TRADE DIVERSION EFFECTS OF CHINA`S VAT EXPORT REBATES

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Abstract: The paper examines trade diversion effects of China`s VAT export rebates within a gravity framework. The findings suggest that increase in rebate by 1% causes 1% decrease in export of third countries and 1/3% decrease in prices. The study identifies 165 country-specific estimates observing a high degree of effects` heterogeneity across countries. These estimates are employed as dependent variable to reveal determinants of the heterogeneity. The results suggest that countries that export higher-quality goods or have lower export diversification are hurt more by China`s rebates. The effects` decomposition for trade in quantity and prices reveal patterns in exporters` competition strategies.

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1. INTRODUCTION

According to Feldstein and Krugman (1990), in an international system where countries charge VAT for imports (as do China), the non-distortionary policy is to also fully rebate VAT on exports, so that the effective VAT rates charged on domestically produced and imported goods are equalized within each country (Garred 2018). However, compared to most other countries with VAT system, China does not fully refund the VAT on exports. Instead, exporters may receive VAT rebates, which vary across products (Gourdon, Monjon and Poncet 2017). In other words, in China, the system of incomplete VAT rebates for exporters is adopted and incomplete rebates constitute a tax on exports (Feldstein and Krugman 1990).

China's system of VAT export rebates has been recognized as a principal instrument of Chinese industrial policy influencing its international competitiveness (Gourdon et al. 2020). Consequently, Chinese government has been continuously accused of providing its firms with an unfair advantage in global trade with the help of incomplete VAT export rebates (Evenett, Fritz and Jing 2012; Gourdon, Monjon and Poncet 2017; Gourdon et al. 2020). Though there are well-established studies, which show that China`s VAT export rebates positively affect domestic export (Chen, Mai and Yu 2006; Chandra and Long 2013; Gourdon, Monjon and Poncet 2017; Gourdon et al. 2020), there is no single paper on their effects for global trade and outside exporters, i.e. trade diversion[1] effects. This paper is the first to provide an explicit empirical test of trade diversion effects of Chinese VAT export rebates. For the test the study utilizes a structural gravity model framework that builds on recent developments of trade research and allows to obtain rather refined evidence. In addition, the study has broader implications for trade research by revealing patterns of export competition in world trade in general.

[1] In this paper trade diversion implies that trade is diverted from one country-exporter towards another country-exporter due to export promotion policy in the latter.

If to regard VAT on export goods as an export tax, rebate on it can be treated as an export subsidy that fits very well into the theoretical framework of the study. Put that in context, when theorizing the impact of China`s VAT export rebates for foreign exports within structural gravity model, I treat VAT as a component of trade costs of domestic (Chinese) exporters and rebate on it as a reduction of these costs.

Chinese VAT export rebates further satisfy important requirements of econometric analysis that ultimately allows to get rather refined and reliable empirical evidence. First, China`s weight in the world trade is exceptionally large[2]. This *per se* implies that China`s trade policies can significantly affect the world trade. Second, China`s VAT rebates` policy has relatively long history. Hence, the time span is long enough for obtaining reliable results. Third, data for Chinese VAT export rebates is available at detailed industry level that enables to include refined industry dimension into the analysis. Finally, Chinese government changes rebates rather frequently[3] that implies enough variation of rebates across industries and time for adequate panel data analysis.

For empirical analysis, a "two-stage" estimation procedure for quantifying and studying heterogeneity in the trade diversion effects of China`s export VAT rebates was adopted from Baier, Yotov and Zylkin (2019).

In a first stage, an explanatory variable that represents the level of China`s VAT export rebate in a four-digit industry i and year t is introduced into a "three-way" fixed effects[4] Poisson Pseudo-Maximum Likelihood (PPML) structural gravity empirical specification of bilateral trade flows of 165 importers and exporters over 2004-2017 disaggregated at four-digit HS industries. I utilize two alternative measures of the dependent variable, bilateral

[2] According to World Integrated Trade Solution (WITS) in 2018 China`s share in World export of 14.57% was the largest followed by the US (8.34%).

[3] For example, according to Gourdon, Monjon and Poncet (2016) in the period of 2002–2012, 75% of the HS8-digit products underwent at least one change in their VAT refund rate.

[4] I.e. I control for time-varying exporter and importer fixed effects (inward and outward multilateral resistances) and time-invariant industry-specific exporter-importer ("pair") fixed effects (bilateral trade costs).

import flows in monetary (USD) and physical (net weight in kilograms) terms, respectively. Within the same model I also regress unit values of bilateral imports (as a ratio of bilateral import flows in monetary and physical terms) on China`s VAT rebates` indicator to reveal evidence on the impact of rebates on international prices. Next, I obtain country-specific estimates. This stage delivers a total of 165 country-specific sets of estimates (for trade in monetary and physical terms and unit values), which then are used as dependent variables in a second stage that studies the determinants of the variance in the estimates.

I find highly statistically significant and robust evidence on trade diversion effects of Chinese VAT export rebates. When bilateral trade is measured in monetary terms, the findings suggest that, other things equal, one unit (represented by percent) increase of China`s VAT rebate leads to roughly one percent (exact number is *minus* 1.18%) decrease in bilateral import from any other exporter, on average. When bilateral trade is measured in physical terms (net weight in kilograms), the respective percentage is *minus* 1.2.

In the regression of unit values of bilateral trade flows on China`s VAT rebates, the evidence suggests that one percent (in absolute terms) increase of VAT rebate leads to about one third of percent (exact number is *minus* 0.36%) decrease in unit values, on average. The relatively small effect was expected since previous studies (Garred 2018, Gourdon et al. 2020) find similar evidence of small or no price effects of China`s VAT export rebates.

The country-specific effects for exports of OECD countries (in monetary terms) are represented on Figure 1.

Fig. 1: China`s VAT export rebates` effects for OECD countries` exports in monetary terms: In percent

As we can observe, the effects are rather heterogenous. Though export of most OECD countries has been negatively affected by Chinese VAT export rebates, for some countries (namely, Chile, Poland, Israel, Mexico, Denmark, Czech Republic, New Zealand and Estonia), the effects have been even positive. Hence, as was already indicated above, I farther studied the factors behind the effects` heterogeneity by regressing country-specific estimates on several explanatory variables.

In general, the results of second-stage analysis are rather intuitive. Richer, larger countries with faster economic growth and larger overall revealed comparative advantage in world trade, which are located more distantly from China suffer less from Chinese export competition. The findings also suggest that an important factor behind the magnitude of the effects is the country`s level of export diversification, particularly its intensive margin. Thereby countries with a more evenly balanced mix of exports or trading partners are more immune to Chinese competition in export markets.

Interestingly, the study finds that protectionist policy (particularly, high import tariffs) helps to dampen negative effects of Chinese export rebates for domestic exporters. Finally, countries that export higher-quality goods are hurt more by China`s rebate policy.

The effects` decomposition into effects for trade in quantity and prices/unit values reveals interesting patterns in exporters` competition

strategies. Exporters from countries with larger revealed comparative advantage in world trade tend to decrease export prices but increase export volumes in reaction to Chinese rebates. Exporters from countries with higher import tariffs are able to improve quality of their goods to such an extent that the composite effect of increased prices and decreased sold volumes is still positive. Exporters of high-quality goods tend to improve quality and, hence, unit values/prices increase but sold volumes decrease. The latter evidence is in line with recent trade literature that emphasizes differences in the quality of products sold by firms within an industry as a new dimension of firms` heterogeneity (see, for example, Schott 2004; Fontagné, Gaulier and Zignago 2008; Schott 2008; Verhoogen 2008; Baldwin and Harrigan 2011; Crozet, Head and Mayer 2012; Martin and Mejean 2014). Similar to this study, Martin and Mejean (2014), also in the context of Chinese competition, suggest and empirically show with French firm-level data that the competition from low-wage countries (particularly, China) drives the quality content of northern countries' exports up.

The paper is linked with four literatures. First, it contributes to the extensive literature that empirically analyzes trade policy effects within gravity model. For over half a century the gravity specification has been a workhorse for empirical studies of international trade and the effects of trade policies on trade. A large fraction of this research is devoted to the effects of Free Trade Agreements (FTAs) on trade. This literature includes (but not limited to) Aitken (1973), Brada and Mendez (1985), Bergstrand (1985), Ghosh and Yamarik (2004), Baier and Bergstrand (2007), Olivero and Yotov (2012), Dai, Yotov and Zylkin (2014), Baier, Yotov and Zylkin (2019). Gravity model has been also used to study trade effects of import tariffs (see, e.g., Crozet and Koenig 2010; Felbermayr, Jung and Larch 2015) and export subsidies (see, e.g., Koo, Karemera and Taylor 1994; Paiva 2008). In this study structural gravity framework is used to estimate the effects of industry-specific trade policy of a large single country for world trade.

Second, the study adds to the literature on the effects of trade policies on untargeted countries. One strand of this literature concerns the FTAs effects for non-members` trade, i.e. FTAs trade diversion effects (see, e.g., Romalis 2007; Magee 2008; Freund 2010; Dai, Yotov and Zylkin 2014; Conconi et al. 2018). The other strand analyzes trade diversion and trade deflection effects of antidumping duties (see, e.g., Bown and Crowly 2006, 2007; Baylis and Perloff 2010; Chandra 2017; Sandkamp 2020). This paper adds to this research by investigating trade diversion effects of export promotion policy of a single large country.

Third, the paper naturally contributes to the literature on the effects of Chinese VAT export rebate policy. Taxation of Chinese exports has received increasing attention from academic researchers in recent years since the Chinese government has made frequent significant adjustments in the level of export taxes and export VAT rebates (Evenett, Fritz and Jing 2012; Gourdon, Monjon and Poncet 2016). While most of the relevant studies have been focusing on the effects of VAT export rebates on China`s domestic export performance (Chen, Mai and Yu 2006; Chandra and Long 2013; Gourdon, Monjon and Poncet 2017; Gourdon et al. 2020), little is known about their effects for other countries. This paper aims to shed light on this issue.

Finally, the study adds to the broader literature on China`s competition effects. Large fraction of this research is devoted to the effects of Chinese import for third-country domestic production activities (see, e.g., Acemoglu et al. 2013; Autor, Dorn and Hanson 2013; Mion and Zhu 2013; Balsvik, Jensen and Salvanes 2015). There are also studies that analyze China`s competition effects for third-country exporters. On one hand, Jenkins (2014) and Iacovone, Rauch and Winters (2013) found that China`s competition negatively affected Brazilian and Mexican export, respectively. On the other hand, Martin and Mejean (2014) find positive impact of Chinese competition on the quality content of French exports. This study analyzes China`s competition effects indirectly via the third-country effects of Chinese governmental industrial

policy that selectively promotes export of certain products and industries. To the best of my knowledge, this is the first study that delivers rather refined evidence on the patterns of China`s export competition effects worldwide.

The paper is organized as follows. Next section briefly discusses China`s VAT rebate policy for exporters. Third section puts forward theoretical framework of the study. Fourth section presents empirical framework while fifth and sixth sections discuss estimation results and their robustness checking, respectively. Final section concludes.

2. BACKGROUND

2.1. Export value-added tax rebate policy in China

Despite its name, VAT is usually intended as a tax on consumption rather than to be a tax on value added. It is charged at all stages of production, but with the provision of some mechanism enabling firms to offset the tax they have paid on their own purchases of goods and services against the tax they charge on their sales of goods and services (Ebrill, Keen and Bodin 2001). In theory, neutral VAT implies a zero rate on exported goods and a full refund of VAT paid by exporters on their inputs (Gourdon et al. 2020). In real practice, the refund can be partial as in China.

China implemented a major tax reform in 1994 by replacing the old industrial and commercial standard tax with a new value-added tax (Cui 2003). Standard rate of VAT in China has been equal to 17 percent up to 2017. 13 per cent VAT rate was set for basic foodstuff, utilities, newspapers and inputs to agricultural production. In 2018, standard VAT rate in China was lowered to 16 percent and in 2019 - to 13 percent. Furthermore, China has implemented a partial VAT refund on inputs paid by exporters, which varies by sector and commodity. Thus, the modern Chinese VAT system imposes an additional tax on exporters whose goods receive a VAT refund rate lower than the applicable VAT rate. According to Gourdon et al. (2020), in 2002-2012 only 13% of the products received full rebates of VAT and, hence, incomplete rebates are the

rule in China and are equivalent to export taxation according to Feldstein and Krugman (1990).

Chinese VAT export rebates change frequently. These changes primarily relate to the support for sophisticated high-technology products, the limitation of export of energy intensive and polluting products, mitigation of trade dispute risks and the pursuit of food security (Gourdon, Monjon and Poncet 2016; Eisenbarth 2017; Gourdon et al. 2020).

