Export Tax Refund and Exporters' Misreporting in China

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Abstract

We estimate the response of the logarithmic difference between exports reported in China's customs and imports reported in the destination countries' customs to export tax refund rates. With an increase of 1 percentage point in export tax refund rates, the logarithmic difference increases by 0.051. In addition, with an increase of 1 percentage point in the export tax refund rates of similar products, this gap decreases by 0.024. These findings provide evidence that exporters overreport exports and misclassify their products as those with high refund rates. Further study reveals that manipulation of quantity accounts for the majority of cases.

Keywords: Export tax refund; bilateral trade discrepancy; over-report; misclassification

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1. Introduction

To reduce firms' tax burdens before they enter the international market, governments in various countries, including China (which refers to mainland China in our paper), usually refund taxes that firms pay domestically, which is allowed by World Trade Organization (WTO) rules. This policy has been shown to have positive effects on exports (Chandra and Long, 2013). However, because the refunds that firms can receive are highly dependent on the export values they report in customs and the export tax refund rates applied to their products, exporters may be induced to overreport their exports and/or misclassify their products as those with high refund rates. This phenomenon is frequently observed; for example, an article in Forbes stated, "China Customs, everyone agrees, counted a substantial number of fictitious export transactions...."[1] This issue, however, has been ignored in the literature.

In China, the rules for obtaining an export tax fund differ for various types of exporters. Exporters in China can be divided into two types. The first type includes trading companies that export products purchased from other producers. These companies do not produce products themselves. The export refund they can receive is the product of the export refund rates and the value of the purchased products. The second type of exporters includes manufacturing firms. These firms can obtain input value added tax (VAT) credits; however, the maximum value they can receive is limited by the product of the export values they claim with the export tax refund rates. Therefore, one way for both types of firms to gain a greater benefit is to over-report their export values and/or to misclassify their products as other products with higher export tax refund rates. Section 2 provides more details about this process.

To investigate how exporters misreport exports in response to the export tax refund, we collect bilateral trade data between China and other countries from 2004 to 2015. For each Harmonized Commodity Description and Coding System (HS) 6-digit product, we construct a logarithmic difference between the export reported in China's customs and the import of the

[1] See the article: https://www.forbes.com/sites/gordonchang/2014/01/12/is-china-really-the-worlds-no-1-trader/#129c95aea195.

same product reported by the customs of the destination countries (hereafter, we sometimes use *gap* to denote this logarithmic difference). We then examine the relationship between this gap and the export tax refund rate. In essence, this approach follows the idea in Fisman and Wei (2004).[2] We find that the gap has a significant positive correlation with the export tax refund rates. We also find that if the average export tax refund rates of similar products (defined as other products within the same HS 4-digit category) is higher, then the gap is smaller. These results prove that exporters not only overreport exports but also misclassify their products as others having higher export tax refund rates.

These results are robust to various tests. We first consider the effects of entrepôt trade. Hong Kong plays an important role in entrepôt trade for exports from China to other countries (Feenstra, et al., 1999; Feenstra and Hanson, 2004). A product from China could be counted by the destination countries as coming from Hong Kong if Hong Kong is used as a transit region. If this is more likely to be the issue for products with a higher refund rate, our estimates are biased upward. As a robustness check, we treat any export from Hong Kong reported in destination countries as coming from China. Results are similar.

Ferrantino, Liu, and Wang (2012) argue that Chinese exporters underreport export values in China's customs to evade VAT, which provides an explanation for the discrepancy in US–China trade. However, we find that if the export tax refund rate and VAT rate are included together (together with other relevant controls) in regressions in which the outcome variable is the logarithmic difference between exports reported in China's customs and imports reported in the destination countries' customs, the coefficient of the VAT rate is very small and is not significant, whereas the coefficient of the export tax refund rate remains significant and positive. We also find that higher export tax refund rates are correlated with a greater likelihood that the gap will be positive. This evidence suggests that overreporting exports in response to the export tax refund is more likely to be the underlying story.

We also conduct the following robustness checks. (1) We address the problem in which

[2] Fisman and Wei (2004) study the relation between tariff evasion and import tariffs. They construct the gap between exports reported in Hong Kong's customs and imports reported in China's customs and then investigate the relationship between this gap and the import tariffs. They argue that this positive relationship provides evidence that firms evade tariffs. They also find that importers misclassify their products as others with lower import tariffs.

products have different units while calculating the average refund rates of similar products within the same HS 4-digit category; the results are robust. (2) We aggregate the data to a higher HS level to alleviate firms' misclassifying behavior, and we still find that firms overreport exports in response to higher refund rates. (3) We focus on trade between China and Hong Kong, and the results remain robust. (4) We conduct a placebo test by focusing on exports by the United States to other countries but assigning China's export refund rates to products with the same HS 6-digit codes; we see no results. (5) We conduct a permutation test to confirm that our results are not driven by random factors.

Finally, we investigate whether exporters misreport the export quantity or price and find evidence that misreporting of quantity accounts for the majority of the gap of export values.

Our paper contributes to the literature in several aspects. First, our paper adds to the literature regarding the impact of tax rates on tax evasion because tax refund can be considered a negative tax. Allingham and Sandmo (1972) conduct the first theoretical investigation of the relationship between tax rates and tax evasion; they predict that the relationship is positive, depending on assumptions of risk aversion and punishment for evasion. Slemrod and Yitzhaki (2002) conduct a comprehensive literature review and summarize that theoretical predictions of the effect of the tax rate on evasion are sensitive to modeling assumptions. Fisman and Wei (2004) study the effect of tariffs on the difference between Hong Kong's reported exports to China and China's reported imports from Hong Kong; they find that higher tariff leads to a greater difference and that evasion also takes the form of misclassification of imports into categories with lower tariffs. Using a similar measurement of evasion, Mishra, Subramanian, and Topalova (2008) find a robust positive elasticity of evasion with respect to tariffs in India. Gorodnichenko, Martinez-Vazquez, and Peter (2009) study the impact of Russia's 2001 flat rate income tax reform on tax evasion, which is measured by the difference between household expenditures and reported earnings, and find that lower income tax rates lead to a large increase in reported income relative to consumption.

Second, our paper is also related to studies of other tax avoidance behaviors induced by taxes. For example, Ellison and Ellison (2009) find a strong relationship between e-retail

sales to a given state and sale tax rates applied to that state, suggesting the importance of tax avoidance motives. Goolsbee, Lovenheim, and Slemrod (2010) find that the increase in Internet usage in the United States has led to a substantial increase in the sensitivity of taxable cigarette sales to state tax rates. Merriman (2010) finds that the difference between the cigarette tax imposed by Chicago and those imposed by surrounding counties decreases the likelihood of a local tax stamp. He also finds that an increase in the distance to the border of the state with the lower tax increases the likelihood of a local tax stamp. LaLumia, Sallee, and Turner (2015) test whether parents shift the timing of childbirth around the New Year to gain benefits and find evidence of a positive, but very small, effect of tax incentives on birth timing.

Third, our paper can be linked with the literature regarding the incidence of VAT. For example, Carbonnier (2007) studies the distribution of the sales tax burden between consumers and producers by estimating the effects of two reforms in France that entailed steep decreases in the VAT rate. He finds that the consumer share of the sales tax burden exceeds that of the producers. Onji (2009) studies the effects of a VAT that brought along a preferential tax scheme for small business below 500 million yen in Japan, and he finds a cluster of corporations just below this threshold, which provides evidence for the incentives for a large firm to masquerade as many small firms. Keen and Lockwood (2010) use a panel of 143 countries over 25 years to study the causes and consequences of VAT. They find a rich set of determinants of VAT adoption, excluding income per capita, and find that most countries that have adopted a VAT have gained a more effective tax instrument. Kosonen (2015) studies the effects of VAT on prices and the quantities of hairdressing services in Finland. He finds that the prices were only cut by half of that implied by a complete pass-through, and hardly any adjustment was seen in the equilibrium quantity.

Fourth, our paper complements other studies that document distortionary behaviors by Chinese exporters. For example, Defever and Riaño (2017) study the impact of a subsidy subject to an export share requirement and find that this subsidy provides greater protection to firms with low profitability, which exacerbates the welfare loss associated with subsidizing exporters. Liu (2013) documents that to obtain input VAT rebates, some processing firms may

export products to obtain rebates, whereas other downstream processing firms choose to re-import these duty-free products as inputs to avoid input VAT payments. Our paper provides evidence for other forms of distortionary behaviors conducted by firms, which should enhance people's understanding of the full effects of the export tax refund policy. Our paper also suggests that statistics of China's exports might be upward biased.

The remainder of this paper is organized as follows. Section 2 introduces the institutional background. Section 3 describes the data. Section 4 presents graphic and regression results. Section 5 shows results from several robustness checks. Section 6 investigates whether exporters misreport quantity, and Section 7 concludes the paper.

2. Background

2.1. Export Tax Refund

The purpose of an export tax refund is to reduce the tax burden imposed on exporters to improve their competitiveness in the international market, which is permitted by WTO rules. Chinese exporters can obtain refunds on VAT and on the consumption tax. VAT is widely implemented, whereas the consumption tax is imposed only on certain products.[3]

VAT was first used in China in 1979, but at that time it was only applied to two industries (machine and machinery, and agricultural machinery) and to three products (bicycles, sewing machines, and electric fans) in some regions. In 1984, the Chinese State Council issued *The Regulations of the People's Republic of China on Value-Added Tax (Draft)*, which formally established the VAT system in China. The Chinese government has since made changes to the VAT system by expanding the range of eligible products. On December 13, 1993, the State Council issued a new document, *The Regulations of the People's Republic of China on Value-Added Tax*, which took effect on January 1, 1994; this new document established the major part of the current VAT system and extended it to nearly all products. In our sample period, the VAT rate for most products is 17%, and the rates for some specific products (mostly agricultural products) are 13%, 11%, or 6%.

