of varieties available to consumers. This decouples changes in aggregate productivity from welfare changes. Consequently, even when trade liberalization reduces aggregate productivity, welfare will still increase.

### 4.6. Relation To Homothetic Heterogeneous Firms Trade Models

Non-homotheticity is not a necessary condition for the existence of only-exporters. They can also arise in standard heterogeneous firm models with homothetic preferences, such as an asymmetric version of Melitz (2003), though the underlying mechanism yields predictions regarding market size that are inconsistent with the evidence presented in Section 3.[14]

[14] As I show in detail in Appendix B, two differences in assumptions relative to the original model in Melitz (2003) are required. First, countries have to be asymmetric. Second one needs to assume that firms either pay no fixed cost of production, but a separate fixed cost of market access for the foreign and domestic market, or that the market access cost is payed together with the fixed production cost for any market.

In a homothetic setting, selection is driven not by a choke price but by a firm's ability to cover fixed market entry costs. In such a framework, a firm's potential revenue is a fraction of the total expenditure in the destination market. A larger or richer destination, characterized by higher total expenditure ($w_n L_n$), therefore offers a larger pool of potential revenue. Since the market entry cost is fixed, higher potential revenues make it easier for firms to cover this cost and achieve profitability. This implies that firms from poorer countries might find it profitable to only serve richer foreign markets, an outcome that aligns with the data. However, the same logic predicts that only-exporters will emerge in small domestic markets to serve large foreign ones. This prediction contradicts the empirical evidence that only-exporters are more prevalent in large countries and tend to serve smaller export destinations.

# 5. Empirical Evidence

This Section tests the model's theoretical predictions using a quasi-natural experiment: China's accession to the World Trade Organization (WTO). This event generated a significant reduction in trade uncertainty for Chinese firms exporting to the United States, providing a clean empirical setting to analyze the effects of trade liberalization. The findings confirm the model's core mechanisms. In response to easier U.S. market access, only-exporters expand along the extensive and intensive margins, while aggregate productivity gains are muted and, in some industries, reversed.

## 5.1. Empirical Approach

A central challenge in testing the model's predictions is identifying a trade liberalization episode that is both a clean representation of a falling trade cost and exogenous to the decisions of firms. China's accession to the World Trade Organization (WTO) provides a

Whether it is a joint fixed production and access cost, or just a market access cost, it is not necessary for the fixed cost to enter the foreign market to be exogenously lower than the fixed cost to enter the domestic market to generate this pattern.

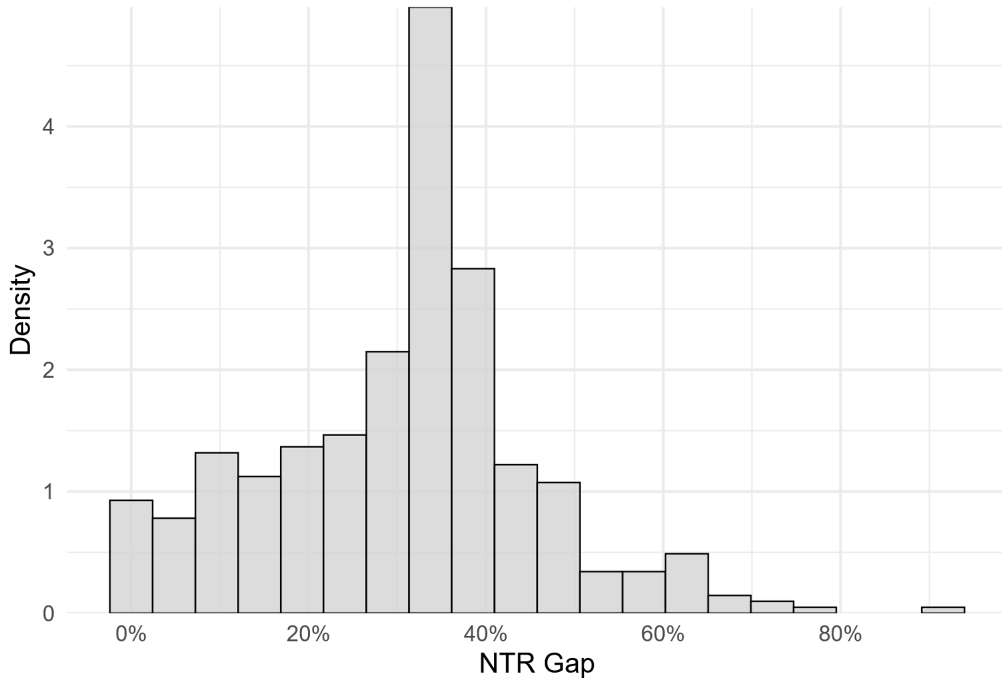
well-suited quasi-natural experiment for this purpose. The event represents a major liberalization between a large, low-income origin country (China) and a high-income destination (the United States), matching the theoretical conditions under which the only-exporter mechanism is most likely to operate.

The primary channel of this liberalization was not a direct tariff reduction but rather a sharp decline in trade policy uncertainty, as established by Pierce and Schott (2016) and Handley and Limão (2017). Prior to this change, China's exports to the U.S. benefited from Normal Trade Relations (NTR) tariffs, which are the standard rates applied to all WTO members. However, this status was not permanent and required annual renewal by U.S. Congress. Failure to renew would have subjected Chinese goods to the substantially higher non-NTR tariffs, which trace their origins to the Smoot-Hawley Tariff Act of 1930. In anticipation of China's WTO accession, U.S. Congress granted China permanent NTR status at the end of 2000. This act eliminated the uncertainty surrounding high potential tariff rates.

This institutional change provides the source of identifying variation. While nearly all industries benefited from the removal of uncertainty, the intensity of the shock varied significantly across them, as Figure 3 shows. The measure of this intensity is the gap between the high non-NTR tariff and the lower NTR tariff rate. The magnitude of this NTR gap is plausibly exogenous to the performance of Chinese firms, as it was determined by historical U.S. trade policy rather than by contemporaneous conditions in China. Neither the non-NTR rates, nor the NTR rates, where targeted at the industrial structure in China. This variation allows for a difference-in-differences research design with continuous treatment, comparing outcomes in industries that experienced a large reduction in uncertainty to those that experienced a smaller one. To estimate the impact of the uncertainty reduction, I employ the following specification:

$$y_{st} = \sum_{t \neq 2000} \beta_t NTR_s \times Year_t + X_{st}\Gamma + \eta_s + \mu_t + \varepsilon_{st} \tag{14}$$

Figure 3: Variation in NTR-gaps across Industries




*Note:* The figure plots the frequencies of the gap between NTR and non-NTR tariffs across 4-digit CIC industries.

The unit of observation is a 4-digit industry $s$ in year $t$. The main coefficients of interest are $\beta_t$ which capture the dynamic effect of the reduction in trade uncertainty. These are estimated by interacting the continuous treatment variable, $NTR_s$, with a set of year dummies, $Year_t$, using the year 2000 as the baseline. $NTR_s$ measures the gap between non-NTR and NTR tariffs for each industry at the beginning of the sample period, 1998, and are derived from Feenstra et al. (2002).

Industry fixed effects, $\eta_s$, absorb all time-invariant differences across industries, while year fixed effects, $\mu_t$, account for common shocks affecting all industries in a given year. The vector $X_{st}$ includes several time-varying controls to account for other policy changes and industry trends. These include U.S. NTR tariffs, the share of firms in Special Economic Zones, and indicators for FDI regulations and non-tariff barriers.[15] To ensure that the estimated effects are not driven by pre-existing differential trends, following Yuan and Ouyang (2025)

[15]Measures on FDI regulation and non-tariff barriers are from Brandt et al. (2017).

the specification also controls for a set of initial 1998 industry characteristics interacted with year dummies. These characteristics are the capital-labor ratio, industry size, export intensity, Chinese input and output tariffs, initial US NTR rates, and an indicator for textile industries. Standard errors are clustered at the 4-digit industry level $s$.

The outcome variable, $y_{st}$, is specified as a series of measures to test the key predictions of the model. These include the share of only-exporters among all firms, their share of total industry revenue and employment, and, most importantly, aggregate industry productivity. Aggregate productivity is measured as the revenue-weighted Total Factor Productivity (TFP), as estimated in Section 3.

To further probe the mechanisms through which trade liberalization affects aggregate industry productivity, I estimate a second specification that explores heterogeneous effects based on initial industry structure. The model predicts that the adverse productivity effects should be concentrated in industries where only-exporters are already largely, as these are the sectors where Condition 12 is most likely to hold. To test this, I augment the baseline model with a triple-interaction term:

$$y_{st} = \sum_{t \neq 2000} \beta_t NTR_s \times Year_t + \sum_{t \neq 2000} \theta_t NTR_s \times D_s^{High-OX-Share} \times Year_t + X_{st}\Gamma + \eta_s + \mu_t + \varepsilon_{st} \tag{15}$$

Here, $D^{High-OX-Share}$ is an indicator variable that equals one if industry $s$ was in the top quintile of the only-exporter share prior to the policy change. In this model, the coefficients $\beta_t$ represent the baseline effect of the uncertainty reduction for industries with a low initial share of only-exporters. The coefficients $\theta_t$ capture the differential effect for industries with a high initial share. The total effect for this latter group is given by the sum $\beta_t + \theta_t$.[16] Specification 15 provides a direct test of whether the productivity consequences of trade liberalization are conditional on the initial prevalence of unproductive exporters.

[16]Note that the regression outlined in equation 15 also controls for the mean difference between industry with an above and below median only-exporter share, though this is absorbed in the industry fixed effects $\eta_s$.

The NTR gap quantifies the difference between WTO tariffs and the higher tariffs Chinese firms could have faced if the U.S. Congress had chosen to revoke NTR status. Thus, a larger gap indicates a larger reduction in trade uncertainty experienced by an industry after 2000. There are firms which switch their 4-digit industry code $s$ over time, and for these firms it is not clear which NTR gap is appropriate. To avoid taking a stance on which NTR gaps to apply, I exclude all firms that switch their 4-digit industry code, which make up about a quarter of all observations.

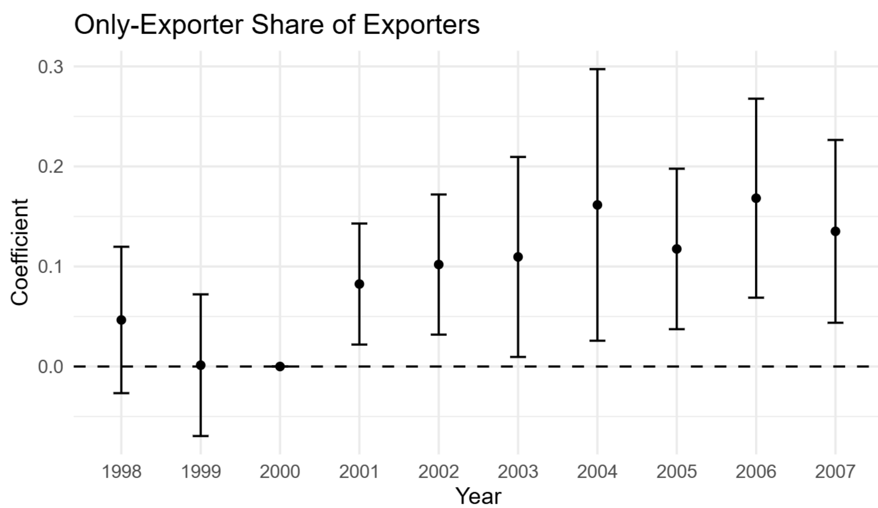
As specified in the data Section 2, all foreign-owned enterprises are excluded from the sample. This has two advantages, first, foreign firms that outsource production to China and hence have high export shares are excluded. Second, in the matched customs data, 94% of pure processing traders are foreign owned, hence removing foreign owned firms virtually removes pure processing exporters.

