Services Liberalization and Export Diversity: Theory and Evidence from Chinese Firms

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Abstract

During the last decades, we observe a liberalization trend in the services sector globally. Using the Chinese exporting firm data, this paper studies how multi-product firms adjust their export strategies in response to the services trade liberalization across export destination countries. Our study finds a highly significant positive relation between the services trade liberalization in the destination countries and each firm's export diversify, which is measured as the product scope, the Herfindahl-Hirschman style index, or the value skewness across varieties,export product switch. Our empirical analysis further finds that firms increase the relatedness of their exporting varieties towards the OECD countries, but reduce it towards the non-OECD countries. With a conventional multi-product firm model, we explore the mechanisms behind all our empirical findings.

JEL Classification: F13 F14

Key Words: Services trade Liberalization; Export Diversity; Chinese Data

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1 Introduction

Since the financial crisis in 2008, we have observed a rising of the anti-globalization movements and the protectionism all over the world. The China-U.S. trade conflict took place in 2018, which further increased the uncertainty of trade policies faced by Chinese exporting firms. However, though the liberalization process encountered obstacles in the commodity trade, the openness level of the services sector have been increasing across countries globally. According to the FDI restrictiveness index recorded by the organization of OECD, most countries have relaxed the restrictions on the FDI in the services sector. In this paper, our main target is to explore how Chinese exporting firms adjust the extensive and intensive margins of export in response to the services liberalization process in the destination countries, i.e., the export value, diversity, and varieties' similarity.

In our study, we measure services trade liberalization in each country with the FDI restrictiveness index recorded by the OECD organization. Taking a view of the data from 2010 to 2017, we observe a rising trend of the services trade liberalization globally. Generally, the openness level of the OECD countries is much higher than non-OECD countries. In each sub-sector, the openness levels are quite different among countries, and in each country, the openness levels are also significantly different among the sub-sectors. Using the Chinese exporting firm data between 2010 and 2016, we study how firms adjust their export strategies during the services trade liberalization process. Specifically, we explore the adjustment of export value, product scope (Lopresti, 2016; Baldwin and Gu, 2009; Bernard et al., 2011), market concentration of the core product (Mayer et al., 2014), export product switch, and the relatedness of varieties (Zahavi and Lavie, 2013). Our empirical analysis finds that: (i) in response to the services trade liberalization in the destination country, Chinese firms are more likely to diversify their exporting diversification and decrease the skewness ratio; (ii) in a more liberalized market, firms take more flexible product strategy to adjust the export scope more frequently. (iii) services trade liberalization increases the relatedness of diversification for the OECD countries, but it lowers the relatedness of diversification for the non-OECD countries. (iv)services trade liberalization has larger effects on product diversification in the destinations with better institution environment. With a conventional multi-product firm model, we further discuss the mechanism behind our empirical findings. Basically, the intuitive explanation is as follows. Services trade liberalization lowers the

firms' marginal cost on sales, i.e., financing cost, transportation cost, information collection cost, management cost, and so on. A reduction in the marginal cost will increase both the export value and scope for each firm in the destination country. However, this positive effect is heterogeneous among different varieties. The core product increase in less proposition, while the margin product increases in a higher proposition. In another words, the export value among varieties will be more dispersed.

Overall, our study contributes to the existing literature by three points. Firstly, the existing related literature are either focus on the study of the impacts of the goods trade liberalization (Yi and Meng, 2018), or the services trade liberalization in the home country (Barone and Cingano, 2011; Javorcik and Li, 2013; Head et al., 2014; Bas, 2014; Hoekman and Shepherd, 2017; Shi, 2016; Li and Zhang, 2018; Sun et al., 2018) . However, no literature studies the impacts of the services liberalization in the destination country on the firms' exporting decisions from the exporting country. Our study fills up this gap. It is important to distinguish the services liberalization process in the destination country from that in the exporting country. The liberalization process in the home country may affect firms' production and sales procedures. We cannot distinguish whether the services liberalization benefits firms' production or sales processes, or both. However, if we find a positive relation between the destination country's services liberalization process and the export value and scope, we can confirm that the services trade liberalization benefits firms' sales procedures, i.e., the financing, transportation, information collection, management, and so on. Another importance for studying the liberalization in the destination country is that we are able to explore whether a country's services trade liberalization process benefits the foreign firms and the domestic sales. All the previous study only confirms that the services liberalization benefits the domestic firms' export performance. Secondly, we obtain a new empirical finding on the export's relatedness: in response to the services liberalization in the OECD countries, the firms will increase the similarity of their exported varieties, while in the non-OECD countries, firms will react to reduce the similarity. Lastly, we construct a conventional muti-product firm model to analyze the mechanism of our empirical findings.

The rest of this paper is constructed in the following order. Section 2 reviews the related literature. Section 3 describes the properties of the data set, specifies the empirical models, and reports the empirical results. Section 4 constructs a theoretical model and discusses the mechanism of the empirical findings. Section 5 summarizes all our findings and conclusions.

2 Literature review

Many literature have discussed the impacts of the trade liberalization on the firms' export performance, but most of them focus on the commodity good trade. Generally, researchers find that the liberalization of the commodity trade, which is usually performed as the tariffs reduction, will incentive the export growth (Khandelwal et al., 2013; Bustos, 2011). However, some other literature argue that the trade liberalization promotes the market competition, and then negatively affects firms' export performance. For example, Bernard et al. (2011) find that the trade liberalization process induces firms to shrink their product scope and focus more on the production of the core products. Mayer et al. (2014) and Yi and Meng (2018) find that the trade liberalization process incentives new firms to enter the market, and as a result, the market competition becomes more intensive. A higher level of market competition reduces the incumbents' profits and forces them to reduce their product scope and concentrate the export value towards the core products. Similarly, Nocke and Yeaple (2014) find that the firm's marginal cost increases in the product scope, and firms usually reduce their product scope to adapt the increasing intensity of market competition due to the trade liberalization. In another study, Lopresti (2016) finds the heterogeneous reactions of the firms with different export ratios in response to the trade liberalization. The firms who pursue relatively high proportion of international sales will increase their product scopes, while the firms with low international participation ratio will reduce their product scopes.

In the recent years, the study on the impacts of the services liberalization has been taken attentions by many researchers. Most of the related literature focus on the study of the impacts on firms' productivity, and reach the conclusion that services liberalization promotes firms' productivity. (Arnold et al., 2016; Zhang et al., 2013; Beverelli et al., 2017) Based on the services restriction index for Czech computed by the European Bank for Reconstruction and Development (EBRD), Arnold et al., 2011 find that the reform and FDI in the services sector increase the firms' productivity. Arnold et al. (2016)constructs the reform index for India's services sector, and find that the services reform in 1991 promotes the growth of India's manufacturing sectors. Using the Chinese manufacturing firm data from the years 1998 to 2007, Zhang et al. (2013) find that the services liberalization reduces the trade and investment barriers in the services sector, lowers the services outsourcing cost, and promotes the services firms' productivity and efficiency.