A consumption tax is used to achieve policy goals such as discouraging the development

[3] The materials in this section are summarized from Yue (2017).

of certain industries. China started to use consumption taxes as early as 1950. The current consumption tax system was regulated by *The Regulation of the People's Republic of China on Consumption Tax* issued by the State Council in 2008 and implemented from 2009. The consumption tax is imposed on any organizations and individuals who produce, process, or import certain consumption goods, including cigarettes, alcohol, high-end cosmetics, jewelry, firecrackers and fireworks, refined oil, motorcycles, cars, golf products, high-end watches, yachts, disposable wooden chopsticks, hardwood flooring, batteries, and coating materials. The rule by which the consumption tax imposed on exported goods is refunded is straightforward; it simply exempts the exporters from consumption taxes. Due to this feature and the limited coverage of products, when we discuss export tax refunds, we usually refer to the refund of the VAT, which is more complicated and is discussed below.

In March 1985, the State Council issued *The Notice on the Regulations of Tax and Tax Refunds on Importing and Exporting Products*. This document states that the export tax refund would start from April 1, 1985. The central government was originally responsible for financing the export tax refunds for enterprises owned by the central government, and local governments were responsible for financing tax refunds for local enterprises until 1988. Between 1988 and 1991, the central government bore the full financial burden for both central government–owned enterprises and local government–owned enterprises. After 1991, the central government was responsible for 80% of the financial burden. This ratio was reduced to 75% in 2004, and then increased to 92.5% in 2005. The different levels of tax refund rates have changed over time. The currently implemented export tax refund rates are 5%, 6%, 9%, 11%, 13%, 15%, 16%, and 17%. For small taxpayers, the refund rate is 3%.[4]

The rules for export tax refunds differ between trading companies and manufacturing firms. The former do not produce products but rather export goods purchased from others. The refund is equal to the value of the purchased products multiplied by the export refund rates applied to these products. For manufacturing firms, several steps are needed to calculate a tax refund. In the first step, firms must calculate the total payable VAT, which is equal to (output VAT for domestic sales – input VAT for domestic sales) + ((VAT rate – refund

[4] Small taxpayers are defined as manufacturers with annual sales below 500,000 RMB, taxpayers other than manufacturers with annual sales below 800,000 RMB, and taxpayers who sell nonphysical assets or real estate with annual sales below 5,000,000 RMB.

rate)*export sales – input VAT for export sales), in which (output VAT for domestic sales – input VAT for domestic sales) is the domestic payable VAT, and ((VAT rate – refund rate)*export sales – input VAT for export sales) is the export payable VAT. The second step includes three cases. In the first case, the total payable VAT is positive, no refund applies, and firms must pay VAT. In the second case, the total payable VAT is negative, but the domestic payable VAT is positive, which means that the input VAT for export sales is large enough to cover the domestic payable VAT; therefore, manufacturing firms can receive a refund whose magnitude is equal to the magnitude of the total payable VAT. In the third case, the total payable VAT and the domestic payable VAT are both negative, which means that firms do not need to pay domestic VAT, so the refund they can receive is equal to the export payable VAT. In the third step, because it is difficult to differentiate the input VAT for export sales from that for domestic sales and because the input VAT is based on purchased inputs but not the inputs used in the current period, to avoid overpayment of the refund, the government establishes an upper limit for the refund a firm can receive. A firm must compare the refund calculated in the second step with the product of export sales and refund rates, and the refund they actually receive is the smaller of the two. Figure 1 summarizes the process of calculating the export tax refund for manufacturing firms discussed above.

2.2. How to Manipulate to Get a Larger Refund?

Because the refund that trading companies can receive is the product of the export values and export tax refund rates, it is straightforward for trading companies to overreport export values and/or misclassify their products as others with higher refund rates to receive a larger refund. However, to overreport export values, trading companies must obtain more input VAT invoices. To receive a larger refund, a manufacturing firm must also first obtain more input VAT invoices so that they can report more input VAT. By doing so, they can ensure that the total payable VAT is negative; otherwise, they cannot receive a refund, as described in Section 2.1. In addition, because the product of export sales and refund rates is the upper limit of the refund firms can receive, they have an incentive to overreport export values and/or misclassify their products as other type with a higher refund rate.

As discussed above, one key to overreporting export value is to obtain more input VAT invoices. Various means can be used to obtain input VAT invoices. One is through the black market. Actually, one of the authors often receives emails asking whether invoices are needed. Figure 1 in the Appendix shows the emails the author received on November 21 and 22, 2019, as examples. The author also received a message asking whether VAT invoices were needed (see Figure 2 in the Appendix). The author used the phone number in this message to contact the seller. Figure 3 in the Appendix shows the conversation between the author and the seller via WeChat (a widely used instant messenger in China). In this case, the price for the VAT invoice turned out to be 7% of the value in the invoice. The seller also sent a photo of the VAT invoice (Figure 4 in the Appendix). This experience shows that it is possible to purchase VAT invoices via the black market.

Another method is to purchase VAT invoices from other companies. A website called *China Judgements Online* (wenshu.court.gov.cn) collects cases regarding detected criminals related to export tax refunds. An examination of these cases shows that purchasing VAT invoices from other companies to receive extra export tax refunds is a common practice. For example, one law paper describes the case as "…she still purchased VAT invoices from these three companies even if she were aware that there was no business with these three companies."[5]

As discussed above, yet another way to manipulate this policy is to misclassify a product with a lower refund rate as a product with a higher refund rate. This can be easy for similar products, as shown by the example in Table 1, which shows products under HS category 0904. The refund rate is 6% for pepper of the genus Piper (neither crushed nor ground; HS code 09041100) and 0% for dry and not ground Capsicum (HS code 09042100). The refund rate is 13% for pepper of the genus Piper (crushed or ground; HS code 09041200). The fruits of the genus Capsicum or of the genus Pimenta (crushed or ground; HS code 09042200) includes two subcategories depending on the VAT rate imposed. If the VAT rate is 9% (HS code 09042200001), the refund rate is 6%, and if the VAT rate is 13% (HS code 09042200002), the refund rate is 13%. These differences in the refund rates give exporters opportunity to

[5] The legal paper (in Chinese) can be found in http://wenshu.court.gov.cn/website/wenshu/181107ANFZ0BXSK4/index.html?docId=e4f15e5bb66d4a7ca52959cfd3bdc266.

misclassify their products.

In reality, misclassification of products is also observed. For example, in one detected case, the defendant misclassified primary processed Gracilaria (with a 5% refund rate) as seaweed bud (with a 15% refund rate).[6] In another detected case, the defendant misclassified baking paper, parchment, hamburger paper, wax paper, and oilproof paper (with a 0% refund rate) as food packaging paper and kitchen paper (with a 13% refund rate).[7]

3. Data

We use three sources of data in this paper: (1) trade flow data; (2) China's export refund rates; and (3) tariffs imposed by destination countries on China's products. Our focus is on 2004 to 2015.

We obtain the trade flow data from the Comtrade database compiled by the United Nations. We obtain information on exports from China to all other countries at the HS 6-digit product level.[8] The Comtrade database reports the information for exports and re-exports which are exports of foreign goods in the same state as previously imported. However, the Comtrade database does not include any information of re-exports from China to other countries; one possible reason is that China includes them in exports. We therefore use the information for exports from China to the destination countries recorded in the Comtrade database. In the main analysis, we focus on the export value (denoted as *export*). The database also reports the export quantity, which is also used in the paper (denoted as *export_quantity*).

The Comtrade database also includes information on imports and re-imports which are goods imported in the same state as previously exported. Our data include 7875 observations of re-imports (roughly 0.3% of all observations). As mentioned above, re-exports could be included in exports in China's customs. In addition, we cannot derive from the data whether countries that report zero re-imports have any re-imports in practice (i.e., they might include

[6] The legal paper (in Chinese) can be found in http://wenshu.court.gov.cn/website/wenshu/181107ANFZ0BXSK4/index.html?docId=edcdacf5fd9347cba813a82b00a0194d.

[7] The legal paper (in Chinese) can be found in http://wenshu.court.gov.cn/website/wenshu/181107ANFZ0BXSK4/index.html?docId=7cad5f9a0fee44a0942eb37a812d9c39.

[8] The HS codes change from time to time. We convert them to HS codes in 1988 such that the products can be compared over years.

re-imports in imports). Therefore, for the sake of consistency, we use the sum of imports and re-imports from China to destinations reported in other countries' customs. We refer to this sum hereinafter as import and denote its value and quantity as *import* and *import_quantity*, respectively.

We can then measure the gap between the exports reported in China's customs and the imports reported in other countries' customs for the same HS 6-digit products. We calculate the gaps for value and quantity as ln(export)-ln(import) and ln(export_quantity)-ln(import_quantity), respectively. Note that we drop all gaps for which either the export or the import is missing or equal to zero. We also drop observations for which the unit used for export_quantity differs from that used for import_quantity when we calculate ln(export_quantity)-ln(import_quantity).

We obtain the data for export refund rates from a website (www.taxrefund.com.cn) that provides monthly refund rates for each HS 8-digit product. To be consistent with trade data, we first aggregate 8-digit information to the 6-digit level using average values. We then aggregate monthly information to annual information, also using average values. Figure 2 shows the distribution of export refund rates, and it is easy to see that the refund rates vary greatly. Figure 3 shows that the differences between the maximum and minimum export tax refund rates within HS 4-digit or 2-digit categories have some variation; this helps to identify exporters' misclassification behaviors. We obtain information on tariffs imposed by destination countries on China's products from the World Integrated Trade Solution, which provides information on tariffs for each HS 6-digit product for each year.

A total of 4471 HS 6-digit products were traded between China and 171 destination countries between 2004 and 2015. Table 2 shows more detailed information regarding the number of products and destination countries for each year and the summary statistics of the main variables used for analysis.

