Institutional Similarity, Firm Heterogeneity and Export Sophistication[1]

Firat Demir[2]

University of Oklahoma

Department of Economics

436 CCD1, 308 Cate Center Drive

Norman, Oklahoma, USA 73019

E-mail: fdemir@ou.edu

Chenghao Hu

Department of Economics

San Francisco State University

1600 Holloway Avenue, Business Building

San Francisco, CA 94132

E-mail: chhu@ucdavis.edu

[1] Acknowledgments: We thank Mustafa Caglayan, Amitava Dutt, Lourenco Paz, Jaime Ros, Katheryn Russ, Deborah L. Swenson, Roberto Veneziani, and the seminar participants at ASSA 2017 meeting in Chicago, SEA 2017 conference in Tampa, and EEA 2019 meeting in New York City for their comments and suggestions on earlier versions of this paper. We also thank Jiandong Ju for sharing the data. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. All remaining errors and omissions are ours.

[2] Corresponding author.

Institutional Similarity, Firm Heterogeneity and Export Sophistication

Abstract

What explains changes in export sophistication across firms and destinations? This paper studies the effects of institutional similarity and firm heterogeneity on export sophistication using detailed firm level data from China and establishes eight stylized facts. First, firms export more sophisticated products to destinations with more similar institutions. Second, the positive effect of institutional similarity is weaker for higher productivity firms. Third, while exports of private, foreign, and joint-venture firms are more sophisticated, they are less sensitive to institutional similarity than public firms. Fourth, export-oriented firms export more sophisticated products and are more sensitive to institutional similarity. Fifth, while physical distance to export markets does not affect export sophistication, firms that export to further destinations are less sensitive to institutional similarity. Sixth, although multiproduct firms and firms with lower export skewness export more sophisticated products, they are more sensitive to institutional similarity. Seventh, the effect of institutional similarity is asymmetric and is less important when exporting to countries with better institutions. Eight, firms that are more dependent on contract enforcement export more sophisticated products, and more so to markets with similar 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 across firms and destinations? This question has been a central topic in new trade theory as well as in development economics, and the attention is well deserved. Increasing product sophistication through technology-and-skills upgrading and improving the quality and diversity of exports are recognized as major steps towards long run development and growth (Kaldor, 1966; Romer, 1990; Krugman, 1997; Imbs and Wacziarg, 2003; An and Iyigun, 2004; Hummels and Klenow, 2005; Rodrik, 2006; Hausmann et al., 2007; Amiti and Freund, 2010; Jarreau and Poncet, 2012). However, despite this large body of research, we know little about the main drivers of export sophistication at the micro level. In this paper we contribute to this literature by exploring two possible external and internal determinants of export sophistication. First, we examine the effect of institutional similarity between home and destination markets on the sophistication level of exported goods. Second, we study the role of firm heterogeneity (in productivity, ownership structure, export orientation, product diversity, market distance, and contract enforcement dependence) and its interaction with institutional similarity.

Existing research on the determinants of export sophistication highlights the importance of trade regimes (Amiti and Freund, 2010), FDI (Greenaway and Kneller, 2007; Jarreau and Poncet, 2012), 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, which has experienced a major upgrading in its export sophistication since the 1990s (Rodrik, 2006; Hausmann et al., 2007). Accordingly, FDI (Xu and Lu, 2009), processing trade and 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 shown to be major drivers of exports upgrading in

China. However, no research has yet examined the effect of institutional similarity on export sophistication in a heterogeneous firm setting.

Why does institutional similarity affect export sophistication? While the literature offers several possible transmission channels, most attention is focused on the level effects. Particularly, institutional development is shown to be a major source of comparative advantage. Weak destination institutions, for example, increase entry costs, market uncertainty and information frictions, 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, institutional development is shown to affect the complexity of production processes, directing countries to specialize in more institutionally dependent and higher value added sectors (Levchenko, 2007; Feenstra et al., 2013).[1]

What we propose in this paper is that, in addition to level effects, institutional similarities and differences also affect exporter behavior through demand and supply side channels. On the supply side, introduction of high-end products requires more sophisticated distribution channels, which are more demanding on the familiarity of destination institutions (Araujo et al., 2014). Institutional similarities also help facilitate higher exporter entry, growth and survival by lowering entry and operational costs and increasing market familiarity. Countries with similar institutional development are also likely to have similar regulatory environments, including patents, regulatory consumer and safety standards, transparency, financial and accounting codes, and contract enforcement, which can facilitate bilateral trade, especially in more sophisticated goods.[2]

The institutional entry barriers for automobile exports, which are classified as high-skill goods goods, for example, are higher in developed country markets than in developing ones.

