Institutional Similarity, Firm Heterogeneity and Export Sophistication: Empirical Evidence from China[1]

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Abstract

We study the effects of institutional similarity and firm heterogeneity on export sophistication using a large panel of Chinese firms. We find that firms export more sophisticated products to destinations with more similar institutions. Furthermore, this effect is significantly lower for higher productivity firms. We also show that private, foreign, and joint-venture firms, and firms with lower export orientation are less sensitive to institutional similarity. Likewise, single-product firms and firms that export to more distant markets and have a higher export skewness are less affected by institutional differences. Lastly, the effect of institutional similarity is asymmetric and is weaker when exporting to countries with better institutions.

Keywords: Export Sophistication; Institutional Similarity; Total Factor Productivity; Firm Heterogeneity; Chinese Firms

JEL Classification: F14; F23; O43; D22

1. Introduction

What explains changes in export sophistication? This question has been a central topic in development economics and economics of growth as well as the new trade theory, and the attention is well deserved. Increasing sophistication of exports through technology-and-skills upgrading, and developing industries that enjoy increasing returns as well as improving export quality and diversity are recognized as major steps towards long run development and growth (Leontief, 1963; Kaldor, 1966; Romer, 1990; Krugman, 1997; Lewis and Trefler, 2002; Imbs and Wacziarg, 2003; An and Iyigun, 2004; Hummels and Klenow, 2005; Rodrik, 2006; Hausmann et al., 2007; Hidalgo and Hausmann, 2009; Amiti and Freund, 2010; Jarreau and Poncet, 2012; Poncet and Waldemar, 2013).

However, despite the large and growing literature, we know little about the main drivers of export sophistication, especially at the micro level. In this paper we contribute to this debate by exploring two possible external and internal determinants of export sophistication at the firm level, which are institutional development and firm heterogeneity. Exploring dynamic changes in export sophistication at the firm level allows us to understand the micro foundation of a country's export structure while examining the role of firm heterogeneity. Specifically, we focus on two issues. First, we explore the effect of institutional similarity between home and destination markets on firms' export sophistication. Second, we study the role of firm heterogeneity in the choice of export sophistication, and its interaction with institutional similarity. Additionally, we examine the effects of other sources of firm heterogeneity, including ownership structure, export orientation, product diversity, market distance and asymmetries in institutional effects.

Existing research on the determinants of export sophistication highlights the importance of trade regimes (Amiti and Freund, 2010), foreign investment (Jarreau and Poncet, 2012; Saadi, 2014), human capital (Feenstra and Wei, 2010; Fang et al., 2015), international networks (Yu and Hu, 2015) and domestic institutions (Zhu and Fu, 2013). A particular interest in this literature is the case of

China as it has experienced a significant upgrading in its export sophistication since the 1990s (Rodrik, 2006; Hausmann et al., 2007; Schott, 2008). Among the main drivers of Chinese exports upgrading, industrial policy (Felipe et al., 2013), FDI (Xu and Lu, 2009), processing trade and global supply chains (Feenstra and Wei, 2010), human capital (Feenstra and Wei, 2010), labor productivity, capital accumulation and financial development (Fang et al., 2015; Yu and Hu, 2015), and research and development (Yu and Hu, 2015) have been pointed out. However, none has yet examined the effect of institutional similarity on export sophistication in a heterogeneous firm setting.

Why does institutional similarity affect export sophistication? Institutional development is shown to shape exporter behavior by working as a source of comparative advantage. Weak destination institutions, for example, increase entry costs, market uncertainty and information frictions for entrant firms, and decrease entry, growth and survival rates as well as the number of exporters, trade volumes and initial sales (Anderson and Marcouiller, 2002; Belloc, 2006; Levchenko, 2007; Aeberhardt et al., 2014; Fernandes et al., 2016). Institutional frictions also affect firms at the extensive margin, discouraging them from introducing new products (Sheng and Yang, 2016). Furthermore, penetration of high-technology and skill-intensive products requires more sophisticated distribution channels, which are more demanding on the familiarity of destination institutions. There is also a growing research showing that institutional development is a significant determinant of the quality and complexity of production processes. Institutionally more developed countries, for example, are shown to specialize in more institutionally dependent and higher value added sectors (Levchenko, 2007; Feenstra et al., 2013). [1]

Institutional differences can affect developed and developing country exporters differently, given their differing experiences at home. For example, developing country exporters are shown to enjoy a comparative advantage in foreign markets with weak institutions as they are more experienced in such business environments (Aleksynska and Havrylchyk, 2013). Familiarity with

destination institutions can also facilitate the sale of higher-skill products, which requires more complex interactions with regulatory authorities, including licensing requirements. Therefore, exporting to markets with similar institutions can allow a comparative advantage to firms. For example, Chinese Hua Wei brand smart phones are widely sold in developing countries across Africa and South East Asia with similar institutional development to that of China. And yet they are not available in the U.S. as Hua Wei faced intellectual property rights issues. The Linder hypothesis also suggests that countries with similar preferences, incomes and endowments may trade more with each other, especially in goods that they have similar preferences (Hallak, 2010; Regolo, 2013).

Differences in institutions can also affect the consumer demand and preference structures, including perceived quality differences (Brucks et al., 2000). For example, when they are available, more sophisticated developing country products such as tablet PCs or smart phones are usually sold at a price discount in developed country markets despite a lack of evidence on their quality inferiority (Brandt and Thun, 2016). Therefore, more sophisticated products may be subject to smaller perceived quality biases between countries with similar institutional development, allowing firms an easier market access. For all these reasons, developing countries may find it easier to export more sophisticated products to each other rather than to developed countries.

Turning to sources of firm heterogeneity, among others, productivity is shown to be an important determinant of exporter performance in various dimensions. Particularly, firms with higher productivity are found to have a higher product variety and quality, and market diversification (Bastos and Silva, 2010; Manova and Zhang, 2012), more durable exporting partner relationship (Aeberhardt et al., 2014; Araujo et al., 2016), larger importer networks (Chaney, 2014), lower demand elasticity and higher mark-ups (Berman et al., 2012; Melitz and Ottaviano, 2008). Surprisingly, however, we know little about how firm heterogeneity affects exporters' reactions to institutional hurdles in destination markets. We argue that more productive firms may be less

sensitive to institutional differences in export markets as they have better maneuvering abilities and risk diversification to deal with such entry barriers. Or, on the contrary, more productive firms may in fact be more sensitive to institutional heterogeneity and perform better in markets with strong institutions as they can take advantage of well-functioning institutions. In both cases, high productivity firms, which are usually multiproduct firms, can choose the sophistication level of their exports. In the latter case, for example, a multiproduct firm can sell higher skill products to countries with similar institutions and lower skill products to those with different institutions.

Based on a rich panel of Chinese manufacturing firms for the period of 2000-2006, our empirical analysis reveals several novel findings that are reported for the first time in the literature. First, we find that firms export more sophisticated products to countries with more similar institutions. Furthermore, we show that this effect is significantly less important for higher productivity firms. We confirm these findings using a rich battery of robustness tests. Our results also highlight the importance of other sources of firm heterogeneity. First, we show that exports of private, foreign, and joint-venture firms are more sophisticated, and are less sensitive to institutional similarity. Second, we find that firms that are more outward oriented export more sophisticated products but are also more sensitive to institutional heterogeneity. Third, while we do not find any export sophistication difference based on the physical distance to export markets, firms that export to further destinations are less sensitive to institutional heterogeneity. Fourth, multiproduct firms and firms with lower export skewness export more sophisticated products but are more sensitive to institutional differences. Lastly, we show that the effect of institutional similarity is asymmetric and is less important when firms export to countries with better institutions than at home.

The rest of the paper is organized as follows. Section two introduces the empirical methodology, including the estimation method and data, and is followed by the empirical results in section three. Section four discusses the extensions, and the final section concludes.