2.2. VAT rebates data patterns

In this study I utilize the product-level data on Chinese VAT rates and VAT rebate rates for exporters from the Chinese tax refund website[5] where the data is available from 2004. The data is reported at eight and ten-digit HS classification codes. For the purposes of descriptive analysis in this section I aggregate the data to six-digit HS codes (rebate rates within a 6-digit code are usually identical; see also Bai and Liu 2019). As the Chinese 10-digit classification is not consistent over time (see also Garred 2018 and Gourdon et al. 2020), I use data only for those six-digit HS codes which do not change across HS editions of 2002, 2007, 2012 and 2017 (4 446 codes). On Figure 2, I report mean and standard deviation of VAT rebate rates for the studied period according to the data (across 4 446 HS6 products).

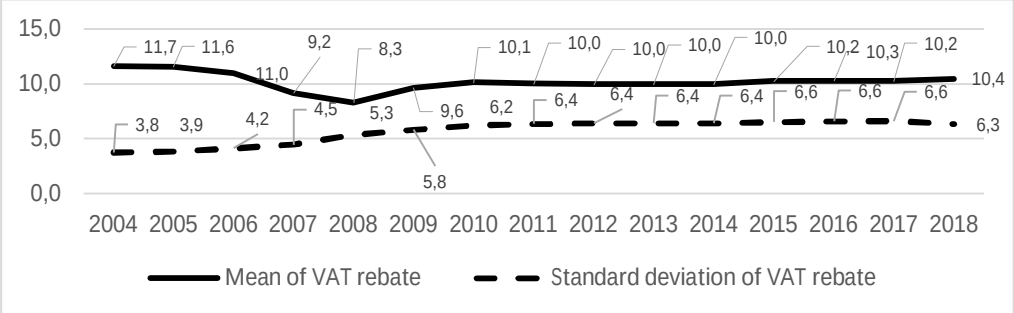

Fig.2: Mean and standard deviation of VAT rebate rates for exporters in China in 2004-2018; based on six-digit HS industry data
Source: Chinese tax refund website and author`s calculations

[5] http://cess.taxrefund.com.cn/AllSearch.htm?web=1. Excel VBA program was written to transfer data from the website into Excel file.

From the Figure we observe that there has been a downward trend in mean VAT rebate until 2008, and then it has increased again and fluctuated around 10 percent between 2010 and 2018. Indeed, during the global economic downturn of 2008-2010, Chinese government implemented a fiscal stimulus program. In addition, between July 2008 and June 2009, all modifications to the Chinese VAT export regime involved expansions of rebates paid on thousands of product lines. Unlike the fiscal stimulus, VAT rebate changes were not reversed at the end of 2010 (Evenett, Fritz and Jing 2012).

In order to inspect the sectoral patterns of Chinese VAT rebates more closely, I run a simple OLS regression with VAT rebate rate in six-digit HS industry as dependent variable, and VAT rate in six-digit HS industry, time and sectoral dummies as explanatory variables. The results are reported in Table A1 in Appendix A. The results suggest that highest rebates have been implemented in transport equipment and general machinery followed by textile products. Smallest rebates are observed in mineral products, wood industry, metallurgy, precious or semi-precious stones/metals and works of art. These patterns are in line with the evidence in previous relevant studies. Eisenbarth (2017) concludes that non-refunded VAT tax in China is higher for industries with higher water pollution intensity (metallurgy, mining, wood processing) and for resources like wood, mineral and metal products as well as precious stones. Gourdon, Monjon and Poncet (2016) conclude that Chinese export VAT rebates largely aim to enhance export of industries with high technological intensity while damping the export of environmentally unfriendly industries.

3. THEORETICAL FRAMEWORK

3.1. Basic setup

The analysis is based on Anderson and Wincoop (2003) version of structural gravity model. In the world of N countries, each country i producers produce a

variety of goods differentiated by place of origin (Armington 1969). Goods are traded with the rest of the world. Q_i denotes fixed supply of each good and p_i is the factory-gate price for each variety. $Y_i = p_i Q_i$ is the value of domestic production and nominal income in country i. E_i is country`s i aggregate expenditure that can be expressed as $E_i = \phi_i Y_i$, where $\phi_i > 1$ implies that country i runs a trade deficit, while $1 > \phi_i > 0$ reflects that country i runs a trade surplus. Trade deficits and surpluses are treated as exogenous (Dekle, Eaton and Kortum [2007, 2008]).

On the demand side, consumer preferences are homothetic, identical across countries, and approximated by a Constant Elasticity of Substitution (CES) utility function for country j:

$$\left\{ \sum_i \beta_i^{\frac{1-\sigma}{\sigma}} c_{ij}^{\frac{\sigma-1}{\sigma}} \right\}^{\frac{\sigma}{\sigma-1}} \qquad (1),$$

where $\sigma > 1$ is the elasticity of substitution among different varieties. $\beta_i > 0$ is the CES preference parameter (commonly treated as an exogenous taste parameter). c_{ij} denotes consumption of varieties from country i in country j. Consumers maximize (1) subject to the standard budget constraint:

$$\sum_i p_{ij} c_{ij} = E_j \qquad (2).$$

E_j denotes the total expenditure in country j at delivered prices $p_{ij} = p_i t_{ij}$ where p_i is a factory-gate price in the country of origin i (the exporter`s supply price) and $t_{ij} \geq 1$ is bilateral trade costs` factor between trading partners i and j. Trade costs are borne by the exporter and include information, design, transport and

various legal and regulatory costs. The exporter passes on these trade costs to the importer.

Solving the consumer`s optimization problem yields the expenditure on goods shipped from country of origin i to destination j as:

$$X_{ij} = \left(\frac{\beta_i p_i t_{ij}}{P_j} \right)^{(1-\sigma)} E_j \quad (3),$$

where $$P_j = \left[\sum_i \left(\beta_i p_i t_{ij} \right)^{1-\sigma} \right]^{1/(1-\sigma)} \quad (4).$$

P_j is a CES consumer price index.

Next, market clearance for goods from each origin is imposed:

$$Y_i = \sum_j \left(\frac{\beta_i p_i t_{ij}}{P_j} \right)^{1-\sigma} E_j \quad (5).$$

In accordance to equation (5), the value of output in country i, Y_i, at delivered prices, should be equal to the total expenditure on this country`s variety in all countries in the world, including i itself. It should be noted that the right-hand-side expression in Equation (5) can be replaced with the sum of all bilateral shipments from i as defined in Equation (3), so that $Y_i = \sum_j X_{ij}$.

Defining $Y \equiv \sum_i Y_i$, dividing the equation (5) by Y, and rearranging terms, we obtain:

$$\left(\beta_i p_i \right)^{1-\sigma} = \frac{Y_i / Y}{\sum_j \left(\frac{t_{ij}}{P_j} \right)^{1-\sigma} \frac{E_j}{Y}} \quad (6).$$

Using equation (6) to substitute for the power transform $\left(\beta_i p_i\right)^{1-\sigma}$ in equations (3) and (4) and after some rearrangements, we obtain the structural gravity system:

$$X_{ij} = \frac{Y_i E_j}{Y}\left(\frac{t_{ij}}{\Pi_i \mathrm{P}_j}\right)^{1-\sigma} \quad (7),$$

$$\Pi_i^{1-\sigma} = \sum_j \left(\frac{t_{ij}}{P_j}\right)^{1-\sigma} \frac{E_j}{Y} \quad (8),$$

$$P_j^{1-\sigma} = \sum_i \left(\frac{t_{ij}}{\Pi_i}\right)^{1-\sigma} \frac{Y_i}{Y} \quad (9),$$

where Π_i and P_j are outward and inward multilateral resistances, respectively. Equation (8) shows that outward multilateral resistance is a weighted-average aggregate of all bilateral trade costs for the producers of goods in each country (exporter side). Similarly, equation (9) defines the inward multilateral resistance as a weighted average of all bilateral trade costs of the consumers in each country (importer side). It should be noted that, according to equation (4), the inward multilateral resistance also bears the interpretation of being a consumer price index.

3.2. VAT export rebate and structural gravity model

This section offers a discussion of the general equilibrium effects of China`s VAT rebates for exporters within the CES-Armington gravity model presented above. Following Larsh and Yotov (2016), the system (7)-(9) is combined with the market clearing condition (6) and added with the definition of the value of output, Y_i, and its relation to aggregate expenditures, E_i:

Partial Equilibrium: $$X_{ij} = \frac{Y_i E_j}{Y}\left(\frac{t_{ij}}{\Pi_i \mathrm{P}_j}\right)^{1-\sigma} \quad (10),$$

Conditional General Equilibrium: $$\Pi_i^{1-\sigma} = \sum_j \left(\frac{t_{ij}}{P_j}\right)^{1-\sigma} \frac{E_j}{Y} \quad (11),$$

$$P_j^{1-\sigma} = \sum_i \left(\frac{t_{ij}}{\Pi_i}\right)^{1-\sigma} \frac{Y_i}{Y} \quad (12),$$

Full Endowment General Equilibrium: $$p_i = \left(\frac{Y_i}{Y}\right)^{\frac{1}{1-\sigma}} \frac{1}{\beta_i \Pi_i} \quad (13),$$

$$E_i = \phi_i Y_i = \phi_i p_i Q_i \quad (14).$$

Hence, in accordance with Head and Mayer (2014) and Larsh and Yotov (2016), I discuss the effects of China`s VAT export rebates in three stages including Partial Equilibrium, Conditional General Equilibrium (which operate via the multilateral resistances` terms) and Full Endowment General Equilibrium (which allow for endogenous response in income and expenditures via equations [13] and [14]).

To incorporate VAT export rebate into structural gravity framework in a simplified manner, we denote VAT export rebate in country c ($c \in i$; China in this study) as evr_c . Since VAT on exported goods is commonly treated as additional cost of exporting (export tax), VAT export rebate should decrease bilateral trade costs of country c with any destination country j by evr_c , i.e. $t_{cj}^{evr_c} = t_{cj} - evr_c$ so that $t_{cj}^{evr_c} < t_{cj}$. Hence, the delivery price from country c to country j will also fall.

The partial equilibrium or direct effect is captured by adjusting t_{ij} in equation (10), while holding output, expenditure and multilateral resistances

constant. Thus, partial equilibrium effect of a VAT export rebate will be an increase of export from country c to each country j:

$$X_{cj}^{evr_c} = \frac{(Y_c)E_j}{Y}\left(\frac{t_{cj}^{evr_c}}{\Pi_c \mathrm{P}_j}\right)^{1-\sigma} \qquad (15),$$

so that $X_{cj}^{evr_c} > X_{cj}$. It should be noted that the direct/partial effect is the initial and, most likely, the strongest effect of the rebate implementation (Larch and Yotov 2016).

The partial equilibrium scenario implies no effects for outsiders. In order to capture such effects, the structural gravity model allows for a general equilibrium analysis via the multilateral resistances. This analysis is labeled as Conditional General Equilibrium because output and expenditure are kept unchanged. More specifically, for given sizes, captured by the first term in the structural gravity equation (10), $Y_i E_j / Y$, the second structural term in (10), $\left(t_{ij} / \left(\Pi_i \mathrm{P}_j\right)\right)^{1-\sigma}$, captures the Conditional General Equilibrium effects of trade policy on trade costs.

First, according to equation (4), the inward multilateral resistances, P_j, will decrease for all importers. Equation (10) reveals that the fall in inward multilateral resistance will cause each country j to import less from all source countries, all else equal. The intuition for this result is that the more integrated country j is with a particular trading partner i (country c, China, in our case), the more remote it becomes relative to all other countries. When the good from country c becomes cheaper, consumers in country j will substitute away from all other goods. In other words, the country c gains additional market share in j, whereas j`s import market becomes more competitive for outside countries.

According to equation (11), with rebate, the outward multilateral resistance of country c, Π_c, also falls because the fall in t_{cj}`s is larger by magnitude than the fall in $P_j$`s. This implies less export from country c to each country j, on average. The explanation is straightforward (Anderson and Wincoop 2003). Lower trade costs faced by exporter from country c will increase the demand for its goods and therefore its supply price p_c. For given bilateral trade costs between c and j, this lowers the level of trade between them.

On the other hand, outward multilateral resistances of outside economies (all other exporters i) will rise due to the fall in P_j`s. This implies more export from each country-exporter i to each country-importer j. Higher trade barriers faced by an exporter i will lower the demand for its goods and therefore its supply price p_i. For given bilateral trade costs between i and j, this raises the level of trade between them.

According to equation (10), the net conditional general equilibrium effect of the export tax rebate in country c for country c and outside exporters (countries i) will depend on the interplay of changes in bilateral costs of country c, inward and outward multilateral resistances. It should be noted that the effects for the affected countries (countries j, importers) will be first-order general equilibrium effects while the effects for outside countries (countries i, exporters) will be second-order. Second-order effects will be dominated by first-order effects and, thus, the net effects for outside exporters are expected to be negative. Hence, for the case of China`s export VAT rebates, the effects are expected to be positive for Chinese exporters and negative for outside exporters.