4. Results

4.1. Graphic Results

To provide a visual impression of the relationship between the gap and the refund rate,

we plot the gap between ln(export) and ln(import) over the export refund rates. Panel A in Figure 4 shows the HS 4-digit products. The x-axis is the refund rate, and the y-axis is the average value of the gap at each refund rate (years are pooled together). The Figure shows that although the dots are noisy due to the large amount of data, the fitted line has a positive slope, which shows the positive correlation between the gap and the refund rate. In Panel B in Figure 4, we plot the gap and the refund rate separately for each year from 2004 to 2015; the fitted lines all have positive slopes, thus confirming the positive correlation between the gap and the refund rate.

To alleviate the influence of noise, we plot the gap over the refund rate at the HS 2-digit product level. Years are pooled together in Figure 5 Panel A, which shows an obvious positive slope of the fitted line. Figure 5 Panel B shows the same plots separately for each year and shows that the gap has a positive correlation with the export refund rate in all years. Because we cannot control for other variables, we rely on the regression results presented below.

4.2. Regression Results

4.2.1. Empirical Strategy

Our analysis focuses on HS 6-digit products and uses destination-product-year level data. We define the exports recorded in China's customs as *export*, but we define the same products recorded in the destination countries' customs as *import*. We estimate the following equation.

$$Ln(export_{ipt}) - Ln(import_{ipt}) = \beta_1 refund_{pt} + \beta_2 refund_{pt}^{other} + \beta_3 tariff_{ipt} + t_{ip} + \alpha_{ip} + \alpha_{it} + \varepsilon_{ipt} \quad (1)$$

In Equation (1), i represents the destination country, p represents the HS 6-digit product, and t represents the year. One variable of interest is $refund_{pt}$, which is the refund rate imposed on product p in year t. Note that the refund rate is product-year specific, which means that the refund rate is the same regardless of the country to which the product is exported. We expect β_1 to be positive: that is, the higher the refund rate, the larger the gap, which means that exporters tend to overreport more.

As discussed in Section 2, exporters can also benefit from an export tax refund by misclassifying their products as other products with higher refund rates. Following Fisman and Wei (2004), we add the average refund rate of other products in the same HS 4-digit category into the regression. In Equation (1), $refund_{pt}^{other}$ is the average refund rate of other products in the same 4-digit category as product p. We expect β_2 to be negative. The higher the average refund rates of the other products in the same category, the smaller the gap, which means that when the refund rates of other products are high, exporters will misclassify product p, thus lowering the reported exports and leading to a smaller gap.

To evade tariffs, exporters can underreport the value at the destination's customs (e.g., Wei and Fisman, 2004). This also enlarges the gap; however, because the tariffs are imposed by the destination countries, there is no reason to believe that they are likely to be correlated with the refund rates. Table 3 reveals no statistically significant correlation between the refund rates and the tariffs. However, to the extent that tariffs might be correlated with refund rates, we add tariffs $tariff_{ipt}$ into the regression as a control variable.

In the regression, we also control for destination-product fixed effects (α_{ip}), destination-year fixed effects (α_{it}), and product-destination specific linear time trends (t_{ip}). Destination-product fixed effects absorb any factors specific to time-invariant destination-product, such as some insurance expenses and transportation costs applied to the specific products exported from China to the destination countries. Destination-year fixed effects absorb any time-specific events in each destination country, such as policies related to imports and/or other macroeconomic events. Product-destination specific linear time trends absorb any linear changes at the product-destination level such as changes in insurance expenses and transportation costs. The remaining factors that might cause bias in our estimates must be time-varying product-destination level variables and correlated with the refund rates. In Equation (1), ε_{ipt} is an error term with a mean of zero. To address heterogeneity and the serial correlation problem, we calculate standard errors using two-way cluster over HS 2-digit product and destination.

4.2.2. Main Results

Table 4 shows the estimation results of Equation (1). We first control for HS 6-digit product, destination, and year fixed effects. The results are shown in Column (1); the coefficient of the refund rate is 0.045 and is significant at the 1% level. We then control for product-destination and year-destination fixed effects instead, with the results shown in Column (2). The coefficient of the refund rate is 0.047 and is also significant at the 1% level. In Column (3), we control the product-destination specific time trend and the same fixed effects as in Column (2), and the coefficient of the refund rate is 0.051 and is still significant at the 1% level. Using the results in Column (3), which is what we prefer, we see that an increase of 1 percentage point in the refund rate enlarges the gap by 0.051; that is, exports reported in China's customs exceed imports in the destination countries' customs by roughly 5.1 more percentage points.[9]

Table 4 also shows that the coefficient of the average of the refund rates of other 6-digit products in the same 4-digit category ($refund^{other}$) is -0.021 and is significant at the 5% level in Column (1), where we control product, destination, and year fixed effects. In Column (2), we control for product-destination and year-destination fixed effects. The coefficient of $refund^{other}$ is -0.022 and is significant at the 5% level. In Column (3), we add product-destination specific time trend; the coefficient of $refund^{other}$ remains -0.024 and is significant at the 5% level. Using the preferred coefficient in Column (3), an increase of 1 percentage point in the average refund rate of other products in the same 4-digit category shrinks the gap by 0.024, which means that exports exceed imports by 2.4 less percentage points. This provides evidence that exporters misclassify their products as similar products with higher refund rates.

We note that in Column (1), the coefficient of tariff is positive and statistically significant at the 1% level. It is consistent with our prediction that exporters under-report at the destination countries' customs to evade tariffs; however, the significance disappears if we control stronger fixed effects, which suggests that tariff evasion may be less prevalent in the import process.

[9] Note that $\ln(\text{export}) - \ln(\text{import}) = \ln(1 + \frac{export-impor}{import}) \cong \frac{export-impor}{import}$.

5. Robustness Checks

In this section, we conduct several tests to investigate the robustness of main results.

Entrepôt trade. The gap between exports reported in China's customs and imports reported in the destination countries' customs might have other causes. For example, Feenstra et al. (1999) argue that entrepôt trade accounts for a large fraction of the discrepancy between US trade data and China trade data. Hong Kong plays an important role in China's trade because a large proportion of China's products are exported to Hong Kong and then re-exported to other countries (Feenstra and Hanson, 2004). If a product exported to a destination country with Hong Kong used as a transit region is recorded in China's customs as an export to this destination country but is recorded as an import from Hong Kong in the destination country's customs, the gap used in our paper is overestimated. If this is more/less likely to be the case for products with higher refund rates, our estimates will be biased upward/downward. Although there is no obvious reason to believe that a correlation exists between refund rates and exporters' possible use of Hong Kong as a transit region for exports, we address this concern by treating imports recorded as coming from Hong Kong in the destination countries' customs as imports from China. In other words, the gap is now defined as $\ln(export_{ipt}) - \ln(import_{ipt}^{CHN} + import_{ipt}^{HK})$. We re-estimate Equation (1) using this newly defined gap, and the results are shown in Columns (1) – (3) in Table 5. We can see similar results as in Table 4, which suggests that entrepôt trade is not a concern.

Because Feenstra et al. (1999) argue that entrepôt trade accounts for a large fraction of the discrepancy between US trade data and China trade data, we drop the United States from the destination countries and re-estimate Equation (1) as an additional test. The results are shown in Columns (4) – (6) in Table 5. The results are similar as those shown in Table 4; it thus provides supplementary evidence that entrepôt trade does not drive our results.

Overreporting versus underreporting. Ferrantino, Liu, and Wang (2012) argue that Chinese exporters underreport export values in China's customs to evade VAT, which provides an explanation for the US–China trade discrepancy. To address whether this is the case, we conduct two tests. First, we add the VAT rate to Equation (1), which accompanies the refund rate from the same website (www.taxrefund.com.cn). If exporters underreport

exports in China's customs to evade VAT, we should expect to see a significant negative coefficient of the VAT rate because given export tax refund rates, the higher the VAT rates, the stronger the incentive of exporters to underreport exports. However, the results in Table 6 show that the coefficients of the VAT rates are not significant and that the magnitudes are also small. In contrast, the coefficients of $refund$ and $refund^{oth}$ are similar with those in Table 4.

Second, if it were the case that exporters underreport exports to evade VAT, it would not be likely to observe that the exports reported in China's customs exceed imports reported in the destination countries' customs. In other words, even if we find a positive correlation between refund rates and the gap, the gap can still be negative. To address this concern, we estimate the same specification as in Equation (1) but replace the outcome variable with an indicator. This indicator is equal to one if the gap is positive while it is equal to zero if the gap is negative or equal to zero. The results are shown in Table 7. We can see that whether we control for product, destination, and year fixed effects (Column (1)) or for product-destination and year-destination fixed effects (Column (2)), the coefficient of the refund rate is positive and is significant at the 1% level. After we add a product-destination specific time trend in Column (3), the coefficient of the refund rate is 0.013 and is significant at the 1% level. An increase of 1 percentage point in the refund rate will increase the likelihood that the gap will be positive by 1.3 percentage points. The results re-enhance the notion that exporters overreport export values to benefit from the export tax refund.

Units. When we construct $refund^{other}$ in Equation (1), we calculate the average refund rates of all other products in the same 4-digit category regardless of whether they have the same unit. One might be concerned that the refund rates are not comparable for products with different units, and it is therefore problematic to calculate their average values. To address this concern, we drop all 4-digit categories whose 6-digit products have different units. We re-estimate Equation (1) using the remaining sample. The results shown in Table 8 are similar to those in Table 4.

One might be curious about whether exporters misclassify their products as those with the same unit or as those with different units. We construct two variables $refund^{oth}_{same}$ and

$refund_{diff}^{other}$. The former is the average refund rates of other products with the same unit within the same 4-digit category, and the latter is the average refund rates of other products with different units within the same category. We then estimate Equation (1) by replacing $refund^{other}$ with these two variables. Note that by doing so, we exclude any 4-digit category in which all 6-digit products have the same unit or in which all 6-digit products have different units. Table 9 shows the estimation results. The coefficients of both $refund_{same}^{oth}$ and $refund_{diff}^{other}$ are negative; however, the magnitude of the coefficient of $refund_{same}^{oth}$ is always larger than that of $refund_{diff}^{oth}$. In particular, in Column (3), which has the most preferred specification, the coefficient of $refund_{same}^{other}$ is significant at the 1% level, whereas the coefficient of $refund_{same}^{othe}$ remains insignificant. The results show that exporters tend to misclassify their products as those with the same unit.