In addition, the growth of services outsourcing promotes the domestic firms' management efficiency and technical innovations. In another paper, Beverelli et al. (2017) treats the services as the intermediate input in the production process, and they find a similar effect of the services liberalization as Zhang et al. (2013), i.e., the services liberalization increases firms' productivity and this effect is more pronounced in the countries with higher efficient institutions. Another group of literature study how the services liberalization affects firms' export performances. Some studies find a positive effect, i.e., the liberalization process increases exporting firms' export probability and value. (Barone and Cingano (2011); Li and Zhang (2018)) Naturally, a higher level of barriers in the services sector will hinder firms' export performances. (Nordas and Kim, 2013)

As many literature find the positive effect of the services liberalization on firms' export performances, some other studies try to disentangle the mechanism behind these findings. Generally, most literature believe that the services liberalization reduces the firms' production cost. Using the data of the OECD countries between the years 1996 to 2002, Barone and Cingano (2011) find that less services restrictions are associated with the higher value-added and export value in the downstream services-intensive industries. Using the firm survey data from the World Bank, Hoekman and Shepherd (2017) find that the services liberalization promotes the services sector's productivity, and then increases the manufacturing firms' export performances. Similarly,Li and Zhang (2018) argue that the services liberalization promotes firms' productivity through lowering the price level of the foreign services and the market-entry cost for the exporting firms. In addition, the FDI in the services sector has technology spillovers on the domestic firms. For example, the domestic firms can learn the advanced management methods and production technologies from the foreign firms, and then increase their innovation, management, production, and export performances. Sun et al. (2018) also reach a similar conclusion as Li and Zhang (2018), i.e., the openness of the services sector increases firms' export value by lowering firms' production cost. Using the Romanian and Chinese retailing sector data respectively, Javorcik and Li (2013) and Head et al. (2014) find that a higher openness level of the retailing sector is associated with a higher level of the export value. This is mainly due to the reduction in the information collection, sales processing, and management cost. In another paper, Bas, 2014 studies the impacts of the openness in India's transportation and telecommunication sectors on exporting firms' performances. They find that the liberalization in these sectors lowers the firms' both fixed and variable exporting costs, and then increases the

firms' export probability and value. Some other studies also find that the development of the internet sector lowers the searching and matching cost between the upstream and downstream firms, and that between the firms and customers. In addition, it lowers the exporting cost and promotes the firms' export performances (Shi, 2016).

Overview of the existing literature, we find that all of them focus on the study of the services liberalization in the home country. There is no literature on how the destination country's liberalization affects the exporting firms' performances. As discussed in the previous section, it is important to fill up this gap in the existing literature. In this paper, we explore how the services liberalization process among the destination countries affect Chinese exporting firms' performances, i.e., export value, scope, and similarity. In addition, we construct a tractable theoretical framework to analyze the mechanisms of our empirical findings.

3 Empirics

3.1 Data and model specification

3.1.1 Data

The data in this paper are retrieved from three sources: the first one is China's customs data set covering the years 2010 to 2016, which records each exporting firm's transaction information, including the firm's registration number, product's classification code (HS8 level), value and quantity, and export destination country; the second one is the data set for the FDI restrictiveness index from the OECD organization, which covers 22 services sub-sectors in 60 countries, and is used to measure the openness level of the services sector in the destination countries; the last one records the input-output tables for each China's province in 2012, which reports the services-usage intensity of each manufacturing industry. To fit our analysis, we make the following adjustments on the data. Firstly, as the international standard code is at the HS6 level, we re-assign the HS6 code to the customs data. Secondly, we assign the provincial location for each firm based on the firm registration number. Thirdly, we merge the customs data set with the FDI restrictiveness data set, and the matching ratio is about 66%. Lastly, we identify the industry of each firm based on the HS4 classification code, and merge the customs data with the input-output table in 2012.

3.1.2 Key variables

Next, we will introduce how we construct the key variables, i.e., services trade liberalization index and export variety.

Services trade liberalization index

We use the FDI restrictiveness index recorded by the OECD organization to measure services trade liberalization in different countries. This index is constructed by four types of restrictions on the FDI, i.e. the restriction on the ownership share, candidate screening and permission, rules on the key managers, and the other restrictions on the operation of the foreign firms. The value for the index ranges from 0 to 1. A higher value indicates a higher restriction level. As illustrated in Figure 1, which reports the data covering 55 countries during the period 2010 to 2017, the restriction levels in the OECD countries are relatively lower those in the non-OECD countries. The restriction levels are getting lower in the non-OECD countries during the reported period, but the changes in the OECD countries are insignificant.This data set covers eight major sub-sectors of the services industry, including distribution, transport, hotels & restaurants, media, communications, financial services, business services, and real estate investment, 60 countries, and the years 1997, 2003, 2006, and 2010 to 2017. The FDI restrictiveness index takes values from 0 to 1, with a higher value indicates a higher restrictiveness level. Specifically, we construct the services openness index for each destination country as follows.[1]

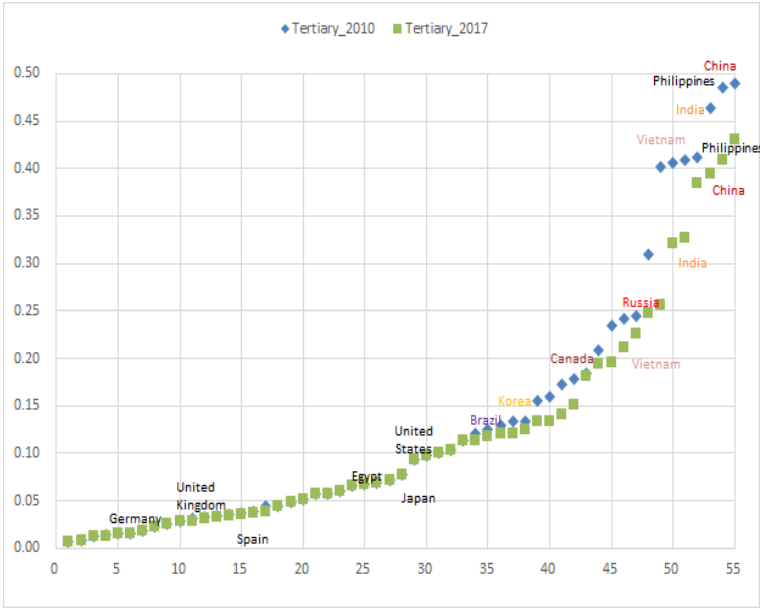
$$DSL_{dt} = 1 - FDI\_res_{dt} \tag{1}$$

Similarly, we follow Arnold et al. (2011)and Zhang et al. (2013) and construct the openness index for each province of China as follows. where FDI_res_{dt} is the FDI restrictiveness index for each destination d in the year t. Obviously, a higher value of DSL_{dt} indicates a higher openness level.

$$CSL_{\iota rt} = \sum_{s} \alpha_{\iota sr} \left(1 - FDI\_res_{st}\right) \tag{2}$$

[1]Unlike the commodity good sector, it is difficult to construct a conventional restrictiveness index for the services sector. Alternatively, most literature use the FDI restrictiveness index to measure the openness of the services sector, e.g. Fernandes and Paunov (2012).)Sun et al. (2018) refers to the Chinese government's policy on the foreign-ownership restrictions in each services sub-sector to quantify the openness level of each sector. In this paper, we follow the existing literature and use the FDI restrictiveness index to measure the openness level in the services sector.

Figure 1: FDI restrictiveness index for countries,2010,2017



where $\alpha_{\iota sr}$ is the service-usage share of the manufacturing sub-sector ι from the services sub-sector s in the province r; FDI_res_{st} is the FDI restrictiveness index of the sub-sector s in China. We use this index as a control variable in our empirical model.