2. Empirical Methodology

2.1 Empirical Model

We examine the joint effects of institutional similarity and productivity differences on firm level export sophistication choice in Eq. (1):

$$Log\left(Skill_{ijt}\right) = \beta_0 + \beta_1 Inst\_Sim_j + \beta_2 Inst\_Sim_j * TFP_{it} + \beta_3 X_{jt} + \delta_{it} + \delta_s + \varepsilon_{ijt} \quad (1)$$

where $Log(Skill_{ijt})$ is the skill intensity of firm i's exports to destination country j in year t. We discuss the measurement of *Skill* and other variables in the data section.

$InstSim_j$ is the destination country j's institutional similarity with China and is defined as $-|Inst_j - Inst_{China}|$ where higher values reflect increasing similarity. We expect $\beta_1 > 0$ as we anticipate firms to export more sophisticated products to destinations that are institutionally more similar to that of home because of lower entry barriers and smaller sunk costs.

Our second main variable of interest is *TFP*, the total factor productivity of firm *i* at time *t*. The interactive term captures the heterogeneous effect of institutional similarity on export sophistication across firms with different productivity levels. We expect $\beta_2 < 0$ suggesting that high productivity firms are less sensitive to institutional similarities in their export decisions as they enjoy better allocative efficiency, risk management and experience, and have more diverse product variety and importer networks.[2]

X_{jt} is a set of Gravity controls, which are shown to affect export skill intensity, including the following variables (Weldemicael, 2014):

$RGDP_{jt}$ is (log) real GDP in destination countries (in 2005 U.S. dollars). We expect *RGDP* to have a positive effect on firms' export sophistication as it controls for the economic size, market potential and income-dependent preference structures in destination markets.

Investment costs including transaction and information frictions are captured by: the (log) (km) distance between *i* and *j* (*Distance*); a binary dummy variable equaling 1 if *i* and *j* share a common language (*Language*), or a common border (*Border*). Previous economic and political ties are captured by binary variables equaling 1 if China and destination country *j*: have ever had a colonial link (*Colony*); were ever the same country (*SameCountry*); have the same legal origin (*Legal*); have a preferential trade agreement (*PTA*); or if *j* is a member of World Trade Organization (*WTO*).

δ_{it} and δ_s are firm-year and two-digit sector-specific fixed effects, respectively. The firm-year fixed effects, here and thereafter, control for all observable (such as productivity, age, size, capital intensity, etc.) and unobservable (such as management quality and managerial goals) time-variant and firm specific determinants of export sophistication. While demanding on the data, they allow us to explore the within firm-year variation across destinations and directly test the effects of institutional similarity and its interaction with firm productivity. However, including firm-year fixed effects in Eq. (1) prevents us from testing the effects of TFP or other firm level and time variant control variables on export sophistication as they are washed out. Therefore, in Eq. (2) we repeat a modified version of Eq. (1) by replacing firm-year fixed effects with a set of observable and time-variant firm specific effects, including firm size (measured by real total sales, *Output*); firm age (*Age*); human capital intensity (measured by average real wages, *Wages*); and capital intensity (measured by the real total capital stock divided by the total number of employees, *Capital*).[3] Additionally, we include firm fixed effects and year fixed effects to control for time-invariant and firm-specific factors as well as firm-invariant global or countrywide shocks that affect all firms symmetrically.

$$Log\left(Skill_{ijt}\right) = \beta_0 + \beta_1 Inst\_Sim_j + \beta_2 Inst\_Sim_j * TFP_{it} + \beta_3 TFP_{it} + \beta_4 X_{jt} + \beta_5 X_{it} + \delta_i + \delta_t + \delta_s + \varepsilon_{ijt} \quad (2)$$

Where δ_i and δ_t are firm fixed effects and year fixed effects, respectively. X_{it} is firm-year controls, and includes firm age, size, real wage per worker, capital intensity and TFP.

Finally, the error term in both equation (1) and (2), ϵ_{ijt}, includes all other idiosyncratic influences on export sophistication choice. The robust standard errors here and in the rest of the paper are clustered at the firm-year level.

2.2 Data

The dataset is from the merger of two separate sources including the Chinese National Bureau of Statistics' (NBSC) annual surveys of industrial production, and the Chinese customs data. The NBSC dataset provides balance sheet information for all industrial firms with annual revenues above 5 million RMB between 1998-2007, and covers over 88% of the total industrial output, with a minimum of 87% in 2001 and a maximum of 90% in 2003. The sample includes a total of 563,747 firms in 421 four-digit CIC (Chinese Industry Classification) manufacturing industries with a minimum of 145,720 firms in 1999 and a maximum of 312,228 firms in 2007.[4] Firm level characteristics such as employment, capital stock, ownership (i.e. foreign, state owned, domestic private), trade regime (i.e. processing vs. non-processing trade), geographical location, wage rate and gross output are acquired directly from the balance sheets in the industrial firm survey. The second dataset, the customs data, is from the Chinese Customs Office and provides monthly transaction level data on all international trade of China with the rest of the world. It includes firm, product, and destination/source information at the 8-digit industrial classification level in U.S. dollars for over 8,000 products during 2000-2006. We aggregated the monthly transaction data into an annual frequency at the 6-digit level to match the data from the production survey. In merging these datasets, we used firm level information including name, phone number, zip code, and name of representatives to match the firms.

In the empirical analysis we focus only on the ordinary trade and exclude firms from alternative trade regimes such as processing trade to limit the effects of unobservable connections between buyers and sellers, including global supply-chains and re-exports.[5] Compared to processing

firms, ordinary firms have more freedom over their export decisions regarding what, where and when to export, and have more control over the skill intensity of their exports across different destinations. We also limit the risk of processing trade distorting our export sophistication measure because of its higher imported high technology and skill content (Lemoine and Ünal-Kesenci, 2004; Feenstra and Wei, 2010; Amiti and Freund, 2010; Dai et al., 2016). Similar to other studies, we exclude exports to Hong Kong, Macau and Taiwan as well as those belonging to trade intermediaries in order to eliminate the concern of entrepot trade. To reduce noise and measurement error, we further exclude firms that: i) have experienced a switch in their firm id's as it signals a merger or acquisition activity; ii) have less than nine employees, negative fixed assets, output value, or value added; and iii) are at the top 1% or bottom 1% of the TFP distribution.

2.3 Measurement of export sophistication, institutions and productivity

To measure export sophistication, we follow Hausmann et al. (2007) and use goods-specific PRODY index as our measure of skill intensity at the product level. Simply, $PRODY_k$ is defined as the income level associated with a given product k as in Eq. (3):

$$PRODY_k = \sum_j \frac{\left(x_{jk} / X_j\right)}{\sum_j \left(x_{jk} / X_j\right)} Y_j \tag{3}$$

where x_{jk} is the total exports of country j in product k, and X_j is the total exports by country j in 2000. Y_j is the real per-capita GDP of country j.[6] The denominator aggregates the value shares of product k in the total export basket of all countries exporting that good, while the weights correspond to the revealed comparative advantage (RCA) of each country in good k.[7] Thus, it allows a ranking of products by their technological intensity, conditional on the income levels of exporting countries. A good is considered more sophisticated if it is exported more intensively by high-income countries, and less sophisticated if it is exported more intensively by low-income countries.

Next, we aggregate this index at the firm level to construct firm level skill intensity in Eq. (4):

$$Skill_{ijt} = \sum_{k} \frac{x_{ijkt}}{X_{ijt}} PRODY_k \quad (4)$$

where $Skill_{ijt}$ is the skill intensity associated with firm i's exports to destination j at time t. Unlike Hausmann et al. (2007), which is constructed at the country level, we develop a firm-country-year level index, which is the weighted average of $PRODY_k$, where the weights are the value shares of products in firm i's export to destination j at time t.[8]

We measure institutional development using the World Governance Indicators (WGI) database of the World Bank, which reports six dimensions of governance for 205 economies since 1996. The six dimensions include: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. We take a simple average of these six indicators to measure the overall institutional development. Given the short time span of our data as well as the slow-changing nature of institutional development, we use the average of this index between 2000 and 2006 and normalize its mean to zero.