Higher levels of aggregation. Our main results reveal that exporters misclassify their products as other similar products with higher refund rates within the same 4-digit category. Therefore, if we aggregate data by the 4-digit level, to the extent that exporters misclassify their products within the 4-digit category, we can account for this issue. We first aggregate data to the 4-digit level and then regress the gap over the refund rate. The results are shown in Columns (1) and (2) in Table 10. We can see that the coefficients of the refund rate are both positive and significant at the 1% level. We then aggregate data to the 2-digit level and conduct a similar analysis. The results shown in Columns (3) and (4) in Table 10 show similar results: exporters do respond to the refund by over-reporting in addition to misclassification.

China–Hong Kong trade only. Because the import tariffs implemented by Hong Kong are zero, there is no incentive to under-report imports into Hong Kong to evade tariffs. Moreover, because Hong Kong is geographically near China, transportation costs are assumed to account for a small portion in the gap. We therefore focus on China–Hong Kong trade as a robustness check. The results shown in Table 11 are robust.

Placebo test. The United States does not use a VAT, so there is no case in which the U.S. government refunds VAT to exporters. We therefore use the United States as a placebo test.

We assign the refund rates implemented by Chinese government to products with the same HS 6-digit codes but exported by the United States to other countries; in other words, we investigate exports from the United States to other countries. We estimate Equation (1) but consider exports from the United States to other countries. The results are shown in Table 12. No coefficient of the refund rates is significant, and the magnitudes are small. We can also see that the coefficient of $refund^{other}$ is insignificant and small in all columns. These results enhance our finding that Chinese exporters respond to export tax refunds by over-reporting exports and misclassifying their products.

Permutation test. To address the concern that our main results could be driven by some random factors, we conduct a permutation test. First, we randomly assign the export refund rates across products in the same year and estimate Equation (1) using the randomly assigned refund rates. We repeat this exercise 2000 times and plot the distribution and cumulative density function of these 2000 coefficients in Figure 6 Panel A. We can see that the coefficient of export tax refund rates shown in Column (3) in Table 4 lies at the far end of the distribution, which confirms that our results are not driven by random factors. Second, we randomly assign the export refund rates across years for the same products and estimate Equation (1) using the randomly assigned refund rates. We repeat this exercise 2000 times. Figure 6 Panel B shows the distribution and cumulative density function of these 2000 coefficients. We can see that the coefficient of the refund rate in Column (3) in Table 4 also lies at the far end of the distribution, confirming our findings again.

We conduct the similar exercise for the export refund rates of similar products. We randomly assign export refund rates of similar products across products in the same year. We then estimate Equation (1) using this newly-constructed variable. We repeat this exercise 2000 times and plot the distribution and cumulative density function of these 2000 coefficients in Figure 6 Panel C. We finally randomly assign export refund rates of similar products across years for the same product. We also repeat 2000 times and plot the distribution and cumulative density function of these 2000 coefficients in Figure 6 Panel D. We can also see that the coefficient of the refund rates of similar products in Column (3) in Table 4 lies at the far end, confirming our findings again.

6. Quantity Versus Price

We can rewrite $\ln(\text{export}) - \ln(\text{import})$ as $(\ln(\text{export\_quantity}) - \ln(\text{import\_quantity})) + (\ln(\text{export\_price}) - \ln(\text{import\_price}))$. In other words, exporters can overreport export values by overreporting quantity or price. In this section, we investigate which part accounts for more.

We re-estimate Equation (1) by replacing $\ln(\text{export}) - \ln(\text{import})$ with $\ln(\text{export\_quantity}) - \ln(\text{import\_quantity})$. The results are shown in Columns (1) – (3) in Table 13. Because information is missing for some products, for the sake of comparison, we also report results from estimating Equations (1) with $\ln(\text{export}) - \ln(\text{import})$ as the outcome variable but using the same sample as regressions for the quantity gap. The results are shown in Columns (4) – (6) in Table 13.

We control product, destination, and year fixed effects in Column (1) and product-destination and year-destination fixed effects in Column (2), and we add the product-destination specific time trend in Column (3). We can see that the coefficients of the refund rate are similar in these three Columns: 0.044, 0.047, and 0.053 (all are significant at the 1% level). Using the results from our preferred specification (Column (3)), we see that an increase of one percentage point in the refund rate enlarges the gap of quantity by 0.053; that is, the quantity of exports reported in China's customs exceeds the quantity of imports reported in the destination countries' customs by 5.3 more percentage points. We can also see that the coefficients of $refund^{other}$ are -0.023 (Column (1)), -0.020 (Column (2)), and -0.030 (Column (3)), and they all are significant at least at the 5% level.

A comparison of the coefficients in Columns (1) – (3) with those in Columns (4) – (6) shows that the over-reported exports are totally accounted for by the over-reported quantity. This could be because the price is easy to check and therefore difficult to manipulate.

7. Conclusions

We investigate how Chinese exporters misreport their exports in response to the export tax refund. Using the logarithmic difference between exports reported in China's customs and imports reported in the destination countries' customs as a measure, we find that a higher

export refund rate leads to a larger gap. This indicates that exporters overreport exports to obtain extra refunds. We also find evidence that exporters misclassify their products as those with higher refund rates and that misreporting of quantity accounts for the misreported export values.

The Chinese government has been using export refunds as a policy tool to stimulate exports. Although it has shown positive effects on exports, our findings suggest that it comes with distortions. Money spent by the government might not be used as efficiently as expected. Our findings also suggest that Chinese exports might be over-estimated; however, the extent to which exports are over-estimated remains a question for future exploration.

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Figure 1. Process of Calculating Export Tax Refunds for Manufacturing Firms

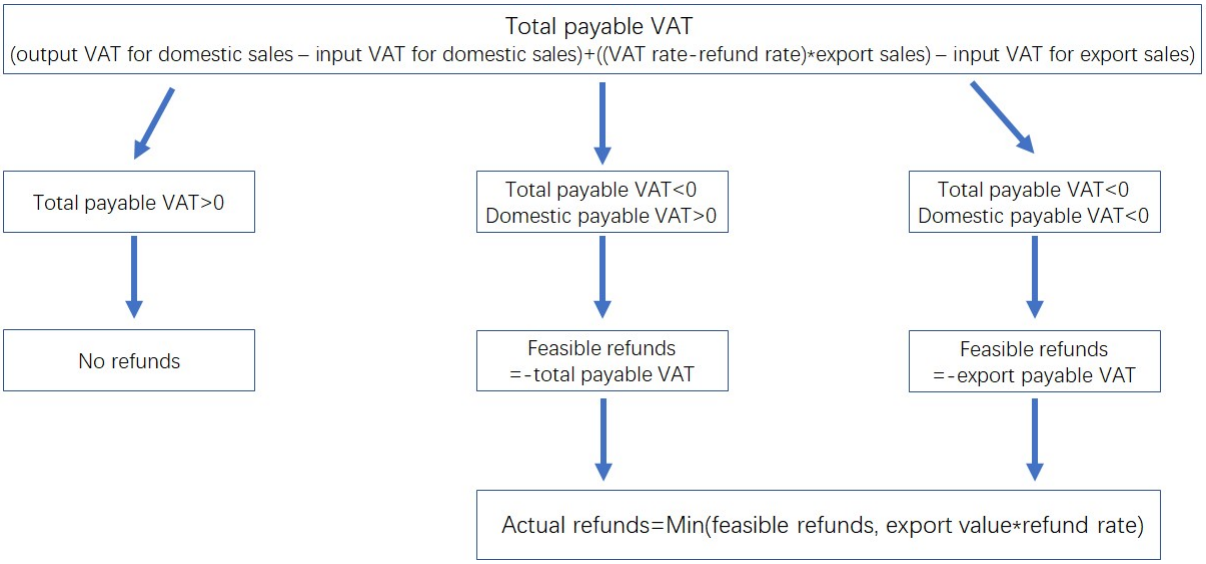
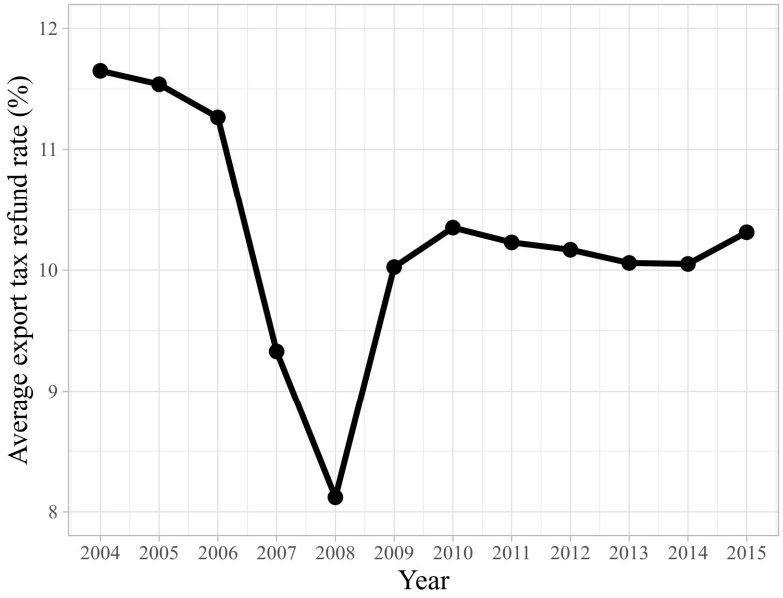