The Full Endowment General Equilibrium effects translate the changes in trade costs into changes in factory-gate prices p_i via equation (13), and then into changes in the value of domestic production Y_i and aggregate expenditure E_i via equation (14). In particular, lower outward multilateral resistance in country c formally translates into higher factory gate prices p_c and, thus, higher output values, export and expenditure. In outside exporters, countries i,

producers will suffer higher outward multilateral resistance and will have to decrease their factory gate prices p_i. This will lead to lower output, export and expenditure.

In summary, we can expect that as a result of tax rebate for exporters in country c, the value of domestic production in country c will increase, $Y_c^{evr_c} > Y_c$ and, thus, total export of country c will increase as well. On average, the value of domestic production of each country i will decrease, $Y_i^{evr_c} < Y_i$, thereby decreasing its export. The theory further implies that, on average, the export from country c to each country j will increase, $X_{cj}^{evr_c} > X_{cj}$, while export from each country i to each country j will decrease, $X_{ij}^{evr_c} < X_{ij}$. These effects will be stronger, the bigger is country c. Finally, the delivery prices will decrease in all countries: in country c due to decrease of trade costs, in all other countries-exporters i - due to decrease in factory gate prices.

4. EMPIRICAL STRATEGY

The panel data in this study has four dimensions: year, industry, exporter and importer. The data on bilateral trade (particularly import) was taken from UN COMTRADE for the period of 2004-2017 for four-digit HS2002 industries for all countries (importers and exporters) as available. The data was balanced over exporter × importer × industry as ID variable and year as time variable. Thus, if a particular combination of exporter × importer × industry does not present in the data for any year, it does not present in the panel structure in general. On one hand, this approach creates a selection bias since we select only those disaggregated bilateral flows, which were non-zero at least in one year in the considered period. However, if we would include all the missing observations, we would end up with a significantly larger sample that would further complicate estimation process from technical point of view[6]. Furthermore, since

[6] In the present version we have around 90 million observations.

there is no straightforward way to separate missing and zero observations based on UN COMTRADE data, the percentage of zeros (if we would treat all missing observations as zeros) would be then about 90 percent that would also overelaborate the estimation procedure.

The number of importers in the initial sample is 192, of exporters – 252, of four-digit industries – 1146. The sample has been further cleaned by excluding China (as exporter and importer) and countries with lowest data frequencies. The exclusion of China is motivated by fundamental differences in the effects of VAT rebates for Chinese and the rest of the world trade. Finally, only observations for which net weight is measured in kilograms have been considered. This was done to secure more straightforward comparison between results for trade in value and quantity and unit values.

The final sample consists of 165 countries (as importers and exporters). The list of countries can be found in Appendix B. The number of observations in final sample is 89, 190, 073. In order to address the issue of many zeros in trade data (nearly 60% in our final sample), the most common recommendation is to use the Poisson Pseudo Maximum Likelihood (PPML) for estimation of structural gravity equation (see, e.g., Head and Mayer 2014; Larch and Yotov 2016). Hence, the baseline specification looks as follows:

$$X_{itab} = exp[\pi_{ta} + \chi_{tb} + \mu_{iab} + a_1 VATR_{it,China}] + \varepsilon_{itab} \quad (16),$$

where X_{itab} is bilateral import flows in US dollars from country a (exporter; 1 … 165) to country b (importer; 1 … 165) in year t (2004 … 2017) and industry i (four-digit HS industry; 1 … 1146). I also utilize bilateral import flows measured by net weight in kilograms as an alternative dependent variable.

$VATR_{it}$ represents China`s VAT export rebate (in percent) in four-digit HS industry i and year t. The product-level data on Chinese export VAT rebate

rates is taken from the Chinese tax refund website[7] that provides a full list of export VAT rebate rates at 10-digit HS product codes from the year of 2004. I first aggregate the rebate rates to six-digit HS codes by taking arithmetic averages (rebate rates within six-digit codes are usually identical; see also Bai and Liu 2019). Since the Chinese 10-digit classification is not consistent over time (see also Garred 2018; Gourdon et al. 2020), for the sake of consistency, I leave out those six-digit HS codes which do not present in at least one of the HS editions of 2002, 2007, 2012 and 2017. Next, I average the data over four-digit HS codes.

The term π_{ta} denotes the set of time-varying exporter (country a) dummies that account for the outward multilateral resistance, countries` output shares and any other observable and non-observable exporter-specific factors that may influence bilateral trade. The term χ_{tb} denotes the set of time-varying importer (country b) dummies, which control for inward multilateral resistances, total expenditure and any other observable and non-observable importer-specific characteristics. The term μ_{iab} denotes the set of time-invariant industry-varying country-pair fixed effects, which measure all observable and non-observable time-invariant industry-specific bilateral trade costs. ε_{itab} is error term that is clustered over industry-year groups.

I also estimate the effects of export VAT rebates on world import prices using the following specification:

$$LN\_UV_{itab} = \pi_{ta} + \chi_{tb} + \mu_{iab} + a_1 VATR_{it,China} + \varepsilon_{itab} \quad (17),$$

where LN_UV_{itab} is natural logarithm of unit value of bilateral import flows in US dollars from country a (exporter) to country b (importer) in year t (2004, …, 2017) and industry i (four-digit HS industry). Unit values are obtained directly

[7] http://cess.taxrefund.com.cn/AllSearch.htm?web=1

from trade data by dividing import value in USD of a product-exporter-importer-year observation by its quantity (represented by net weight in kilograms). Zero trade flows were naturally excluded and, consequently, OLS has been used to estimate the equation (17).

Studies on the effects of VAT export rebates for Chinese export pinpoint the endogeneity of VAT rebates and utilize various instrumental variables to address the problem (Chandra and Long 2013; An, Hu and Tan 2017; Gourdon et al. 2020). In the context of this study the endogeneity of China`s VAT export rebates is not a significant issue since the dependent variable considers only foreign trade flows.

5. RESULTS

5.1. Baseline estimation results

In Table 1 I summarize economy-wide results. Estimations have been made using PPML and OLS models with multiple levels of fixed effects[8]. Descriptive statistics of the variables is reported in Appendix C.

Table 1: Baseline structural gravity equation economy-wide results

Dependent variable ➔	**M1: Trade flow in USD, PPML**	**M2: Trade flow in kg, PPML**	**M3: Natural Logarithm of unit value, OLS**
Constant	19.4 (0.018)***	36.88 (0.02)***	2.43 (0.003)***
$VATR_{it}$	-0.012 (0.002)***	-0.012 (0.005)***	-0.004 (0.0003)***
Effect in percent	***-1.18%***	***-1.2%***	***-0.36%***
Time-varying exporter fixed effects	Yes	Yes	Yes
Time-varying importer fixed effects	Yes	Yes	Yes
Time-invariant industry-varying country-pair fixed effects	Yes	Yes	Yes
Pseudo (PPML)/Adj. (OLS) R-sq.	*0.98*	*0.99*	*0.74*
N. obs.	*81,599,553*	*80,702,691*	*35,886,291*

Notes: **(**1) * if p < 0.10, ** if p < 0.05; *** if p < 0.01; (2) Standard errors in parentheses; (3) Errors are clustered over industry-year groups.

[8] The estimations were conducted using *ppmlhdfe* and *reghdfe* stata commands.

We can observe that all coefficient estimates have signs consistent with the theory and are highly statistically significant. Pseudo/Adjusted R-square is in 0.74-99 range. The coefficients` interpretation is straightforward. According to Model 1, other things equal, one unit (unit of measurement of VAT rebate is percent) increase in China`s VAT rebate in industry i causes, on average, a 1.18% decrease[9] in that industry bilateral import value of country *b* (importer) from any outside exporter. The respective percentage for Model 2, where the dependent variable is measured by net weight of bilateral import flows (in kilograms), is *minus* 1.2. Results in Model 3 indicate that increase in China`s VAT rebate for exporters by one percent causes roughly one-third percent (exact number is *minus* 0.36%) decrease in world import prices (represented by unit values). The latter result is in line with previous evidence of relatively small price effects of China`s VAT export rebates (Garred 2018; Gourdon et al. 2020).

5.2. Differentiating China`s VAT rebates` trade effects at third-country level

The estimation framework can be easily adopted to obtain estimates of China`s VAT rebates` trade diversion effects at third-country level (i.e. for third-country exporters) as follows:

$$X_{itab} = exp[\pi_{ta} + \chi_{tb} + \mu_{iab} + a_1 VATR_{it,China} + a_2 D_{Y,b} + a_3 VATR_{it,China} \times D_{Y,b}] + \varepsilon_{itab} \quad (18a),$$

$$LN\_UV_{itab} = \pi_{ta} + \chi_{tb} + \mu_{iab} + a_1 VATR_{it,China} + a_2 D_{Y,b} + a_3 VATR_{it,China} \times D_{Y,b} + \varepsilon_{itab} \quad (18b),$$

where $D_{Y,b}$ is a Dummy variable that equals to one for import of country b from a certain third country Y and zero otherwise. The rebates` effect for the import from a certain third country is represented by the sum of coefficients a_1 and a_3. The country-level differences in effects for exporters are determined by the coefficient a_3 while the coefficient a_1 is approximately the same in all country-

[9] 100(exp[-0.012]-1)=-1.18. Precise Stata 7-digit coefficient was used for computations.

specific regressions with values approaching its values in baseline regressions (Table 1).

The summary of country-specific effects for trade in monetary and physical terms and unit values is delivered in Appendix D. A graphical depiction on Figures 3-5 presents the distribution of the estimates of a_3 with their associated 95% confidence bounds.

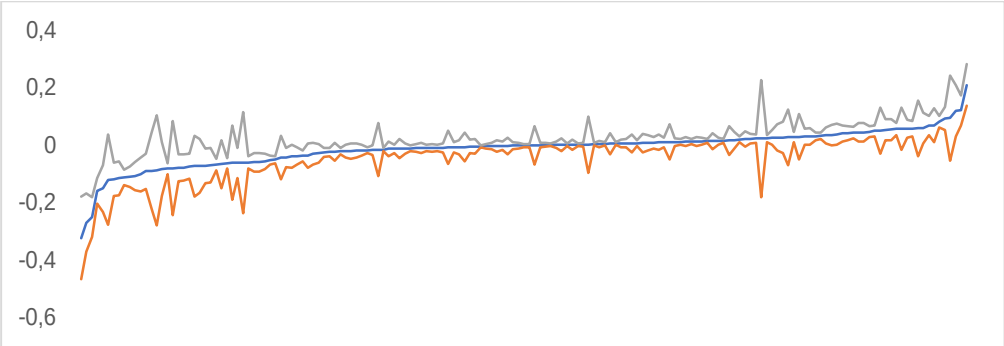

Fig.3: Distribution of trade diversion effects of China`s export VAT rebates, a_3 estimate with 95% Cis: For trade in monetary terms

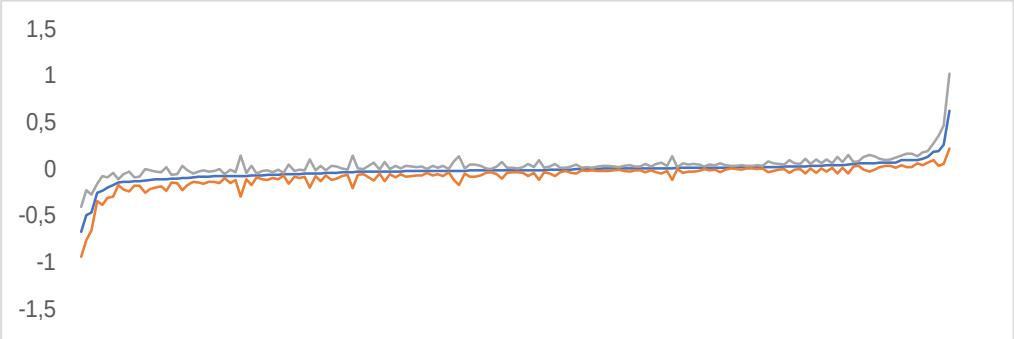

Fig.4: Distribution of trade diversion effects of China`s export VAT rebates, a_3 estimate with 95% Cis: For trade in physical terms

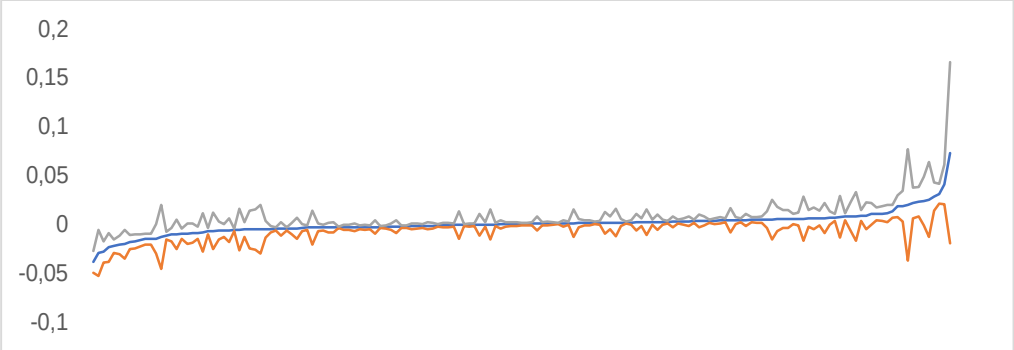

Fig.5: Distribution of trade diversion effects of China`s export VAT rebates, a_3 estimate with 95% Cis: For unit values

As we can observe, not all trade diversion effects are negative. However, we find negative and statistically significant effects for 74.6% of countries (123 out of 165) for trade in monetary terms. For trade in physical terms and unit values, the respective percentages are 75.2% (124 out of 165 countries) and 81.2% (134 out of 165 countries), respectively. It should be also noted that the rest of the effects are positive and statistically significant since we cannot have insignificant effects as the coefficient a_1 is negative and statistically significant in all country-specific regressions with values close to those observed in Table 2 (for the corresponding dependent variables).