We estimate the TFP with the Olley-Pakes method, which is described in detail in the online Appendix (Olley and Pakes, 1996). Before estimating the production function, we used the input and output deflators at the 4-digit level constructed by Brandt et al (2012). For the capital stock we used the fixed asset price index by NBSC. We then normalized the TFP variable with a mean of zero and variance of one.

Finally, the real GDP data (constant 2005 U.S. dollars) are from the Penn World Table (PTW 8.0), the gravity controls are from the CEPII database, and WTO membership and PTA data are from the WTO.

Table 1 provides the summary statistics for the variables that are used in the regression analysis. Table 2 shows the number of: i) exporting firms, ii) destinations countries, iii) HS 6-digit

exported products, and iv) destination-product pairs between 2000-2006. Consistent with the previous studies, we observe a steady increase in the number of sample firms and destination countries. We also find an increase in the number of products being exported, reaching 4,404 in 2006 compared to 3,641 in 2000. The upward trend is even stronger for destination-product pairs, which increased from 41,909 in 2000 to 133,435 in 2006.

<Insert Tables 1 & 2 here>

Table 3 shows the average and median number of destination markets, products and market-product pairs per firm by year. In 2000, an average (median) firm exported 5 (2) different products to 5.4 (3) markets and had around 11.6 (4) destination-product pairs. Over time, we observe a significant increase in these indicators so that by 2006 an average (median) firm exported 5.8 (3) different products to 8.6 (5) markets and had 18.3 (8) different destination-product combinations.

<Insert Table 3 here>

In Table 4 we present the percentage distribution of the number of exported products (columns (1)-(4)) and the number of export destinations (columns (5)-(8)) across firms in 2000 and 2006. In 2000, 33.37% of firms exported only one product, accounting for 11.89% of the total export value in the sample. In contrast, less than 10% of firms exported more than ten products, and yet they accounted for more than 33% of the total export value. By 2006, we observe a significant rise in the number of multiproduct firms as the percentage of firms that exported only one product decreased from 33% to 24%. Meanwhile, the share of multiproduct firms that exported more than 10 products rose from 33.42% to 37.49% of the total export value. Overall, an increasing number of firms became multiproduct exporters during this period, allowing them more flexibility to choose what to export.

<Insert Table 4 here>

Looking at the distribution of firms across destination markets in columns (5)-(8), we find that the percentage of firms that serve only one market decreased significantly over time, from 32.45% in 2000 to 19.16% in 2006. Meanwhile, the share of firms that served more than ten markets almost doubled from 15% in 2000 to 27.45% in 2006. These firms also accounted for a majority of total export values, up from 45.82% in 2000 to 62.51% in 2006. Overall, we see that a majority of firms in our sample are multiproduct and multi-destination, allowing us to explore the within firm variations across destination and product categories.

3. Empirical Results

Table 5 presents regression results from equations (1) and (2), showing the effects of institutional similarity and productivity differences on firms' export sophistication. Column (1) shows the effects of institutional similarity without the TFP interaction variable, which is added in column (2). In column (3), we replace the firm-year fixed effects, which are included in columns (1) and (2), with observable and time-variant firm-level controls, including *Output*, *Age*, *Wages*, and *Capital*, and also introduce firm, year and industry fixed effects. In all regressions, we also control for sectoral heterogeneity using two-digit industry fixed effects. The results suggest that the institutional similarity variable, *InstSim*, has a positive and statistically significant effect (at the 1% level) on export sophistication, confirming that Chinese firms find it easier to export more sophisticated products to markets that have more similar institutions to that of China.

<Insert Table 5 here>

And yet, the negative and significant interaction variable on institutional similarity and TFP in columns (2) and (3) suggests that the positive effect of institutional similarity on export sophistication is decreasing in firm productivity. In other words, higher productivity firms are less sensitive to institutional similarity in their export skill intensity choices. As discussed earlier, one possible explanation is that higher productivity firms are more capable of dealing with unfamiliar

destination environments as they are equipped with better know-how, managerial and operational capabilities, and are multiproduct firms with a wider network of supplier and destination choices. They are also more flexible in adjusting prices due to their higher markup rates, which make them less sensitive to institutional entry barriers.

The predicted effects of institutional similarity and productivity are also economically significant. To illustrate the economic significance, we first examine the effect of one standard deviation increase in institutional similarity (i.e. moving from USA-China with a similarity level of -1.623 to Antigua and Barbuda-China with a similarity level of -0.629) on export sophistication at the mean level of TFP (i.e. zero, at the normalized level of TFP) using the benchmark estimates in column (2).[9] We also repeat this exercise by moving from the lower 75th (90th) percentile to the 25th (10th) percentile in institutional similarity, which corresponds to moving from an institutionally less similar country such as France (Uruguay) to a more similar country such as Swaziland (India). Second, we distinguish the effect of institutional similarity at different quartiles of TFP. The results are summarized in Table 6. Column (1) suggests that one standard deviation increase in institutional similarity increases export sophistication by 0.3% at the mean level of TFP. Meanwhile, the same number is 0.43% at the 5th percentile of TFP distribution and 0.13% at 95th percentile, supporting the idea that the positive effect of institutional similarity on export sophistication is decreasing in firm productivity. Column (2) shows what will happen if the institutional similarity increases from the lower 75th percentile (Uruguay) to the higher 25th percentile (India). As expected, a trade partner switching to an institutionally more similar country increases export sophistication by 0.18%-0.61% depending on the productivity distribution. The differences are even starker in column (3) where we move the institutional similarity from the 90th percentile (France) to the 10th percentile (Swaziland) and find that the export sophistication rises by 0.32%-1.1%, conditional again on productivity.

<Insert Table 6 here>

Turning to other variables of interest in Table 5, across all three sets of regressions country-specific control variables appear with robust coefficient estimates and carry the expected signs. We find that destination market size (*RGDP*) has a positive and significant effect on export sophistication while geographical distance has a negative and significant effect. Sharing a common border, a common legal origin or colonial tie all has a positive and significant effect while previously being the same country yield a negative and significant effect. Common official language appears to have a positive but statistically insignificant effect. We also find that if the destination country has a PTA with China, it tends to have a positive and significant effect on export sophistication. Yet, the WTO membership is found to be mostly insignificant. In column (3), surprisingly we observe that TFP, size, capital intensity, and human capital intensity have no significant effect on export sophistication, while firm age is negative and significant implying that older firms tend to export products with a lower skill intensity.

3.1 Robustness analysis

In this section we perform a series of robustness tests for our benchmark results. We start by testing the sensitivity of our findings to the measurement of our main variables of interest in Table 7, which are export skill-intensity, institutional development, and the TFP. First, we construct alternative measures of the PRODY index as proposed by Huber (2017) using the data for the full sample period of 2000-2006 rather than using the first year in the sample, 2000, as in our benchmark estimations. Particularly, we construct: i) PRODY-2 index, which uses time-varying export and GDP per capita values (column 1); ii) PRODY-3 index, which uses the average exports over time for each country and uses time varying GDP values (column 2); iii) PRODY-4 index, which uses the average GDP per capita over time for each country while using time varying export values (column 3); iv) PRODY-5 index, which uses the average values for both exports and GDP per capita in the PRODY calculation (column 4); v) Michaely Index-1, which is based on the export-weighted GDP

per capita of countries using time-varying GDPs and trade information (column 5) (the index increases in value for commodities that are exported by higher income countries, which proxies for a country's technological sophistication) (Michaely, 1984); and vi) Michaely Index-2, which uses the estimated coefficient from a simple linear regression of the country's trade share of a particular good on their GDP per capita as a measure of the income content of a good (column 6).