Figure 2. Distribution of Export Tax Refund Rates

Panel A. Average Export Tax Refund Rates Across Years



Panel B. Distribution of Export Tax Refund Rates for Each Year

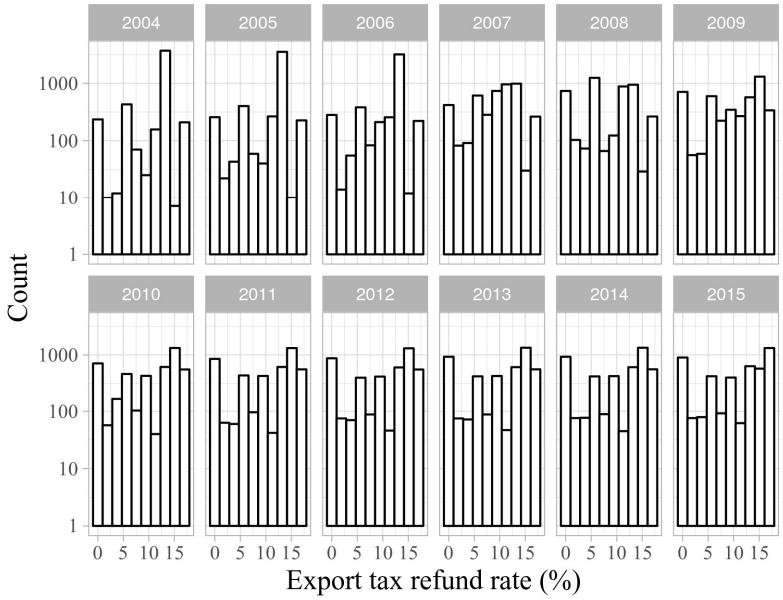
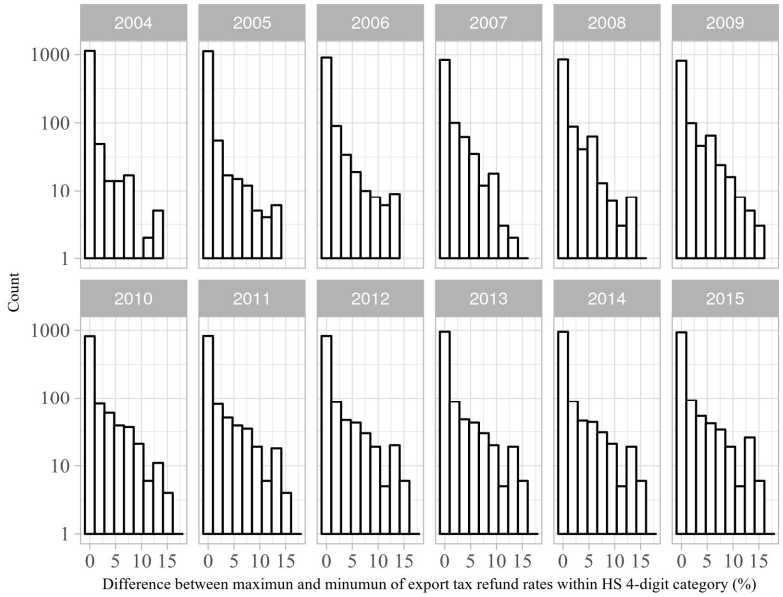


Figure 3. Difference between Maximum and Minimum Export Tax Refund Rates

Panel A. Within HS 4-Digit Category for Each Year



Panel B. Within HS 2-Digit Category for Each Year

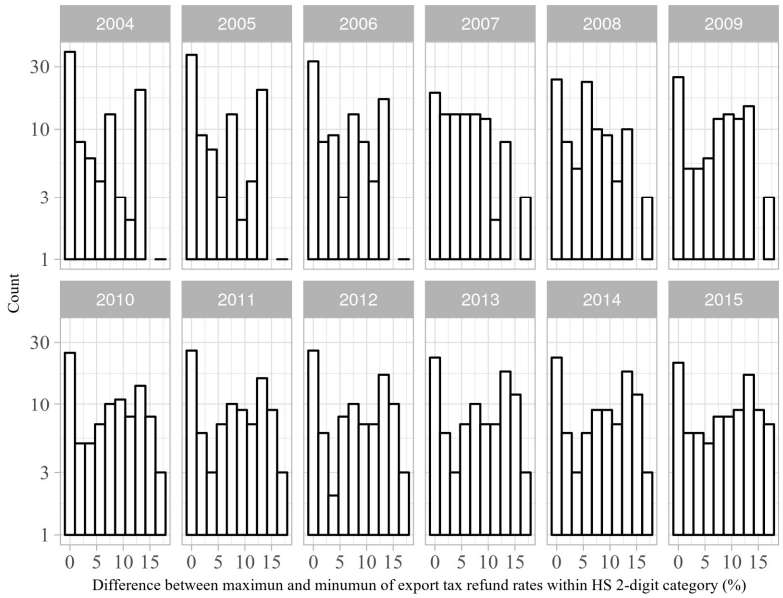
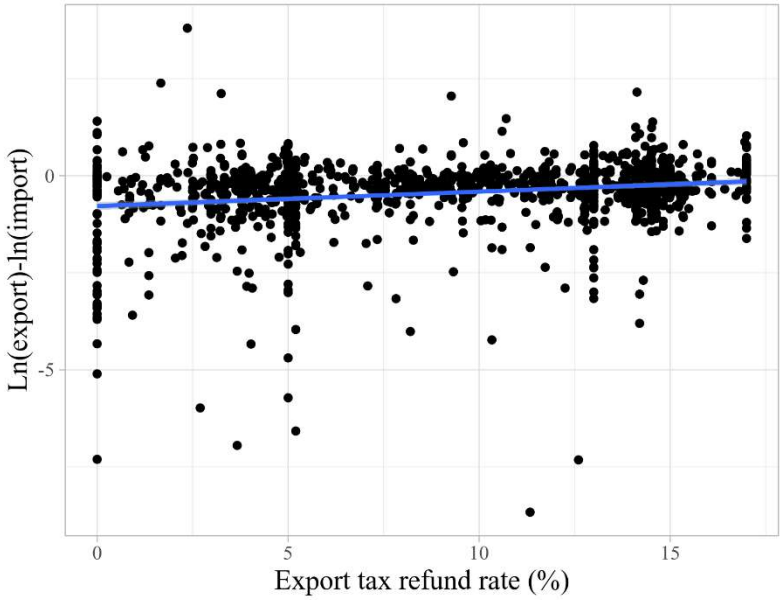


Figure 4. Correlation between Export Tax Refund Rates and Export Value Gap

Panel A. Correlation for Pooled Sample (HS 4-digit)



Panel B. Correlation for Each Year (HS 4-digit)

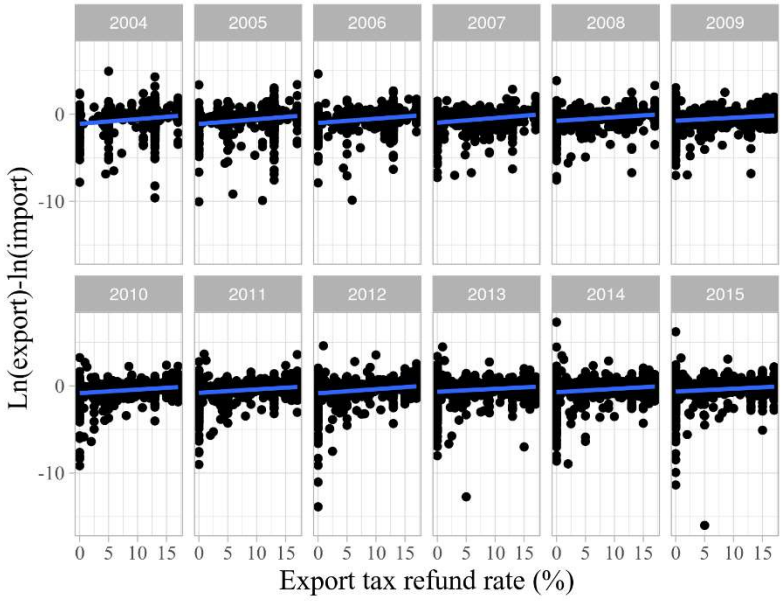
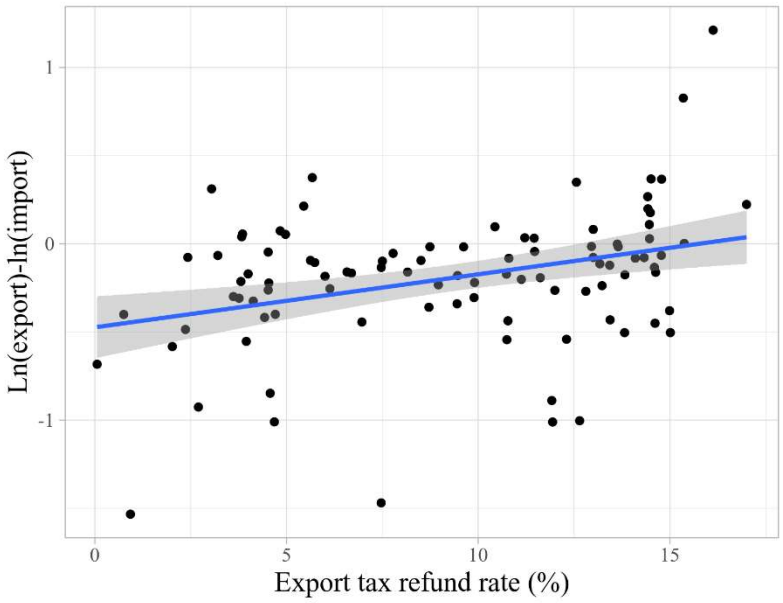


Figure 5. Correlation between Export Tax Refund Rates and Export Value Gap

Panel A. Correlation for Pooled Sample (HS 2-digit)



Panel B. Correlation for Each Year (HS 2-digit)