Geographical patterns of trade diversion effects of China`s VAT export rebates for trade in monetary terms (value) are visualized on Figure 6.

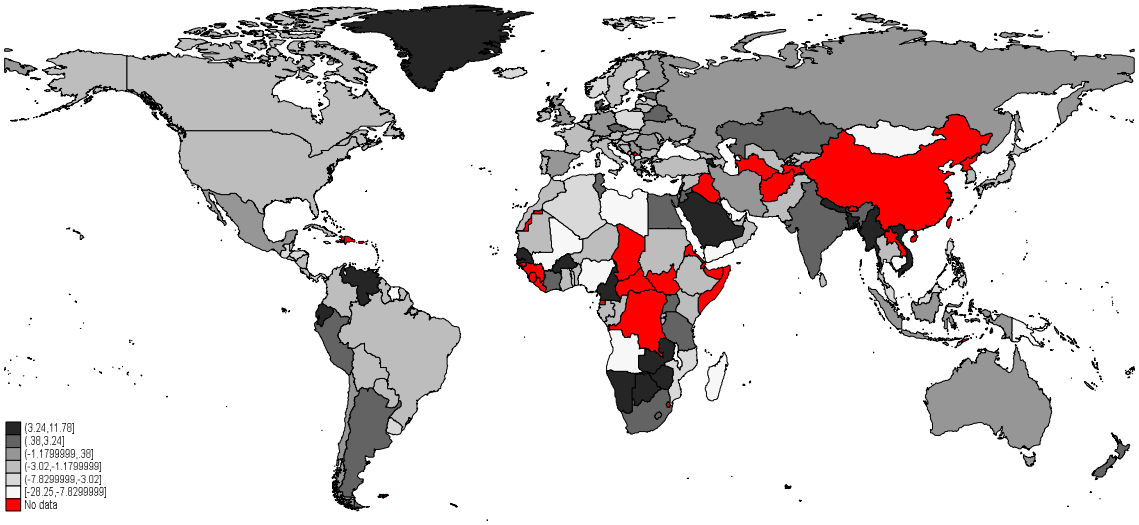

Fig.6: Trade diversion effects of China`s VAT export rebates for trade in monetary terms: Final effects in percent
Note: Final effects in percent have been taken from Table D1 in Appendix D. In computation of final percentages coefficients a_3 statistically insignificant at p = 0.1 significance level have been equaled to zero.

We can observe that most developed countries, European and North American, have experienced moderate to relatively large negative effects. In general, effects tend to be more heterogenous across developing/emerging countries compared to developed countries. Most heterogenous effects are observed in

Africa. Northern Africa has been more negatively affected than Southern Africa, on average. The effects are also rather heterogenous among Asian and Latin American countries.

Overall, the above analysis confirms that Chinese export rebate policy has had rather heterogenous effects on its international competitors. In the next section we examine this issue empirically.

5.3. Country-specific determinants of trade diversion effects of China`s export VAT rebates

To evaluate the determinants behind the direction and magnitude of trade diversion effects of China`s VAT export rebates, I regress country-specific effects (as sum of coefficients a_1 and a_3) on several explanatory variables. This approach was adopted from Baier, Yotov and Zylkin (2019) who study the empirical determinants of the estimated effects of free trade agreements.

Because the first stage estimates of trade diversion effects have been potentially estimated with unobservable error, we need to discuss how this error enters the second stage. Baier, Yotov and Zylkin (2019) refer to Lewis and Linzer (2005) as an exceptionally useful reference in this regard. More specifically, for the dependent variable in a regression that is based on estimates, Lewis and Linzer (2005) suggest that when the share of the regression residual due to sampling error in the dependent variable is high, the standard weighted least squares (WLS) are preferred to OLS with robust standard errors. In this study, as was already pointed above, the differences in country-specific effects are determined by coefficient a_3. The coefficient a_3 was found statistically insignificant (i.e. with p-value equal or larger than 0.1) for around 50% of country-level regressions for each of the three dependent variables (trade in monetary/physical terms and unit values). The average p-value of insignificant coefficients is 0.48, 0.51 and 0.5 for trade in monetary terms, in physical terms and unit values, respectively. Hence, indeed in our data the share of error can

be considered as rather high in the second-stage dependent variables. Taking this into consideration, standard WLS have been utilized as baseline estimation method.

5.3.1. Explanatory variables

First, I consider factors that reflect general development: GDP per capita in USD, population and GDP growth in % in a country i as arithmetic averages over the period of 2004-2017. The data was taken from World Bank.

Next, I include more specific factors. First indicator is geodesic distance between country i and China as reported in CEPII database. According to Mayer and Zignago (2011), CEPII geodesic bilateral distances have been calculated following great circle formula. In this study I used the variant of CEPII distance computed based on geographical coordinates of the capital cities.

Second variable is overall revealed comparative advantage of country i. The data comes from the World Integrated Trade Solution (WITS). First, revealed comparative advantage indices of country i in year t (2004, .., 2017) have been computed using the following formula of weighted average:

$$RCA_{it} = \frac{\sum_{s=1}^{s=16} RCA_{ist} \times WESh_{st}}{\sum_{s=1}^{s=16} WESh_{st}} \quad (19),$$

where RCA_{ist} is revealed comparative advantage index of country i in year t in sector s. WITS reports data for 15 broad sectors (animal, vegetables, food products, minerals, fuels, chemicals, plastic or rubber, hides and skins, wood, textile and clothing, footwear, stone and glass, machinery/electrical, transportation and miscellaneous). $WESh_{st}$ is sector s share in world export in year t. Next, arithmetic averages of weighted revealed comparative advantage indices over the period of 2004-2017 have been computed for each country i.

Third variable reflects import tariffs` level in country i. It is measured by arithmetic average of three import tariff indicators: Most Favored Nation ((MFN) simple average tariff (%), effectively applied simple average tariff (%) and the average of MFN tariffs weighted by their corresponding trade value (%) in country i as arithmetic means over the period of 2004-2017. The data comes from WITS.

Fourth variable reflects the usage of Chinese intermediate goods in production in country i. It is computed as the ratio (multiplied by 100%) of simple average of export of intermediate goods from China to country i over the period of 2004-2017 to GDP in country i, also averaged over 2004-2017. The data on Chinese export of intermediate goods comes from WITS and on GDP – from World Bank.

Finally, I include several indicators of export characteristics. First, I consider export quality indicator in country i as simple average over the period of 2004-2010. The data comes from the diversification toolkit of IMF (via IMF DataMapper). The methodology of computing the IMF export quality variable is based on unit values and described in detail in Henn, Papageorgiou and Spatafora (2013). Higher values for the quality indices indicate higher quality levels.

Second, I include three indicators of export diversification that also have been taken from the diversification toolkit of IMF. The core export diversification index measures export diversification of country i over either product narrowly defined or trading partners. It is further broken down into the extensive and intensive margins of diversification. Extensive export diversification reflects an increase in the number of export products or trading partners. Intensive export diversification considers the shares of export volumes across active products or trading partners. Hence, a country`s export is less diversified when export revenues are driven by few sectors or trading partners, even though the country might be exporting many different goods or to many different trading partners (extensive margin). Consequently, countries with a

more evenly balanced mix of exports or trading partners have a higher level of intensive diversification (IMF policy paper 2014). The computation of all the three indices is based on the Theil index as described in Cadot Carrère and Strauss-Kahn (2011). It should be noted that higher values for the all three indices indicate lower diversification. For estimation purposes of this study arithmetic averages of the respective indices over 2004-2010 for each country i have been used.

I further use two alternative indicators of export diversification taken from the WITS. The first one is the number of exported HS6 products by country i as average over 2004-2017. The second one is index of export market penetration of country i as average over 2004-2017. It is calculated as the number of countries to which the reporter exports a particular product divided by the number of countries that report importing the product that year. These two variables reflect product-level and destination-level/geographical export differentiation, respectively.

5.3.2. Estimation results and their discussion

The descriptive statistics and correlation matrix of the variables are presented in Appendix E. The WLS estimation results for the effects for trade in value (measured by sum of coefficients a_1 and a_3 and weighted by inverse standard errors of coefficients a_3) are presented in Table 2. Alternatively, OLS with robust standard errors` estimation results are provided in Appendix F.

Table 2: Determinants of trade diversion effects of China`s export VAT rebates: WLS estimation results. Trade in monetary terms.

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Constant	-0.131 (0.016)***	-0.244 (0.031)***	-0.01 (0.044)	-0.008 (0.044)	-0.138 (0.036)***	-0.36 (0.051)***
GDP per capita (Natural Logarithm)	0.001 (0.001)	0.002 (0.001)*	0.005 (0.001)***	0.004 (0.001)***	0.002 (0.001)*	0.006 (0.001)***
Population (Natural Logarithm)	0.002 (0.0004)***	0.003 (0.0005)***	0.0004 (0.001)	0.0001 (0.001)	-0.001 (0.001)*	0.006 (0.001)***
GDP growth	0.001 (0.0004)***	0.002 (0.001)***	0.001 (0.001)	0.001 (0.001)*	0.001 (0.001)*	0.001 (0.001)**
Distance (Natural logarithm)	0.009 (0.001)***	0.01 (0.001)***	0.005 (0.001)***	0.005 (0.001)***	0.008 (0.001)***	0.01 (0.002)***
Revealed comparative advantage		0.066 (0.022)***	-0.021 (0.03)	-0.031 (0.03)	0.06 (0.028)**	0.109 (0.03)***
Import tariff		0.002 (0.0003)***	0.002 (0.0003)***	0.002 (0.0003)***	0.002 (0.0003)***	0.001 (0.0003)***
Chinese intermediates` usage		-0.0003 (0.001)	-0.001 (0.001)	-0.0002 (0.001)	-0.001 (0.001)	-0.00004 (0.001)
Export quality			-0.075 (0.016)***	-0.042 (0.017)**	-0.053 (0.015)***	-0.012 (0.014)
Export diversification			-0.011 (0.002)***			
ED extensive margin				0.007 (0.003)**		
ED intensive margin				-0.015 (0.002)***		
Number of exported HS3 products					0.00001 (0.000001)***	
Index of export market penetration						-0.001 (0.0001)***
N. obs.	*156*	*124*	*117*	*116*	*119*	*119*

Notes: **(**1) * if p < 0.10, ** if p < 0.05; *** if p < 0.01; (2) Standard errors in parentheses.

From the results we predictably observe that countries, which are richer, larger (size is measured by population), grow faster and are geographically more distant from China tend to suffer less from Chinese export competition. The

evidence further suggests that countries with higher revealed comparative advantage in the world trade are better prepared to intensified competition in international markets that is in line with classical trade theory.

Next, we find that higher import tariffs help to dampen negative effects of Chinese competition. This result indicates that negative effects of Chinese rebates for outside trade also propagate via direct erosion of domestic production in third countries (when Chinese imported products substitute domestically produced analogues). This therefore negatively affects export potential of third countries` producers. Higher import tariffs help to mitigate this impact.

Countries that produce higher quality goods are more likely to be negatively affected by Chinese export promotion policies. This confirms Chinese export quality upgrading tendencies (see, for example, Bas and Strauss-Kahn 2015; Anwar and Sun 2018) that increases the capability of Chinese exporters to compete with high-quality foreign goods. It can further indicate that Chinese rebate policy leads to quality improvement in Chinese export.

Export diversification, particularly its intensive margin, helps a third country-exporter to stand against negative effects of China`s export rebate policy. In other words, countries with a more evenly balanced mix of exports or trading partners are more immune to increased Chinese competition.

Finally, while product-level export diversification of a country dampens negative trade diversion effects of Chinese rebates, destination-level diversification, contrarily, escalates them. This evidence favors product diversification strategy in securing country`s competitiveness in the world economy. Furthermore, high level of export dispersion across multiple destinations might indicate low market shares and, hence, week market power in destination markets (particularly, for small exporting countries) that in turn makes these exporters more vulnerable to intensified international competition.

In Tables 3 and 4 I further report estimation results for the effects for trade in quantity and unit values.

Table 3: Determinants of trade diversion effects of China`s export VAT rebates: WLS estimation results. Trade in physical terms.