In column (7), we consider the export sophistication index of Lall et al. (2006), using time varying per capita GDPs and export values after classifying countries into ten different income groups. The idea behind Lall-1 is that goods that are exported by countries at different income levels reflect their sophistication levels. Last, in column (8) we use the skill intensity measure of Lall (2000) and classify exports into medium and high technology-and-skill-intensive products at three-digit SITC level (Rev 2) and then use their shares in total exports as our dependent variable. In all these measures, the use of time-varying trade and the time-varying GDP per capita information allows us to control for any changes in the capability requirements of products included in the product sophistication index over time. We report coefficient estimates only for our main variables in Table 7 but provide full results and estimation methods in the online Appendix. In all eight sets of regressions using alternative measure of export sophistication, our benchmark results remain intact.

<Insert Table 7 here>

Next, we test the sensitivity of results to alternative measures of institutional development including the following: i) the international country risk guide composite political risk index (*ICRG*), which measures institutional development using an average index of 12 indicators (i.e. government stability, socio-economic conditions, investment profile, internal conflict, external conflict, corruption, military in politics, religion in politics, law and order, ethnic tensions, democratic accountability and bureaucracy quality); ii) political institutional quality index from Polity IV (*Polity IV*); iii) a factor variable constructed using the factor analysis on our six governance indicators;[10] and

iv) the institutional similarity index based on Kogut and Singh (1988): $Inst_{sim} = -\frac{1}{6}\sum_{d=1}^{6}\frac{\left(Inst_{dct} - Inst_{China}\right)^2}{V_d}$, where $Inst_{dct}$ refer to each subcomponent of the WGI index. The regression results for our main variables from these exercises are reported in Table 8 and confirm our earlier findings. We continue to find that institutional similarity has a significantly positive effect on export sophistication and that this effect is decreasing in firm productivity.

As an additional test, instead of using a composite index with equal weights for each of the six components of the WGI index, we repeat the benchmark regressions for each component separately. As each indicator reflects a different dimension of institutional development, we want to make sure that our results are not sensitive to the weighting method or to a particular aspect of institutional development. The regression analysis using each of these six variables reveals almost identical coefficient estimates and is reported in the online Appendix.

<Insert Table 8 here>

Regarding the measurement of TFP, we employ two alternative measures: i) the OLS method with firm-level fixed effects to compute the input shares, and ii) the Levinsohn and Petrin (2003) method. The results, including details on the estimation method, are reported in the online Appendix and continue to support our previous findings.

We also want to make sure that our results are not sensitive to sample selection bias. To this end, we perform several tests: First, we redefine ordinary exporters by focusing on firms whose ratio of ordinary exports to total exports is above 60%, 80% or 100% for a given firm-year-country triplet. Second we divide the sample into two by new and old exporters to check for any differences between the two groups. Third, we count the firm-year-country specific number of products and separate firms into single-product and multiproduct exporters. We repeat this exercise for multiproduct firms that export more than one vs. five products for a given firm in a given year. Fifth,

we experiment with different sample periods by considering only 2002-2006 and 2003-2006 subsamples to out the influence of WTO accession of China in 2001. Sixth, we drop petroleum related industries (CIC 25), which might be subject to different considerations because of their market structure. Seventh, we drop the largest and smallest exporters (top 5% and/or bottom 5% of distribution) as well as observations classified as infrequent exporters. Eighth, to focus on continuous exporters, we drop observations with export-destination pairs that are less than two, three or four in frequency in both firm-year and firm-year-country criteria. The results from these exercises are consistent with our earlier findings and are reported in the online Appendix.

We also experiment with additional control variables in our empirical specification by including bilateral real exchange rate changes, exchange rate volatility and overall tariff rate applied to Chinese exports in a given destination. The tariff rate we use is destination country-China specific and is measured by *log(1+tariff)*, where *tariff* is the ad valorem tariff rate of country *j* (weighted average of all applied tariffs) at time *t* derived from World Bank's World Integrated Trade Solutions. Our main results remain unchanged after these exercises and are reported in the online Appendix.[11]

Finally, we experiment with alternative specifications of our benchmark regression. First, we exclude either *GDP* or *Legal Origin* variables, or both. It is possible that institutional similarity might be endogenous to both of these variables, which would cause biased estimates. Second, we drop firm size in order to better identify the effect of TFP. After these exercises, the results remained unchanged and are reported in the online Appendix. Third, we introduce an income similarity variable measured as $GDPPCSim_{China,t} = -\log |GDPPC_{China,t} - GDPPC_{jt}|$ so that higher values indicate increasing GDP per capita similarity between China and destination country *j*. Recent empirical work suggests that income similarity is a significant predictor of bilateral trade patterns (Hallak, 2010). To make sure that institutional similarity is not capturing the effect of income similarity, as the two are correlated, we introduce both variables as well as their interactions with the

TFP together. The results show that income similarity is indeed a significant determinant of export sophistication. Furthermore, we find that income similarity is significantly less important for the export sophistication choice of more productive firms, very much like the case with the institutional similarity effect. And yet, institutional similarity continues to be an economically and statistically significant determinant of export sophistication choice and that this effect is decreasing in TFP. In fact, the coefficient estimates remained almost the same as those in benchmark estimates. The results are reported in the online Appendix.

4. Extensions

In this section we expand our benchmark analysis by considering additional sources of firm heterogeneity, which are firm-year and firm-year-country specific.

4.1 Ownership structure

The ownership and equity structure can have significant effects on firms' production and distribution decisions. Foreign firms, for example, are usually more capital, technology and skill intensive, enjoy better distribution networks, and are more integrated into the global supply chains with better distribution channels. They also have better know-how and are more experienced in dealing with different institutional settings than local firms. Foreign investments are also shown to have a positive effect on host countries' export sophistication (Harding and Javorcik, 2012; Jarreau and Poncet, 2012; Eck and Huber, 2017). Therefore, we expect foreign firms and firms with joint-ventures to have a higher skill-intensity of exports, and more importantly, to be less sensitive to institutional differences between China and destination countries. To test these possibilities, we consider four different types of ownership, which are state-owned enterprises (SOE), domestic and privately owned firms (*Domestic*), joint ventures (*Joint*), and foreign owned firms (*Foreign*).[12] In the regression analysis, we treat SOE as the omitted category. In the sample, around 7% of firms are

SOE, 27% are domestic private, 34% are joint-ventures and 32% are foreign. Our identification strategy here relies on firm ownership switching over time.

The results in Table 9 suggest that export sophistication of domestic firms, foreign firms and joint-ventures are less affected by institutional similarity than SOEs. For all three dummy variables except for SOEs, the interactive terms are negative and significant. Furthermore, our main results remain intact showing that increasing institutional similarity leads to higher skill intensity and that this effect is decreasing in firm productivity. With respect to the ownership effects in column (2), all three ownership dummy variables appear positive and significant, especially so for private domestic firms. This result is consistent with Feenstra and Wei (2010), who report that increasing export sophistication of China is mostly driven by domestic rather than foreign firms.

<Insert Table 9 here>

4.2 Role of export orientation and destination remoteness

Next, we examine the effects of export openness (*Openness*), measured by the total exports to output ratio, and export remoteness, defined by (trade value) weighted average of geographical distance of all trade partners of a firm. Both variables can affect export sophistication. More open firms, for example, have a higher TFP and capital intensity, more skilled labor force, and better know-how and international managerial capabilities that allow them to tackle institutional barriers better than home market oriented firms. Alternatively, firms that are more export oriented might be more sensitive to institutional heterogeneity than inward oriented firms, whose revenues come from home market. If this is the case, we will expect to have a negative interaction term between institutional similarity and export openness. For export remoteness, the previous literature shows that firms that can export to further destinations have higher productivity and are less sensitive to external shocks (Bastos and Silva, 2010). Therefore, we expect these firms to export more sophisticated products and be less

sensitive to institutional barriers. To identify these effects, we replace firm-year fixed effects with firm fixed effects, year fixed effects and firm-year controls.