Export diversification

we use five indexes to measure the firms' export diversification, . First, to investigate the product scope adjustment, we measure product scope as the number of export varieties (6-digit Harmonized System (HS) classification) of the firm f at year t (Iacovone and Javorcik (2010); Mayer et al. (2014))

Second, In order to capture not only discrete changes in the range of product scope, but also the distribution of sales across export products, we use Herfindahl-Hirschman-style index to measure diversity (Lopresti (2016))

$$div\_hh_{fdt} = 1 - \sum_i \left(\frac{v_{fidt}}{\sum_i v_{fidt}} \right)^2 \tag{3}$$

$$div\_en_{fdt} = 1 - \sum_i \left(\frac{v_{fidt}}{\sum_i v_{fidt}} \right) ln \left(\frac{v_{fidt}}{\sum_i v_{fidt}} \right) \tag{4}$$

where div_hh_{fdt} and div_en_{fdt} are the diversify indexes for firm f in destination d and the year t,which are computed following the Herfindahl-Hirschman Index and the index from Baldwin and Gu (2009)and Bernard et al. (2011); v_{fidt} is the export value of product i provided by firm f in the destination d and the year t .All else being equal, the more diversified the firm sales is, the larger the index is. The main advantage of this measure is its ability to capture the relative importance of product functions by considering the proportion of products introduced in each segment.

Third, Following Mayer et al. (2014) and Chatterjee et al. (2013), we measure the skewness of each firm in each destination country as: The skewness ratio is defined as the value or quantity ratio of the largest exported variety to the second largest exported variety in each industry, i.e., $sk01_{fdt} \equiv \frac{v_{fdt}^{m=1}}{v_{fjt}^{m=2}}$ or $sk02_{fdt} \equiv \frac{v_{fdt}^{m=1}}{v_{fdt}^{m=3}}$. For this measure, we rank all the products exported by a firm according to the value of exports to the destination country, and use this ranking as an indicator rank m for the product. Here, v represents the sales of the product with ranking m.

Fourth, given that the unobserved changes firms presumably make to their product mix, product adding and dropping also exert considerable influence on the product scope of firms. It is important to discover the true importance of firms' adjustments to their extensive margins. Following Bernard et al. (2011), we focus on the features of product switching by continuing exporting firms. The first step is to identify if the firm is an exporting firm. If the firm enters the exporting market from 2011 to 2016, we define that firm-year observation as $newfirm$ with a value of 1, otherwise 0. If the firm exit the exporting market from 2011-2015, we define that firm-year observation as $exitfirm$ with a value of 1, otherwise 0. If the firm is a continuing exporter through 2010 to 2016, we define it as $stayfirm$ with a value of 1, otherwise 0. The second step is to identify the entry and exit in the destination country. If the firm enters the country from 2011 to 2016, we define it as $newfc$ with a value of 1, otherwise 0. If the firm exits the country through 2011-2015, we define it as $exitfc$ with a value of 1, otherwise 0. The third step is to identify the adding and dropping of product within continuing exporters. If a product is added to the country by the firm during 2011-2016 and the firm is neither a $newfirm$ nor $newfc$, we define it as add with a value of 1, otherwise 0.If a product is dropped

from the country by the firm during 2011-2015 and the firm is neither a $exitfirm$ nor $exitfc$, we define it as *drop* with a value of 1, otherwise 0. Finally, we define$fcpadd$ and $fcpdrop$ to represent the total number of adding and dropping products respectively.

Last but not least is the Relatedness of export product mix. To further capture the relatedness of product categories by considering the distance between different product functions, we use a concentric measure to describe the relatedness of the product mix of each firm-country (Zahavi and Lavie (2013)).

$$relatedness_{fdt} = \sum_{i}^{N_{ft}} \sum_{k}^{N_{ft}} S_{fidt} S_{fkdt} r_{fikt} \tag{5}$$

where $i, k = 1...n$, with N_{ft} being the number of product variety firm f has exported in the year t and S_{fidt} (S_{fkdt}) is the share of product i (k) within the firm exports sales in destination d in the year t. r_{fikt} receives a value of 3 if i and k share the same six-digit HS, a value of 2 if they have different product functions but share the same four-digit HS, a value of 1 if they have different product functions but share the same two-digit HS and a value of 0 if they reflect different product functions. Table 1 below summarizes the statistic characteristics of the key variables.

3.1.3 Model specification

To investigate the effects of services trade liberalization on China's export strategy, we set up the estimation equation as follows:

$$DV_{fhrdt} = \beta_0 + \beta_1 DSL_{dt} + \beta_2 CSL_{hrt} + \beta_3 destariff_{hdt} + \beta_4 Chinatariff_{ht} + \beta_5 GDP_{dt} + \beta_6 GDP\_pc + e_f + e_d + e_t + \varepsilon_{fdt} \tag{6}$$

f denotes firm,h denotes the industry, r denotes Chinese province,d denotes the export destination, t denotes year. DV can be export value, export product scope (Number of varieties exported to each destination country), product diversification (div_hh_{fjt} or div_en_{fjt}), product skewness ($sk01_{fjt}$ or $sk02_{fjt}$), or product relatedness ($relateness_{fdt}$). The main explaining variable is the services trade liberalization index of exporting destination country (DSL_{dt}). Control variables include China's services trade liberalization CSL_{hrt}, the import tariffs of China ($Chinatariff_{ht}$), the import tariffs of destination country($destariff_{hdt}$),

GDP, and GDP per capita of the destination countries. We also include firm fixed effects (e_f),destination fixed effects(e_d)and year fixed effects (e_t). ε_{fdt} is the error term. Note that all variables are in the log-form, except the services openness indexes DSL_{dt} and CSL_{hrt}.

3.2 Empirical results and robustness checks

3.2.1 Baseline results

To investigate the effects of destination countries services trade liberalization on China's exporting diversification strategy, we firstly estimate the effects of services trade liberalization on China's export value and exporting product diversification according to equation (1) based on the sample of continuously exporting firms. The results are presented in 5 (see the Appendix),services trade liberalization in destination countries promote the export value and export diversification. According to column (2),services trade liberalization index increases 10%, firms exporting to more liberalized countries will increase 15.92% ($0.1e^{0.465}$).Services liberalization index increased 10%,export variety will increase 12.7% ($0.1e^{0.242}$)based on HS6. DSL will also promote export diversification by increasing export diversification indexed by HH index and decreasing export skewness, as the results shown in column (9)-(16). DSL increases 10% will promote export diversification about 10.21% ($0.1e^{0.0207}$) and 11.48% ($0.1e^{0.138}$).

For the baseline results, we could not consider the entry and exit of the exporting product, so we change the dependent variable to the export product switch as defined above and re-estimate equation 6. The results in 5 (see the Appendix) show that the DSL will significantly encourage exporting firms adding more products, but have less effects on product exiting. A 10% increase of the DSL will induce the exporting firms to add about 16.18% product into more services liberalized destination. When we divide the samples to OECD and non-OECD countries, some different results are found as shown in the last four columns. For OECD countries, The DSL will promote more product entering, but have no significant effects on product exiting; while for the non-OECD countries, the DSL will promote the exporting firms to take more flexible product switching strategies. Not only more products are added into more liberalized developing countries, but also more products exit the market. One explanation for the different exporting behavior is that the market competition in OECD countries is more severe and services sectors are more liberalized.So Chinese

exporting firms take more conservative product strategy and obtain its competitiveness by more varieties to realize scale economy. For the non-OECD countries with lower level of services trade liberalization, if the exporting firms have entered this market with more prophase entry costs, they will take more active behavior to expand the product scope and reduce the risks of operation.