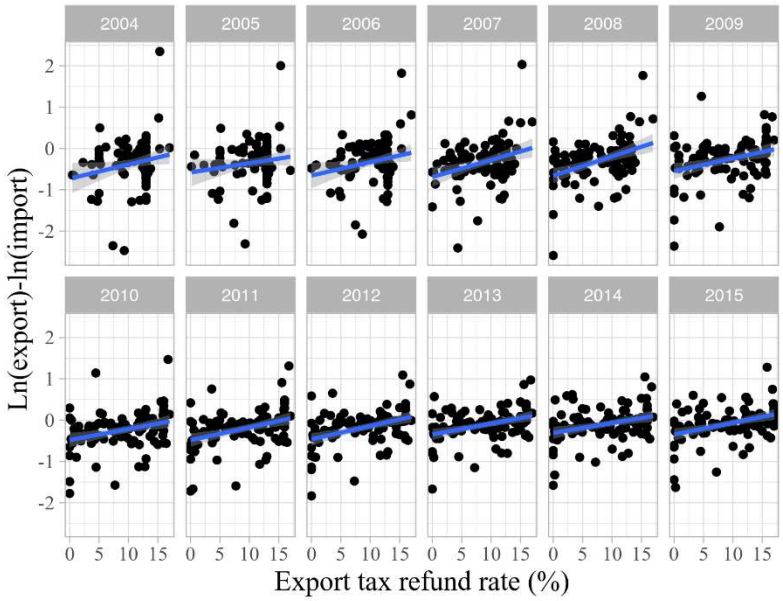
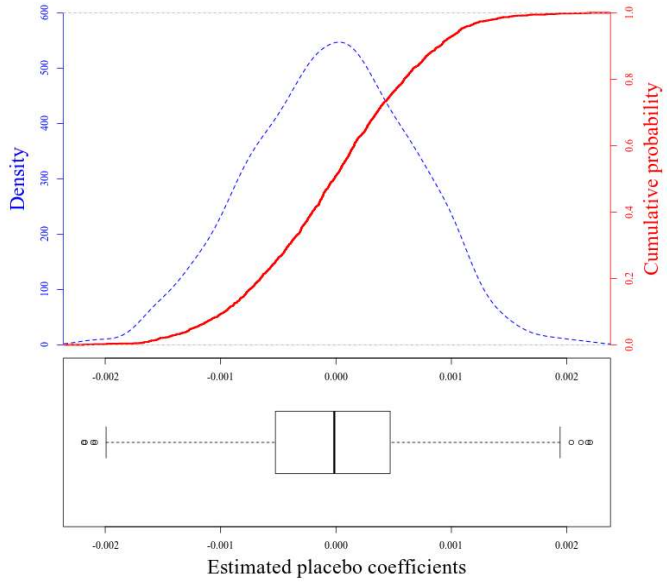
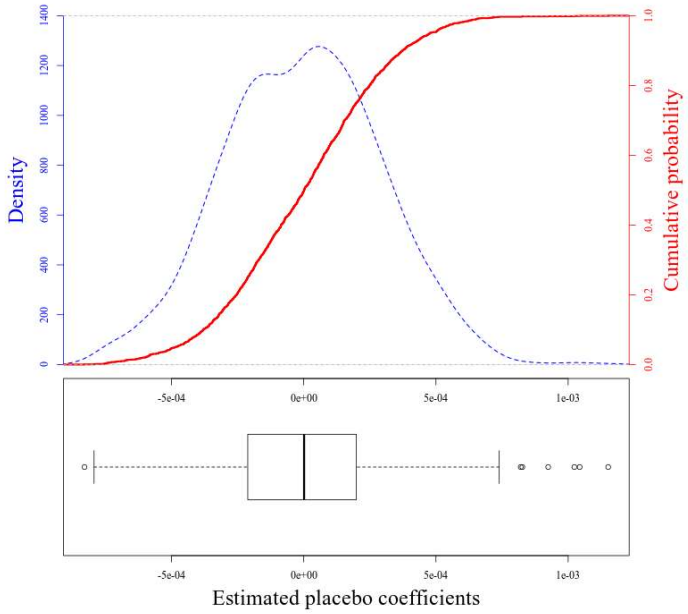


Figure 6. Permutation Tests

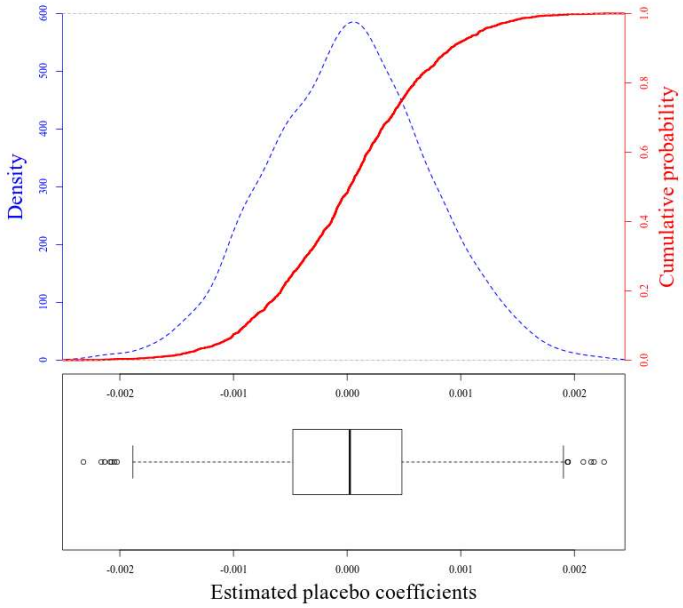
Panel A. Randomly Assign Export Tax Refund Rates across Products



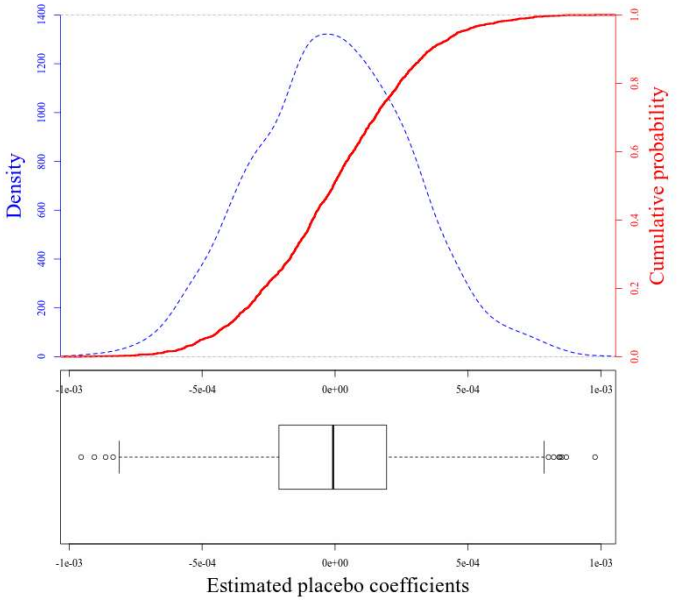
Panel B. Randomly Assign Export Tax Refund Rates across Years



Panel C. Randomly Assign Export Tax Refund Rates of Similar Products across Products



Panel D. Randomly Assign Export Tax Refund Rates of Similar Products across Years



Notes: In Panel A, we randomly assign the export refund rates across products in the same year. In Panel B, we randomly assign the export refund rates across years for the same product. In Panel C, we randomly assign the export refund rates of similar products across products in the same year. In Panel D, we randomly assign the export refund rates of similar products across years for the same product. We estimate Equation using these randomly assigned variables, respectively. We repeat 2,000 times. Panels A and B show the distribution and the cumulative density function of the 2,000 coefficients of export refund rates, while Panels C and D are for the 2,000 coefficients of export refund rates of similar products.

Table 1. Example of Export Tax Refund Rates

HS code	Product name	Refund rate (%)
09041100	Pepper of genus Piper, neither crushed nor ground	6
09041200	Pepper of genus Piper, crushed or ground	13
09042100	Dry and not grinding Capsicum	0
0904220000	Fruits of genus Capsicum or of genus Pimenta, crushed or ground	
09042200001	with 9% VAT rate	6
09042200002	with 13% VAT rate	13

Notes: Information was obtained in April 2019.

Table 2. Summary Statistics and Sample Distribution by Year

Panel A: Summary Statistics

Variable	Mean	SD	Median	Min	Max	OBS
Export value (1,000 dollars)	6343.285	131176.479	169.539	0.001	44185973.999	2289426
Import value (1,000 dollars)	7433.356	137179.185	210.810	0.001	42465971.686	2289426
Ln(export value)-ln(import value)	-0.226	2.132	-0.175	-17.321	17.472	2289426
Ln(export quantity)-ln(import quantity)	-0.127	2.416	-0.034	-27.264	17.973	2040579
Refund rate (%)	11.844	4.705	13.000	0.000	17.000	2289426
Refund rate of similar products (%)	11.814	4.613	13.000	0.000	17.000	2289426
Tariff (%)	7.024	11.732	5.000	0.000	3000.000	2289426

Panel B: Sample Distribution

Year	Destinations	6-digit products	4-digit products	No. of 6-digit products within 4-digit category
2004	99	4286	910	4.710
2005	108	4310	912	4.726
2006	116	4333	911	4.756
2007	104	4082	896	4.556
2008	114	4047	893	4.532
2009	121	4056	896	4.527
2010	127	4057	896	4.528
2011	130	4063	895	4.540
2012	121	4013	889	4.514
2013	126	3990	890	4.483
2014	105	4013	891	4.504
2015	113	4007	890	4.502
All	171	4471	917	4.876

Notes: Observation in Panel A is the HS 6-digit product. Export value is the export value reported in Chinese customs. Import value is the import value reported in destination countries' customs. Refund rate of similar products is the average refund rate of other products in the same 4-digit category. Tariff is tariffs imposed on Chinese products by destination countries.