Columns (1) and (2) in Table 10 show the effects of export openness. We find that firms that are more open are more sensitive to institutional similarity than inward oriented firms. From column (2) we also see that more open firms are likely to export more sophisticated products. In columns (3) and (4) we find that firms that export to further destinations are indeed less sensitive to institutional similarity. And yet, we find no evidence that the remoteness itself has any effect on export sophistication. Lastly, in all sets of regressions, our earlier findings continue to hold.

<Insert Table 10 here>

4.3 Role of firm-country-year specific export characteristics

What about the role of firm-destination-year specific export characteristics, particularly product variety, measured by the number of products exported at the 8-digit classification level to a destination (*Product*), and product skewness, measured by the skewness of goods exported to a destination (*Skewness*). We expect firms that export a larger variety and have lower skewness to be more sensitive to destination institutions in choosing which products (high vs. low skill) to export. In contrast, single product firms or firms with higher export skewness are less likely to have the flexibility to choose what and where to export and therefore be less responsive to institutional similarity. Regarding export sophistication, however, we expect multiproduct firms and firms with higher export market diversification to export more sophisticated goods.

The results are reported in columns (5) and (8) of Table 10. Columns (5) and (6) control for the effects of product variety, measured by the (log) number of products for a given firm-destination-year triplet, on export sophistication. We find that while multiproduct firms export more sophisticated products, they are also more sensitive to institutional similarity when they export a greater number of products to a given destination. In columns (7) and (8) we consider export

skewness measured by the Herfindal index of sales specific to a firm-destination-year triplet. We find that product skewness is negatively associated with export sophistication. Furthermore, we find that firms that have a more concentrated export structure (i.e. more skewed) are less sensitive to institutional similarity. These results suggest that having a higher product variety or less skewed export concentration allow firms to have more flexibility to choose what to export.

4.4 Asymmetric effects of institutional similarity

A natural corollary of our main results is the question of symmetry regarding the effects of institutional differences across countries. Particularly we expect entry barriers to be higher for firms exporting to countries with worse institutional development. To test for this possibility, we interact the institutional similarity variable with a positive institutional gap dummy (*D*), which is equal to one if a destination has better institutions.[13] The results, which are shown in Table 11, suggest that institutional similarity is significantly less important for firms exporting to an institutionally more developed destination. However, institutional similarity remains as a significant determinant of export sophistication independent of the direction of institutional disparities. As before, full regression results are reported in the online Appendix.

<Insert Table 11 here>

5. Conclusion

Recent advances in international economics suggest that firm and country heterogeneity play fundamental roles in shaping exporter behavior and performance. Particularly, home and destination institutions are shown to affect the production and specialization processes at the product and industry levels. Likewise, firm level differences in productivity and experience are found to influence exporter entry, growth and survival dynamics. In this paper we contribute to this literature by studying the effects of institutional similarities and firm heterogeneity on export sophistication at the firm level. We also examine the importance of other sources of firm heterogeneity, including

ownership structure, firm openness, destination remoteness, product variety, export skewness, income similarity, and asymmetric effects of institutional differences.

The empirical analysis reveals several novel findings that are reported for the first time in the literature. First, we find that firms tend to export more sophisticated products to countries with more similar institutions. Second, we show that this effect is significantly less pronounced for higher productivity firms. These two new findings are consistent with recent theoretical and empirical research that emphasizes the importance of institutional similarities in international trade. Furthermore, these results are also consistent with the finding that developing country firms enjoy a comparative advantage in poorer institutional environments.

Our results also highlight the importance of firm heterogeneity. First, we show that compared to private or foreign firms, public firms are at a disadvantage in export sophistication. Second, firms that are more export oriented are more sensitive to institutional differences. Third, firms that export to further destinations are less sensitive to institutional differences. Fourth, multiproduct firms and firms with lower export skewness are more sensitive to such differences. Fifth, income similarity is a significant determinant of export sophistication and that this effect is present in addition to the institutional similarity effect. Lastly, the effect of institutional similarity is asymmetric as it is less important when firms export to countries with better institutions.

Overall, these findings allow us to a better understanding of the behavior of higher productivity and multiproduct firms in a developing country context. In this paper, we emphasize that institutional similarity between destination and home countries can be a significant determinant of firm-product level export dynamics when firms produce multiple products and can choose which products to export across destinations. Lastly, our work sheds light on the design of export-promoting policies in developing countries, which aim to stimulate export structure upgrade and exports diversification.

Endnotes

[1] See Nunn and Trefler (2014) for a comprehensive review.

[2] Among firms in the upper 25% of the TFP distribution in 2006, 93% exported at least two, 82% exported at least three, and 58% exported at least ten different HS6 products.

[3] Total sales are deflated by 4-digit industry specific output deflators, wages by 4-digit input deflators, and capital stock is deflated by the capital stock deflator using Brandt et al. (2012).

[4] We cleaned the raw data following Brandt et al. (2012). We also excluded the tobacco industry as it is highly regulated with severe distortions in its market structure. Domestic currency values are converted to the USD using average exchange rates. More details on the sample are provided in the online Appendix.

[5] The processing trade consists of "purely assembly" and "import-and-assembly" type trade flows. To identify firms' trade regimes we adopt the following criteria: if the average share of ordinary sales for a firm-country-year observation over all years is greater than 90%, then the firm is classified as an ordinary trade regime. We experimented with different cut-off points in the robustness section.

[6] In our benchmark estimation, we use PPP-adjusted GDP measure of PRODY from 1999-2001. In the robustness section, we also employ a time varying PRODY index.

[7] Notice that the weighting method is a variant of the Balassa's RCA index and adds up to 1.

[8] For a similar application of this index, see Harding and Javorcik (2012), Jarreau and Poncet (2012), Zhu and Fu (2013), and Eck and Huber (2017).

[9] The institutional similarity variable is normalized with a standard deviation of one.

[10] The simple correlation coefficient of the WGI index with the ICRG is 0.95 and with the Polity IV is 0.56. Details on the factor analysis are available in the online Appendix.

[11] We find that depreciations, lower volatility and higher tariffs have a positive effect on export sophistication.

[12] The ownership categories are provided by the customs data.

[13] In the Appendix, we also experimented with a gap dummy equaling one if the destination country has 0.5 or one standard deviation better institutions.

References

Aeberhardt, R., Buono, I., Fadinger, H., 2014. Learning, Incomplete Contracts and Export Dynamics: Theory and Evidence from French Firms. *European Economic Review* 68, 219–249.

Aleksynska, M., Havrylchyk, O., 2013. FDI from the South: The Role of Institutional Distance and Natural Resources. *European Journal of Political Economy* 29, 38–53.

Amiti, M., Freund, C., 2010. The Anatomy of China's Export Growth, in: China's Growing Role in World Trade. In R.C. Feenstra and S-J. Wei (Eds.) "China's Growing Role in World Trade" (pp. 35–56) University of Chicago Press: Chicago.

An, G., Iyigun, M.F., 2004. The Export Technology Content, Learning by Doing and Specialization in Foreign Trade. *Journal of International Economics* 64, 465–483.

Anderson, J.E., Marcouiller, D., 2002. Insecurity and the Pattern of Trade: An Empirical Investigation. *The Review of Economics and Statistics* 84, 342–352.

Araujo, L., Mion, G., Ornelas, E., 2016. Institutions and Export Dynamics. *Journal of International Economics* 98, 2–20.

Bastos, P., Silva, J., 2010. The Quality of A Firm's Exports: Where You Export to Matters. *Journal of International Economics* 82, 99–111.

Belloc, M., 2006. Institutions and International Trade: A Reconsideration of Comparative Advantage. *Journal of Economic Surveys* 20, 3–26.

Berman, N., Martin, P., Mayer, T., 2012. How Do Different Exporters React to Exchange Rate Changes? *The Quarterly Journal of Economics* 127, 437–492.