According to the results of product scope in 5 (see the Appendix), we find that the DSL increase the number of product by measures all digit levels of HS6, HS4 and HS2. But the coefficients for measure of HS2 are smaller than HS6, and that means product diversification is conducted within the related products. However, the less related product diversification could also be chosen by exporting firms because the coefficients for HS2 are also positive and significant. Thus, more discussion are needed for the relatedness of product diversification strategy. The results are presented in 5 (see the Appendix). For the whole sample, we find the insignificant effects of the DSL on the relatedness. But when we divide the sample to OECD and non-OECD countries, some interesting results present. The DSL increases the relatedness of diversification for OECD countries, while it promotes the unrelatedness of diversification for non-OECD countries. These results enforce the former conclusions of China's exporting product strategy in different destinations with the balancing choice of scale economy and risk aversions. Since the severe competitions in OECD markets, China's exporting firms could focus on their key competitive products and export more related products to realize the scale economy. While, for the non-OECD markets, due to less liberalized services market and weak business environment, China's exporters could gain more profits by taking more unrelated diversification strategies.

3.2.2 Robustness checks

To investigate the mechanisms of how services trade liberalization on export diversification, more results for liberalization of main services sectors are obtained. We also do robustness test on heterogeneous effects by firm ownership and institutional environment of the destination countries.

Main services sectors

Services trade liberalization will decrease exporting costs and lower the threshold of market entry, so in

general , promote export probability and total exporting values (Bas, 2014). However, services liberalization will have effects on the choice of product strategy in different destination, with more product variety and flexible product switch in more liberalized destination in order to balance the scale economy and risk aversions. Thus we investigate the mechanism of how services trade liberalization on China's export product strategy by focusing on different services sectors, such as distribution (wholesale and retail), transportation, information, finance and business services sectors. So the interaction of liberalization for each service sector with the services input intensities are included in the estimation, and the results for product scope and diversification measured by HH index are shown in 5 (see the Appendix). [2] DSL in distribution, transportation and finance sectors have positive and significant effects on product diversification, while Liberalization in information and business sectors have positive but not all the significant effects on diversification. The openness of distribution sectors helps exporting firms get access to the distribution channels, market information, and decrease the marketing costs and information searching costs,(Javorcik and Li, 2013; Head et al., 2014). Transportation liberalization will help exporting firms promote the transportation efficiency and decrease the transportation costs. Finance services liberalization could bring more financing instruments, decrease financing costs, increase financing efficiency (Javorcik and Li, 2013). While, since business services and information services sectors are less liberalized in developing countries and more competitive in developed countries, though liberalization in information services sectors can decrease the information costs (Shi, 2016) and liberalization in business services sectors can introduce more management experience and increase the management efficiency (Sun et al., 2018), but Chinese exporting firms could not compete with the competitive foreign multinational firms, so the effects are insignificant.

By firm ownership

Robustness for firm ownership are presented in 5 (see the Appendix). The baseline results still hold no matter of the firm ownership. DSL has positive and significant effects on product diversification for state-owned enterprises, foreign invested firms and private firms.

By institution environment of the destination countries

[2]Due to the space limitation, the results for other measure are not included here, but the main conclusions all hold.

Services trade liberalization might be not effective if the institution environment is not good enough for the implementation of services liberalization and domestic regulations. Beverelli et al. (2017) find that lowering services trade barriers could promote productivity only with a powerful and effective institutional environment. So how could the institution environment affect China's export diversification strategy? We include the interaction of the DSL with destination's institution environment which is indexed by government effectiveness, rule of law and control of corruption as calculated and reported in the WGI database of World Bank. These three index are from -2.5 to 2.5, then we normalize them to 0-5 in our estimation for the explanations of the results. In 5 (see the Appendix), the DSL has a larger effect on the product diversification in the destinations with better institution environment. Therefore, Chinese exporting firms could also pay attention to the implementation of the liberalization in services sectors, since most services sectors needs with-border regulation of the local governments.

4 Theoretical framework

4.1 Households

Following Melitz and Ottaviano (2008), Dhingra (2013), and Qiu and Yu (2014), we assume the consumers' utility function for country j is the form of the quasi-linear preference:

$$U_d = q_{d0} + \int_{i\in\Omega_d} (\alpha + z_i)\, q_{di} di - \frac{1}{2}\beta_A \left(\int_{i\in\Omega_d^A} q_{di} di \right)^2 - \frac{1}{2}\beta_B \left(\int_{i\in\Omega_d^B} q_{di} di \right)^2 - \frac{1}{2}\gamma \int_{i\in\Omega_d} q_{di}^2 di \qquad (7)$$

where q_{d0} is her consumption of the numeraire good; q_{di} is the consumption of variety i in country d; Ω_d^A is the set of all varieties from the industry A that sold in country d ; Ω_d^B is the set of all varieties from the industry B that sold in country d ; z_i is the quality of product i.

The quasi-linear preference assumes a constant marginal utility of the numeraire good (captured by the first term), a decreasing marginal utility for the differentiate good (captured by the second and fourth terms with a quadratic formula), and a measure of the competition among the differentiate products in each industry (captured by the third and forth terms). The quasi-linear preference captures the consumption feature that

consumers compare when deciding the purchase amount among different varieties and deciding whether or not to buy a variety. For example, if the price of one variety is relatively high compared with other varieties, and then the sales of this variety will be relatively low. If the price of the variety increases further, then the consumers may decide not to buy this product and save money on the consumption of the numeraire good. The advantage of choosing this preference is that it induces a market demand function, which can allow firms to frequently withdraw their varieties from the market.

The consumer maximizes the utility subject to the budget constraint, i.e.,

$$p_{d0}q_{d0} + \int_{i\in\Omega_d} p_{di}q_{di}di \leq W \tag{8}$$

where W is the income of a typical consumer, which is identical across countries. Without loss of generality, we assume the price of the numeraire good is identical across countries and normalized as one. The prices of the differentiated products are different across country-variety pairs.

From the above, it follows that the demand function for variety i belonging to industry χ in country d is

$$q_{di} = L_d q_{di} = L_d \left(\frac{\alpha + z_i}{\gamma} - \frac{1}{\gamma} p_{di} - \frac{\beta_\chi}{\gamma} Q_d^\chi \right) \tag{9}$$

where $\chi = A,\ B$; and $Q_d^\chi \equiv \int_{i\in\Omega_d^\chi} q_{di}di$ is an index of the consumption of all the differentiated products in industry χ of country d and L_d denotes the population size of country d.

Here, we conduct a conventional method to identify whether the two products belong to different varieties or not. The products are categorized as follows: they are different varieties if they are produced by different firms or their HS8 or HS6 codes are different; they belong to different industries if their HS2 codes are different.

4.2 Manufacturing firms

In each industry, the firms produce variety i with the productivity level φ_i , where $i \in N$. Firm-specific productivity for variety i is assumed to be given by $\varphi_i = \kappa i^{-1}$, where κ is the firm-specific general productivity measurements, representing overall efficiency factors, including management level, transferable technologies,

etc. The cost function for the representative firm f is composed of two parts:

$$C_f = \int_{d \in J_f} \left[\int_{i \in \Omega_f} \left(\frac{c}{\varphi_i} q_{di} di + F_i \right) di \right] dj \tag{10}$$

Here, to avoid a cumbersome notation, we have omitted the subscript f in the symbol for the firm-specific productivity level. F_i is the sunk cost for the firm f to be able to produce variety i . Ω_f collects all varieties produced by the firm f, and J_f collects all the markets in which the firm f sells its products. As a conventional assumption following Qiu and Yu (2014), we assume a non-decreasing marginal cost function in variety i. In this case, we have $r \geq 1$. Then, we can write the profit function for firm f as follows:

$$\pi_f = \int_{d \in J_f} \left\{ \int_{i \in \Omega_f} \left[\delta_d p_{di} q_{di} - \frac{c}{\varphi_i} q_{di} - F_i \right] di \right\} dj \tag{11}$$

where $\delta_d \leq 1$ indicates the ice-berg cost to transport products to country d, which is a decreasing function in the service price index of country d, i.e., $\delta_d = \varsigma_d \left(P_d^S \right)^{-r}$and $r > 0$.