Table 3. Correlation between Refund Rates and Tariffs for HS 6-digit Products

	(1)	(2)	(3)	(4)
	Tariff			
Refund rate	0.093	-0.012		
	(0.111)	(0.016)		
Refund rate of similar products			0.096	-0.012
			(0.119)	(0.017)
Product fixed effects	No	Yes	No	Yes
Destination fixed effects	No	Yes	No	Yes
Year fixed effects	No	Yes	No	Yes
Adjusted R^2	0.001	0.305	0.001	0.315
Observations	2,395,356	2,395,356	2,289,426	2,289,426

Notes: Refund rate of similar products is the average refund rates of other 6-digit products within the same HS 4-digit category. Tariff is the tariff rate imposed on Chinese products by destination country. Two-way clustered standard errors are in parentheses, clustered at the HS 2-digit product and destination. ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

Table 4. Impact of Export Tax Refund on Export Value Gap

	(1)	(2)	(3)
Dependent Variable: Ln(export)−ln(import)			
Refund rate	0.045***	0.047***	0.051***
	(0.008)	(0.009)	(0.011)
Refund rate of similar products	-0.021**	-0.022**	-0.024**
	(0.009)	(0.010)	(0.009)
Tariff	0.006***	0.001	0.0001
	(0.002)	(0.001)	(0.001)
Product FE	Yes	No	No
Destination FE	Yes	No	No
Year FE	Yes	No	No
Product-Destination FE	No	Yes	Yes
Year-Destination FE	No	Yes	Yes
Product-Destination FE × *t*	No	No	Yes
Adjusted R^2	0.190	0.507	0.608
Observations	2,289,426	2,289,426	2,289,426

Notes: Refund rate of similar products is the average refund rates of other 6-digit products within the same HS 4-digit category. Tariff is the tariff rate imposed on Chinese products by destination country. Two-way clustered standard errors are in parentheses, clustered at the HS 2-digit product and destination. ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

Table 5. Entrepôt Trade

	(1)	(2)	(3)	(4)	(5)	(6)
	Whole Sample			Excluding USA		
Dependent Variable	Ln(export)−ln(import +import from HK)			Ln(export)−ln(import)		
Refund rate	0.045***	0.047***	0.051***	0.045***	0.047***	0.052***
	(0.008)	(0.009)	(0.011)	(0.008)	(0.009)	(0.011)
Refund rate of similar products	-0.019**	-0.020**	-0.023**	-0.021**	-0.023**	-0.025***
	(0.009)	(0.010)	(0.010)	(0.009)	(0.010)	(0.009)
Tariff	0.005***	0.001	0.0001	0.006***	0.001	0.0001
	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Product FE	Yes	No	No	Yes	No	No
Destination FE	Yes	No	No	Yes	No	No
Year FE	Yes	No	No	Yes	No	No
Product-Destination FE	No	Yes	Yes	No	Yes	Yes
Year-Destination FE	No	Yes	Yes	No	Yes	Yes
Product-Destination FE × *t*	No	No	Yes	No	No	Yes
Adjusted R^2	0.196	0.511	0.612	0.190	0.506	0.607
Observations	2,252,849	2,252,849	2,252,849	2,248,503	2,248,503	2,248,503

Notes: Refund rate of similar products is the average refund rates of other 6-digit products within the same HS 4-digit category. Tariff is the tariff rate imposed on Chinese products by destination country. Two-way clustered standard errors are in parentheses, clustered at the HS 2-digit product and destination. ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

Table 6. Adding VAT Rates

	(1)	(2)	(3)
Dependent Variable: Ln(export)−ln(import)			
Refund rate	0.046***	0.048***	0.052***
	(0.008)	(0.009)	(0.012)
Refund rate of similar products	-0.021**	-0.023**	-0.024**
	(0.009)	(0.010)	(0.010)
VAT rate	0.012	0.002	-0.013
	(0.027)	(0.032)	(0.055)
Tariff	0.006***	0.001	0.0001
	(0.002)	(0.001)	(0.001)
Product FE	Yes	No	No
Destination FE	Yes	No	No
Year FE	Yes	No	No
Product-Destination FE	No	Yes	Yes
Year-Destination FE	No	Yes	Yes
Product-Destination FE × t	No	No	Yes
Adjusted R^2	0.190	0.507	0.607
Observations	2,277,541	2,277,541	2,277,541

Notes: Refund rate of similar products is the average refund rates of other 6-digit products within the same 4-digit HS category. Tariff is the tariff rate imposed on Chinese products by destination country. Two-way clustered standard errors are in parentheses, clustered at the 2-digit HS product and destination. ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

Table 7. Using Different Outcome Variable

	(1)	(2)	(3)
Dependent Variable:	$1\{\ln(\text{export}) - \ln(\text{import}) > 0\}$		
Refund rate	0.010***	0.011***	0.013***
	(0.002)	(0.002)	(0.003)
Refund rate of similar products	-0.004**	-0.005**	-0.007***
	(0.002)	(0.002)	(0.002)
Tariff	0.001***	0.0002	0.0002
	(0.000)	(0.000)	(0.000)
Product FE	Yes	No	No
Destination FE	Yes	No	No
Year FE	Yes	No	No
Product-Destination FE	No	Yes	Yes
Year-Destination FE	No	Yes	Yes
Product-Destination FE × *t*	No	No	Yes
Adjusted R^2	0.157	0.400	0.462
Observations	2,289,426	2,289,426	2,289,426

Notes: Refund rate of similar products is the average refund rates of other 6-digit products within the same HS 4-digit category. Tariff is the tariff rate imposed on Chinese products by destination country. Two-way clustered standard errors are in parentheses, clustered at the HS 2-digit product and destination. ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

Table 8. Using 4-digit Categories with All Products Having Same Unit

	(1)	(2)	(3)
Dependent Variable: Ln(export)−ln(import)			
Refund rate	0.048***	0.049***	0.053***
	(0.009)	(0.010)	(0.014)
Refund rate of similar products	-0.024**	-0.026**	-0.029**
	(0.010)	(0.012)	(0.012)
Tariff	0.005***	0.001	0.0002
	(0.002)	(0.001)	(0.001)
Product FE	Yes	No	No
Destination FE	Yes	No	No
Year FE	Yes	No	No
Product-Destination FE	No	Yes	Yes
Year-Destination FE	No	Yes	Yes
Product-Destination FE × *t*	No	No	Yes
Adjusted R^2	0.190	0.511	0.613
Observations	1,617,129	1,617,129	1,617,129

Notes: We drop any HS 4-digit category if it includes 6-digit products with different units. Refund rate of similar products is the average refund rates of other 6-digit products within the same HS 4-digit category. Tariff is the tariff rate imposed on Chinese products by destination country. Two-way clustered standard errors are in parentheses, clustered at the HS 2-digit product and destination. ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

Table 9. Different Measures of Refund Rates of Similar Products

	(1)	(2)	(3)
Dependent Variable: Ln(export)−ln(import)			
Refund rate	0.028**	0.032**	0.046***
	(0.013)	(0.014)	(0.010)
Refund rate of similar products with the same unit	-0.033	-0.034	-0.020***
	(0.022)	(0.023)	(0.006)
Refund rate of similar products with different units	-0.006	-0.006	-0.001
	(0.018)	(0.020)	(0.007)
Tariff	0.010***	0.002	0.001
	(0.003)	(0.002)	(0.002)
Product FE	Yes	No	No
Destination FE	Yes	No	No
Year FE	Yes	No	No
Product-Destination FE	No	Yes	Yes
Year-Destination FE	No	Yes	Yes
Product-Destination FE × *t*	No	No	Yes
Adjusted R^2	0.206	0.517	0.606
Observations	491,816	491,816	491,816

Notes: Refund rate of similar products with same unit is the average refund rates of other 6-digit products within the same HS 4-digit category and with the same unit. Refund rate of similar products with different units is the average refund rates of other 6-digit products within same HS 4-digit category but with different units. Tariff is the tariff rate imposed on Chinese products by destination country. Two-way clustered standard errors are in parentheses, clustered at the HS 2-digit product and destination. ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

Table 10. Using Higher Levels of Aggregation

	(1)	(2)	(3)	(4)
	HS 4-digit	Year-HS 4-digit	HS 2-digit	Year-HS 2-digit
Dependent Variable: Ln(export)−ln(import)				
HS 4-digit Refund rate	0.046***	0.029***		
	(0.015)	(0.007)		
HS 2-digit Refund rate			0.030***	0.018**
			(0.010)	(0.008)
HS 2-digit Product FE	Yes	No	No	Yes
HS 4-digit Product FE	No	Yes	No	No
Year FE	No	Yes	No	Yes
Adjusted R^2	0.154	0.621	0.107	0.789
Observations	1,236	13,508	96	1,152

Notes: Observations in Columns (1), (2), (3), and (4) are at the HS 4-digit, Year-HS 4-digit, HS 2-digit, and Year-HS 2-digit levels, respectively. Standard errors are in parentheses, clustered at the HS 2-digit product. ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

Table 11. Only Using Trade Between China and Hong Kong

	(1)	(2)
Dependent Variable: Ln(export)−ln(import)		
Refund rate	0.034***	0.051***
	(0.006)	(0.011)
Refund rate of similar products		-0.018
		(0.012)
Product FE	Yes	Yes
Year FE	Yes	Yes
Adjusted R^2	0.516	0.514
Observations	41,948	39,924

Notes: We only use trade between China and Hong Kong. Refund rate of similar products is the average refund rates of other 6-digit products within the same HS 4-digit category. Two-way clustered standard errors are in parentheses, clustered at the HS 2-digit product and destination. ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

Table 12. Using Trade Between the United States and Other Countries as a Placebo Test

	(1)	(2)	(3)
Dependent Variable: Ln(export)−ln(import)			
Assigned refund rate	0.001	-0.0002	0.004
	(0.003)	(0.003)	(0.004)
Assigned refund rate of similar products	-0.002	0.001	-0.002
	(0.003)	(0.003)	(0.005)
Tariff on US products	0.002**	0.001	0.0001
	(0.001)	(0.001)	(0.000)
Product FE	Yes	No	No
Destination FE	Yes	No	No
Year FE	Yes	No	No
Product-Destination FE	No	Yes	Yes
Year-Destination FE	No	Yes	Yes
Product-Destination FE × t	No	No	Yes
Adjusted R^2	0.139	0.536	0.606
Observations	1,226,540	1,226,540	1,226,540