### 5.2. Results

The empirical results from the difference-in-dosage analysis provide strong support for the mechanisms outlined in the theoretical model. The reduction in trade policy uncertainty following China's WTO accession led to a significant increase in the prevalence and market share of only-exporters, driven by the entry of low-productivity firms.

Figure 4 plots the estimated coefficients ($\beta_t$) from equation 14, illustrating the dynamic effect of the reduction in trade uncertainty on the only-exporters share of exporters at the industry level. The coefficients are statistically insignificant prior to 2001, confirming the absence of pre-trends. Following the policy change, there is a clear and statistically significant increase in the only-exporters share of exporters in industries that experienced a larger reduction in uncertainty (i.e., those with a higher NTR gap). For an industry with an average NTR gap (30%), the results imply a 4.5 percentage point increase in the only-exporter share of exporters by 2007. This finding is consistent with Proposition 3, which predicts that a fall in trade costs, in this case, a reduction in the expected cost of trade due to lower uncertainty, reduces the export productivity threshold. This allows a new wave of less productive firms to enter the export market. Given the tough competitive environment in China's domestic market, these marginal entrants are more likely to become only-exporters. Figure A1 in the Appendix further confirms that this compositional shift hold not just among exporters but all firms within an industry, as the overall share of only-exporters also increases.

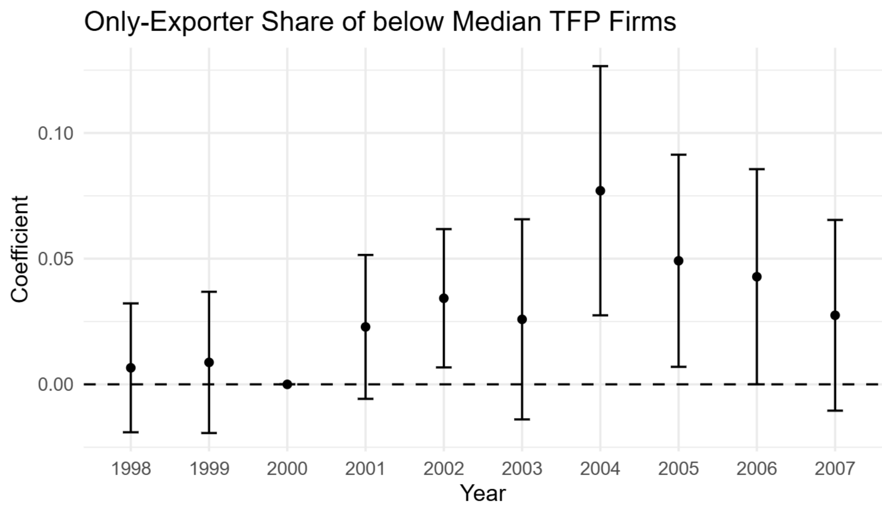
Figure 4: Trade Policy Uncertainty Reduction and the share of Exporters that are Only-Exporters




*Note:* The figure plots estimates for $\beta_t$ from specification 14, where the share of exporters that are only-exporters is the dependent variable. Standard errors are clustered at the 4-digit industry level, displayed confidence interval are at the 95% level. The coefficients capture the dynamic effect of the reduction in trade policy uncertainty, estimated from a difference-in-differences specification. The continuous treatment is the industry's initial Normal Trade Relations (NTR) gap, which measures the difference between non-NTR and NTR tariff rates. Each point estimate shows the differential effect of the NTR gap on the outcome variable for a given year relative to the baseline year 2000. The specification includes 4-digit industry and year fixed effects, as well as a full set of time-varying industry controls and initial industry characteristics interacted with year dummies.

Additionally, Figure 5 provides direct evidence that this phenomenon is driven by firms at the bottom of the productivity distribution. The dependent variable here is the only-exporter share of firms with below-median TFP. The event study plot shows a sharp, positive, and statistically significant effect post-2000. This confirms that the surge in only-exporters is not a general phenomenon across all productivity levels but is concentrated among the least productive firms in the industry. This result corroborates the central mechanism of the paper: trade liberalization, in this context, facilitated the entry and expansion of the least productive firms, which find it optimal to serve only the richer, less-contested foreign market while bypassing their competitive domestic market.

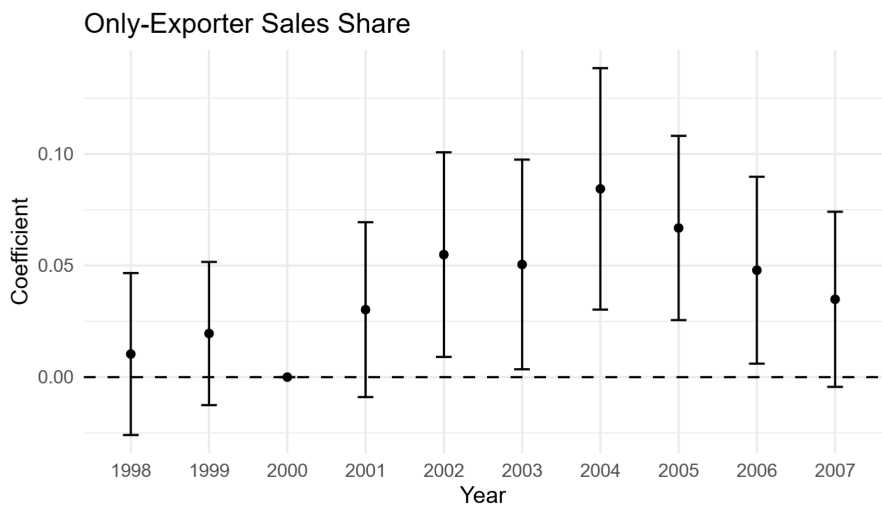
Figure 5: Trade Policy Uncertainty Reduction and the Only-Exporter share of below median TFP firms




*Note:* The figure plots estimates for $\beta_t$ from specification 14, where the only-exporter share of below median TFP firms is the dependent variable. Standard errors are clustered at the 4-digit industry level, displayed confidence interval are at the 95% level. The coefficients capture the dynamic effect of the reduction in trade policy uncertainty, estimated from a difference-in-differences specification. The continuous treatment is the industry's initial Normal Trade Relations (NTR) gap, which measures the difference between non-NTR and NTR tariff rates. Each point estimate shows the differential effect of the NTR gap on the outcome variable for a given year relative to the baseline year 2000. The specification includes 4-digit industry and year fixed effects, as well as a full set of time-varying industry controls and initial industry characteristics interacted with year dummies.

While the entry of new, low-productivity only-exporters is a key prediction, the model also highlights a reallocation of resources towards low productivity exporters. Figure 6 examines this by plotting the effect on the total sales share of only-exporters. The results show a significant increase in the market share captured by only-exporters after 2000. This finding provides direct empirical support for Proposition 4, which states that a fall in variable trade costs reallocates market share from high-productivity to low-productivity exporters. Since only-exporters have been documented in Section 3 as being the least productive firms, their growing market share confirms this reallocation channel. The trade liberalization disproportionately benefited the least efficient firms, allowing them to expand their market share.

Figure 6: Trade Policy Uncertainty Reduction and the market share of Only-Exporters

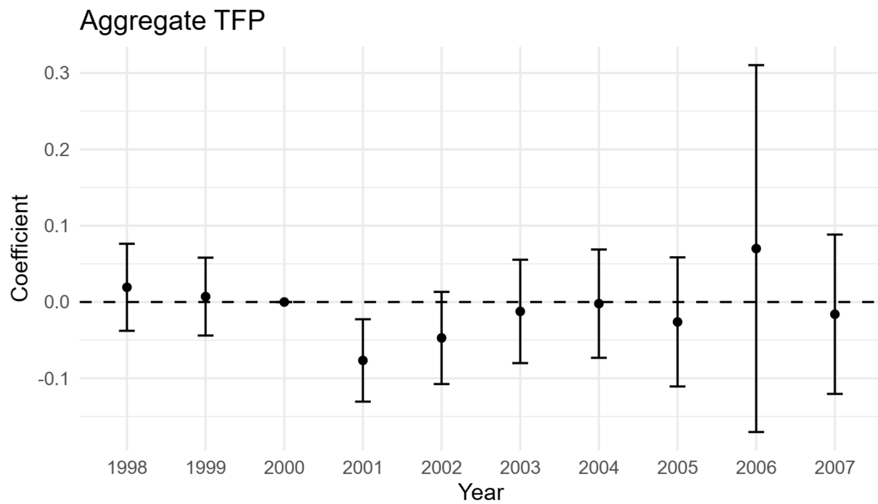



*Note:* The figure plots estimates for $\beta_t$ from specification 14, where the sales share of only-exporters is the dependent variable. Standard errors are clustered at the 4-digit industry level, displayed confidence interval are at the 95% level. The coefficients capture the dynamic effect of the reduction in trade policy uncertainty, estimated from a difference-in-differences specification. The continuous treatment is the industry's initial Normal Trade Relations (NTR) gap, which measures the difference between non-NTR and NTR tariff rates. Each point estimate shows the differential effect of the NTR gap on the outcome variable for a given year relative to the baseline year 2000. The specification includes 4-digit industry and year fixed effects, as well as a full set of time-varying industry controls and initial industry characteristics interacted with year dummies.

A central tenet of modern trade theory is that liberalization boosts aggregate productivity by reallocating market share toward the most efficient firms, which are exporters. The central question is therefore what these reallocations toward less productive firms imply for aggregate industry performance. Figure 7 addresses this by plotting the event study coefficients for sales-weighted aggregate industry TFP. There is no evidence of the expected productivity gains in industries that experienced a larger reduction in trade uncertainty. The coefficients are statistically indistinguishable from zero across most of the post-treatment period and are negative in the years immediately following WTO accession. This finding provides empirical support for Proposition 5, which predicts that when only-exporters are prevalent, a reduction in trade costs can attenuate and even decrease aggregate productivity.

The influx of low-productivity only-exporters and the reallocation of market share towards them created a significant drag on industry TFP, effectively muting any potential gains from trade liberalization.