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Constant	-0.1 (0.039)**	-0.415 (0.068)***	-0.183 (0.088)**	-0.179 (0.088)**	-0.147 (0.086)*	-0.54 (0.094)***
GDP per capita (Natural Logarithm)	-0.001 (0.001)	-0.001 (0.002)	0.002 (0.002)	0.0004 (0.002)	-0.005 (0.002)**	0.004 (0.003)
Population (Natural Logarithm)	0.004 (0.001)***	0.006 (0.001)***	0.003 (0.001)**	0.003 (0.001)**	-0.003 (0.002)*	0.009 (0.002)***
GDP growth	-0.004 (0.001)***	-0.001 (0.001)	-0.002 (0.001)*	-0.001 (0.001)	0.0002 (0.001)	-0.002 (0.001)*
Distance (Natural logarithm)	0.004 (0.003)	0.013 (0.003)***	0.01 (0.004)***	0.009 (0.004)***	0.011 (0.004)***	0.011 (0.004)***
Revealed comparative advantage		0.225 (0.035)***	0.15 (0.047)***	0.13 (0.047)***	0.162 (0.045)***	0.298 (0.051)***
Import tariff		-0.002 (0.001)***	-0.002 (0.001)***	-0.002 (0.001)***	-0.002 (0.001)***	-0.003 (0.001)***
Chinese intermediates` usage		0.001 (0.001)	0.0004 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Export quality			-0.084 (0.026)***	-0.041 (0.028)	-0.072 (0.023)***	-0.004 (0.021)
Export diversification			-0.012 (0.003)***			
ED extensive margin				0.005 (0.005)		
ED intensive margin				-0.015 (0.003)***		
Number of exported HS3 products					0.00002 (0.000003)***	
Index of export market penetration						-0.001 (0.001)**
N. obs.	*156*	*124*	*117*	*116*	*119*	*119*

Notes: **(**1) * if p < 0.10, ** if p < 0.05; *** if p < 0.01; (2) Standard errors in parentheses.

Table 4: Factors of trade diversion effects of China`s export VAT rebates: WLS estimation results. Unit values.

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Constant	0.015 (0.003)***	0.022 (0.006)***	0.033 (0.008)***	0.034 (0.008)***	0.029 (0.006)***	0.002 (0.009)
GDP per capita (Natural Logarithm)	-0.0004 (0.0001)***	0.0001 (0.0002)	-0.0001 (0.0002)	-0.0002 (0.0002)	-0.0003 (0.0002)	0.0003 (0.0002)
Population (Natural Logarithm)	-0.0004 (0.0001)***	-0.0003 (0.0001)***	-0.0004 (0.0001)***	-0.0004 (0.0001)***	-0.0004 (0.0001)***	0.0003 (0.0002)*
GDP growth	-0.0002 (0.0001)***	-0.0002 (0.0001)	-0.0001 (0.0001)	-0.0001 (0.0001)	-0.0001 (0.0001)	-0.00003 (0.0001)
Distance (Natural logarithm)	-0.001 (0.0002)***	-0.001 (0.0002)***	-0.001 (0.000)***	-0.001 (0.0003)***	-0.001 (0.0002)***	-0.001 (0.0002)***
Revealed comparative advantage		-0.011 (0.004)***	-0.02 (0.005)***	-0.021 (0.005)***	-0.018 (0.005)***	-0.01 (0.005)**
Import tariff		0.0001 (0.0001)**	0.0001 (0.0001)***	0.0002 (0.0001)***	0.0001 (0.0001)**	0.0001 (0.0001)**
Chinese intermediates` usage		-0.0004 (0.0001)***	-0.0004 (0.0001)***	-0.0004 (0.0001)***	-0.0004 (0.0001)***	-0.0003 (0.0001)***
Export quality			0.004 (0.003)	0.005 (0.003)*	0.004 (0.003)	0.007 (0.002)***
Export diversification			-0.001 (0.0003)*			
ED extensive margin				0.001 (0.001)		
ED intensive margin				-0.001 (0.0003)**		
Number of exported HS3 products					0.000001 (0.0000)*	
Index of export market penetration						-0.0001 (0.0000)***
N. obs.	*156*	*124*	*117*	*116*	*119*	*119*

Notes: **(**1) * if p < 0.10. ** if p < 0.05; *** if p < 0.01; (2) Standard errors in parentheses.

The results above enable to reveal interesting facts about competition strategies of exporters in various countries. Size of the country, its distance from China, its revealed comparative advantage in the world trade, level of import tariffs and export quality are found to be important factors that can affect international export strategies.

First, exporters in larger countries and countries located more distantly from China tend to decrease prices and increase exported volumes when they

face intensified competition from Chinese exporters. Second, exporters from countries with higher overall revealed comparative advantage in world trade are more likely to charge lower prices for their goods in international markets that also helps to increase sold volumes when international competition is increased. This result is theoretically expected as higher comparative advantage implies lower costs and, hence, higher flexibility for price/production volume adjustments.

Third, high import tariffs negatively affect exported volumes but positively impact export prices that ultimately results in overall positive effect for trade in monetary terms (as reported in Table 2). This suggests that in the face of increased international competition in export markets, protection from import allows domestic exporters to improve quality of their goods to such an extent that the composite effect of increased prices and decreased sold volumes is still positive.

Finally, exporters of high-quality goods tend to choose a strategy of further improving the quality that results in charging higher prices and decreased volumes of export sales. This evidence is in line with similar findings of Martin and Mejean (2014) who also empirically show that increased competition from low-wage countries (particularly, China) further drives high-wage countries to improve their goods` quality.

6. ROBUSTNESS CHECKING

6.1. China`s VAT rebates` effects for unit values

Since it is widely believed (see, e.g., Baldwin and Harrigan 2011) that industry level unit values are noisy indicators of price, particularly for very small trade values, following Baldwin and Harrigan (2011) I also estimate equation (17) discarding all import flows less than 1000, 500 and 100 USD that eliminates 18, 13 and 5 percent of observations, respectively. The results are presented in Table 5.

Table 5: Structural gravity equation estimation results for unit values: Reduced subsamples

Dependent variable	**Excluding obs. with import value < 1000**	**Excluding obs. with import value < 500**	**Excluding obs. with import value < 100**
Constant	2.43 (0.003)***	2.45 (0.003)***	2.46 (0.003)***
$VATR_{it}$	-0.004 (0.0003)***	-0.004 (0.0003)***	-0.004 (0.0003)***
% change in unit value	-0.35%	-0.35%	-0.35%
Time-varying exporter fixed effects	Yes	Yes	Yes
Time-varying importer fixed effects	Yes	Yes	Yes
Time-invariant industry-varying country-pair (exporter-importer) fixed effects	Yes	Yes	Yes
N. obs.	29, 449, 586	31, 159, 238	34, 083, 464
Adjusted R-sq.	0.8	0.78	0.76

Notes: **(**1) * if p < 0.10; ** if p < 0.05; *** if p < 0.01; (2) Standard errors in parentheses; (3) Errors are clustered over industry-year groups; (4) All observations with zero bilateral import flows were automatically excluded from the estimation due to impossibility to compute unit values.

As can be seen, the results are robust to exclusion of very small trade values.

6.2. Alternative indicator of VAT export rebate variable

Following Gourdon et al. (2020), I also consider alternative measure of VAT rebate that accounts for the fact that VAT rate applied differs across industries. The alternative measure is defined as VAT_{it} -$VATR_{it}$ where VAT_{it} is the VAT rate in industry i in year t. This indicator represents an export VAT tax since when the VAT rebate is incomplete, the exporter pays an export tax. The results are presented in Table 6.

Table 6: Structural gravity equation economy-wide results with VAT export tax variable

Dependent variable ➔	**M1: Trade flow in USD, PPML**	**M2: Trade flow in kg, PPML**	**M3: Natural Logarithm of unit value, OLS**
Constant	19.2 (0.013)***	36.74 (0.039)***	2.37 (0.002)***
$ETAX_{it}$	0.012 (0.002)***	0.011 (0.004)**	0.004 (0.0003)***
Effect in percent	+1.23%	+1.1%	+0.36%
Time-varying exporter fixed effects	Yes	Yes	Yes
Time-varying importer fixed effects	Yes	Yes	Yes
Time-invariant industry-varying country-pair fixed effects	Yes	Yes	Yes
N. obs.	81, 599, 553	80, 702, 691	35, 886, 291
Pseudo R-sq.	0.97	0.99	0.74

Notes: **(**1) * if p < 0.10; ** if p < 0.05; *** if p < 0.01; (2) Standard errors in parentheses; (3) Errors are clustered over industry-year groups.

As we can see, the results mirror the baseline results in Table 2 (with opposite signs of respective coefficients since export VAT tax and VAT export rebate are inversely related to each other by definition). Increase of China`s export VAT tax by one unit (measured in percent) leads to increase in bilateral import value of country *b* (importer) from any outside exporter by 1.23%, on average. The respective percentage change for trade in physical terms is *plus* 1.1. Finally, increase of China`s export VAT tax by one unit (percent) leads to the increase of unit value by 0.36%.

7. CONCLUSIONS

Using a large sample of trade flows between 165 importers and exporters disaggregated at four-digit HS industries over 2004-2017, the study empirically estimates the effects of China`s VAT export rebates for world trade (third-country exporters) within three-way fixed effects PPML structural gravity framework. The evidence points to highly significant negative trade diversion effects of Chinese export rebates. The effects are quite heterogenous across countries, however. Predictably, richer, larger, faster growing countries with

larger relative comparative advantage in world trade and located more distantly from China suffer less from Chinese export competition. On the other hand, countries that export goods of higher quality and have less diversified export (particularly, its intensive margin) are found to be hurt more by Chinese rebate policy.

REFERENCES

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

Aitken, N. D. (1973). The effect of the EEC and EFTA on European trade: A temporal cross-section analysis. *The American Economic Review*, *63*(5), 881-892.

An, L., Hu, C., & Tan, Y. (2017). Regional effects of export tax rebate on exporting firms: Evidence from China. *Review of International Economics*, *25*(4), 774-798.

Anderson, J. E., & Van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. *American economic review*, *93*(1), 170-192.

Anwar, S., & Sun, S. (2018). Foreign direct investment and export quality upgrading in China's manufacturing sector. *International Review of Economics & Finance*, *54*, 289-298.

Armington, P. S. (1969). A theory of demand for products distinguished by place of production. *Staff Papers*, *16*(1), 159-178.

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

Baier, S. L., & Bergstrand, J. H. (2007). Do free trade agreements actually increase members' international trade?. *Journal of international Economics*, *71*(1), 72-95.

Baier, S. L., Yotov, Y. V., & Zylkin, T. (2019). On the widely differing effects of free trade agreements: Lessons from twenty years of trade integration. *Journal of International Economics*, *116*, 206-226.

Bai, J., & Liu, J. (2019). *The Impact of Intranational Trade Barriers on Exports: Evidence from a Nationwide VAT Rebate Reform in China* (No. w26581). National Bureau of Economic Research.

Baldwin, R., & Harrigan, J. (2011). Zeros, quality, and space: Trade theory and trade evidence. *American Economic Journal: Microeconomics*, *3*(2), 60-88.

Balsvik, R., Jensen, S., & Salvanes, K. G. (2015). Made in China, sold in Norway: Local labor market effects of an import shock. *Journal of Public Economics*, *127*, 137-144.

Bas, M., & Strauss-Kahn, V. (2015). Input-trade liberalization, export prices and quality upgrading. *Journal of International Economics*, *95*(2), 250-262.

Baylis, K., & Perloff, J. M. (2010). Trade diversion from tomato suspension agreements. *Canadian Journal of Economics/Revue canadienne d'économique*, *43*(1), 127-151.

Bergstrand, J. H. (1985). The gravity equation in international trade: some microeconomic foundations and empirical evidence. *The review of economics and statistics*, 474-481.

Bown, C. P., & Crowley, M. A. (2006). Policy externalities: How US antidumping affects Japanese exports to the EU. *European Journal of Political Economy*, *22*(3), 696-714.

Bown, C. P., & Crowley, M. A. (2007). Trade deflection and trade depression. *Journal of International Economics*, *72*(1), 176-201.

Brada, J. C., & Mendez, J. A. (1985). Economic integration among developed, developing and centrally planned economies: A comparative analysis. *The Review of Economics and Statistics*, 549-556.

Cadot, O., Carrère, C., & Strauss-Kahn, V. (2011). Export diversification: what's behind the hump?. *Review of Economics and Statistics*, *93*(2), 590-605.

Chandra, P. (2017). Trade Destruction and Trade Diversion: Evidence from China. *China & World Economy, 25*(3), 31-59.

Chandra, P., & Long, C. (2013). VAT rebates and export performance in China: Firm-level evidence. *Journal of Public Economics, 102*, 13-22.

Chen, C. H., Mai, C. C., & Yu, H. C. (2006). The effect of export tax rebates on export performance: Theory and evidence from China. *China Economic Review, 17*(2), 226-235.