Brandt, L., Thun, E., 2016. Constructing a Ladder for Growth: Policy, Markets, and Industrial Upgrading in China. *World Development* 80, 78–95.

Brandt, L., Van Biesebroeck, J., Zhang, Y., 2012. Creative Accounting or Creative Destruction? Firm-Level Productivity Growth in Chinese Manufacturing. *Journal of Development Economics* 97, 339–351.

Brucks, M., Zeithaml, V.A., Naylor, G., 2000. Price and Brand Name As Indicators of Quality Dimensions for Consumer Durables. *Journal of the Academy of Marketing Science* 28, 359–374.

Chaney, T., 2014. The Network Structure of International Trade. *American Economic Review* 104, 3600–3634.

Dai, M., Maitra, M., Yu, M., 2016. Unexceptional Exporter Performance in China? The Role of Processing Trade. *Journal of Development Economics* 121, 177–189.

Eck, K., Huber, S., 2016. Product Sophistication and Spillovers from Foreign Direct Investment. *Canadian Journal of Economics* 49, 1658–1684.

Fang, Y., Gu, G., Li, H., 2015. The Impact of Financial Development on the Upgrading of China's Export Technical Sophistication. *International Economic Policy* 12, 257–280.

Feenstra, R.C., Wei, S.-J. (Eds.), 2010. China's Growing Role in World Trade, National Bureau of Economic Research conference report. University of Chicago Press, Chicago.

Feenstra, R.C., Hong, C., Ma, H., Spencer, B.J., 2013. Contractual Versus Non-Contractual Trade: The Role of Institutions in China. *Journal of Economic Behavior & Organization* 94, 281–294.

Felipe, J., Kumar, U., Usui, N., Abdon, A., 2013. Why Has China Succeeded? And Why It Will Continue To Do So. *Cambridge Journal of Economics* 37, 791–818.

Fernandes, A.M., Freund, C., Pierola, M.D., 2016. Exporter Behavior, Country Size and Stage of Development: Evidence from the Exporter Dynamics Database. *Journal of Development Economics* 119, 121–137.

Hallak, J.C., 2010. A Product-Quality View of the Linder Hypothesis. *The Review of Economics and Statistics* 92, 453–466.

Harding, T., Javorcik, B.S., 2012. Foreign Direct Investment and Export Upgrading. *Review of Economics and Statistics* 94, 964–980.

Hausmann, R., Hwang, J., Rodrik, D., 2007. What You Export Matters. *Journal of Economic Growth* 12, 1–25.

Hidalgo, C.A., Hausmann, R., 2009. The Building Blocks of Economic Complexity. *PNAS* 106, 10570–10575.

Huber, S., 2017. Indicators of Product Sophistication and Factor Intensities: Measurement Matters. *Journal of Economic and Social Measurement* 42(1), 27-65.

Hummels, D., Klenow, P.J., 2005. The variety and quality of a nation's exports. *The American Economic Review* 95, 704–723.

Imbs, J., Wacziarg, R., 2003. Stages of diversification. *The American Economic Review* 93, 63–86.

Jarreau, J., Poncet, S., 2012. Export Sophistication and Economic Growth: Evidence from China. *Journal of Development Economics* 97, 281–292.

Kaldor, N., 1966. Causes of the Slow Rate of Economic Growth of the United Kingdom: An Inaugural Lecture. *Cambridge University Press.*

Kogut, B., Singh, H., 1988. The Effect of National Culture on the Choice of Entry Mode. *Journal of International Business Studies* 19, 411–432.

Krugman, P.R., 1997. Development, Geography, and Economic Theory. *MIT press.*

Lall, S., 2000. The Technological Structure and Performance of Developing Country Manufactured Exports, 1985-98. *Oxford Development Studies* 28, 337–369.

Lall, S., Weiss, J., Zhang, J., 2006. The "Sophistication" of Exports: A New Trade Measure. W*orld Development* 34 (2), 222–237.

Lemoine, F., Ünal-Kesenci, D., 2004. Assembly Trade and Technology Transfer: The Case of China. *World Development* 32, 829–850.

Leontief, W., 1963. The Structure of Development. *Scientific American* 209, 148–167.

Levchenko, A.A., 2007. Institutional Quality and International Trade. *Review of Economic Studies.* 74(3), 791–819.

Levinsohn, J., Petrin, A., 2003. Estimating Production Functions Using Inputs to Control for Unobservables. *Review of Economics Studies* 70, 317–341.

Lewis, H., Trefler, D., 2002. Increasing Returns and All That: a View from Trade. *The American Economic Review* 92, 93–119.

Manova, K., Zhang, Z., 2012. Export Prices Across Firms and Destinations. *The Quarterly Journal of Economics* 127, 379–436.

Melitz, M.J., Ottaviano, G.I., 2008. Market Size, Trade, and Productivity. *The Review of Economic Studies* 75, 295–316.

Michaely, M., 1984. Trade, Income Levels, and Dependence. *Studies in International Economics* Vol. 8, Amsterdam: Elsevier.

Nunn, N., Trefler, D., 2014. Domestic Institutions as a Source of Comparative Advantage, in: *Handbook of International Economics*. Elsevier, pp. 263–315.

Olley, G.S., Pakes, A., 1996. The Dynamics of Productivity in the Telecommunications Equipment Industry. *Econometrica* 64, 1263–1297.

Poncet, S., Waldemar, F.S. de, 2013. Export Upgrading and Growth: The Prerequisite of Domestic Embeddedness. *World Development* 51, 104–118.

Regolo, J., 2013. Export Diversification: How Much Does the Choice of the Trading Partner Matter? *Journal of International Economics* 91, 329–342.

Rodrik, D., 2006. What's So Special about China's Exports? *China & World Economy* 14, 1–19.

Romer, P.M., 1990. Endogenous Technological Change. *Journal of Political Economy* 98, S71–S102.

Saadi, M., 2014. Does Foreign Direct Investment Increase Exports' Productivity? Evidence from Developing and Emerging Countries. *International Review of Applied Economics* 28, 482–506.

Schott, P.K., 2008. The Relative Sophistication of Chinese Exports. *Economic Policy* 23, 6–49.

Sheng, L., Yang, D.T., 2016. Expanding Export Variety: The Role of Institutional Reforms in Developing Countries. *Journal of Development Economics* 118, 45–58.

Weldemicael, E., 2014. Technology, Trade Costs and Export Sophistication. *World Economy* 37, 14–41.

Xu, B., Lu, J., 2009. Foreign Direct Investment, Processing Trade, and the Sophistication of China's Exports. *China Economic Review* 20, 425–439.

Yu, C., Hu, X., 2015. Sophistication of China's Manufactured Exports and Determinants. *Transnational Corporations Review* 7, 169–189.

Zhu, S., Fu, X., 2013. Drivers of Export Upgrading. *World Development* 51, 221–233.