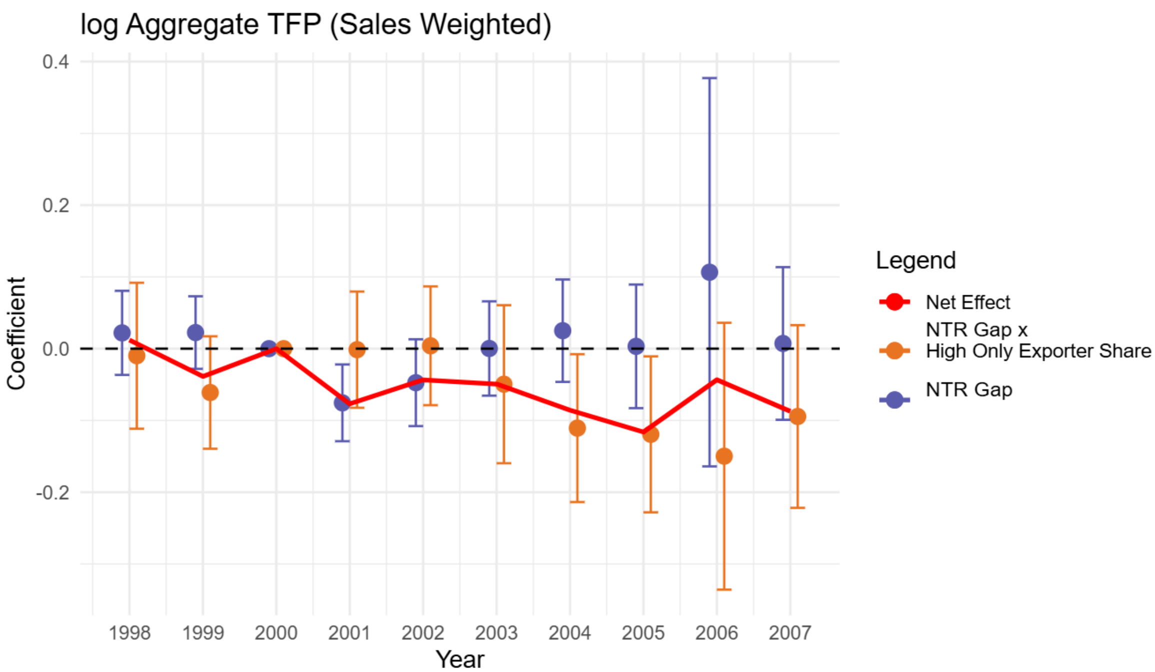
Figure 7: Trade Policy Uncertainty Reduction and Aggregate Industry TFP




*Note:* The figure plots estimates for $\beta_t$ from specification 14, where sales weighted industry aggregate log TFP is the dependent variable. Standard errors are clustered at the 4-digit industry level, displayed confidence interval are at the 95% level. The coefficients capture the dynamic effect of the reduction in trade policy uncertainty, estimated from a difference-in-differences specification. The continuous treatment is the industry's initial Normal Trade Relations (NTR) gap, which measures the difference between non-NTR and NTR tariff rates. Each point estimate shows the differential effect of the NTR gap on the outcome variable for a given year relative to the baseline year 2000. The specification includes 4-digit industry and year fixed effects, as well as a full set of time-varying industry controls and initial industry characteristics interacted with year dummies.

To further test this mechanism, Figure 8 presents the results from the modified specification in equation 15, which explores heterogeneous effects based on the initial prevalence of only-exporters. The results suggest that the productivity effects are not uniform. For industries with a low initial share of only-exporters (the baseline effect, shown in blue), the impact on aggregate TFP is largely insignificant. The story appears different for industries that had a high share of only-exporters prior to WTO accession. The interaction term (in orange) is consistently negative, indicating a differential negative effect for this group, although it only reaches statistical significance in two of the post-treatment years. The net effect for these industries (the red line) points towards a decline in aggregate TFP, in line with the predictions of Proposition 5, suggesting that adverse productivity outcomes are concentrated in those industries where the conditions for only-exporters to thrive were already established. For an industry with an average NTR gap (30%) in the top quintile of only-exporter share, the results imply a cumulative decline in aggregate TFP of -3% by 2007, relative to a similar industry with no exposure to the uncertainty reduction.

Figure 8: Trade Policy Uncertainty Reduction and Aggregate Industry TFP




*Note:* The figure plots estimates for $\beta_t$ from model 15, where sales weighted industry aggregate log TFP is the dependent variable. Standard errors are clustered at the 4-digit industry level, displayed confidence interval are at the 95% level. The continuous treatment is the industry's initial Normal Trade Relations (NTR) gap, and all effects are shown relative to the baseline year 2000. The "NTR Gap" series plots the baseline effect for industries with a low initial share of only-exporters ($\beta_t$). The "NTR Gap x High Only Exporter Share" series shows the additional, differential effect for industries in the top quintile of the only-exporter share distribution ($\theta_t$). The "Net Effect" series represents the total effect for these high-share industries, plotting the sum of the baseline and differential coefficients ($\beta_t + \theta_t$). The specification includes 4-digit industry and year fixed effects, plus a comprehensive set of time-varying industry controls and initial industry characteristics interacted with year dummies.

Finally, Figure 9 investigates a potential channel for this aggregate productivity decline: a deterioration in allocative efficiency. To measure this, the figure plots the effect on the within-industry correlation between a firm's TFP and its market share, a proxy for allocative efficiency. This metric is based on the principle that an efficient market should allocate greater market share to more productive firms; a stronger positive correlation thus signifies higher efficiency. The results for industries with a high initial only-exporter share (the net effect, shown by the red line) suggest a decline in this correlation after 2000. This pattern, which is statistically significant in two post-treatment years, indicates that trade liberalization led to market share being reallocated from more productive firms to less productive ones. This result is consistent with the mechanism described in Proposition 4 and provides a plausible explanation for the aggregate TFP losses documented in Figure 8. In sum, the evidence suggests that the reduction in trade uncertainty disproportionately benefited the least productive firms, allowing them to enter and gain market share, which in turn appears to have worsened allocative efficiency and depressed overall industry productivity.

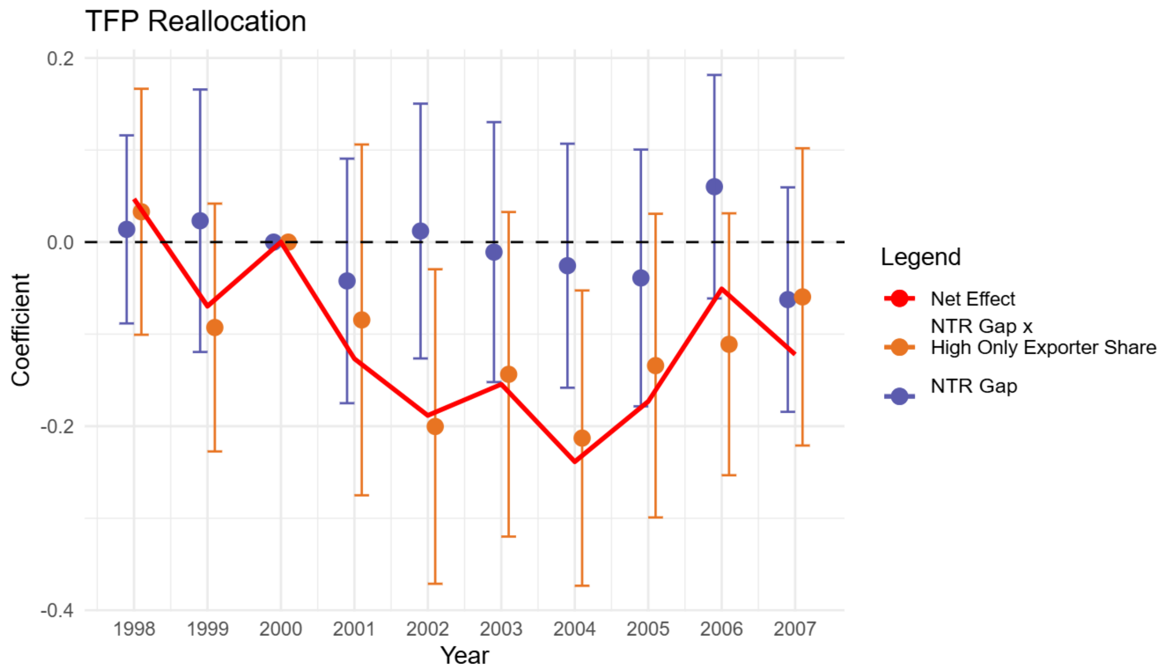
# 6. Quantitative Analysis

The preceding empirical analysis in Section 5 demonstrated that the reduction in trade uncertainty following China's WTO accession led to an increased prevalence of low-productivity only-exporters and, in some industries, a decline in aggregate TFP. To quantify the magnitude of these effects and understand the underlying channels, this Section quantifies the aggregate productivity impact of the trade uncertainty reduction in a multi-sector version of the theoretical model from Section 4. The quantitative exercise confirms that this trade liberalization episode caused a net decline in China's aggregate productivity of -0.15%, driven primarily by easier market access to the U.S. market, which outweighed the pro-competitive effects at home and in other export markets.

## 6.1. Quantitative Framework

The quantitative analysis extends the baseline model to a multi-sector economy. The preferences of the representative consumer in country $n$ are given by a Cobb-Douglas aggregator

Figure 9: Trade Policy Uncertainty Reduction and the Correlation between Market Share and TFP




*Note:* The figure plots estimates for $\beta_t$ from model 15, where the correlation coefficient between a firm's market share and TFP is the dependent variable. Standard errors are clustered at the 4-digit industry level, displayed confidence interval are at the 95% level. The continuous treatment is the industry's initial Normal Trade Relations (NTR) gap, and all effects are shown relative to the baseline year 2000. The "NTR Gap" series plots the baseline effect for industries with a low initial share of only-exporters ($\beta_t$). The "NTR Gap x High Only Exporter Share" series shows the additional, differential effect for industries in the top quintile of the only-exporter share distribution ($\theta_t$). The "Net Effect" series represents the total effect for these high-share industries, plotting the sum of the baseline and differential coefficients ($\beta_t + \theta_t$). The specification includes 4-digit industry and year fixed effects, plus a comprehensive set of time-varying industry controls and initial industry characteristics interacted with year dummies.

over sectoral sub-utilities:

$$U_n = \prod_s (U_{ns})^{\beta_{ns}}$$

where $U_{ns}$ is the sub-utility for sector $s$ as defined in the baseline model, and $\beta_{ns}$ represents the country-specific expenditure share for each sector. Firm productivity within each country-sector $(i, s)$ is drawn from a Pareto distribution characterized by a scale parameter $b_{is}$. The shape parameter, $\theta$, which also governs the trade elasticity, is assumed to be constant across all countries and sectors. Following the estimates from Bakker et al. (2024) using comprehensive Chinese census data, I set $\theta = 3.24$. Labor is assumed to freely move across sectors, facilitating a common wage rate $w_i$ in country $i$.

Bilateral trade flows and domestic sales data for 117 manufacturing sectors are sourced from the International Trade and Production Database for Simulation (ITPD-S), as compiled by Borchert et al. (2024). To manage computational complexity, countries with a total export value below \$10 billion are aggregated into a "Rest of World" composite. I further assume that trade deficits are a constant share of expenditures using the year 2000 as the baseline.