The firms make decisions on both the price of each variety and the total number of varieties in the specific country. Without loss of generality, to simplify our analysis, we make the following conventional assumptions. All Chinese exporting firms are identical, which means they share the same technology and the same marginal cost on each variety. To simplify our analysis without losses of generality, we assume there are fixed number of firms in the destination markets, which include the Chinese firms and the domestic firms of the destination country. [3] We separate the products into two industrial categories, industry A and B. Industry A is the primary industry, which requires relatively low marginal cost on each variety; and industry B is high-tech industry, which requires relatively high marginal cost on each variety. We assume product $i_A \in N$ belongs to industry A, and product $i_B \in N$ belongs to industry B. Productivity on each variety is different within the firm-industry boundary, and for convenience, the productivity of product i_A or i_B is denoted in the decreasing order of productivity, e.g. $\varphi_k < \varphi_m$ if $m > k$ .We also separate the destination countries into two groups, i.e., the developing and developed countries. In the developing countries, the domestic firms are identical to Chinese firms, i.e., they share the same quality levels z_L for all the products in both industries A and B. In developed countries, the domestic firms are superior than Chinese firms in product quality in the

[3]Due to the home market effect or border effect, the majority firms are domestic firms in the destination countries. Thus, we believe it is reasonable to crowd out the effects from the third country's firms.

industry B, i.e., $z_H > z_L$, but they share the same quality with Chinese firms in the industry A , i.e., z_L. This assumption is equivalent to assume that the developed countries pursue absolute advantage in the industry B, and the developing countries pursue comparative advantage in the industry A. Lastly, to make sure the total number of varieties that each firm is able to produce is unbounded above, we assume the variety-fixed cost is zero, i.e., $F_i = 0$.

Then a typical firm's optimal price, quantity, and export scope strategies to each country j in industry χ are solved as:

$$\begin{cases} p_{di} = & max\left\{0,\ \frac{1}{2}\left[\alpha + z_L - \beta_\chi Q_d^\chi + \frac{c}{\delta_d \varphi_i}\right]\right\} \\ q_{di} = & max\left\{0,\ \frac{L}{2\gamma}\left[\alpha + z_L - \beta_\chi Q_d^\chi - \frac{c}{\delta_d \varphi_i}\right]\right\} \\ M_j^{\chi *} = & max\left\{0,\ \delta_j\left(\frac{\kappa}{c}\right)\left(\alpha + z_L - \beta_\chi Q_d^\chi\right)\right\} \end{cases} \tag{12}$$

Given all the solutions above, we can further solve for the total number of varieties exported to a typical country j as:

$$M_j^* = \begin{cases} \delta_j\left(\frac{\kappa}{c}\right)\left(\alpha + z_L - \beta_A Q_d^A\right) & if\ \beta_B Q_d^B \geq \alpha + z_L \geq \beta_A Q_d^A \\ \delta_j\left(\frac{\kappa}{c}\right)\left(\alpha + z_L - \beta_B Q_d^B\right) & if\ \beta_A Q_d^A \geq \alpha + z_L \geq \beta_B Q_d^B \\ \delta_j\left(\frac{\kappa}{c}\right)\left[\sum\limits_\chi \left(\alpha + z_L - \beta_\chi Q_d^\chi\right)\right] & if\ \alpha + z_L \geq \max\limits_\chi \left\{\beta_\chi Q_d^\chi\right\} \end{cases} \tag{13}$$

Next, we will focus the case when Chinese firms export all products to each market, i.e., $\alpha + z_L \geq \max\limits_\chi \left\{\beta_\chi Q_d^\chi\right\}$, and analyze how the firms will adjust their export scope in response to a reduction in service cost due to the service sector liberalization.

4.3 Service firms and the services sector trade liberalization

We assume that there are N_S number of service sub-sectors in each country. In each sub-sector, the service suppliers face perfect price competition. In this case, if a manufacturing firm would like to get service from the sub-sector ν, this firm will choose a supplier that offers the lowest price, i.e.,

$$p_{d\nu}^S = \min_\iota \left\{\left(1 + \tau_{d\nu\iota}^S\right) p_{d\nu\iota}^S\right\} \tag{14}$$

where $\tau^S_{d\nu\iota}$ is the tariff rate or restriction index for supplier ι to operate in country d.

To make a certain amount of sales in country d, a typical firm needs to use the services from all service sub-sectors. Specifically, this firm chooses the service usage from each sub-sectors by solving the following problem:

$$min \sum_{\nu} p^S_{d\nu} x^S_{d\nu} \tag{15}$$

s.t.

$$\left[\sum_{\nu} \left(x^S_{d\nu}\right)^{\frac{1}{\theta}}\right]^{\theta} \geq \bar{X^S_d}$$

where $p^S_{d\nu}$ is the service price in sub-sector ν; $x^S_{d\nu}$ is the service usage from each sub-sector ν; $\bar{X^S_d}$ is the minimum requirement of composition service to sell one unit of product in country d.

Based on this setting, we can solve for the service sector's composite price index as:

$$P^S_d = \left[\sum_{\nu} \left(p^S_{d\nu}\right)^{-\frac{\theta}{1-\theta}}\right]^{-\frac{1-\theta}{\theta}} \tag{16}$$

Obviously, a decrease of restriction index $\tau^S_{d\nu\iota}$ will reduce the value of price index P^S_d, and further lower the ice-berg cost for each firm-variety. In this paper, we concern the properties of three variables, i.e., the quantity of each variety, the export scope, and export skewness ratio in each market. The skewness ratio is defined as the quantity ratio of the largest exported variety to the second largest exported variety in the country d, i.e., $sk_d \equiv \frac{\alpha+z_L-\beta_\chi Q^\chi_d-\frac{c}{\delta_d\varphi_1}}{\alpha+z_L-\beta_\chi Q^\chi_d-\frac{c}{\delta_d\varphi_2}}$ or $\frac{\left(\alpha+z_L-\beta_\chi Q^\chi_d\right)^2-\left(\frac{c}{\delta_d\varphi_1}\right)^2}{\left(\alpha+z_L-\beta_\chi Q^\chi_d\right)^2-\left(\frac{c}{\delta_{dj}\varphi_2}\right)^2}$, where $\varphi_1 > \varphi_2$. [4] To explicit how quantity, export scope, and export skewness ratio change in response to a reduction of service cost, we can

[4] Here, for convenience purpose, we compare the value ratio within each industry. Our analysis conclusion doesn't change when the comparison turns to be between two different industries' products, only if the export quantity increases in the variety's productivity.

equivalently take first order condition of these variables with respect to the ice-berg cost.