Conconi, P., García-Santana, M., Puccio, L., & Venturini, R. (2018). From final goods to inputs: the protectionist effect of rules of origin. *American Economic Review, 108*(8), 2335-65.

Crozet, M., Head, K., & Mayer, T. (2012). Quality sorting and trade: Firm-level evidence for French wine. *The Review of Economic Studies, 79*(2), 609-644.

Crozet, M., & Koenig, P. (2010). Structural gravity equations with intensive and extensive margins. *Canadian Journal of Economics/Revue canadienne d'économique, 43*(1), 41-62.

Cui, Z. (2003). China's export tax rebate policy. *China: An International Journal, 1*(2), 339-349.

Dai, M., Yotov, Y. V., & Zylkin, T. (2014). On the trade-diversion effects of free trade agreements. *Economics Letters, 122*(2), 321-325.

Dekle, R., Eaton, J., & Kortum, S. (2007). Unbalanced trade. *American Economic Review, 97*(2), 351-355.

Dekle, R., Eaton, J., & Kortum, S. (2008). Global rebalancing with gravity: Measuring the burden of adjustment. *IMF Staff Papers, 55*(3), 511-540.

Eisenbarth, S. (2017). Is Chinese trade policy motivated by environmental concerns?. *Journal of Environmental Economics and Management, 82*, 74-103.

Eaton, J., & Fieler, A. C. (2019). *The Margins of Trade* (No. w26124). National Bureau of Economic Research.

Ebrill, L., Keen, M., Bodin, J. P., & Summers, V. (2001). The modem VAT. *Washington, IMF Publication Services.*

Evenett, S. J., Fritz, J., & Jing, Y. C. (2012). Beyond dollar exchange-rate targeting: China's crisis-era export management regime. *Oxford Review of Economic Policy*, *28*(2), 284-300.

Felbermayr, G., Jung, B., & Larch, M. (2015). The welfare consequences of import tariffs: A quantitative perspective. *Journal of International Economics*, *97*(2), 295-309.

Feldstein, M. S., & Krugman, P. R. (1990). International trade effects of value-added taxation. In *Taxation in the global economy* (pp. 263-282). University of Chicago Press.

Fontagné, L., Gaulier, G., & Zignago, S. (2008). Specialization across varieties and North–South competition. *Economic policy*, *23*(53), 52-91.

Freund, C. (2010). Third-country Effects of Regional Trade Agreements. *The World Economy*, *33*(11), 1589-1605.

Garred, J. (2018). The persistence of trade policy in China after WTO accession. *Journal of International Economics*, *114*, 130-142.

Ghosh, S., & Yamarik, S. (2004). Are regional trading arrangements trade creating?: An application of extreme bounds analysis. *Journal of International Economics*, *63*(2), 369-395.

Gourdon, J., Monjon, S., & Poncet, S. (2016). Trade policy and industrial policy in China: What motivates public authorities to apply restrictions on exports?. *China Economic Review*, *40*, 105-120.

Gourdon, J., Monjon, S., & Poncet, S. (2017). Incomplete VAT rebates to exporters: how do they affect China's export performance?

Gourdon, J., Hering, L., Monjon, S., & Poncet, S. (2020). Estimating the repercussions from China's export VAT rebate policy.

Head, K., & Mayer, T. (2014). Gravity equations: Workhorse, toolkit, and cookbook. In *Handbook of international economics* (Vol. 4, pp. 131-195). Elsevier.

Henn, C., Papageorgiou, C., & Spatafora, M. N. (2013). *Export quality in developing countries* (No. 13-108). International Monetary Fund.

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

Jenkins, R. (2014). Chinese competition and Brazilian exports of manufactures. *Oxford Development Studies*, *42*(3), 395-418.

Koo, W. W., Karemera, D., & Taylor, R. (1994). A gravity model analysis of meat trade policies. *Agricultural Economics*, *10*(1), 81-88.

Larch, M., & Yotov, Y. (2016). General equilibrium trade policy analysis with structural gravity.

Lewis, J. B., & Linzer, D. A. (2005). Estimating regression models in which the dependent variable is based on estimates. *Political analysis*, 345-364.

Magee, C. S. (2008). New measures of trade creation and trade diversion. *Journal of International Economics*, *75*(2), 349-362.

Martin, J., & Mejean, I. (2014). Low-wage country competition and the quality content of high-wage country exports. *Journal of International Economics*, *93*(1), 140-152.

Mayer, T., & Zignago, S. (2011). Notes on CEPII's distances measures: The GeoDist database.

Mion, G., & Zhu, L. (2013). Import competition from and offshoring to China: A curse or blessing for firms?. *Journal of International Economics*, *89*(1), 202-215.

Olivero, M. P., & Yotov, Y. V. (2012). Dynamic gravity: endogenous country size and asset accumulation. *Canadian Journal of Economics/Revue canadienne d'économique*, *45*(1), 64-92.

Paiva, C. (2008). Assessing protectionism and subsidies in agriculture—A gravity approach. *Journal of International Development: The Journal of the Development Studies Association*, *20*(5), 628-640.

Romalis, J. (2007). NAFTA's and CUSFTA's Impact on International Trade. *The review of Economics and Statistics*, *89*(3), 416-435.

Sandkamp, A. (2020). The trade effects of antidumping duties: Evidence from the 2004 EU enlargement. *Journal of International Economics*, *123*, 103-307.

Schott, P. K. (2004). Across-product versus within-product specialization in international trade. *The Quarterly Journal of Economics*, *119*(2), 647-678.

Schott, P. K. (2008). The relative sophistication of Chinese exports. *Economic policy*, *23*(53), 6-49.

Verhoogen, E. A. (2008). Trade, quality upgrading, and wage inequality in the Mexican manufacturing sector. *The Quarterly Journal of Economics*, *123*(2), 489-530.

APPENDICES

Appendix A: VAT rebates` industrial patterns: Empirical analysis

Table A1: OLS regression results: Dependent variable is VAT rebate rate in six-digit HS industry

Variable	Coefficient
Constant	-6.76 (0.24)***
VAT rate	1.15 (0.02)***
Year 2005	-0.12 (0.08)
Year 2006	-0.7 (0.08)***
Year 2007	-2.51 (0.08)***
Year 2008	-3.36 (0.08)***
Year 2009	-2.12 (0.08)***
Year 2010	-1.62 (0.08)***
Year 2011	-1.74 (0.08)***
Year 2012	-1.77 (0.08)***
Year 2013	-1.79 (0.08)***
Year 2014	-1.79 (0.08)***
Year 2015	-1.51 (0.08)***
Year 2016	-1.47 (0.08)***
Year 2017	-1.37 (0.08)***
Year 2018	-0.45 (0.08)***
Live animals; animals products; ch1-5	Benchmark
Vegetable products; ch6-14	-1.36 (0.1)***
Animal or vegetable fats and waxes; oil and their cleavage products; prepared edible fats; ch15	-2.51 (0.17)***
Prepared foodstuff; beverages; tobacco; ch16-24	1.59 (0.12)***
Mineral products; ch25-27	-8.88 (0.12)***
Separate chemically defined compounds generally are dealt with in inorganic or organic chemicals; ch28-29	-3.4 (0.11)***
Other products of the chemical industries; ch30-38	-2.69 (0.11)***
Plastic, rubber, articles thereof; ch39-40	-2.05 (0.12)***
Raw hides and skins, leather, furskins and articles thereof; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut; ch41-43	-5.35 (0.15)***
Wood, cork, and articles thereof; manufactures of plaiting materials, basket ware and wickerwork.; ch44-46	-7.59 (0.17)***
Pulp, paper and paperboard and articles thereof and products of the printing industry.; ch47-49	-7.15 (0.13)***
Textiles in forms ranging from the raw material to the finished fabric.; ch50-55	3.23 (0.11)***
Textile articles; ch56-63	3.79 (0.11)***
Footwear, headgear, umbrellas, feathers and articles made therewith; artificial flowers; articles of human hair.; ch64-67	2.32 (0.17)***
Articles of stone, plaster, cement, asbestos, mica or similar materials; ceramic products; glass and glassware.; ch68-70	-3.24 (0.13)***
Pearls, precious or semi-precious stones, precious metals, metals clad with precious metal and articles thereof; imitation jewellery; coin. ; ch71	-6.99 (0.17)***
Base metals and articles of base metals; ch72-83	-4.53 (0.11)***
Machinery and mechanical appliances; electrical equipment; parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles; ch84-85	4.14 (0.1)***
Vehicles, aircraft, vessels and associated transport equipment; ch86-89	4.74 (0.13)***
Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus, clocks and watches, musical instruments; ch90-92	2.74 (0.12)***
Arms and ammunition and parts and accessories thereof; ch93	-1.74 (0.3)***
Miscellaneous manufactured articles; ch94-96	1.1 (0.13)***
Works of art, collectors' pieces and antiques; ch97	-8.23 (0.44)***
N. obs./Adj. R-sq.	*65.321/0.59*

Notes: **(**1) * if p < 0.10, ** if p < 0.05; *** if p < 0.01; (2) Standard errors in parentheses; (3) *ch* corresponds to HS chapter.

Appendix B: List of countries used in the study

Table B1: List of countries

Albania, Algeria, Andorra, Angola, Antigua and Barbuda, Argentina, Armenia, Aruba, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bermuda, Bolivia, Bosnia Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, CÃ´te d'Ivoire, Cabo Verde, Cambodia, Cameroon, Canada, Chile China. Hong Kong SAR, China. Macao SAR, Colombia, Congo, Costa Rica, Croatia, Cuba, Cyprus, Czechia, Denmark, Ecuador, Egypt, El Salvador, Estonia, Ethiopia, Faeroe Islands, Fiji, Finland, Former Sudan, France, French Polynesia, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Greenland, Guatemala, Guyana, Honduras, Hungary Iceland, India, Indonesia, Iran, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Latvia, Lebanon, Libya, Lithuania, Luxembourg, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Mauritania, Mauritius, Mayotte, Mexico, Mongolia, Montenegro, Morocco, Mozambique, Myanmar Namibia, Nepal, Neth. Antilles, Netherlands, New Caledonia, New Zealand, Nicaragua, Niger, Nigeria, North Macedonia, Norway, Oman, Pakistan, Palau, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Rep. of Korea, Rep. of Moldova, Romania, Russian Federation, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Saudi Arabia, Senegal, Serbia Seychelles, Singapore, Slovakia, Slovenia, Solomon Isds, South Africa, Spain, Sri Lanka, State of Palestine, Sudan, Suriname, Sweden, Switzerland, Syria, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, Ukraine, United Arab Emirates, United Kingdom, United Rep. of Tanzania, Uruguay, USA, Uzbekistan, Venezuela, Viet Nam, Yemen, Zambia, Zimbabwe

Appendix C: Descriptive statistics of the dependent and explanatory variables in baseline estimations

Table C1: Descriptive statistics of the variables

Variable	*Obs.*	*Mean*	*Std. Dev.*	*Min*	*Max*
Bilateral import in USD	89, 190, 073	1688818	7.73e+07	0	8.56e+10
Bilateral import in kg	89, 190, 073	1.36e+08	1.27e+12	0	1.20e+16
Unit Value	37, 549, 440	630.81	271687	1.42e-11	6.32e+08
Unit value, natural logarithm	37, 549, 440	2.39	1.89	-24.98	20.26
VAT rebate	89, 190, 073	10.53	5.43	0	17