The central policy experiment is the reduction in trade uncertainty between China and the United States, which I model as a symmetric reduction in the bilateral trade cost, $\tau_{US,China}$. To translate the observed reduction in uncertainty into a trade cost equivalent, I first estimate its impact on trade flows. To do so I draw on bilateral export data at the HS-6 digit level from the BACI dataset for the period 1996-2007 (Gaulier and Zignago 2010). I estimate a difference-in-difference model similar to Pierce and Schott (2016), where I regress the log of exports from China to the US on an indicator for the post-2000 period, interacted with the NTR gap, controlling for HS-6 fixed effects and year fixed effects.

$$\ln(x_{pt}) = \gamma D_{pt} + \alpha_p + \delta_t + \epsilon_{pt} \tag{16}$$

where $x_{pt}$ represents exports from China to the U.S. for product $p$ in year $t$. The variable $D_{pt}$ is an interaction term equal to the Normal Trade Relations (NTR) gap for product $p$ in years after 2000, and zero otherwise. The specification includes product fixed effects ($\alpha_p$) and year fixed effects ($\delta_t$). The estimated coefficient, $\hat{\gamma} = 0.54$ (standard error = 0.103), captures the semi-elasticity of exports with respect to the NTR gap. This is almost identical to the results in Yuan and Ouyang (2025), and a year-by-year interaction shown in Figure A2 in the Appendix reveals no significant pre-trends. This estimate is then used to compute the ad-valorem equivalent (AVE) tariff reduction, $\hat{\tau}$, that would generate the same change in trade flows given the model's trade elasticity $\theta$: $\hat{\tau}_s = \exp(\frac{\hat{\gamma}\times\text{NTR-Gap}_s}{\theta})$ for each sector $s$. This calculation yields an average trade cost reduction of 5.1%, a figure consistent with the

5% estimate in Handley and Limão (2017). Lastly, this AVE reduction is then applied as the counterfactual shock to $\tau_{US,China}$.

To solve for the counterfactual equilibrium after this shock, I employ the exact hat algebra methodology pioneered by Dekle et al. (2008). This approach involves representing the model's system of equations in terms of proportional changes ('hats') relative to the initial, observed equilibrium in 2000. This method allows the model to be solved for the counterfactual changes in endogenous variables, such as wages and trade shares, without requiring values for unobserved parameters like the technology shifters ($b_{is}$) and levels of trade cost ($\tau_{nis}$).

### 6.2. Results

The counterfactual excercise asks how Chinese aggregate productivity changed due to the WTO accession induced trade uncertainty reduction relative to the baseline of 2000. The model predicts that aggregate productivity can either increase or decrease, depending on the relative strength of competing channels. On the one hand, easier access to the US market lowers the export productivity threshold ($\phi^*_{US,China}$), allowing less productive Chinese firms to enter, which exerts downward pressure on aggregate productivity. On the other hand, the resulting increase in competition can raise the domestic productivity threshold ($\phi^*_{China,China}$), pushing out the least productive firms serving the domestic market. Furthermore, general equilibrium effects on wages can alter productivity thresholds for all other export destinations which may amplify or mitigate these effects.

In the model, aggregate productivity 13 for the exporting country $i$ is defined as the labor-share-weighted average of sectoral productivities:

$$\overline{\phi}_i = \sum_s \frac{L_{is}}{L_i} \overline{\phi}_{is}$$

where each sectoral productivity, $\overline{\phi}_{is}$, is given by:

$$\overline{\phi}_{is} = \frac{\theta}{\theta - 1} \frac{\eta + \theta}{\eta + \theta - 1} \frac{\sum_n (\phi^*_{nis})^{1-\theta}}{\sum_n (\phi^*_{nis})^{-\theta}}$$

To disentangle these channels, I decompose the total change in China's aggregate productivity into contributions from its underlying sources. The change in aggregate productivity arises from shifts in the productivity cutoffs for each sector-destination pair and from the reallocation of labor between sectors. The contribution of each channel is calculated as its respective component of the total change in the final counterfactual equilibrium. The "US Effect" captures the part of the total change driven by adjustments in the China-to-US export cutoffs across all sectors. The "Domestic Effect" isolates the impact of changes in domestic productivity cutoffs across all sectors. The "All other Destination Effects" component aggregates the general equilibrium impact on all other export cutoffs. Finally, the "Sectoral Reallocation" effect measures the change in aggregate productivity resulting from shifts in sectoral labor shares.

The results of this decomposition are presented in Table 4. The overall effect of the trade liberalization is a -0.15% decline in aggregate productivity. The decomposition reveals that the primary driver of this decline is the "US Effect". The lower export threshold for the US market, which facilitated the entry of less productive only-exporters, accounts for a substantial -0.396 percentage point reduction in productivity.

This strong negative effect is partially mitigated by pro-competitive forces. The "Domestic Effect", stemming from intensified competition within China, contributes +0.1031 percentage points to productivity. Similarly, Chinese relative wages increase due to the increased demand for its products, which makes exporting to other countries more difficult for the least productive firms, account for the positive "All other Destination Effects" of +0.1515 percentage points. The reallocation of labor across sectors plays a negligible role, contributing only -0.0073 percentage points. The sum of these forces yields the total negative effect on China's aggregate productivity.

Table 4: Aggregate Productivity Decomposition for China

| **Component** | **Contribution to Productivity Change** |
|---|---|
| Overall Effect | -0.1498 |
| *Decomposition:* | |
| Domestic Effect | 0.1031 |
| US Effect | -0.3956 |
| All other Destination Effects | 0.1515 |
| Sectoral Reallocation | -0.0073 |

Despite the negative impact on aggregate productivity, trade liberalization leads to welfare gains for both countries. As established in the theoretical Section 4, the model's structure, combining quadratic utility with a Pareto productivity distribution, implies that welfare is driven by the number of available varieties rather than by changes in their composition. The model predicts a welfare increase of 0.192% for China and 0.091% for the US This outcome highlights a central implication of the paper: a trade policy that expands consumer choice can be welfare-enhancing even if it simultaneously reallocates market share toward less productive firms and lowers aggregate productivity.

# 7. Conclusion

A significant share of exporters in developing economies consists of "only-exporters" which are systematically less productive than their peers. This paper proposes a trade model with non-homothetic preferences that rationalizes this pattern through an "exporting to escape" mechanism, where unfavorable conditions such as low income and intense competition at home push the least productive firms to serve more favorable foreign markets. An analysis of China's accession to the World Trade Organization confirms that trade liberalization, by lowering the export threshold to the United States, increased the prevalence of these unproductive exporters and reallocated market share toward the bottom of the productivity distribution. Consequently, the expected aggregate productivity gains from trade were muted and, in some industries, reversed, which demonstrates that the effects of trade integration are conditional on the initial economic environment.

These findings contribute to the literature on firm heterogeneity by identifying a demand-driven mechanism that refines the predictions of standard trade models. Whereas canonical models predict that liberalization reallocates market share toward the most productive firms (Melitz 2003), this paper shows that in the context of asymmetric trade between low- and high-income countries, integration can systematically benefit the least productive firms. This outcome is not driven by conventional supply-side fixed cost but by demand-side asymmetries induced by non-homothetic preferences and differences in market structure. By incorporating these features, the analysis offers a mechanism that more accurately rationalizes the observed sorting patterns than standard CES models, aligning with a growing body of work demonstrating how demand structure can fundamentally alter the aggregate consequences of trade (Melitz and Ottaviano 2008; Fieler 2011). A central implication is the potential decoupling of aggregate productivity from welfare. The theoretical framework shows that trade liberalization is always welfare-enhancing by increasing variety, even as it induces a decline in aggregate productivity. This finding adds nuance to the measurement of the gains from trade, suggesting that a singular focus on productivity can be misleading.

The paper's findings also carry implications for development economics and trade policy. It introduces a novel, trade-induced channel for resource misallocation. While the existing literature often attributes misallocation in developing economies to domestic frictions such as credit constraints or subsidies (Hsieh and Klenow 2009; Atkin and Donaldson 2022), this paper demonstrates that a deterioration in allocative efficiency can be an endogenous outcome of trade integration itself, particularly when low-income countries open up to richer foreign markets. The central policy lesson is that the effects of trade liberalization are conditional on the economic environment. For developing countries, the productivity outcomes of opening up to high-income partners can differ substantially from those of South-South trade integration, a conditionality that is critical for managing expectations and designing effective complementary policies.

Future research should investigate the dynamic evolution of only-exporters. The static analysis presented here cannot determine if these firms learn by exporting, eventually gaining sufficient productivity to re-enter their domestic markets. If such a graduation path exists, the "exporting to escape" channel could represent a novel dynamic gain from trade, where an initially adverse compositional shock transforms into a long-run productivity benefit. This possibility implies a modified infant industry argument for policy: targeted export promotion could use less-contested and richer foreign markets as a training ground, helping marginal firms build the capabilities required for future domestic competition.

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# Appendix A.

## A.1. Production Function Estimation

This Section outlines how I estimate 2-digit sector specific production functions following the approach of De Loecker and Warzynski (2012) and Ackerberg et al. (2015) as implemented for China by Brandt et al. (2017).

I assume a Cobb-Douglas Gross-Output production function taking intermediate inputs, labor, and capital as inputs.

$$q_{ft} = \beta_m m_{ft} + \beta_l l_{ft} + \beta_k k_{ft} + \omega_{ft} + \varepsilon_{it} \tag{A1}$$

where all lower case letters denote log terms, and gross output value $q_{ft}$, intermediate input $m_{ft}$ for firm $f$ at time $t$ are deflated by industry level input and output deflators using deflators provided by Brandt et al. (2017). Capital $k_{ft}$ are fixed assets deflated by a capital deflator following the perpetual-inventory method. Labor $l_{ft}$ is measured as the number of workers. Because firm level deflators are not available, firm level price deviations from the industry average remain in my measures for output and intermediate inputs. In turn $\omega_{ft}$ captures firm level productivity and firm level price deviations from the industry price deflators.

My control function uses intermediate inputs $m$, with firm $f$'s intermediate input demand being

$$m_{ft} = m(l_{ft}, k_{ft}, X_{ft}, \omega_{ft}) \tag{A2}$$

Where $X_{ft}$ is a vector of factors that may influence optimal input decisions. As in Levinsohn and Petrin (2003), I assume that $\omega_{ft}$ is the only unobserved firm specific factor that affects input demand, and that $m_{ft}$ is a strictly monotonic function of $\omega_{ft}$. Since firm-level price deviations from the industry deflators are still part of $\omega_{ft}$, I further assume that firm specific prices are a strictly monotonic function of $\omega_{ft}$. I can then invert $m(.)$ to get a proxy for productivity $h(.)$

$$\omega_{ft} = h(m_{ft}, l_{ft}, k_{ft}, X_{ft}) \tag{A3}$$

As recommended by De Loecker (2013), I allow the law of motion of productivity to depend on a firm's export status, which is contained in the vector $X_{ft}$. To capture further factors that could influence a firm's optimal input choice, $X_{ft}$ also incorporates NTR-gaps interacted with a post treatment dummy, a firm's SEZ status, and changes in Chinese input and output tariffs. I assume that $\omega_{ft}$ follows a first order Markov process as described by $g(.)$

$$\omega_{ft} = g(\omega_{ft-1}, X_{ft}) + \xi_{ft} \tag{A4}$$

where $\xi_{ft}$ is an innovation to the firms productivity process. I further assume that capital $k_{it}$ is set at $t-1$ by the firm investment decision and is hence exogenous to any current innovation to a firms productivity. Further, $m_{it-1}$ as well as $l_{it-1}$ are orthogonal to $\xi_{it}$ and will be used as instruments later on.