Table 1: Summary Statistics

Variable	Obs	Mean	Std.	Min	Max
(log) Skill	1,055,324	9.40	0.45	-0.82	10.44
InstSim	1,050,350	-0.58	1.16	-2.52	1.29
TFP	867,259	0.32	0.82	-1.44	2.87
(log) RGDP	1,022,551	12.66	1.91	3.96	16.37
(log) Distance	1,050,906	8.80	0.64	6.70	9.87
Contingent	1,050,906	0.07	0.25	0	1
Language	1,050,906	0.05	0.21	0	1
Same Country	1,050,906	0.04	0.19	0	1
Colony	1,050,906	0.00	0.03	0	1
Legal	1,050,906	0.09	0.29	0	1
WTO	1,050,906	0.91	0.28	0	1
PTA	1,055,385	0.14	0.34	0	1
(log) Output	1,055,385	-1.68	1.32	-9.02	9.25
(log) Age	1,044,483	2.02	0.72	0	4.04
(log) Wage	1,054,617	2.54	0.59	-5.20	8.75
(log) Capital Intensity	1,055,385	3.43	1.32	-6.13	9.75
Openness	1,055,385	0.86	15.64	0.00	1625.86
Remoteness	1,055,318	8.82	0.44	3.70	9.87
(log) Export Value	1,055,385	10.62	2.05	-0.03	19.94
(log) Number of Products	1,055,385	0.44	0.65	0	5.65
Export Skewness	1,055,385	0.86	0.23	0.02	1
Experience	1,055,385	1.63	1.29	0	4.87

Notes: *Skill* is skill intensity at firm-destination-year level. *InstSim* is the institutional similarity between China and destination countries using the WGI database. *TFP* is the total factor productivity estimated by the Olley and Pakes (1996) method. *RGDP* is the real GDP (in constant 2005 dollars). *Distance* is the geographical distance in km. *Contingent*, *Language*, *Same country*, *Colony*, and *Legal* are dummy variables equaling one if destination country has a common border, shares a common official language, was ever the same country, has a past colonial relationship, or shares a common legal origin with China. *WTO* and *PTA* are WTO membership and PTA dummies. *Output*, *Age*, *Wage* and *Capital-intensity* are firm level total sales, age, average wage bill and capital-intensity (i.e., total fix asset divided by total employment). *Openness* is the share of total exports in total output;

Remoteness is the trade-weighted average of geographical distance of all trade partners; *Export value* is real total export value of a firm in USD; *Number of Products* is the number of 8-digit products exported to a destination; *Export Skewness* is the skewness of exports to a given destination in a given year; *Experience* is the total number of previous destinations that share a common border or same language, or belong to the same continent and income group with the current destination.

Table 2: Number of Exporters, Destinations, Products, and Destination-Product Pairs by Year

Year	# of Exporters	# of Destinations	# of HS6 Products	# of Destination-Product Pairs
2000	8,179	188	3,641	41,909
2001	10,237	192	3,787	52,507
2002	13,001	194	4,075	68,663
2003	16,508	193	4,133	79,781
2004	26,371	198	4,326	106,403
2005	28,403	198	4,311	118,922
2006	33,730	199	4,404	133,435

Notes: # *of exporters* refers to the number of exporters, # *of destinations* are the number of destinations firms export to, # *of HS6 Products* is the number of 6-digit (HS) products exported, and # *of destination-product-pairs* is the number of distinct destination and product pairs. The sample is based on those observations used in the regression analysis.

Table 3: Average Number of Products, Markets and Market-Product Pairs

	Average per firm			Median per firm		
Year	Number of products	Number of markets	Number of market-product pairs	Number of products	Number of markets	Number of market-product pairs
2000	5.0	5.4	11.6	2	3	4
2001	5.0	6.1	12.7	2	3	5
2002	5.7	7.0	15.1	3	4	6
2003	5.5	7.4	15.2	3	4	7
2004	5.5	7.7	16.0	3	4	7
2005	5.9	8.5	18.1	3	5	8
2006	5.8	8.6	18.3	3	5	8

Notes: The number of products, markets and market-product pairs refer to average and median values per firm for each given year. The sample is based on those observations used in the regression analysis.

Table 4: Share of firms by number of products exported - ordinary trade firms

Number of products/ destinations	Products				Destinations			
	2000		2006		2000		2006	
	% of firms	% of value	% of firms	% of value	% of firms	% of value	% of firms	% of value
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	33.37%	11.89%	24.18%	10.08%	32.45%	9.82%	19.16%	4.86%
2	19.18%	11.04%	17.07%	9.91%	16.80%	7.89%	12.74%	4.65%
3	11.41%	9.21%	12.40%	8.94%	9.96%	8.02%	9.17%	4.35%
4	8.15%	8.51%	8.98%	7.69%	7.18%	5.73%	7.19%	4.17%
5	5.41%	5.75%	6.70%	6.34%	5.17%	4.63%	5.80%	3.52%
6	3.86%	4.16%	5.03%	5.57%	3.58%	3.45%	4.91%	3.67%
7	2.90%	5.84%	4.00%	4.55%	2.92%	3.27%	4.13%	3.37%
8	2.39%	3.50%	3.29%	3.82%	2.75%	4.08%	3.36%	2.80%
9	2.17%	3.52%	2.49%	2.95%	2.07%	3.84%	3.25%	3.17%
10	1.48%	3.16%	2.06%	2.66%	2.03%	3.45%	2.83%	2.93%
>10	9.69%	33.42%	13.79%	37.49%	15.08%	45.82%	27.45%	62.51%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Notes: In columns (1) and (3), % of firms refers to the percentage shares of firms that export a certain number of products in a given year. In columns (2) and (4), *% of value* refers to the percentage share of firms that export a certain number of products in total export values in 2000 and 2006. In columns (5) and (7), *% of firms* refer to the percentage share of firms that export to a given number of destinations in 2000 and 2006. In columns (6) and (8), the *% of value* refers to the percentage share of firms that export to a certain number of destinations in total export values. *Number of products* counts the total number of products exported by a firm to all destinations in a given year. *Number of destinations* counts the total number of destinations exported by a firm in a given year.

Table 5: Institutional similarity and Export Sophistication

	(1)	(2)	(3)
$InstSim_{jt}$	0.002***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)
$InstSim_{jt}$ *TFP_{it}		-0.001***	-0.001***
		(0.000)	(0.000)
TFP_{it}			-0.002
			(0.002)
$RGDP_{jt}$	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)
$Distance_{jt}$	-0.001**	-0.001**	-0.001**
	(0.001)	(0.001)	(0.001)
$Border_j$	0.004***	0.003**	0.003***
	(0.001)	(0.001)	(0.001)
$Language_j$	0.001	0.001	0.000
	(0.001)	(0.001)	(0.001)
$Same\ Country_j$	-0.008***	-0.009***	-0.009***
	(0.002)	(0.002)	(0.002)
$Colony_j$	0.043***	0.039***	0.034***
	(0.011)	(0.012)	(0.012)
$Legal_j$	0.002**	0.002**	0.003***
	(0.001)	(0.001)	(0.001)
WTO_{jt}	0.002*	-0.001	0.000
	(0.001)	(0.001)	(0.001)
PTA_{jt}	0.007***	0.008***	0.007***
	(0.001)	(0.001)	(0.001)
$Output_{it}$			-0.001
			(0.001)
Age_{it}			-0.005***
			(0.002)
$Wage_{it}$			-0.002
			(0.001)
$Capital_{it}$			-0.001
			(0.001)
Constant	9.389***	9.379***	9.435***
	(0.006)	(0.006)	(0.026)
Industry FE	Yes	Yes	Yes
Firm FE	No	No	Yes
Year FE	No	No	Yes
Firm-year FE	Yes	Yes	No
R-Sq (Adj)	0.837	0.841	0.828
N	1,022,449	839,798	831,415

Notes: *, **, and *** refer to significance at 10%, 5% and 1% levels. Standard errors in parenthesis are clustered at firm-year level. *Industry FE*, *Firm FE*, *Year FE*, and *Firm-year FE* refer to industry, firm, year, and firm-year fixed effects. *Rsq (Adj)* is adjusted R-squared and *N* is number of observations. For other variable definitions, refer to Table 1.

Table 6: Economic Significance of Institutional Similarity and Productivity Effects

Percentile of TFP Distribution	Increase of Destination Institutional Similarity By		
	One Standard Deviation	75th to 25th percentile	90th to 10th percentile
5%	0.43%	0.61%	1.10%
10%	0.40%	0.57%	1.02%
25%	0.37%	0.51%	0.92%
mean	0.30%	0.42%	0.76%
75%	0.24%	0.34%	0.61%
90%	0.17%	0.24%	0.43%
95%	0.13%	0.18%	0.32%

Notes: The 5^{th}, 10^{th}, 25^{th}, 50^{th}, 75^{th}, 90^{th}, and 95^{th} percentiles of TFP distribution are -1.344, -1.041, -0.654, -0.174, -0.578, 1.308, 1.728. One standard deviation of institutional similarity is 1. 10^{th}, 25^{th}, 75^{th} and 90^{th} percentiles of institutional similarity are -1.563, -0.597, 0.832 and 1.098. All values are from the raw manufacturing dataset without applying any restrictions as in the merged final dataset.