Therefore, institutional similarity can be a source of comparative advantage. Developing country exporters, for example, are shown to have a comparative advantage in markets with weak institutions as they are more experienced in such business environments thanks to their own experiences at home (Aleksynska and Havrylchyk, 2013). Familiarity with destination institutions can also encourage the sale of higher-skill products, which require more complex interactions with regulatory authorities and rely on more relationship-specific distribution channels. For example, Chinese Huawei brand smart phones are widely sold in developing countries across Africa, Middle East and South East Asia with similar institutional development to that of China. In fact, Huawei ranks number two in global smartphone market with a 16% share in 2018, surpassing Apple, and is one of the fastest growing companies in developing countries. And yet Huawei is not even in the top ten list in the US, and has a marginal market share of 0.4%. Huawei also faces major institutional barriers in the US and Western Europe as it faces opposition from lawmakers and judiciary over security risks and for alleged copyright violations. Likewise, because of such supply side factors, developing countries such as China, India, Iran or Russia enjoy high levels of automobile exports to other countries at similar levels of institutional development. Brand names such as Lada (Russia), Geely (China), Samand (Iran), or Tata (India) are well recognized in developing country markets but not in advanced economies. In fact, over 80% of Iranian, Russian and Indian car exports were to developing countries in 2017. The same is true for China once we exclude Western manufacturers (Observatory of Economic Complexity, 2019).

On the demand side, the Linder hypothesis suggests that countries with similar preferences are more likely to trade each other (Hallak, 2010; Regolo, 2013). Institutional similarities, which also reflect societal and cultural affinity, as argued by Hofstede (2001), affect consumer preferences. Such similarities also help increase consumer awareness, brand recognition, consumption habits, and lower any perceived quality biases (Brucks et al., 2000, Liu et al., 2018). For example, more

sophisticated products from developing countries such as automobiles, tablet PCs or smart phones are usually sold at a discount in developed country markets despite a lack of evidence on their quality inferiority (Brandt and Thun, 2016). Therefore, more sophisticated products might be subject to lower perceived quality biases and higher brand recognition between countries with more similar institutional development, allowing them easier market access. Different product characteristics in low versus high institutional environments might also affect consumer demand. Cars without air conditioning or airbags, such as many Russian cars, for example, would not have much success in the US market but could be quite successful in markets with less institutional development, if consumer preferences were similar (Copeland and Kotwal, 1996). Similar demand side factors could be at play, for example, for Huawei cellphones as well.

Turning to sources of firm heterogeneity, productivity is an important determinant of exporter performance in various dimensions. Particularly, higher productivity firms are found to have higher product variety, quality and market diversification (Bastos and Silva, 2010; Crino and Epifani, 2012; 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), and are found to export more to high-income destinations (Crino and Epifani, 2012). High productivity firms are also found to adjust the quality of exported goods across different destinations by varying the quality of inputs (Manova and Zhang, 2012). Surprisingly, however, we know little about how firm heterogeneity affects exporters' reactions to institutional differences. We might expect more productive firms to be less sensitive to institutional differences as they have more know-how, and managerial, distributive and productive capabilities. Furthermore, because high productivity firms are likely trade with more partners within and across different destinations, they might be less sensitive to institutional differences (Aeberhardt et al., 2014; Chaney, 2014; Araujo et al., 2016). Even fixed export costs,

such as those caused by institutional barriers, can be less important for high productivity firms as they can substitute improving productivity for higher fixed costs (Castro et al., 2016).

Or, conversely, more productive firms, especially those from well-developed institutional markets, might actually be more sensitive to institutional differences and perform better in markets with more similar and well-functioning institutions. Particularly, because more productive firms rely on higher quality and more differentiated inputs, they are more dependent on external institutions such as contract enforcement or intellectual property rights (Nunn, 2007; Manova and Zhang, 2012; Feenstra et al., 2013). Therefore, they might decide to export higher skill products to countries with more developed and familiar institutions, and export lower skill products to others. However, higher productivity firms from developing countries might still be less sensitivity to institutional differences when exporting to developed country markets with better institutions. Borrowing from the corruption literature, another possibility is that high productivity firms from countries with less developed institutions might enjoy a privileged status in their home countries through economic and political connections and have easier access to government bureaucracy and judiciary, allowing them to avoid regulatory hurdles. If this were the case, these firms might find it harder to operate in markets with better institutional development as they will not have the same advantages. However, they are very likely to enjoy similar privileges in other countries at similar levels of institutional development, allowing them to export more sophisticated products without facing the scrutiny they would be subjected to in high institutional markets.