The estimation procedure follows Ackerberg et al. (2015) and takes two steps. First, I estimate

$$q_{ft} = \varphi(l_{ft}, \tilde{k}_{ft}, \tilde{m}_{ft}, X_{ft}, Z_{ft}) + \epsilon_{ft} \tag{A5}$$

as a third order polynomial of capital, labor and intermediate inputs with interaction terms with each other and each firm's exporting status. I further include province, year and ownership type fixed effects as well as Chinese tariff changes, NTR-gap post treatment indicator, export status, and SEZ fixed effects combined in $Z_{ft}$.

The second step uses the predicted values for $\varphi_{it}$ to estimate productivity

$$\hat{\omega}_{ft} = \varphi_{ft} - \beta_k k_{ft} - \beta_l l_{ft} - \beta_m m_{it} \tag{A6}$$

I then proxy the firm productivity process $\omega_{ft}$ with a linear function

$$\omega_{ft} = \alpha_0 + \alpha_1 \omega_{ft-1} + \gamma X_{ft} + \xi_{ft} \tag{A7}$$

Given my assumptions, $k_{ft}$, $m_{ft-1}$ as well as $l_{ft-1}$ are orthogonal to $\xi_{it}$, which I use to construct moment conditions to identify $\beta$

$$E\left[\xi_{it}(\beta)\begin{bmatrix} k_{it} \\ m_{it-1} \\ l_{it-1} \end{bmatrix}\right] = 0 \tag{A8}$$

I use this moment condition to identify $\beta = (\beta_k, \beta_l, \beta_m)$ by GMM using the factor's cost shares as starting values. The corresponding estimate for TFP is referred to as TFP (ACF) in the paper, and calculated as the production function residual given the estimated output elasticities.

As an alternative measure I follow the approach of Syverson (2004). This approach estimates TFP as a residual from a production function where the output elasticities are proxied by factor cost shares. This approach relies on the assumptions of a constant-returns-to-scale (CRS) Cobb-Douglas production technology and cost-minimizing behavior by firms.

Assume a firm $f$ in a 4-digit industry $i$ at time $t$ has the following gross-output production function:

$$Y_{fit} = \omega_{fit} K_{fit}^{\alpha_i^k} L_{fit}^{\alpha_i^l} M_{fit}^{\alpha_i^m}$$

where $Y$ is real gross output, $\omega$ is TFP, $K$ is real capital stock, $L$ is labor, and $M$ are real intermediate input costs. The output elasticities for capital ($\alpha_i^k$), labor ($\alpha_i^l$), and materials ($\alpha_i^m$) are assumed to be common across all firms within a given industry $i$. Under the CRS assumption, $\alpha_i^k + \alpha_i^l + \alpha_i^m = 1$.

Under the assumption of cost minimization, the output elasticity of an input equals its share in total cost. I first calculate the firm-level cost share for each input: capital, labor, and materials. The cost of capital is based on a user cost, $r$, calculated as the sum of the real interest rate and the depreciation rate. The nominal interest rate, $i$, is the average lending rate from the People's Bank of China between 1991 and 2022 (6.48%). The inflation rate, $\pi$, is the average for China between 1998 and 2007 (2.81%, source: World Bank), and the depreciation rate, $\delta$, is the average for the same period (5%, taken from Penn World Table). This yields an $r = 0.0867$.

Firm-level cost shares are then computed as:

$$\beta_{fit}^k = \frac{rK_{fit}}{TC_{fit}}; \quad \beta_{fit}^l = \frac{w_{fit}L_{fit}}{TC_{fit}}; \quad \beta_{fit}^m = \frac{M_{fit}}{TC_{fit}}$$

where $TC_{fit}$ is the firm's total cost. To mitigate measurement error and idiosyncratic noise in firm-level shares, they are aggregated to the 4-digit industry level. The output elasticity for each factor in industry $i$ is estimated as the output-weighted average of the firm-level cost shares for all firms in that industry:

$$\hat{\alpha}_i^j = \sum_{f \in i} \frac{Y_{fit}}{\sum_f Y_{fit}} \beta_{fit}^j \quad \text{for } j \in \{k, l, m\}$$

Finally, with the estimated industry-level output elasticities, firm-level TFP is calculated as the Solow residual:

$$\hat{\omega}_{fit} = \ln(Y_{fit}) - \hat{\alpha}_i^k ln(K_{fit}) - \hat{\alpha}_i^l ln(L_{fit}) - \hat{\alpha}_i^m ln(M_{fit})$$

This measure corresponds to the TFP (C).

### A.2. Alternative Explanations

A valid concern is that the observed patterns are driven by confounding firm types rather than the proposed economic mechanism. Only-exporters could, for instance, include non-producing export intermediaries, such as trading firms, that specialize in reselling goods abroad. To account for non-producing export intermediaries, the sample excludes firms with no reported output or with unusually high sales-to-output ratios. A second, more significant, confounding factor in the Chinese context is processing trade. Firms engaged in processing trade operate under a special customs regime, importing inputs duty-free for assembly and subsequent re-export. These firms have been shown to be less productive than ordinary exporters (Yu and Tian 2012; Dai et al. 2016). This issue is addressed by excluding foreign-owned firms from the main sample, a step which removes virtually all pure processing firms, as 94.8% of them are foreign-owned. Furthermore, all analyses using matched customs data are restricted to "General Trade" transactions, explicitly removing processing flows. The finding that only-exporters are less productive is robust to controlling for processing trade in a sample that includes foreign firms (Table A1), confirming these firms do not drive the results.

Table A1: Productivity and Processing Trade

| | TFP (ACF) | TFP (C) | LP |
|---|---|---|---|
| Normal Exporter | -0.012*** | -0.015*** | -0.004 |
| | (0.001) | (0.001) | (0.005) |
| Only-Exporter | -0.045*** | -0.039*** | -0.285*** |
| | (0.002) | (0.002) | (0.008) |
| Pure Processing Exporter | 0.002 | -0.014*** | -0.152*** |
| | (0.004) | (0.003) | (0.011) |
| Num.Obs. | 677722 | 681200 | 681200 |
| R2 | 0.787 | 0.311 | 0.265 |

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The sample is merge of Chinese Customs data from (2000, 2004, 2005, 2007) and the Chinese Annual Survey of Industrial Firms. The sample includes all non-exporters and matched exporters and contains foreign owned firms. Standard Errors are clustered at the firm level. All outcomes are in logs. All columns control for year, province, 4-digit industry, ownership type fixed effects (including foreign ownership), and SEZ status. Column 1 displays results from TFP estimated using the proxy variable approach as in De Loecker and Warzynski (2012) - Ackerberg et al. (2016) method using Gross-Output Cobb-Douglas production function. Column 2 constructs TFP using cost-shares as output elasticities and assuming a constant returns to scale Cobb-Douglas production function at the 4-digit industry level. Column 3 reports labor productivity (Value Added per Worker). The difference in the number of observations between column 1 and 2 occurs because in the prduction function estimation, some industries are estimated to have negative output elasticities of captial. These industries are excluded.

Other institutional features of the Chinese economy could also explain the findings. Lu et al. (2010), for instance, find that foreign-owned exporters in China are generally less productive, a concern which the exclusion of these firms from the main analysis directly addresses. Another possibility is that export-contingent subsidies, which are common in China's Special Economic Zones (SEZs), distort firm behavior (Defever and Riaño 2017). Such policies can protect firms with low profitability and high export shares, potentially confounding the only-exporter classification. However, the paper's results are robust to controlling for a firm's location within an SEZ, indicating that these specific subsidies do not drive the main findings.[17]

To rule out further alternative explanations, I explore several additional firm characteristics in the World Bank Enterprise Survey following equation 3. Table A2 presents the results of this comparison. A potential confounder is differential reporting, where formal export sales are captured but informal domestic sales are not. The data show no significant difference, however, in the share of sales paid informally across firm types. Operational constraints, such as limited production capacity or access to finance, could also shape a firm's decision. Constrained firms may choose to only serve the most profitable market, which may not be the domestic one. Yet, reported capacity utilization does not differ significantly, and only-exporters are less likely than non-exporters to report financing as a problem.

Finally, differences in product quality could play a role. Using internationally recognized quality certification as a proxy, both only-exporters and normal exporters are more likely than non-exporters to be certified. This aligns with findings that firms often export higher-quality goods (Hummels and Skiba 2004; Bernard et al. 2007). Such investments can be conceptualized as an export customization cost necessary to operate abroad. The high rate of certification among only-exporters suggests their business model is structured around incurring these costs to satisfy the requirements of foreign markets.

### A.3. Industry Heterogeneity

Table A3 identifies the characteristics of industries where only-exporters are most common. To do so, the Chinese Annual Survey of Industrial Firms is aggregated to the 4-digit industry-year level to estimate the following model:

$$y_{it} = \gamma X_{it} + \beta c_i + \eta_t + \varepsilon_{it} \tag{A9}$$

Where $y_{it}$ is the share of exporters that are only-exporters in industry $i$ at time $t$. Time invariant industry characteristics are captured $c_i$, while $X_{it}$ controls for ownership type and special economic zones shares, and $\eta_t$ are year fixed effects. The industry-level characteristics used in the analysis are defined as follows. Product sophistication is a measure capturing the

[17] A firm's SEZ status is determined by its proximity to the centroid of trade-related SEZs, using data from Martin and Zhang (2021). Further detail on the construction of the SEZ indicator can be found in Section 2.

Table A2: Other Firm Characteristics across countries

| | Informality | Capacity | Finance | Quality |
|---|---|---|---|---|
| Normal Exporter | 0.184 | -0.003 | 0.010 | 0.180*** |
| | (0.186) | (0.009) | (0.018) | (0.026) |
| Only-Exporter | 3.425 | -0.020 | -0.094*** | 0.165*** |
| | (2.298) | (0.038) | (0.029) | (0.056) |
| Num.Obs. | 50395 | 63401 | 67858 | 68063 |
| R2 | 0.116 | 0.064 | 0.129 | 0.245 |

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Data comes from the World Bank Enterprise Survey. Standard Errors are clustered at the country level. All columns control for the share of state and foreign capital as well as 2-digit ISIC industry and country-year (sample) fixed effects. Informality is defined as the share of sales paid informally, quality is a dummy whether a firm has an international quality certificate, capacity is the self reported capacity utilization, finance indicates a dummy whether a firm reports financial constraints to be a problem, and lastly Quality is an indicator for whether a firm reports to have international quality certificates. Varying number of observations are due to differences in missings in the individual variables.

technological complexity of an industry's output, as defined by Jarreau and Poncet (2012). Upstreamness quantifies an industry's distance from final demand, indicating its position in the production value chain, following Alfaro et al. (2019). Finally, capital intensity is measured as the capital-to-labor ratio. Less capital-intensive industries are representative of China's comparative advantage, where domestic competition is particularly strong, as shown by Lu (2010).