Notes: We use binary trade data between the United States and other countries. Export value is the value reported in US customs and import value is the value reported in other countries' customs. Assigned refund rate is the refund rate implemented by China on products with the same HS 6-digit code. Assigned refund rate of similar products is the average assigned refund rates of other 6-digit products within the same HS 4-digit category. Tariff is the tariff rate imposed on US products by other countries. Two-way clustered standard errors are in parentheses, clustered at the HS 2-digit product and destination. ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

Table 13. Impact of Export Tax Refund on the Quantity Gap

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	Ln(export quantity)−ln(import quantity)			Ln(export)−ln(import)		
Refund rate	0.044***	0.047***	0.053***	0.047***	0.048***	0.052***
	(0.009)	(0.010)	(0.011)	(0.008)	(0.009)	(0.012)
Refund rate of similar products	-0.023**	-0.020**	-0.030***	-0.021**	-0.023**	-0.025**
	(0.009)	(0.010)	(0.011)	(0.009)	(0.010)	(0.010)
Tariff	0.004***	0.001	-0.00001	0.005***	0.001	0.0001
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Product FE	Yes	No	No	Yes	No	No
Destination FE	Yes	No	No	Yes	No	No
Year FE	Yes	No	No	Yes	No	No
Product-Destination FE	No	Yes	Yes	No	Yes	Yes
Year-Destination FE	No	Yes	Yes	No	Yes	Yes
Product-Destination FE × *t*	No	No	Yes	No	No	Yes
Adjusted R^2	0.182	0.510	0.604	0.191	0.511	0.611
Observations	2,040,579	2,040,579	2,040,579	2,040,579	2,040,579	2,040,579

Notes: Refund rate of similar products is the average refund rates of other 6-digit products within the same HS 4-digit category. Tariff is the tariff rate imposed on Chinese products by the destination country. Two-way clustered standard errors are in parentheses, clustered at HS 2-digit product and destination. ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

Appendix Figure 1. Emails Regarding the Selling of Invoices

Case 1: Email received on November 22, 2019.

Content in English:

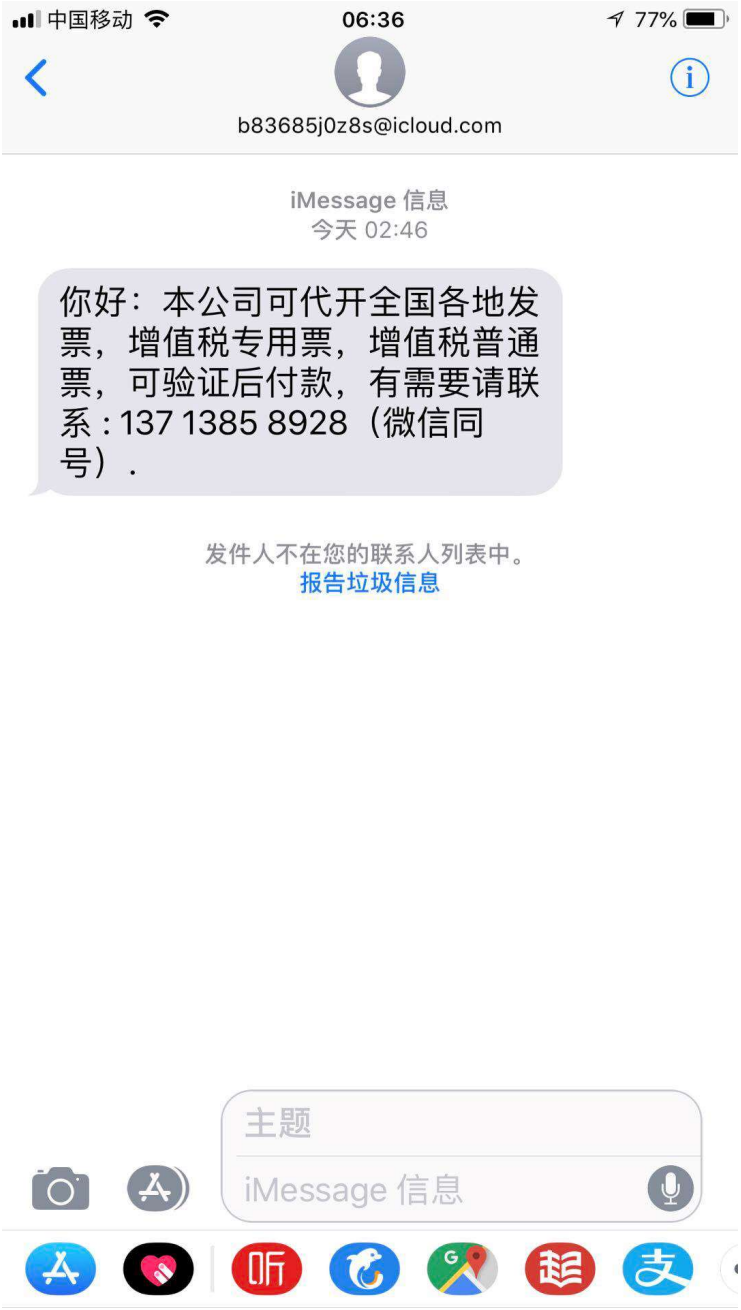
"Our company provides invoices. Please contact me if needed. Contact: 13798446717 (same number for WeChat)."

Case 2: Email received on November 21, 2019.

Content in English:

"We provide official invoices eligible for the whole country. Prices are low. You can pay after you verify the invoices. Contact: 13267029350 (Xiangyang Liu), same number for WeChat."

Appendix Figure 2. Message for Selling Invoices



Content in English:

"How are you doing: our company provides common invoices, VAT special invoices, and VAT common invoices. You can pay after you verify the invoices. If you are interested, please contact: 13713858928 (same number for WeChat)."

Appendix Figure 3. Conversation with Invoice Seller

Content in English:

Seller (on the left): I have approved your request to add me as a friend. We can start to talk.

Seller: Hello.

Me (on the right): I would like to get a VAT invoice for an export tax refund.

Me: Are you there?

Seller: How much money do you want to write in the invoice?

Me: What is your price?

Me: How can I know that the invoice is not faked?

Seller: Seven points for the special VAT invoice.

Seller: You can pay after you verify the invoice.

Me: Can you send me a picture of the invoice?

Seller: I can send one to you in the afternoon after I go to work.

Me: OK

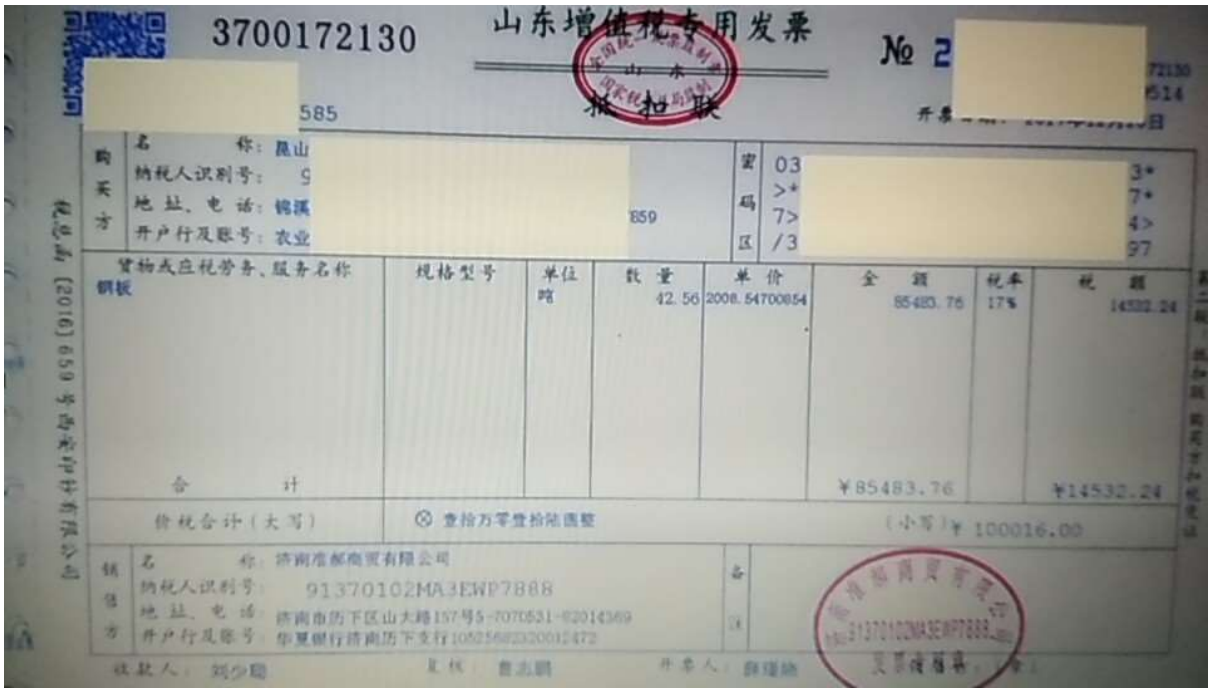
Me: Can you send the picture now? One more question: what is the minimum amount of money you are willing to write in the invoice? Or you are willing to write any amount of money?

Seller: At least 70 or 80 thousand.

Me: Understood. Now please send me a picture of the invoice.

Seller: *Sends a picture of the invoice.*

Appendix Figure 4. The Picture of the Invoice



Note: A VAT special invoice for Shandong Province. The product is steel plate. The unit is tons. The quantity is 42.56. The price is 2008.54700854. The total value is 85483.76. The tax rate is 17%. The tax payable is 14532.24.