Appendix D Trade diversion effects by country

Table D1: Trade diversion effects: Final percentages

Country	Effect for trade in value	Effect for trade in quantity	Effect for unit values
Albania	-1.18***-2.64[0.11]	-1.2**-1.19 [0.68]	-0.92***/*
Algeria	-7.45***/***	-7.7**/***	-0.36***+0.25 [0.56]
Andorra	-1.18***-6.83[0.14]	-1.2**+5.1 [0.26]	-0.36***+0.17 [0.82]
Angola	-9.55***/***	-8.41**/**	-2.62***/***
Antigua and Barbuda	-1.18***+6.19[0.23]	-8.21**/***	-0.36***+0.55 [0.59]
Argentina	+1.25***/***	+1**/*	-0.16***/*
Armenia	+4.38***/***	+13.33**/***	+2.86***/***
Aruba	-7.63***/**	-7.49**/***	-0.36***+0.86 [0.27]
Australia	-1.15***-1.59[0.11]	-1.25**+0.88 [0.23]	-0.75***/***
Austria	-1.18***+0.03[0.92]	-1.2**-0.55 [0.57]	-0.36***+0.1 [0.15]
Azerbaijan	-1.18***+6.01[0.12]	-1.2**+3.97 [0.29]	-0.36***+0.65 [0.13]
Bahamas	-4.82***/*	-9.37**/**	+3.87***/***
Bahrain	-1.18***-0.12[0.92]	-1.2**-0.65 [0.74]	+1.03***/***
Bangladesh	+4.78***/***	+9.72**/***	-0.36***-0.27 [0.17]
Barbados	+2.51***/**	-1.2**-2.12 [0.48]	-0.36***+0.02 [0.97]
Belarus	+1.96***/**	-1.2**+1.52 [0.51]	+0.48***/***
Belgium	-1.18***+0.23[0.51]	+1.43**/***	-0.36***-0.05 [0.42]
Belize	-1.18***+5.31[0.2]	-1.3**-1.38 [0.55]	-0.36***-0.01 [0.99]
Benin	-1.18***-7.51[0.35]	-11.28**/**	-0.36***-0.89 [0.1]
Bermuda	-1.18***+10.03[0.2]	-1.2**-2.38 [0.79]	-0.36***
Bolivia (Plurinational State of)	-1.18***+1.61[0.27]	+1.15**/*	-0.36***+0.21 [0.51]
Bosnia Herzegovina	-1.18***-0.57[0.55]	-1.2**+2.08 [0.28]	-0.36***+0.22 [0.23]
Botswana	+8.61***/***	-1.2**+1.81 [0.49]	-2.37***/***
Brazil	-1.19***+0.77[0.29]	-1.2**-0.44 [0.77]	+0.02***/***
Brunei Darussalam	-8.76***/***	-7.56**/***	-0.36***+0.69 [0.38]
Bulgaria	-1.18***-0.84[0.23]	-1.2**+0.88 [0.36]	-0.36***+0.2 [0.1]
Burkina Faso	+11.56***/***	-1.2**-1.13 [0.82]	+0.76***/*
Burundi	-1.18***-8.21[0.38]	-12.94**/**	-0.36***-0.47 [0.66]
CÃ´te d'Ivoire	+3.24***/***	+6.51**/***	-0.36***-0.39 [0.21]
Cabo Verde	-1.18***-6.24[0.13]	-1.2**-3.95 [0.6]	+2.11***/*
Cambodia	-7.83***/**	-22.56**/***	-2.01***/***
Cameroon	+5.06***/**	-12.31**/*	-0.36***+0.55 [0.2]
Canada	-1.19***+0.28[0.63]	-1.28**+2.24 [0.16]	-0.36***+0.004 [0.96]
Chile	0.04***/*	+2.29**/**	-0.37***-0.15 [0.32]

China, Hong Kong SAR	-6.99***/***	+6.67**/***	-0.54***/**
China, Macao SAR	-22.86***/***	-1.2**-8.67 [0.17]	-0.36***+0.39 [0.26]
Colombia	-1.18***+1.9[0.19]	-1.21**+2.19 [0.24]	-0.36***-0.02 [0.91]
Congo	-1.18***-11.22[0.14]	-7.87**/*	-0.44 [0.73]
Costa Rica	-1.18***-2.13[0.17]	-1.2**-0.24 [0.9]	-0.36***-0.29 [0.13]
Croatia	-1.18***-0.18[0.74]	-1.2**+1.01 [0.44]	-0.07***/**
Cuba	-1.18***+2.89[0.22]	-1.2**-1.6 [0.59]	+0.82***/**
Cyprus	-1.18***-1.62[0.19]	-1.2**-0.97 [0.7]	+0.25***/**
Czechia	0.41***/***	+1.65**/***	+0.03***/***
Denmark	+0.38***/***	-1.2**+1.18 [0.39]	-0.36***-0.02 [0.84]
Ecuador	+3.72***/***	+2.32**/**	-0.36***+0.18 [0.42]
Egypt	+2.04***/**	+6.18**/***	-0.36***-0.14 [0.27]
El Salvador	-1.18***+0.32[0.71]	+1.99**/**	-0.36***+0.05 [0.82]
Estonia	+3.04***/***	-1.2**-0.01 [0.99]	+0.04***/***
Ethiopia	-1.18***+0.67[0.72]	-8.54**/***	-0.36***-0.95 [0.2]
Faeroe Isds	+11.78***/***	+19.73**/***	-0.36***-0.27 [0.76]
Fiji	-1.18***-3.39[0.12]	-7.77**/*	-0.36***-0.43 [0.33]
Finland	-1.17***-0.78[0.14]	-1.19**-1.31 [0.16]	-0.36***+0.09 [0.35]
Fmr Sudan	-1.18***-0.59[0.84]	-1.2**-1.99 [0.68]	-0.36***+0.04 [0.96]
France	-1.19***+0.33[0.2]	+0.51**/***	-0.36***-0.0005 [0.99]
French Polynesia	-5.17***/**	-5.32**/**	-0.36***-0.47 [0.63]
Gabon	-1.18***-4.05[0.28]	-1.2**+1.71 [0.79]	-0.36***-0.96 [0.21]
Gambia	-1.18***+1.79[0.49]	-1.2**-0.45 [0.9]	-0.36***-0.75 [0.45]
Georgia	-1.18***-0.04[0.98]	-8**/**	+0.79***/***
Germany	-0.54***/***	+1.19***/***	-0.6***/***
Ghana	-1.18***-5.81[0.36]	-1.2**-1.21 [0.64]	-1.27***/***
Greece	-1.17***-1.1[0.12]	+1.58**/**	-0.36***+0.14 [0.14]
Greenland	+5.89***/***	-1.2**+4.6 [0.16]	-0.36***+0.89 [0.49]
Guatemala	-5.96***/***	-1.2**-2.74 [0.18]	+0.4***/***
Guyana	-1.18***-1.1[0.39]	-1.2**-1.6 [0.55]	-1.19***/*
Honduras	-5.9***/***	-6.54**/***	-0.36***-0.27 [0.28]
Hungary	-2.09***/*	-1.2**-1.04 [0.45]	-0.36***+0.06 [0.59]
Iceland	-3.04***/*	-1.2**-0.46 [0.77]	-1.35***/***
India	+0.95***/***	-1.17**-1.54 [0.5]	-0.54***/***
Indonesia	-1.16***-0.75[0.2]	-1.18**-0.58 [0.65]	-0.56***/**
Iran	-1.17***-1.08[0.52]	-10.09**/***	-0.98***/***
Ireland	-1.18***+0.81[0.61]	-3.15**/**	-0.36***+0.19 [0.15]
Israel	+0.25***/***	+6.23**/***	-0.09***/**
Italy	-1.19***+0.32[0.14]	+1.45**/***	-0.22***/***

Jamaica	-8.03***/***	-1.2**+6.01 [0.25]	-0.36***-0.48 [0.22]
Japan	-2.44***/***	+6.18**/***	-0.36***+0.09 [0.15]
Jordan	+0.42***/**	-1.2**-1.81 [0.21]	-0.36***-0.25 [0.23]
Kazakhstan	+1.64***/**	+3.88**/***	-0.36***+0.5 [0.1]
Kenya	-1.18***+1.18[0.17]	+85.74**/***	-1.43***/***
Kuwait	+2.93***/***	-1.2**+1.54 [0.16]	+0.58***/***
Kyrgyzstan	-1.18***+2.9[0.31]	+5.93**/*	-0.36***-0.37 [0.51]
Latvia	-1.18***-0.74[0.34]	-4.51**/***	+0.08***/***
Lebanon	+1.23***/***	-1.2**+1.64 [0.47]	-0.03***/**
Libya	-11.09***/***	-12.73**/***	-0.36***+0.6 [0.34]
Lithuania	-2.72***/*	-1.2**+1.49 [0.15]	+0.14***/***
Luxembourg	-4.63***/***	-1.2**-0.56 [0.65]	-0.36***-0.2 [0.22]
Madagascar	-15.54***/***	-1.2**+3.35 [0.34]	-0.36***+0.28 [0.48]
Malawi	-11.72***/***	-1.2**+2.93 [0.33]	-2.31***/***
Malaysia	-3.02***/***	-1.24**+1.65 [0.58]	-0.36***+0.08 [0.37]
Maldives	-12.05***/***	-1.2**-0.62 [0.89]	-0.36***-0.62 [0.51]
Mali	-8.87***/*	-39.23**/***	-0.36***+0.46 [0.47]
Malta	-1.18***+1.22[0.7]	-21.07**/***	-0.36***-0.22 [0.53]
Mauritania	-1.18***-0.5[0.85]	-1.2**-3.02 [0.38]	+2.01***/***
Mauritius	-6.74***/***	-1.2**-0.98 [0.76]	-1.79***/***
Mayotte	+22.12***/***	+10.99**/***	-0.36***+2.07 [0.48]
Mexico	+0.31***/**	-5.57**/***	+0.11***/***
Mongolia	-24.36***/***	-1.2**-0.37 [0.95]	+2.54***/***
Montenegro	-1.18***-1.39[0.77]	+20.89**/**	-0.36***+0.95 [0.18]
Morocco	-1.18***+0.78[0.29]	-1.2**+0.24 [0.89]	-0.78***/**
Mozambique	-6.88***/**	-11.03**/**	-4.06***/***
Myanmar	+3.43***/***	-1.2**+2.09 [0.31]	-2.49***/***
Namibia	+3.47***/***	+9.19**/***	-0.36***+0.61 [0.19]
Nepal	+4.79***/***	-1.2**+3.01 [0.14]	-0.36***+0.37 [0.12]
Neth. Antilles	-1.18***-6.89[0.19]	-1.2**-6.11 [0.23]	-0.36***+0.21 [0.71]
Netherlands	-0.57***/**	-1.25**+1.44 [0.18]	-0.36***+0.006 [0.92]
New Caledonia	-1.18***-2.76[0.14]	-1.2**-1.85 [0.72]	+1.57***/**
New Zealand	+2.23***/***	+9.14**/***	-0.6***/**
Nicaragua	-1.18***-0.25[0.84]	+1.39**/**	-1.17***/**
Niger	-1.18***+0.09[0.98]	-48.9**/***	+1.91***/***
Nigeria	-11.52***/***	-13.48**/***	-0.36***-0.26 [0.36]
North Macedonia	-8.42***/***	+1.79**/**	-0.36***+0.25 [0.22]
Norway	-3.44***/***	-5.89**/***	-0.6***/**
Oman	-1.18***-0.28[0.81]	-4.89**/**	-0.36***+0.31 [0.26]
Pakistan	-1.18***-0.01[0.99]	-1.2**-2.16 [0.23]	-0.13***/*

Palau	-1.18***+2.5[0.81]	+29.17**/**	-0.36***+7.66 [0.12]
Panama	-6.44***/***	-6.84**/***	+0.16***/***
Papua New Guinea	-10.57***/***	-18.39**/***	-0.36***+0.27 [0.7]
Paraguay	-1.18***+0.31[0.79]	-1.2**-1.73 [0.23]	-0.36***-0.4 [0.26]
Peru	+1.15***/*	-10.24**/***	+0.15***/***
Philippines	-3.35***/***	-9.19**/***	-0.61***/*
Poland	-3.44***/***	+4.8**/***	-0.36***+0.12 [0.14]
Portugal	-1.18***-0.24[0.54]	+1.34**/***	-0.59***/**
Qatar	-6.72***/***	-6.95**/***	+0.34***/**
Rep. of Korea	-2.69***/***	-1.17**-2.14 [0.13]	-0.07***/***
Rep. of Moldova	-1.18***+0.94[0.49]	-1.2**-1.2 [0.51]	-0.36***-0.19 [0.57]
Romania	+0.3***/*	-1.2**+1.32 [0.39]	-0.6***/**
Russian Federation	-1.15***-0.75[0.25]	-1.15**-0.77 [0.34]	+0.08***/***
Rwanda	-1.18***+2.95[0.56]	-1.2**-4.75 [0.35]	-0.36***-0.5 [0.64]
Saint Kitts and Nevis	-1.18***-8.36[0.19]	-1.2**-6.44 [0.55]	-0.36***-1.23 [0.46]
Saint Lucia	-1.18***+3.11[0.45]	-15.93**/**	-0.36***+0.81 [0.46]
Saint Vincent and the Grenadines	-14.82***/***	-13.49**/***	-3.15***/**
Saudi Arabia	+4.68***/***	+3.31**/***	-0.36***-0.09 [0.51]
Senegal	+4.49***/***	+5.81**/**	+0.25***/*
Serbia	0.2***/*	-1.2**+1.67 [0.25]	-0.36***-0.11 [0.56]
Seychelles	-1.18***+0.91[0.58]	-10.88**/***	-1.78***/*
Singapore	-1.17***-0.83[0.37]	-1.16**-9.44 [0.12]	-0.36***-0.11 [0.23]
Slovakia	-1.18***+0.84[0.11]	+0.1**/*	-0.36***+0.03 [0.8]
Slovenia	-1.18***+0.35[0.33]	-1.2**+0.15 [0.86]	-0.03***/***
Solomon Isds	-11.25***/***	-12.74**/***	-0.36***+0.63 [0.59]
South Africa	+1.29***/***	+5.55***/***	-0.76***/***
Spain	-1.17***-0.25[0.26]	-1.21**+0.76 [0.27]	-0.15***/***
Sri Lanka	-1.18***+0.99[0.35]	-6.25**/*	-0.63***/*
State of Palestine	-4.7***/**	-1.2**-3.71 [0.37]	-0.36***-0.55 [0.37]
Sudan	-1.18***-5.74[0.51]	-1.2**-1.1 [0.89]	-0.36***+2.63 [0.19]
Suriname	-8.53***/***	-1.2**-1.76 [0.58]	-0.36***+0.65 [0.26]
Sweden	-1.18***+0.03[0.92]	+0.96**/***	-0.22***/*
Switzerland	-1.18***+0.6[0.3]	-1.21**+1.34 [0.45]	-0.36***-0.04 [0.56]
Syria	-1.18***-0.53[0.67]	+5.23**/**	+0.09***/**
Thailand	-1.18***+0.13[0.74]	-1.22**+1.26 [0.35]	-0.24***/*
Togo	-1.18***+0.37[0.94]	-1.2**+0.55 [0.82]	-2.09***/***
Trinidad and Tobago	-1.17***-1.84[0.18]	-5.48**/**	+0.77***/***
Tunisia	+2.12***/***	+2.71**/***	-0.36***+0.15 [0.38]
Turkey	-1.18***+0.01[0.98]	-1.21**+1.28 [0.2]	-0.16***/***