Table 7: Alternative Measures of Export Sophistication

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	PRODY2	PRODY3	PRODY4	PRODY5	Michaely1	Michaely2	Lall1	Lall2
InstSim	0.003***	0.003***	0.003***	0.002***	0.002***	0.005***	0.001***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
*InstSim*TFP*	-0.001***	-0.001***	-0.001***	-0.001***	-0.000	-0.001	-0.000	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Constant	9.766***	9.771***	9.735***	9.748***	10.089***	-15.258***	3.590***	0.398***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.004)	(0.015)	(0.005)	(0.006)
Gravity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sq (Adj)	0.789	0.796	0.790	0.803	0.838	0.750	0.897	0.877
N	839,798	839,798	839,798	839,798	839,798	733,543	839,798	839,852

Notes: Columns (1)-(4) refer to different methods of calculating export sophistication based on the PRODY index as described in the text. Columns (6)-(7) are based on the Michaely index. Columns (7) and (8) refer to the Lall et al. (2006) and Lall (2000) methods of measuring export sophistication, respectively. *Gravity* refers to the same set of country level control variables as in Table 5. For other variable definitions refer to Tables 1 and 5.

Table 8: Alternative Measures of Institutional Similarity

	(1)	(2)	(3)	(4)
	ICRG	Polity IV	Factor Variable	Kogut-Singh
InstSim	0.003***	0.001**	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
*InstSim*TFP*	-0.002***	-0.001**	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	9.382***	9.387***	9.383***	9.381***
	(0.006)	(0.006)	(0.006)	(0.006)
Gravity	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Firm-year FE	Yes	Yes	Yes	Yes
R-sq (Adj)	0.842	0.842	0.841	0.841
N	825,728	833,894	839,798	839,798

Notes: *ICRG* is the International Country Risk Guide composite political risk index, *Polity IV* Polity IV index, *Factor Variable* is the factor analysis of the WGI index's six sub component *Kogut-Singh* is the Kogut and Singh index using the six subcomponents of the WGI index. For variable definitions, refer to Tables 1, 5 and 6.

Table 9: Effects of ownership structure

	(1)	(2)
$InstSim_{it}$	0.007***	0.006***
	(0.001)	(0.001)
$InstSim_{it}$ *TFP_{it}	-0.001***	-0.001***
	(0.000)	(0.000)
TFP_{it}		-0.002
		(0.002)
$InstSim_{it}$* $Domestic_{it}$	-0.005***	-0.003**
	(0.001)	(0.001)
$InstSim_{it}$* $Foreign_{it}$	-0.005***	-0.004***
	(0.001)	(0.001)
$InstSim_{it}$* $Joint_{it}$	-0.005***	-0.004***
	(0.001)	(0.001)
$Domestic_{it}$		0.037***
		(0.012)
$Foreign_{it}$		0.026*
		(0.014)
$Joint_{it}$		0.024*
		(0.014)
Constant	9.379***	9.409***
	(0.006)	(0.028)
Industry FE	Yes	Yes
Firm FE	No	Yes
Year FE	No	Yes
Firm-year FE	Yes	No
Gravity	Yes	Yes
Firm-Year Controls	No	Yes
R-sq (Adj)	0.842	0.828
N	830,176	822,051

Notes: *, **, and *** refer to significance at 10%, 5% and 1% levels. Standard errors in parenthesis are clustered at firm-year level. Country-year controls and firm-year controls are added but not reported. *Domestic*, *Foreign* and *Joint* refer to dummy variables for domestic private firms, foreign firms, and joint ventures. SOE is the omitted category dummy. *Gravity* is the same set of Gravity control variables as in Table 5. Firm-year controls are firm specific and time variant control variables as in column (3) of Table 5. For other variable definitions, refer to Tables 1 and 5.

Table 10: Regression results with heterogeneity of firm-year specific export characteristics

	Export Openness		Export Remoteness		Number of Products		Export Skewness	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$InstSim_{jt}$	0.002***	0.003***	0.040***	0.038***	0.002***	0.002***	0.002***	0.002***
	(0.0004)	(0.0003)	(0.007)	(0.007)	(0.0004)	(0.0003)	(0.0004)	(0.0003)
$InstSim_{jt}$ *TFP_{it}	-0.001***	-0.001***	-0.001***	-0.001***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.0004)	(0.0003)	(0.0004)	(0.0003)	(0.0004)	(0.0003)	(0.0004)	(0.0003)
TFP_{it}		-0.002		-0.002		-0.002		-0.002
		(0.002)		(0.002)		(0.002)		(0.002)
$InstSim_{jt}$ *$Openness_{it}$	0.0004***	0.0004***						
	(0.0002)	(0.0001)						
$Openness_{it}$		0.001***						
		(0.0003)						
$InstSim_{jt}$ *$Remote_{it}$			-0.004***	-0.004***				
			(0.001)	(0.001)				
$Remote_{it}$				-0.003				
				(0.002)				
$InstSim_{jt}$ *$Product_{ijt}$					0.004***	0.003***		
					(0.001)	(0.0004)		
$Product_{ijt}$					0.013***	0.013***		
					(0.001)	(0.001)		
$InstSim_{jt}$ *$Skew_{ijt}$							-0.007***	-0.006***
							(0.001)	(0.001)
$Skew_{ijt}$							-0.029***	-0.030***
							(0.001)	(0.001)
Constant	9.380***	9.434***	9.377***	9.457***	9.376***	9.432***	9.376***	9.433***
	(0.006)	(0.026)	(0.006)	(0.031)	(0.006)	(0.027)	(0.006)	(0.026)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
Firm-year FE	Yes	No	Yes	No	Yes	No	Yes	No
Gravity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-year controls	No	Yes	No	Yes	No	Yes	No	Yes
R-sq (adj)	0.841	0.828	0.841	0.828	0.841	0.828	0.842	0.828
N	839,798	831,415	839,754	831,371	839,798	831,415	839,798	831,415

Notes: *, **, and *** refer to significance at 10%, 5% and 1% levels. Standard errors in parenthesis are clustered at firm-year level. Country-year controls and firm-year controls are added but not reported. *Openness* is exporter openness, *Remote* is export remoteness, *Product* is (log) number of firm-year-destination specific exported products, and *Skew* is firm-year-destination specific export skewness measured by HHI index of exports. For other variable definitions, refer to Table 1 and 5.

Table 11: Test of asymmetric effects of institutional similarity

	(1)	(2)	(3)
$InstSim_{it}$	0.005***	0.005***	0.006***
	(0.001)	(0.001)	(0.001)
$InstSim_{it} * D_{it}$	-0.003***	-0.003***	-0.003***
	(0.001)	(0.001)	(0.001)
$InstSim_{it} * TFP_{it}$		-0.001***	-0.001***
		(0.000)	(0.000)
TFP_{it}			-0.002
			(0.002)
Constant	9.388***	9.378***	9.434***
	(0.006)	(0.006)	(0.026)
Industry FE	Yes	Yes	Yes
Firm FE	No	No	Yes
Year FE	No	No	Yes
Firm-year FE	Yes	Yes	No
Gravity	Yes	Yes	Yes
Firm-year controls	No	No	Yes
R-sq (Adj)	0.837	0.841	0.828
N	1,022,449	839,798	831,415

Notes: *, **, and *** refer to significance at 10%, 5% and 1% levels. Standard errors in parenthesis are clustered at firm-year level. Controls variables are added but not reported. Positive institutional gap dummy takes value of 1 if the destination institutional quality is better than that of China. For other variable definitions, refer to Table 1 and 5.