Building on these possible theoretical channels and using a detailed manufacturing survey and customs data on Chinese firms, this paper establishes eight novel stylized facts on the relationship between export sophistication, institutional similarity and firm heterogeneity. First, we find that firms export more sophisticated products to countries with more similar institutions. Second, this effect is significantly less important for higher productivity firms. Third, exports of

private, foreign, and joint-venture firms are more sophisticated, and are less sensitive to institutional similarity. Fourth, while more export-oriented firms export more sophisticated products, they are also more sensitive to institutional similarity. Fifth, while physical distance to export markets does not appear to affect export sophistication, firms that export to further destinations are found to be less sensitive to institutional similarity. Sixth, although multiproduct firms and firms with lower export skewness export more sophisticated products, they are more sensitive to institutional similarity. Seventh, the effect of institutional similarity is asymmetric and is less important when exporting to countries with better institutions. Eight, firms that are more dependent on contract enforcement export more sophisticated products, and more so to markets with similar institutions.

We confirm that these results are robust to a rich battery of sensitivity tests, including measurement of export sophistication, total factor productivity and institutional similarity. Furthermore, we confirm that these findings are not driven by income similarity, or other observable and unobservable firm and destination specific and time-variant factors. We propose that the empirical patterns we uncover here should be incorporated in theoretical models of bilateral trade.

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, followed by the robustness analysis. 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):

$$\ln(Skill_{ijt}) = \beta_0 + \beta_1 InstSim_j + \beta_2 InstSim_j * TFP_{it} + \beta_3 X_{jt} + \delta_{it} + \delta_s + \varepsilon_{ijt} \quad (1)$$

where $ln(Skill_{ijt})$ 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 home because of familiarity, lower entry barriers and smaller sunk costs.

Our second main variable of interest is TFP_{it}, 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.[3]

X_{jt} is a set of gravity controls, which are shown to affect export skill intensity, including the following (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*); binary dummy variables equaling 1 if i and j share a common language (*Language*), or a common border (*Border*). Previous economic and political ties are captured by dummy 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*). These

variables capture part of the familiarity effect from the *InstSim* variable and therefore may cause a downward bias on β_1.

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 age, size, capital intensity, etc.) and unobservable (such as management quality) time-variant and firm specific determinants of export sophistication. While demanding on the data, these fixed effects allow us to explore the within firm-year variation across destinations. 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 as they are all washed out. For robustness, in Eq. (2) we repeat a modified version of Eq. (1) by replacing the firm-year fixed effects with a set of observable and time-variant firm specific controls, including (log) 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 based on the perpetual inventory method divided by the total number of employees, *Capital*).[4] Additionally, we include firm and year fixed effects to control for time-invariant and firm-specific factors as well as firm-invariant shocks that affect all firms symmetrically.

$$\ln(Skill_{ijt}) = \beta_0 + \beta_1 InstSim_j + \beta_2 InstSim_j * TFP_{it} + \beta_3 TFP_{it} + \beta_4 X_{jt} + \beta_5 X_{it} + \delta_i + \delta_t + \delta_s + \varepsilon_{ijt} \quad (2)$$

Where δ_i and δ_t are firm and year fixed effects, respectively. X_{it} is firm-year controls, and includes firm age, size, real wage per worker, capital intensity and TFP. The error term in both equation (1) and (2), ϵ_{ijt}, includes all other idiosyncratic influences on export sophistication. The robust standard errors here and in the rest of the paper are clustered at the firm-year level. .

Lastly, to rule out any other time-variant country-specific factors that may be correlated with destination country institutions, causing omitted variable bias, we introduce country-year fixed

effects for destination country *j*. However, inclusion of this variable causes destination country and year specific variables, including *InstSim*, to drop. Thus, in that case we focus only on the interactive term of destination institutions and firm TFP.

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.[5] Firm level characteristics such as employment, capital stock, ownership (i.e. foreign, state owned, domestic private), 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, trade regime (i.e. processing vs. non-processing trade), 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 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.[6] Compared to processing firms,

ordinary firms have more freedom over their exporting decisions regarding what, where and when to export, and have more control over the skill intensity of their exports. 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. $PRODY_k$ 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.[7] 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 of each country in good k.[8] Thus, it allows a ranking of products by their technological intensity, conditional on the income levels of exporters. A good is considered more (less) sophisticated if it is exported more intensively by high-income (low-income) countries.

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

$$Skill_{ijt} = \sum_k \frac{x_{ijkt}}{X_{ijt}} PRODY_k \tag{4}$$

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*.[9] We should also note that we examine eight other measures of product sophistication in the robustness section.