Uganda	+2.39***/**	-1.2**+7.13 [0.12]	+0.31***/*
Ukraine	-1.17***-1.07[0.25]	-1.18**-0.89 [0.47]	-0.36***-0.02 [0.87]
United Arab Emirates	-1.18***-0.06[0.94]	-1.2**-0.34 [0.77]	-0.2***/*
United Kingdom	-0.7***/**	-1.17**-1.15 [0.22]	-0.86***/***
United Rep. of Tanzania	+2.81***/**	-1.2**+3.78 [0.34]	-1.91***/***
Uruguay	-6.74***/***	-1.2**-0.98 [0.76]	-1.79***/***
USA	-1.2***+0.24[0.31]	-1.18***-0.17 [0.96]	-0.57***/***
Uzbekistan	-1.18***+1.14[0.41]	-1.2**+2.27 [0.37]	-0.36***+0.13 [0.73]
Venezuela	+7.48***/***	+2.88**/***	+0.03***/*
Viet Nam	+3.97***/***	-6.57**/**	-0.1***/*
Yemen	-28.25***/***	-37.62**/***	+1.56***/***
Zambia	+6.08***/**	-1.2**-3.21 [0.39]	-3.07***/***
Zimbabwe	+3.47***/***	+9.19**/***	-0.36***+0.61 [0.19]

Notes: (1) * if p < 0.10, ** if p < 0.05; *** if p < 0.01; (2) The percentages have been computed using formula $(exp(a_1 + a_2)\text{-}1)\times 100$. Since two coefficients have been used to compute respective percentages, the p-values` marks (*; ** and ***) are reported for both coefficients in their order and separated by /. If one of the coefficients is not statistically significant, percentage changes computed based on the sum of direct and interaction term`s coefficients are reported separately with p-value of insignificant part reported in square parentheses.

Appendix E: Descriptive statistics and correlation matrix of the dependent and explanatory variables in estimations of determinants of trade diversion effects of China`s VAT export rebates

Table E1: Descriptive statistics

Variable	*Obs.*	*Mean*	*Std. Dev.*	*Min*	*Max*
Effects for value	165	-0.022	0.063	-0.332	0.200
Effects for quantity	164	-0.026	0.111	-0.671	0.619
Effects for unit values	165	-0.003	0.012	-0.041	0.070
GDP per capita (Natural Logarithm)	162	8.781	1.458	5.425	11.543
Population (Natural Logarithm)	164	15.717	2.035	9.818	20.937
GDP growth, %	161	3.767	2.216	-4.925	10.993
Distance (Natural logarithm)	159	8.996	0.523	6.862	9.868
Revealed comparative advantage	160	0.974	0.055	0.610	1.083
Import tariff	131	9.174	4.550	0	28.466
Chinese intermediates` usage, %	160	1.246	2.584	0.0002	18.489
Export quality	149	0.822	0.156	0.299	1.086
Export diversification	154	3.347	1.216	1.440	6.290
ED extensive margin	154	0.342	0.483	-0.034	2.401
ED intensive margin	153	3.003	1.075	1.394	5.809
Number of exported HS3 products	163	2317.548	1427.895	48.750	4630
Index of export market penetration	163	6.774	8.629	1.046	47.390

Table E2: Correlation matrix

VAR	Effects for value	Effects for quantity	Effects for unit values	GDP per capita (Natural Logarithm)	Population (Natural Logarithm)	GDP growth	Distance (Natural logarithm)	Revealed comparative advantage	Import tariff	Chinese intermediates` usage	Export quality	Export diversification	ED extensive margin	ED intensive margin	Number of exported HS3 products	Index of export market penetration
Effects for value	1.00															
Effects for quantity	0.37	1.00														
Effects for unit values	0.00	-0.13	1.00													
GDP per capita (LN)	0.12	0.15	0.12	1.00												
Population (LN)	0.13	0.09	-0.02	-0.29	1.00											
GDP growth	0.06	0.03	-0.09	-0.36	0.28	1.00										
Distance (LN)	0.09	-0.05	-0.14	-0.04	-0.27	-0.26	1.00									
Revealed comparative advantage	0.07	-0.01	-0.17	-0.05	-0.14	-0.18	-0.05	1.00								
Import tariff	0.04	-0.10	0.04	-0.37	-0.09	-0.05	0.25	0.01	1.00							
Chinese intermediates` usage	-0.06	0.02	-0.19	-0.28	0.04	0.11	-0.26	0.08	-0.01	1.00						
Export quality	0.17	0.03	0.21	0.53	-0.13	-0.31	-0.12	0.33	-0.36	-0.11	1.00					
Export diversification	-0.30	-0.34	0.01	-0.15	-0.27	0.15	0.13	-0.34	0.36	-0.07	-0.52	1.00				
ED extensive margin	0.02	-0.04	0.06	0.07	-0.07	-0.07	0.15	-0.33	0.18	-0.11	-0.21	0.43	1.00			
ED intensive margin	-0.34	-0.36	-0.01	-0.20	-0.26	0.20	0.07	-0.21	0.31	-0.02	-0.47	0.90	-0.02	1.00		
Number of exported HS3 products	0.26	0.32	0.02	0.42	0.54	-0.14	-0.26	0.11	-0.48	-0.12	0.47	-0.72	-0.24	-0.68	1.00	
Index of export market penetration	0.12	0.12	-0.01	0.41	0.49	-0.12	-0.34	0.19	-0.34	-0.03	0.44	-0.55	-0.21	-0.50	0.74	1.00

Note: LN – natural logarithm.

Appendix F: Empirical determinants of trade diversion effects: OLS with robust standard errors results

Table F1: Determinants of trade diversion effects of China`s export VAT rebates: OLS with robust standard errors` estimation results. Trade in monetary terms.

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Constant	-0.41 (0.185)**	-0.697 (0.324)**	-0.438 (0.338)	-0.428 (0.328)	-0.475 (0.345)	-0.903 (0.387)**
GDP per capita (Natural Logarithm)	0.007 (0.006)	0.011 (0.008)	0.013 (0.008)	0.012 (0.008)	0.003 (0.008)	0.017 (0.009)*
Population (Natural Logarithm)	0.006 (0.003)**	0.009 (0.004)**	0.004 (0.004)	0.004 (0.004)	-0.002 (0.006)	0.013 (0.005)**
GDP growth	0.003 (0.005)	0.004 (0.006)	0.008 (0.006)	0.009 (0.006)	0.009 (0.006)	0.007 (0.006)
Distance (Natural logarithm)	0.024 (0.014)	0.026 (0.015)*	0.022 (0.016)	0.02 (0.015)	0.027 (0.016)	0.025 (0.016)
Revealed comparative advantage		0.175 (0.15)	0.026 (0.138)	0.057 (0.143)	0.055 (0.149)	0.186 (0.167)
Import tariff		0.002 (0.002)	0.004 (0.002)*	0.003 (0.002)*	0.004 (0.002)**	0.002 (0.002)
Chinese intermediates` usage		0.0004 (0.002)	0.0003 (0.002)	0.0004 (0.002)	0.001 (0.002)	0.001 (0.002)
Export quality			0.021 (0.064)	0.021 (0.062)	0.055 (0.063)	0.101 (0.066)
Export diversification			-0.02 (0.009)**			
ED extensive margin				-0.003 (0.015)		
ED intensive margin				-0.024 (0.008)***		
Number of exported HS3 products					0.00002 (0.00001)**	
Index of export market penetration						-0.002 (0.001)**
R-square	*0.07*	*0.11*	*0.21*	*0.23*	*0.19*	0.16
N. obs.	*156*	*124*	*117*	*116*	*119*	*119*

Notes: **(**1) * if p < 0.10, ** if p < 0.05; *** if p < 0.01; (2) Standard errors in parentheses.

Table F2: Determinants of trade diversion effects of China`s export VAT rebates: OLS with robust standard errors` estimation results. Trade in physical terms.

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Constant	-0.173 (0.246)	-0.365 (0.422)	0.268 (0.402)	0.291 (0.4)	0.287 (0.448)	-0.744 (0.428)*
GDP per capita (Natural Logarithm)	0.013 (0.01)	0.015 (0.015)	0.027 (0.014)*	0.026 (0.014)**	-0.003 (0.013)	0.029 (0.016)*
Population (Natural Logarithm)	0.005 (0.005)	0.005 (0.006)	-0.003 (0.005)	-0.004 (0.005)	-0.024 (0.012)*	0.014 (0.006)**
GDP growth	0.001 (0.007)	0.002 (0.009)	0.007 (0.009)	0.008 (0.009)	0.01 (0.01)	0.004 (0.011)
Distance (Natural logarithm)	-0.005 (0.016)	0.003 (0.018)	-0.001 (0.016)	-0.004 (0.016)	0.01 (0.017)	0.01 (0.016)
Revealed comparative advantage		0.083 (0.083)	-0.111 (0.148)	-0.075 (0.164)	-0.081 (0.159)	0.214 (0.152)
Import tariff		-0.001 (0.002)	0.002 (0.003)	0.002 (0.002)	0.003 (0.003)	-0.001 (0.002)
Chinese intermediates` usage		0.002 (0.004)	0.001 (0.003)	0.001 (0.003)	0.003 (0.003)	0.003 (0.004)
Export quality			-0.274 (0.153)*	-0.274 (0.153)*	-0.192 (0.136)	-0.073 (0.123)
Export diversification			-0.06 (0.021)***			
ED extensive margin				-0.038 (0.028)		
ED intensive margin				-0.065 (0.022)***		
Number of exported HS3 products					0.0001 (0.00003)**	
Index of export market penetration						-0.002 (0.001)
R-square	*0.03*	*0.03*	*0.22*	*0.23*	*0.19*	0.06
N. obs.	*155*	*123*	*116*	*115*	*118*	*118*

Notes: **(**1) * if p < 0.10, ** if p < 0.05; *** if p < 0.01; (2) Standard errors in parentheses.

Table F2: Determinants of trade diversion effects of China`s export VAT rebates: OLS with robust standard errors` estimation results. Unit values.

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Constant	0.066 (0.039)*	0.139 (0.051)***	0.094 (0.038)**	0.093 (0.039)**	0.089 (0.038)**	0.085 (0.042)**
GDP per capita (Natural Logarithm)	-0.0003 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Population (Natural Logarithm)	-0.001 (0.001)	-0.001 (0.001)	-0.0004 (0.001)	-0.0004 (0.001)	0.0001 (0.001)	0.0002 (0.001)
GDP growth	-0.001 (0.001)*	-0.001 (0.001)**	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Distance (Natural logarithm)	-0.005 (0.002)**	-0.008 (0.003)***	-0.005 (0.002)***	-0.005 (0.002)***	-0.005 (0.002)***	-0.006 (0.002)***
Revealed comparative advantage		-0.041 (0.014)***	-0.059 (0.022)***	-0.058 (0.021)***	-0.059 (0.022)***	-0.056 (0.021)**
Import tariff		0.0002 (0.0004)	0.0004 (0.0004)	0.0004 (0.0004)	0.0003 (0.0004)	0.0004 (0.0004)
Chinese intermediates` usage		-0.001 (0.0003)***	-0.001 (0.0003)***	-0.001 (0.0003)***	-0.001 (0.0003)***	-0.001 (0.0003)***
Export quality			0.027 (0.013)**	0.027 (0.013)**	0.026 (0.012)**	0.026 (0.013)**
Export diversification			0.0004 (0.001)			
ED extensive margin				0.001 (0.002)		
ED intensive margin				0.0004 (0.001)		
Number of exported HS3 products					-0.000001 (0.000001)	
Index of export market penetration						-0.0003 (0.0002)
R-square	*0.09*	*0.19*	*0.21*	*0.21*	*0.21*	*0.21*
N. obs.	*156*	*124*	*117*	*116*	*119*	*119*

Notes: **(**1) * if p < 0.10, ** if p < 0.05; *** if p < 0.01; (2) Standard errors in parentheses.