Table A3: Industry Characteristics

| | Share of Exporters that are Only Exporters | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| ln Product Sophistication | -0.050*** | | | | -0.063*** |
| | (0.017) | | | | (0.014) |
| ln Upstreamness | | -0.062*** | | | -0.020 |
| | | (0.014) | | | (0.014) |
| ln K/L ratio 98 | | | -0.098*** | | -0.097*** |
| | | | (0.010) | | (0.011) |
| HHI 98 | | | | -0.134*** | -0.156*** |
| | | | | (0.046) | (0.048) |
| Num.Obs. | 4176 | 4151 | 4176 | 4176 | 4151 |
| R2 | 0.373 | 0.382 | 0.457 | 0.369 | 0.486 |

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Data comes from the Chinese Annual Industrial Survey. Standard errors are clustered at the 4-digit industry level. All columns control for ownership type shares, the share of firms in trade promoting special economic zones, and for year fixed effects. Product sophistication measures how similar the product mix is to those in high income countries, upstreamness measures how far "upstream" an industry is in the production sequence, K/L ratio is the capital labor ratio in 1998, and HHI is the Herfindahl-Hirschman index in 1998.

## A.4. Additional Tables And Figures

### A.4.1. Summary Statistics

Table A4: Summary Statistics by Exporter Type

| | **Non-Exporter** | | **Normal Exporter** | | **Only-Exporter** | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD |
| TFP (ACF) | 1.08 | 0.67 | 1.04 | 0.69 | 0.88 | 0.60 |
| TFP (C) | 0.97 | 0.36 | 0.98 | 0.37 | 1.05 | 0.25 |
| Labor Productivity | 95.99 | 185.26 | 80.88 | 153.99 | 49.25 | 74.29 |
| Sales | 38985.84 | 229701.78 | 170491.95 | 1363534.39 | 26399.72 | 81648.37 |
| Employees | 174.05 | 371.95 | 580.48 | 2013.23 | 207.84 | 390.17 |
| Real Wages | 13.13 | 101.13 | 14.38 | 14.39 | 13.89 | 10.34 |
| Capital Intensity | 74.48 | 200.86 | 69.08 | 174.92 | 27.06 | 57.42 |
| Value Added Share | 0.32 | 0.15 | 0.30 | 0.13 | 0.29 | 0.12 |
| SEZ Status | 0.22 | 0.41 | 0.25 | 0.43 | 0.19 | 0.39 |
| Firm Age | 10.04 | 11.27 | 12.24 | 13.00 | 7.17 | 7.57 |

The table shows means and standard deviations for various firm characteristics, categorized by firm type: Non-Exporter, Normal Exporter, and Only-Exporter. TFP (ACF) refers to Total Factor Productivity in logs calculated using the ACF method, TFP (C) refers to Total Factor Productivity in logs calculated using the cost shares method. Note that TFP measures are only comparable within 2-digit industries, and cross-industry aggregates provided in this table should not be used for any inference. Labor Productivity is measured as value added per employee, Sales are a firm's total revenue (in 1000 RMB), Employees indicate the number of employees, Real Wages are average firm wages adjusted for inflation, Capital Intensity is the ratio of capital to labor, Value Added Share represents the average share of value added in a firm's total output, SEZ Status is a binary indicator for firms located in Special Economic Zones, and Firm Age is measured in years. Data is sourced from the ASIF dataset.

Table A5: Exporter Type Transition Matrix

| | | **Firm Type in $t$** | | |
|---|---|---|---|---|
| | | Non-Exporter | Normal Exporter | Only-Exporter |
| **Firm Type in $t-1$** | Non-Exporter | 95.80 | 3.77 | 0.43 |
| | Normal Exporter | 21.16 | 73.76 | 5.08 |
| | Only-Exporter | 14.16 | 26.68 | 59.17 |

*Notes:* The table shows the transition probabilities (in percent) between different firm types. The rows represent the firm type in period $t-1$, while the columns represent the firm type in period $t$. Analysis is limited to firms that appear in two consecutive years.

### A.4.2. Event Study Results

Figure A1 plots the estimated coefficients ($\beta_t$) from equation 14, illustrating the dynamic effect of the reduction in trade uncertainty on the share of only-exporters at the industry level. The coefficients are statistically insignificant prior to 2000, confirming the absence of pre-trends. Following the policy change, there is a clear and statistically significant increase

Table A6: Industry Summary Statistics

| Variable | Mean | SD | Min | Max |
|---|---|---|---|---|
| Number of Firms | 302.19 | 545.53 | 1.00 | 8734.00 |
| Number of Employees | 70.89 | 150.85 | 0.033 | 2288.66 |
| Share of Only-Exporters | 0.04 | 0.08 | 0.00 | 0.80 |
| Share of Normal Exporters | 0.16 | 0.12 | 0.00 | 1.00 |
| Share of Only-Exporters among Exporters | 0.13 | 0.17 | 0.00 | 1.00 |
| Share of Non-Exporters | 0.80 | 0.16 | 0.00 | 1.00 |

*Notes:* This table presents summary statistics of the Annual Survey of Industrial Firms aggregated to the 4-digit industry and year level. The mean is taken across across 4-digit industry × year aggregates. SD denotes standard deviation. Number of employees is in thousands. The 'Share' variables are expressed as proportions.

Table A7: ASIF-Customs Matched and Unmatched Sample Summary Statistics

| | **Unmatched Sample** | | **Matched Sample** | |
|---|---|---|---|---|
| Variable | Mean | SD | Mean | SD |
| Output | 10.19 | 1.37 | 10.77 | 1.36 |
| Exports | 8.84 | 1.73 | 9.43 | 1.72 |
| Employees | 5.05 | 1.19 | 5.40 | 1.21 |
| Sales | 10.16 | 1.37 | 10.75 | 1.36 |
| Value Added | 8.90 | 1.45 | 9.45 | 1.45 |
| Only-Exporter Share | 0.17 | | 0.26 | |

*Notes:* This table compares statistics for key variables between the unmatched and matched samples between ASIF and Chinese Customs data for 2000, 2004, 2005, and 2007. The overall matchrate is 51%. SD denotes standard deviation. All variables are on log scale, except 'Only-Exporter Share' which is a proportion.

in the share of only-exporters in industries that experienced a larger reduction in uncertainty (i.e., those with a higher NTR gap).

### A.4.3. Trade Flows

Figure A2 presents the estimated coefficients ($\gamma_t$) from equation A10, which examines the dynamic effect of the reduction in trade uncertainty on trade flows at the product level.

$$\ln(x_{pt}) = \sum_{t \neq 2000} \gamma_t D_{pt} + \alpha_p + \delta_t + \epsilon_{pt} \tag{A10}$$

where $x_{pt}$ represents exports from China to the U.S. for 6-digit HS Product $p$ in year $t$. The variable $D_{pt}$ is an interaction term equal to the Normal Trade Relations (NTR) gap for

Table A8: World Bank Enterprise Survey Summary Statistics

| | Non-Exporter | | Normal Exporter | | Only-Exporter | |
|---|---|---|---|---|---|---|
| Variable | Mean | SD | Mean | SD | Mean | SD |
| Log Sales (USD) | -0.16 | 1.74 | 0.55 | 1.79 | 0.43 | 1.86 |
| Employment | -10.50 | 130.41 | 31.22 | 404.75 | 69.42 | 422.65 |
| Log Labor Productivity | -0.03 | 1.13 | 0.12 | 1.03 | -0.13 | 1.26 |
| Informal Sales Share | -0.09 | 6.96 | -0.01 | 5.10 | 3.51 | 8.68 |
| Quality Certificate | -0.03 | 0.36 | 0.11 | 0.48 | 0.11 | 0.48 |
| Capacity Utilization | 0.11 | 21.10 | -0.30 | 19.68 | -1.07 | 21.07 |
| Finance Constraint | 0.00 | 0.47 | 0.01 | 0.47 | -0.08 | 0.47 |
| Competition | 0.00 | 1.13 | 0.02 | 1.03 | -0.29 | 0.87 |

*Notes:* This table presents summary statistics for key firm characteristics. Values are grouped by exporter type. SD denotes standard deviation. All values are demeaned by country-year and weighted using survey weights. 'Log Sales (USD)' is the natural logarithm of sales in USD. 'Employment' is the number of employees. 'Log Labor Productivity' is the natural logarithm of labor productivity, calculated as sales per employee. 'Informal Sales Share' represents the share of sales made through informal channels. 'Quality Certificate' is a binary indicator for whether the firm has an international quality certification. 'Capacity Utilization' measures the extent to which a firm uses its productive capacity. 'Finance Constraint' is a binary indicator for whether the firm faces financial constraints. 'Competition' is an index measuring perceived competition intensity. Data is sourced from the World Bank Enterprise Surveys.

product $p$ in years after 2000, and zero otherwise. The specification includes product fixed effects ($\alpha_p$) and year fixed effects ($\delta_t$).

The coefficients are statistically insignificant prior to 2000, confirming the absence of pretrends. After the policy change, there is a clear and statistically significant increase in trade flows in 6-digit products that experienced a larger reduction in uncertainty.

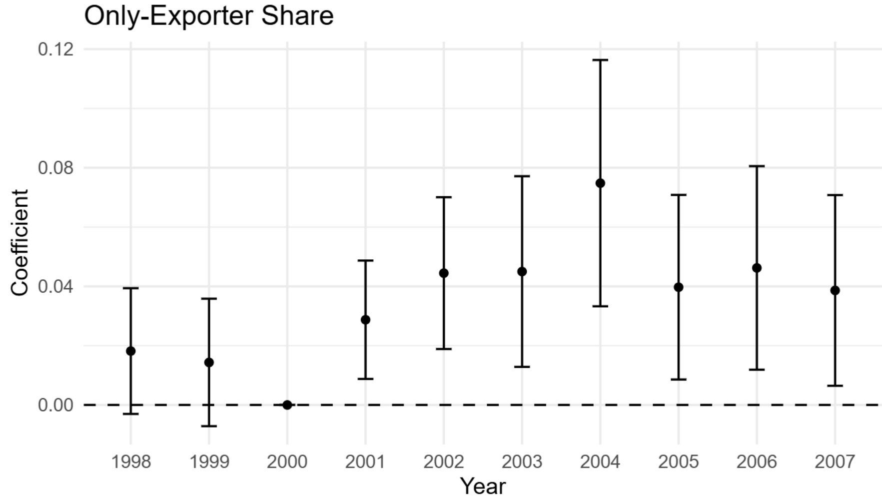
# Appendix B.

## B.1. Equilibrium Conditions And Parametrization

$G_i(\phi)$ represents the cumulative distribution function (CDF) of firm productivity in country $i$, $H(c^x_{ni})$ the independent CDF of the export customization cost $c^x_{ni}$. For simplicity I assume that $c^x_{ni} = c^x_{ki}$ $\forall k, n$ and $c^x_{ii} = 1$ by definition. Let the associated probability density functions (PDF) be $g_i(\phi)$ and $h(c^x_{ni})$. Only a subset of firms in $i$ that exceed the cut-off productivity $\phi^*_{ni}(c^x_{ni})$ find it profitable to enter market $n$. Given the CDFs $G_i(\phi)$ and $H(c^x_{ni})$, the mass of successful entrants $M_{ni}$ will be

$$M_{ni} = \int_{c^x=1}^{\infty} J_i[1 - G_i(\phi^*_{ni}(c^x_{ni})]dH(c^x_{ni})$$

Figure A1: Trade Policy Uncertainty Reduction and the share of Only-Exporters




*Note:* The figure plots estimates for $\beta_t$ from specification 14, where the share of firms that are only-exporters is the dependent variable. Standard errors are clustered at the 4-digit industry level, displayed confidence interval are at the 95% level. The coefficients capture the dynamic effect of the reduction in trade policy uncertainty, estimated from a difference-in-differences specification. The continuous treatment is the industry's initial Normal Trade Relations (NTR) gap, which measures the difference between non-NTR and NTR tariff rates. Each point estimate shows the differential effect of the NTR gap on the outcome variable for a given year relative to the baseline year 2000. The specification includes 4-digit industry and year fixed effects, as well as a full set of time-varying industry controls and initial industry characteristics interacted with year dummies.