$$\begin{cases} \frac{\partial q_{di}}{\partial \delta_d} = & \frac{c}{\delta_d^2 \varphi_i} - \beta_\chi \frac{\partial Q_d^\chi}{\partial \delta_d} \\ \frac{\partial M_d^{\chi *}}{\partial \delta_d} = & \frac{\kappa}{c}\left[2\left(\alpha + z_L\right) - \beta_\chi \left(Q_d^\chi + \delta_d \frac{\partial Q_d^\chi}{\partial \delta_d}\right)\right] \\ \frac{\partial M_d^*}{\partial \delta_d} = & \frac{\kappa}{c}\left[2\left(\alpha + z_L\right) - \sum_\chi \beta_\chi \left(Q_d^\chi + \delta_d \frac{\partial Q_d^\chi}{\partial \delta_d}\right)\right] \\ \frac{\partial sk_d}{\partial \delta_d} = & \frac{\left(\alpha + z_L - \beta_\chi Q_d^\chi - \frac{c}{\delta_d \varphi_2}\right)\left(\frac{c}{\delta_d^2 \varphi_1} - \beta_\chi \frac{\partial Q_d^\chi}{\partial \delta_d}\right) - \left(\alpha + z_L - \beta_\chi Q_d^\chi - \frac{c}{\delta_d \varphi_1}\right)\left(\frac{c}{\delta_d \varphi_2} - \beta_\chi \frac{\partial Q_d^\chi}{\partial \delta_d}\right)}{\left(\alpha + z_L - \beta_\chi Q_d^\chi - \frac{c}{\delta_d \varphi_2}\right)^2} \end{cases} \tag{17}$$

Observing these results, we find that, the signs of these derivatives depend on the sign of $\frac{\partial Q_d^\chi}{\partial \delta_d}$ and the relative scale of parameter β_x . Firstly, it's easy to see that the sign of $\frac{\partial Q_d^\chi}{\partial \delta_d}$ is positive. A reduction of service cost in country d will induce the expansion of exporting volume and varieties to country d. Otherwise, confliction emerges in the quantity and export scope equations. Furthermore, if the parameter β_χ is small enough, i.e., $\beta_\chi < \frac{2(\alpha + z_L)}{Q_d^\chi + \delta_d \frac{\partial Q_d^\chi}{\partial \delta_d}}$, then in a typical developing country u in industry χ, the signs of these derivatives are:

$$\begin{cases} \frac{\partial q_{du}}{\partial \delta_u} & \gtreqless 0 \\ \frac{\partial M_u^{\chi *}}{\partial \delta_u} & > 0 \\ \frac{\partial M_u^*}{\partial \delta_u} & > 0 \\ \frac{\partial sk_u}{\partial \delta_u} & < 0 \end{cases} \tag{18}$$

The properties of the changes of theses variables in response to a service trade liberalization are summarized as the following proposition.

Next, we will check the results when the market becomes a developed country n. The firm's strategies are also described by equations (12) and (13). Now, as the developed countries' firms produce relatively high quality products in the industry B, the signs of each derivatives may change. For example, if the change of quantity index (competition level) in industry B satisfies the following property $z_H > \beta_B \left(Q_d^B + \delta_d \frac{\partial Q_d^B}{\partial \delta_d}\right) - \alpha > z_L$, then Chinese firms will reduce export varieties to this country in the industry B. Notice that this property doesn't conflict the condition that $\frac{\partial Q_d^\chi}{\partial \delta_d} > 0$. The results in the industry A are the same as in the

developing country case, i.e., $z_L > \beta_A \left(Q_d^A + \delta_d \frac{\partial Q_d^A}{\partial \delta_d} \right) - \alpha$. Otherwise, no firm enters the market. Given the conditions above, we reach the following results on the sign of each derivative.

$$\begin{cases} \frac{\partial q_{in}}{\partial \delta_n} & \gtreqless 0 \\ \frac{\partial M_n^{A*}}{\partial \delta_n} & > 0 \\ \frac{\partial M_n^{B*}}{\partial \delta_n} & < 0 \\ \frac{\partial M_n^{*}}{\partial \delta_n} & \gtreqless 0 \\ \frac{\partial sk_n}{\partial \delta_n} & < 0 \end{cases} \tag{19}$$

The results in equation(19) indicate that in the industry A, Chinese firms will expand their export scope, while in the industry B, Chinese firms will reduce their export scope. The net effect on the total number of varieties is uncertainty. We will use the export product's relatedness index to check these predictions. A reduction in the relatedness index in response to the service trade liberalization is consistent with the result that export scope increases within one industry but reduces in another industry.

5 Conclusion

Our study investigates empirically and theoretically the effects of services trade liberalization in destination countries on exporting product strategy . The empirical results show that service trade liberalization in exporting destinations has a significantly positive impact on product diversification of China's export. Moreover, service trade liberalization will make exporters more flexible in the adjustment of product scope, so that can actively and flexibly adjust the product scope and diversity according to different destinations. Services trade liberalization increases the relatedness of diversification for OECD countries, but lowers the relatedness of diversification for non-OECD countries,and has larger effects on product diversification in the destinations with better institution environment. Then, our paper discusses the mechanisms of service trade liberalization by different services sectors. Some robustness checks are made by firm ownership and destination institution. With a conventional multi-product firm model, we explore the mechanisms behind all our empirical findings.

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Table 1. Services trade liberalization and export diversification: baseline results

VARIABLES	$ln\,(sumexport_{fdt})$		$ln\,(scopehs6_{fdt})$		$ln\,(scopehs4_{fdt})$		$ln\,(scopehs2_{fdt})$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DSL_{dt}	0.465***	0.519***	0.242***	0.246***	0.185***	0.187***	0.0901***	0.0837***
	(0.0655)	(0.0650)	(0.0296)	(0.0293)	(0.0271)	(0.0269)	(0.0217)	(0.0215)
CSL_{hrt}	0.0618	0.0622	-0.00324	-0.00309	-0.0235	-0.0234	-0.0539**	-0.0538**
	(0.0494)	(0.0494)	(0.0294)	(0.0294)	(0.0278)	(0.0278)	(0.0234)	(0.0234)
$ln\,(destariff_{dt})$	-0.0103**	-0.00639	-0.00522**	-0.00366	-0.00243	-0.00102	-0.000323	0.000685
	(0.00505)	(0.00505)	(0.00239)	(0.00239)	(0.00221)	(0.00220)	(0.00185)	(0.00184)
$ln\,(Chinatariff_{ht})$	0.0108	0.0109	0.00802	0.00804	0.00245	0.00246	0.00267	0.00267
	(0.0134)	-0.0134	(0.00819)	(0.00819)	(0.00764)	(0.00764)	(0.00632)	(0.00632)
$lnGDP_{dt}$	0.661***		0.235***		0.211***		0.139***	
	(0.0275)		(0.0126)		(0.0115)		(0.00934)	
$lnGDP\_pc_{dt}$		0.746***		0.280***		0.253***		0.174***
		(0.0308)		(0.0140)		(0.0127)		(0.0104)
$Constant$	-4.059***	6.218***	-4.972***	-1.406***	-4.508***	-1.309***	-2.931***	-0.869***
	(0.635)	(0.224)	(0.294)	(0.106)	(0.268)	(0.0971)	(0.217)	(0.0792)
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,570,121	2,570,121	2,570,121	2,570,121	2,570,121	2,570,121	2,570,121	2,570,121
R-squared	0.467	0.467	0.641	0.641	0.623	0.623	0.614	0.614