Conditional on firms surpassing the cut-off productivity $\phi^*_{ni}$, the productivity distribution of firms serving market $n$ is described by the conditional density

$$\mu_{ni}(\phi, c^x_{ni}) = \frac{g_i(\phi)h(c^x_{ni})}{\int_1^\infty \int_{\phi^*_{ni}(c^x_{ni})}^\infty g_i(\phi)h(c^x_{ni})d\phi dc^x_{ni}}, \quad \text{if } \phi \geq \phi^*_{ni}c^x_{ni}$$

Using this conditional density, the aggregate quantity statistics $Q_n$ in destination $n$ can be expressed as

$$Q_n = \sum_i M_{ni} \int_1^\infty \int_{\phi^*_{ni}(c^x_{ni})}^\infty q_{ni}(\phi, c^x_{ni})\mu_{ni}(\phi, c^x_{ni})d\phi dc^x_{ni}$$

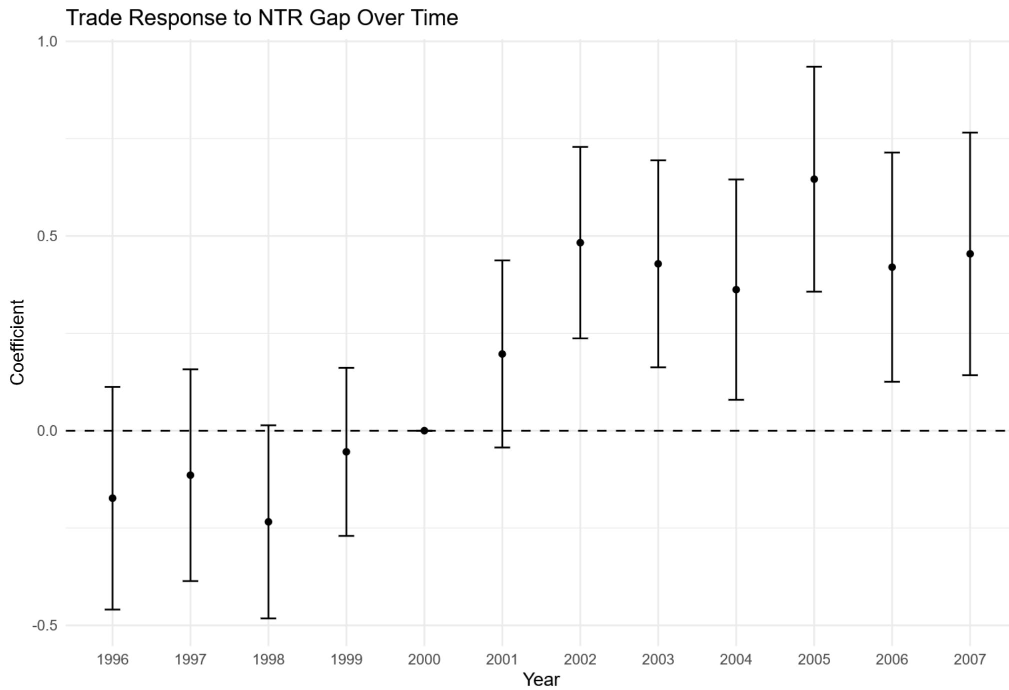
And similarly, the aggregate price statistic $\tilde{P}_n$ in $n$ is

$$\tilde{P}_n = \sum_i M_{ni} \int_1^\infty \int_{\phi^*_{ni}(c^x_{ni})}^\infty p_{ni}(\phi, c^x_{ni})\mu_{ni}(\phi, c^x_{ni})d\phi dc^x_{ni}$$

Trade flows from $i$ to $n$ are

$$X_{ni} = M_{ni} \int_1^\infty \int_{\phi^*_{ni}(c^x_{ni})}^\infty p_{ni}(\phi, c^x_{ni})x_{ni}(\phi, c^x_{ni})\mu_{ni}(\phi, c^x_{ni})d\phi dc^x_{ni} \tag{B1}$$

Figure A2: Trade Policy Uncertainty Reduction Trade Response




*Note:* The figure plots estimates for $\gamma_t$ from specification A10, where the log of export flows from China to the US is the dependent variable. Standard errors are clustered at the 6-digit HS Product level, displayed confidence interval are at the 95% level.

Under the assumption of free entry, unrestricted entry drives expected profits in $i$ to zero as long as some firms produce. Hence, in equilibrium expected profits in $i$ must equal the fixed cost of entry $F$, which is payed in labor. Expected profits in $i$ are determined by aggregating individual expected profits across all markets. Setting this equal to the fixed cost of entry $w_i F$ yields the free entry condition

$$w_i F = \sum_n \int_1^\infty \left[1 - G_i(\phi^*_{ni}(c^x_{ni}))\right] h(c^x_{ni}) dc^x_{ni} \int_1^\infty \int_{\phi^*_{ni}(c^x_{ni})}^\infty \pi_{ni}(\phi, c^x_{ni}) \mu_{ni}(\phi, c^x_{ni}) d\phi dc^x_{ni}$$

And finally the income/spending identity is

$$w_i L_i = \sum_n X_{ni}$$

Which ensures that labor markets clear for a wage $w_i$.

To derive closed form solutions for the equilibrium conditions, I assume specific functional forms for $G_i(\phi)$ and $H(c^x_{ni})$. In particular, following Melitz and Ottaviano (2008), I let $G_i(\phi)$ be Pareto distributed with $G_i(\phi) = 1 - (b_i/\phi)^\theta$ with shape parameter $\theta > 1$ and support

$[b_i, \infty)$. Further, $c_{ni}^x$ is also Pareto distributed with $H(c_{ni}^x) = 1 - (c_{ni}^x)^{-\eta}$ where $\eta > 1$ is the shape parameter. The conditional pdf of firms in $i$ serving $n$ is

$$\mu_{ni}(\phi, c_{ni}^x) = \theta \frac{(\phi_{ni}^*(c_{ni}^x))^\theta}{\phi^{\theta+1}} \frac{\eta + \theta}{(c_{ni}^x)^{\eta+\theta+1}} \text{ if } \phi \geq \phi_{ni}^* c_{ni}^x$$

Using this parametrization the aggregate quantity statistic $Q_n$ becomes

$$Q_n = \frac{\alpha M_n}{2\gamma(\theta + 1)}$$

Since $\sum_i M_{ni} = M_n$. Similarly, $\tilde{P}_n$ is

$$\tilde{P}_n = \frac{2\theta + 1}{2\theta + 2} \frac{w_n}{\phi_{nn}^*} M_n$$

Where I used the fact that $\phi_{nn}^* = \phi_{ni}^* \frac{w_n}{\tau_{ni} c_{ni}^x w_i}$. Furthermore, the free entry condition can be obtained by deriving average profits given this parametrization, which yields[18]

$$w_i F = \sum_k \left( \frac{b_i}{\phi_{ki}^*} \right)^\theta \frac{\tau_{ki} w_i}{\phi_{ki}^*} \frac{\alpha L_k}{2\gamma(\theta + 1)(\theta + 2)} \frac{\eta}{\eta + \theta}$$

The income/spending identity can be derived similarly to the free entry condition and is

$$w_i L_i = \sum_k J_i \left( \frac{b_i}{\phi_{ki}^*} \right)^\theta \frac{\tau_{ki} w_i}{\phi_{ki}^*} \frac{\alpha L_k}{2\gamma(\theta + 2)} \frac{\eta}{\eta + \theta} \tag{B2}$$

Setting the two conditions equal yields the equilibrium number of entrants in $i$

$$J_i = \frac{L_i}{(\theta + 1)F} \tag{B3}$$

Which, together with the spending identity of importer $n$ (i.e. income in $n$ matching expenditure of $n$) characterizes the net cut-off productivity.[19]

$$\phi_{ni}^* = \left[ \frac{\eta\alpha}{2\gamma(\theta + 1)(\theta + 2)(\eta + \theta) F w_n} \sum_k L_k \left( \frac{b_k}{\tau_{nk} w_k} \right)^\theta \right]^{\frac{1}{\theta+1}} \tau_{ni} w_i$$

The derivation of trade shares $\lambda_{ni}$ (i.e. the share that $n$ imports from $i$) follows from the

[18] Note that $\phi_{ki}^*$ is the net productivity threshold, not inclusive of the export customization cost.

[19] Despite the different functional form assumption on preferences, this yields virtually the same cut-off productivity as Simonovska (2015), suggesting that the subsequent results are not unique to this particular functional form assumption.

income/spending identity B2 and trade flows B1. Substituting $\phi^*_{ni}$ with 11, gives trade shares $\lambda_{ni}$

$$\lambda_{ni} = \frac{L_i b_i^\theta (\tau_{ni} w_i)^{-\theta}}{\sum_k L_k b_k^\theta (\tau_{nk} w_k)^{-\theta}} \tag{B4}$$

which take the usual gravity form.

## B.2. Comparative Statics

### B.2.1. Productivity Threshold Elasticity

Here I derive the elasticities of the productivity thresholds $\phi^*_{ni}$ and $\phi^*_{nn}$ with respect to the variable trade cost $\tau_{ni}$. The analysis considers two countries, $i$ and $n$. For simplicity, call $\tau_{ni} = \tau$ and define the wage ratio $w \equiv \frac{w_i}{w_n}$.

**Wage Ratio and Trade Share Elasticities** The balanced trade condition, $\lambda_{ni} w_n L_n = \lambda_{in} w_i L_i$ defines the wage ratio $w = \frac{\lambda_{ni} L_n}{\lambda_{in} L_i}$. The elasticity of the wage ratio with respect to trade costs $\varepsilon_{w,\tau} = \frac{d\ln(w)}{d\ln(\tau)}$ is therefore given by the difference in the elasticities of the trade shares:

$$\varepsilon_{w,\tau} = \varepsilon_{\lambda_{ni},\tau} - \varepsilon_{\lambda_{in},\tau} \tag{B5}$$

The expenditure share of $n$ on goods from $i$ is

$$\lambda_{ni} = \frac{L_i b_i^\theta (\tau w)^{-\theta}}{L_n b_n^\theta + L_i b_i^\theta (\tau w)^{-\theta}}$$

Log-differentiating $\lambda_{ni}$ with respect to $\ln(\tau)$ and simplifying yields the elasticity of the trade share

$$\varepsilon_{\lambda_{ni},\tau} = -\theta(1 - \lambda_{ni}) - \theta \varepsilon_{w,\tau}(1 - \lambda_{ni})$$

In a two-country setting, the home expenditure share is $1 - \lambda_{ni} = \lambda_{nn}$. Thus, the expression simplifies to

$$\varepsilon_{\lambda_{ni},\tau} = -\theta \lambda_{nn}(1 + \varepsilon_{w,\tau}) \tag{B6}$$

By symmetry it follows that $\varepsilon_{\lambda_{in},\tau}$ is

$$\varepsilon_{\lambda_{in},\tau} = -\theta \lambda_{ii}(1 + \varepsilon_{w,\tau}) \tag{B7}$$

Substituting the trade share elasticities into the expression for $\varepsilon_{w,\tau}$ and rearranging gives

$$\varepsilon_{w,\tau} = \frac{\theta(\lambda_{ii} - \lambda_{nn})}{1 + \theta(\lambda_{nn} + \lambda_{ii})} \tag{B8}$$

**Productivity Threshold Elasticity** The market access productivity threshold is

$$\phi_{ni}^* = \left[\chi \frac{L_n b_n^\theta}{\lambda_{nn}}\right]^{\frac{1}{\theta+1}} \tau w$$

where $\chi$ gathers constants. Its elasticity with respect to $\ln(\tau)$ is

$$\varepsilon_{\phi_{ni}^*,\tau} = \frac{d\ln(\phi_{ni}^*)}{d\ln(\tau)} = 1 + \varepsilon_{w,\tau} - \frac{1}{\theta+1}\varepsilon_{\lambda_{nn},\tau}$$

From the identity $\lambda_{nn} + \lambda_{ni} = 1$, it follows that $\varepsilon_{\lambda_{nn},\tau} = \theta\lambda_{ni}(1 - \varepsilon_{w,\tau})$. Substituting this and the expression for $\varepsilon_{w,\tau}$ gives

$$\varepsilon_{\phi_{ni}^*,\tau} = \left(1 - \frac{\theta\lambda_{ni}}{\theta+1}\right)\left(\frac{1+2\theta\lambda_{ii}}{1+\theta(\lambda_{nn}+\lambda_{ii})}\right) > 0 \tag{B9}$$

Which is positive as $1 > \frac{\theta\lambda_{ni}}{\theta+1}$.
The domestic productivity threshold, $\phi_{nn}^*$ is

$$\phi_{nn}^* = \left[\chi \frac{L_n b_n^\theta}{\lambda_{nn}}\right]^{\frac{1}{\theta+1}}$$

Following the steps above its elasticity with respect to variable trade cost is

$$\varepsilon_{\phi_{nn}^*,\tau} = -\frac{\theta\lambda_{ni}}{1+\theta}\left(\frac{1+2\theta\lambda_{ii}}{1+\theta(\lambda_{nn}+\lambda_{ii})}\right) < 0 \tag{B10}$$

Hence, the export productivity threshold $\phi_{ni}^*$ declines as variable trade cost $\tau$ fall, but the domestic productivity threshold $\phi_{nn}^*$ increases.

### B.2.2. Revenue Elasticity

The revenue function for a firm with productivity $\phi$ from country $i$ exporting to country $n$, net of export customization cost $c_{ni}^x$, is given by

$$r_{ni}(\phi) = \frac{\alpha\tau_{ni}w_i L_n}{4\gamma\phi_{ni}^*}\left(1 - \frac{(\phi_{ni}^*)^2}{\phi^2}\right)$$

To find the elasticity of revenue with respect to a change in variable trade costs $\tau_{ni}$, I log-differentiate the revenue function with respect to $\ln(\tau_{ni})$

$$\varepsilon_{r_{ni},\tau_{ni}} = \frac{d\ln(r_{ni}(\phi))}{d\ln(\tau_{ni})} = 1 + \varepsilon_{w_i,\tau_{ni}} - \varepsilon_{\phi^*_{ni},\tau_{ni}} + \frac{d}{d\ln(\tau_{ni})}\ln\left(1 - \frac{(\phi^*_{ni})^2}{\phi^2}\right)$$

Solving the final term and simplifying yields the full elasticity:

$$\varepsilon_{r_{ni},\tau_{ni}} = 1 + \varepsilon_{w_i,\tau_{ni}} - \varepsilon_{\phi^*_{ni},\tau_{ni}}\left(\frac{1 + (\phi^*_{ni}/\phi)^2}{1 - (\phi^*_{ni}/\phi)^2}\right) \tag{B11}$$

I next examine how this revenue elasticity changes with firm productivity $\phi$. The partial derivative of $\varepsilon_{r_{ni},\tau_{ni}}$ with respect to $\phi$ depends only on the final term. Let $Z(\phi) = \frac{1+(\phi^*_{ni}/\phi)^2}{1-(\phi^*_{ni}/\phi)^2}$. The derivative of this component is:

$$\frac{\partial Z(\phi)}{\partial \phi} = -\frac{4\phi(\phi^*_{ni})^2}{(\phi^2 - (\phi^*_{ni})^2)^2} < 0$$

This derivative is negative for all exporting firms, for which $\phi > \phi^*_{ni}$. Since the elasticity of the export threshold with respect to trade costs is positive ($\varepsilon_{\phi^*_{ni},\tau_{ni}} > 0$, as derived previously), the derivative of the revenue elasticity with respect to productivity is:

$$\frac{\partial \varepsilon_{r_{ni},\tau_{ni}}}{\partial \phi} = -\varepsilon_{\phi^*_{ni},\tau_{ni}}\frac{\partial Z(\phi)}{\partial \phi} > 0$$

The revenue growth rate for an exporting firm from a reduction in trade costs is given by $-\varepsilon_{r_{ni},\tau_{ni}}$. It follows that the derivative of this growth rate with respect to productivity is negative:

$$\frac{\partial(-\varepsilon_{r_{ni},\tau_{ni}})}{\partial \phi} < 0$$

When trade costs fall, the revenue of less productive exporters grows faster. The total revenue growth for all exporters in $i$ to $n$ is a weighted average of these individual firm growth rates. Since each firm's growth rate is a strictly decreasing function of its productivity, the least productive firms must grow faster than the average. This is sufficient to prove that the market share of these less productive exporters increases.

### B.3. Homothetic Model

Here I go through an asymmetric version of the Melitz (2003) model to show that it can also rationalize the existence of only-exporters, though the mechanism differs from the previous Section and does not fully align with the stylized facts.

### B.3.1. Set-Up

The set-up follows that of Section 4, with the difference that preferences are CES with elasticity of substitution $\sigma$. Just like before, firms produce a single differentiated variety under monopolistic competition. They are ex-ante identical and draw a productivity level $\phi$ from a country specific distribution $G_i(\phi)$ with support $[b_i, \infty)$ upon paying a fixed entry cost $f_e$, which is assumed to be identical for all $i$. I abstract from an export customization cost $c^x_{ni}$ here, as it is not necessary to highlight the central differences and commonalities. After paying the fixed entry cost which is thereafter sunk, they must pay a market specific fixed cost of production and market access $f_{ni}$.

Note that equivalently, one could assume that there is no fixed cost of production, but only a separate fixed market access cost to enter each market. This deviates from Melitz (2003) where the fixed cost of production is necessary to serve the foreign and domestic market, but serving the foreign market incurs an additional fixed market access cost. Under this assumption, it would always be profitable for a firm that exports to serve the domestic market as well, and only-exporters could not exist.

Firms that cannot cover the fixed cost of serving *any* market freely exit. Successful entrants produce under constant marginal cost with productivity $\phi$. The pricing rule gives constant markups over marginal cost.

### B.3.2. Equilibrium And Market Selection

To be a successful entrant firms need to make non-negative profits, so that the marginal entrant is just able to recover the fixed cost to serve market $n$. Hence, the zero cut-off profit condition is:

$$\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}\left(\frac{\tau_{ni}w_i}{\phi}\right)^{1-\sigma}\frac{L_n w_n}{P_n^{1-\sigma}} = w_i f_{ni}$$

Which gives an expression for the productivity threshold $\phi^*_{ni}$ required to serve market $n$

$$\phi^*_{ni} = \left(\frac{\sigma w_i f_{ni}\left(\frac{\sigma}{\sigma-1}w_i\tau_{ni}\right)^{\sigma-1}}{w_n L_n P_n^{\sigma-1}}\right)^{\frac{1}{\sigma-1}} \tag{B12}$$

Equation (B12) defines the minimum productivity ($\phi^*_{ni}$) a firm from country $i$ requires to profitably serve market $n$. This threshold reflects a trade-off between market entry costs and revenue potential. Higher costs, such as fixed access costs ($f_{ni}$), origin-country wages ($w_i$), and trade barriers ($\tau_{ni}$), raise the required productivity. Conversely, greater market attractiveness, particularly higher total expenditure ($w_n L_n$), lowers the threshold by making it easier for firms to cover fixed costs.

Without making any assumptions on the structure of the export fixed costs $f_{ni}$ relative to the domestic fixed cost $f_{ii}$, it is clear that the export productivity threshold $\phi_{ni}^*$ can be lower than the domestic productivity threshold $\phi_{ii}^*$, allowing for the possibility of only-exporters to exist.

$$\frac{w_n L_n}{w_i L_i} \geq \frac{f_{ni}}{f_{ii}} (\tau_{ni})^{\sigma-1} \left( \frac{P_i}{P_n} \right)^{\sigma-1} \tag{B13}$$

Here the left-hand side represents the relative total expenditure between the domestic market $i$ and foreign market $n$. For the condition to hold, the foreign market must be sufficiently larger and richer than the domestic market. This represents a central divergence relative to the non-homothetic model in Section 4, where the size of the market played a crucial role in its competitiveness thoughness, making it harder for firms to enter in larger markets. Here, this prediciton is reversed, and a larger market offers firms greater potential for profitability without the downside of increased competition, making it more attractive for them to enter.

It is not necessary to assume that the market access costs of the foreign market are lower than those of the domestic market to generate only-exporters. Without loss of generality, I will now assume that $f_{ni} = f_{ii} \; \forall n, i$. To complete the comparison to the model derived above, I apply the same parametrization of productivity draws $\phi$, namely $\phi \sim G_i(\phi) = 1 - (\frac{b_i}{\phi})^{\theta}$. The only-exporter condition, $\phi_{ni}^* < \phi_{ii}^*$, can then be expressed as:

$$\tau_{ni} \left( \frac{w_i}{w_n} \right)^{\frac{\sigma}{\sigma-1}} \leq \frac{b_i}{b_n} \left( \frac{\lambda_{nn}}{\lambda_{ii}} \right)^{\frac{1}{\theta}} \tag{B14}$$

Where the effect of market size $L_n$ is fully captured by the domestic trade share $\lambda_{nn}$. This is because in this set-up, they unambiguously move in the same direction. A larger market will also lead to higher domestic trade shares. In contrast, in the non-homothetic model presented in Section 4, the relationship is more nuanced. While a larger market $L_n$ will still lead to a higher domestic trade share $\lambda_{nn}$, it will also increase competitive toughness in $n$, therefore directly moving in the opposite direction in the non-homothetic only-exporter condition 12. These opposing effects are in line with the prevalence of only-exporters in the data, as presented in Section 3.