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 1. continuous

VARIABLES	$div1hh_{fdt}$		$div2en$		$ln\,(skew01)$		$ln\,(skew02)$	
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
DSL_{dt}	0.0207**	0.0167*	0.138***	0.139***	-0.00545	-0.0540	-0.211**	-0.233**
	(0.00922)	(0.00913)	(0.0208)	(0.0206)	(0.0798)	(0.0795)	(0.103)	(0.103)
CSL_{hrt}	0.0112	0.0113	0.0284	0.0284	-0.261***	-0.261***	-0.105*	-0.106*
	(0.00852)	(0.00852)	(0.0195)	(0.0195)	-0.0639	(0.0639)	(0.0597)	(0.0597)
$ln\,(destariff_{dt})$	-0.00449***	-0.00424***	-0.00662***	-0.00581***	0.0322***	0.0324***	0.0213**	0.0204**
	(0.000784)	(0.000783)	(0.00172)	(0.00172)	(0.00700)	(0.00701)	(0.00914)	(0.00914)
$ln\,(Chinatariff_{ht})$	-0.00131	-0.00131	0.0125**	0.0125**	0.0527***	0.0527***	0.00776	0.00773
	(0.00218)	(0.00218)	(0.00597)	(0.00597)	(0.0121)	(0.0121)	(0.0120)	(0.0120)
$lnGDP_{dt}$	0.0306***		0.120***		-0.0216		-0.159***	
	(0.00390)		(0.00879)		(0.0336)		(0.0436)	
$lnGDP\_pc_{dt}$		0.0408***		0.145***		0.0207		-0.170***
		(0.00435)		(0.00981)		(0.0378)		(0.0491)
$Constant$	-0.473***	-0.0342	-1.511***	0.308***	2.156***	1.554***	6.473***	3.954***
	(0.0894)	(0.0309)	(0.203)	(0.0734)	(0.765)	(0.257)	(0.991)	(0.330)
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,570,121	2,570,121	2,570,121	2,570,121	1,898,813	1,898,813	1,371,304	1,371,304
R-squared	0.618	0.618	0.656	0.657	0.433	0.433	0.485	0.485

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2. Services trade liberalization and export switch

VARIABLES	$ln\,(fcpadd_{fdt})$ Full Samples		$ln\,(fcpdrop_{fdt})$ Full Samples		$ln\,(fcpadd_{fdt})$ OECD		$ln\,(fcpadd_{fdt})$ Non-OECD	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DSL_{dt}	0.481***	0.479***	0.031	0.0753	0.996***	1.099***	0.439***	0.397***
	-0.0505	-0.0502	-0.0544	-0.054	-0.196	-0.193	-0.0593	-0.0599
CSL_{hrt}	0.112***	0.112***	0.0678	0.0681	0.118***	0.118***	0.1	0.101
	-0.0387	-0.0387	-0.0432	-0.0432	-0.041	-0.041	-0.0672	-0.0672
$ln\,(destariff_{dt})$	0.00492	0.00557	-0.00944**	-0.0058	0.00211	0.00261	0.0678***	0.0832***
	-0.00456	-0.00456	-0.00454	-0.00453	-0.00474	-0.00475	-0.0211	-0.0214
$ln\,(Chinatariff_{ht})$	0.0152	0.0152	0.0101	0.0102	0.0200*	0.0200*	0.00093	0.00104
	-0.0107	-0.0107	-0.00947	-0.00947	-0.0109	-0.0109	-0.0163	-0.0163
$lnGDP_{dt}$	0.106***		0.404***		0.0604**		0.288***	
	-0.0225		-0.0224		-0.0298		-0.0414	
$lnGDP\_pc_{dt}$		0.129***		0.438***		0.0245		0.352***
		-0.0253		-0.0254		-0.0337		-0.0445
$Constant$	-1.721***	-0.124	-10.53***	-2.370***	-1.833**	-0.592*	-5.930***	-1.628***
	-0.515	-0.174	-0.623	-0.18	-0.742	-0.341	-0.953	-0.304
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,140,296	1,140,296	1,115,881	1,115,881	843,475	843,475	296,821	296,821
R-squared	0.505	0.505	0.514	0.514	0.522	0.522	0.543	0.543

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2. Countinuous

VARIABLES	$ln\,(fcpdrop_{fdt})$			
	OECD		Non-OECD	
	(9)	(10)	(11)	(12)
DSL_{dt}	0.453**	0.741***	0.0836	0.064
	-0.191	-0.185	-0.0621	-0.0626
CSL_{hrt}	0.07	0.0702	0.0961	0.0965
	-0.0451	-0.0451	-0.0728	-0.0729
$ln\,(destariff_{dt})$	-0.00703	-0.00288	-0.0176	-0.0107
	-0.0048	-0.00478	-0.0171	-0.0174
$ln\,(Chinatariff_{ht})$	0.0135	0.0135	0.000702	0.00075
	-0.00995	-0.00995	-0.0149	-0.0149
$lnGDP_{dt}$	0.391***		0.187***	
	-0.0294		-0.0541	
$lnGDP\_pc_{dt}$		0.385***		0.227***
		-0.0317		-0.0576
$Constant$	-10.02***	-4.014***	-4.341***	-0.714*
	-0.713	-0.307	-1.514	-0.416
Firm FEs	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
Observations	828,798	828,798	287,083	287,083
R-squared	0.531	0.531	0.552	0.552

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3. Services trade liberalization and export relatedness of product diversification

VARIABLES	$fcrelate_{fdt}$					
	Full Samples		OECD		Non-OECD	
	(1)	(2)	(1)	(2)	(3)	(4)
DSL_{dt}	-0.00439	-0.00324	0.0170	0.0182*	-0.0118*	-0.0126**
	(0.00533)	(0.00524)	(0.0112)	(0.0109)	(0.00635)	(0.00631)
CSL_{hrt}	0.000588	0.000592	7.77e-05	7.91e-05	0.00180	0.00181
	(0.00213)	(0.00213)	(0.00236)	(0.00236)	(0.00375)	(0.00375)
$ln\,(destariff_{dt})$	-0.000629	-0.000708*	0.000211	0.000158	-0.00352***	-0.00349***
	(0.000405)	(0.000406)	(0.000450)	(0.000450)	(0.00106)	(0.00106)
$ln\,(Chinatariff_{ht})$	0.00160***	0.00160***	0.00195***	0.00195***	0.000597	0.000597
	(0.000405)	(0.000405)	(0.000435)	(0.000435)	(0.000751)	(0.000751)
$lnGDP_{dt}$	0.00595***		0.00305		-0.00205	
	(0.00157)		(0.00204)		(0.00405)	
$lnGDP\_pc_{dt}$		0.00656***		0.00331		-0.000445
		(0.00171)		(0.00212)		(0.00423)
$Constant$	-0.119***	0.00112	-0.0553	-0.0105	0.121	0.0667**
	(0.0431)	(0.0118)	(0.0498)	(0.0203)	(0.113)	(0.0302)
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,834,597	1,834,597	1,344,467	1,344,467	490,130	490,130
R-squared	0.501	0.501	0.531	0.531	0.527	0.527

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4. Services trade liberalization and export diversification by services sub-sectors

VARIABLES	$ln\,(scope_{fdt})$				
	(1)	(2)	(3)	(4)	(5)
$distribution\_lib_{dt}$	0.149***				
	(0.0175)				
$transportation\_lib_{dt}$		0.124***			
		(0.0252)			
$information\_lib_{dt}$			0.0420***		
			(0.0149)		
$finance\_lib_{dt}$				0.261***	
				(0.0231)	
$business\_service\_lib_{dt}$					0.0186
					(0.0235)
CSL_{dt}	-0.00320	-0.00320	-0.00326	-0.00323	-0.00338
	(0.0294)	(0.0294)	(0.0294)	(0.0294)	(0.0294)
$ln\,(destariff_{dt})$	-0.00402*	-0.00394*	-0.00301	-0.00257	-0.00254
	(0.00239)	(0.00239)	(0.00239)	(0.00239)	(0.00239)
$ln\,(Chinatariff_{ht})$	0.00800	0.00801	0.00800	0.00805	0.00799
	(0.00819)	(0.00819)	(0.00819)	(0.00819)	(0.00819)
$lnGDP\_pc_{dt}$	0.304***	0.304***	0.316***	0.286***	0.327***
	(0.0137)	(0.0140)	(0.0139)	(0.0138)	(0.0140)
$Constant$	-1.491***	-1.464***	-1.465***	-1.472***	-1.523***
	(0.107)	(0.106)	(0.107)	(0.107)	(0.107)
Firm FEs	Yes	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes
Observations	2,570,121	2,570,121	2,570,121	2,570,121	2,570,121
R-squared	0.641	0.641	0.641	0.641	0.641

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4. Continuous

VARIABLES	$diven_{fdt}$				
	(6)	(7)	(8)	(9)	(10)
$distribution\_lib_{dt}$	0.0851***				
	(0.0123)				
$transportation\_lib_{dt}$		0.0646***			
		(0.0175)			
$information\_lib_{dt}$			0.00915		
			(0.0105)		
$finance\_lib_{dt}$				0.171***	
				(0.0160)	
$business\_service\_lib_{dt}$					0.00877
					(0.0165)
CSL_{dt}	0.0284	0.0284	0.0283	0.0284	0.0283
	(0.0195)	(0.0195)	(0.0195)	(0.0195)	(0.0195)
$ln\,(destariff_{dt})$	-0.00602***	-0.00590***	-0.00528***	-0.00518***	-0.00517***
	(0.00172)	(0.00172)	(0.00172)	(0.00172)	(0.00172)
$ln\,(Chinatariff_{ht})$	0.0125**	0.0125**	0.0125**	0.0125**	0.0125**
	(0.00597)	(0.00597)	(0.00597)	(0.00597)	(0.00597)
$lnGDP\_pc_{dt}$	0.158***	0.160***	0.170***	0.144***	0.172***
	(0.00950)	(0.00978)	(0.00970)	(0.00954)	(0.00966)
$Constant$	0.260***	0.272***	0.253***	0.276***	0.242***
	(0.0736)	(0.0737)	(0.0742)	(0.0736)	(0.0737)
Firm FEs	Yes	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes
Observations	2,570,121	2,570,121	2,570,121	2,570,121	2,570,121
R-squared	0.657	0.656	0.656	0.657	0.656

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5. Services trade liberalization and export diversification by firm ownership

VARIABLES	$lnscope_{fdt}$					
	state-owned		foreign		private	
	(1)	(2)	(3)	(4)	(5)	(6)
DSL_{dt}	0.388***	0.389***	0.345***	0.364***	0.143***	0.154***
	(0.0896)	(0.0897)	(0.0461)	(0.0456)	(0.0420)	(0.0416)
CSL_{hrt}	0.147*	0.147*	-0.0645	-0.0640	0.000559	0.000596
	(0.0835)	(0.0836)	(0.0482)	(0.0482)	(0.0382)	(0.0382)
$ln\,(destariff_{dt})$	-0.0356***	-0.0333***	0.00960***	0.0120***	-0.0113***	-0.0105***
	(0.00823)	(0.00822)	(0.00367)	(0.00366)	(0.00329)	(0.00329)
$ln\,(Chinatariff_{ht})$	0.0361*	0.0363*	0.0174	0.0176	-0.00632	-0.00634
	(0.0215)	(0.0215)	(0.0119)	(0.0119)	(0.00998)	(0.00998)
$lnGDP_{dt}$	0.503***		0.288***		0.160***	
	(0.0394)		(0.0220)		(0.0165)	
$lnGDP\_pc_{dt}$		0.604***		0.331***		0.181***
		(0.0438)		(0.0245)		(0.0181)
$Constant$	-10.92***	-3.313***	-6.408***	-1.967***	-3.046***	-0.572***
	(0.915)	(0.318)	(0.508)	(0.180)	(0.382)	(0.138)
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	286,346	286,346	888,952	888,952	1,394,627	1,394,627
R-squared	0.667	0.667	0.634	0.634	0.623	0.623

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5. Continuous

VARIABLES	$diven_{fdt}$					
	state-owned		foreign		private	
	(7)	(8)	(9)	(10)	(11)	(12)
DSL_{dt}	0.254***	0.256***	0.189***	0.196***	0.0850***	0.0906***
	(0.0703)	(0.0701)	(0.0290)	(0.0289)	(0.0301)	(0.0298)
CSL_{hrt}	0.104*	0.105*	-0.0282	-0.0280	0.0449*	0.0449*
	(0.0576)	(0.0576)	(0.0257)	(0.0257)	(0.0269)	(0.0269)
$ln\,(destariff_{dt})$	-0.0211***	-0.0197***	0.00100	0.00200	-0.00993***	-0.00948***
	(0.00672)	(0.00671)	(0.00234)	(0.00233)	(0.00240)	(0.00240)
$ln\,(Chinatariff_{ht})$	0.0356**	0.0357**	0.0111	0.0112	0.00344	0.00343
	(0.0158)	(0.0158)	(0.00851)	(0.00851)	(0.00734)	(0.00734)
$lnGDP_{dt}$	0.315***		0.117***		0.0854***	
	(0.0305)		(0.0134)		(0.0117)	
$lnGDP\_pc_{dt}$		0.378***		0.136***		0.0974***
		(0.0337)		(0.0152)		(0.0129)
$Constant$	-5.916***	-1.147***	-1.528***	0.271**	-0.579**	0.742***
	(0.702)	(0.239)	(0.311)	(0.112)	(0.270)	(0.0975)
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	286,346	286,346	888,952	888,952	1,394,627	1,394,627
R-squared	0.635	0.635	0.674	0.674	0.638	0.638

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6. Services trade liberalization and export diversification by destination institution environment

VARIABLES	$ln\,(scope_{fdt})$			$diven_{fdt}$		
	(1)	(2)	(3)	(4)	(5)	(6)
$DSL\_gov\_effectiveness_{dt}$	0.00948**			0.00984***		
	(0.00451)			(0.00319)		
$DSL\_rule\_of\_law_{dt}$		0.0386***			0.0283***	
		(0.00528)			(0.00370)	
$DSL\_control\_corruption_{dt}$			0.0218***			0.00870***
			(0.00432)			(0.00305)
CSL_{hrt}	-0.00335	-0.00337	-0.00338	0.0283	0.0283	0.0283
	(0.0294)	(0.0294)	(0.0294)	(0.0195)	(0.0195)	(0.0195)
$ln\,(destariff_{dt})$	-0.00200	-0.00252	-0.00209	-0.00460***	-0.00516***	-0.00499***
	(0.00240)	(0.00239)	(0.00239)	(0.00173)	(0.00172)	(0.00172)
$ln\,(Chinatariff_{ht})$	0.00800	0.00803	0.00798	0.0125**	0.0125**	0.0125**
	(0.00819)	(0.00819)	(0.00819)	(0.00597)	(0.00597)	(0.00597)
$lnGDP_{dt}$						
$lnGDP\_pc_{dt}$	0.324***	0.295***	0.308***	0.167***	0.147***	0.165***
	(0.0138)	(0.0141)	(0.0141)	(0.00951)	(0.00978)	(0.00967)
$Constant$	-1.503***	-1.336***	-1.405***	0.265***	0.380***	0.288***
	(0.107)	(0.109)	(0.109)	(0.0738)	(0.0750)	(0.0748)
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,570,121	2,570,121	2,570,121	2,570,121	2,570,121	2,570,121
R-squared	0.641	0.641	0.641	0.656	0.657	0.656

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1