We measure institutional development using the World Governance Indicators (WGI) of the World Bank, which reports six dimensions of governance for 205 economies, including: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. Given the short time span of the sample as well as the slow-changing nature of institutional development, we use the simple average of these six indicators between 2000 and 2006, and normalize its mean to zero with a standard deviation of one. Next, we estimate the TFP (normalized with a mean of zero and variance of one) by the Olley-Pakes method, which is described fully in the 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. Finally, 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. 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, while less than 10% of firms exported more than ten products, 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. 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 rising share of firms have become multiproduct and multi-destination overtime, allowing us to explore the within firm variations across products and destinations.

<Insert Tables 3 & 4 here>

3. Empirical Results

Table 5 presents regression results from equations (1) and (2), showing the effects of institutional similarity and productivity on export sophistication. Column (1) shows the effects of institutional

similarity without the TFP interaction, 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 control for sectoral heterogeneity using two-digit industry fixed effects. The results suggest that institutional similarity, *InstSim*, has a positive and statistically significant effect (at 1% level) on export sophistication. That is Chinese firms find it easier to export more sophisticated products to countries that are institutionally more similar to China. 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 is decreasing in firm productivity. In other words, higher productivity firms are less sensitive to institutional similarity in their export sophistication. 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 have a wider network of supplier and destination choices. They are also more flexible in adjusting prices through markup rates, which make them less sensitive to institutional differences when deciding what to export.

<Insert Table 5 here>

To illustrate the economic significance of our findings, 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) using the benchmark estimates of column (2) in Table 5. We also repeat this exercise by moving from the lower 75^{th} (90^{th}) percentile to the 25^{th} (10^{th}) 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 percentiles

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 the 95th percentile, showing 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 firm exporting to an institutionally more similar country increases export sophistication by [0.18%-0.61%] depending on the TFP 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, across all three sets of regressions in Table 5 country-specific control variables appear with robust coefficient estimates and carry 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, legal origin or colonial tie have a positive and significant effect while previously being the same country yields a negative and significant effect. Common language has a positive but 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, we find the WTO membership variable to be mostly insignificant. In column (3), we observe that TFP, size, capital intensity, and human capital intensity have no observable effect on the choice of export sophistication, while firm age has a negative and significant effect implying that older firms tend to export products with a lower skill intensity.

4. Extensions

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

4.1 Ownership structure

Ownership structure can have significant effects on production and distribution decisions of firms. Foreign firms, for example, are more capital, technology and skill intensive, have better distribution networks, and are more integrated into the global supply chains (Greenaway and Kneller, 2007). They also have better know-how and are more experienced in dealing with different institutional settings than local firms. Therefore, we expect foreign firms and firms with joint-ventures to have a higher sophistication level of exports, and more importantly, to be less sensitive to institutional differences. To test these possibilities, we consider four different types of ownership, which are state-owned enterprises (SOE), privately owned domestic firms (*Domestic*), joint ventures (*Joint*), and foreign owned firms (*Foreign*).[10] 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 relies on firm ownership switching over time.

The results in Table 7 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 7 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, measured 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 domestic 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 expect to have a negative interaction term between institutional similarity and export openness. For export remoteness, previous literature shows that firms that 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 8 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. In the Appendix, we repeat the regression analysis of Table 8 by including country-year fixed effects and find almost identical results.

<Insert Table 8 here>

4.3 Role of firm-destination-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 are expected to 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) - (8) of Table 8. 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 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 Herfindahl-Hirschman Index (HHI) 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 allows firms to have more flexibility in choosing what to export.

4.4 Asymmetric effects of institutional similarity

What if the effects of institutional differences are not symmetric? Particularly, we might expect entry barriers to be higher for firms exporting to countries with worse rather than better institutions. For example, consider the following: Suppose a firm exports both to country A and B, and that

institutional development in China is between country A (lower) and B (higher) with an equal distance to both. In this case, we may expect the effect of *InstSim* to be stronger for firms exporting to country A than country B as they face relatively higher entry barriers in country A, making institutional differences more important. To test 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.[11] The results in Table 9 suggest that institutional similarity is significantly less important for firms exporting to an institutionally more developed destination. However, institutional similarity remains a significant determinant of export sophistication independent of the direction of institutional disparities. As before, full results are reported in the Appendix.

<Insert Table 9 here>

4.5 Industry heterogeneity and firm dependence on contract enforcement

Institutional dependence at the industry level can affect exporters' reactions to institutional differences. Particularly, previous research suggests that industry-level heterogeneity in institutional dependence of the production processes affects export sophistication and specialization across countries. Countries with strong rule of law and contract enforcement, for example, are found to have a comparative advantage in industries that use more differentiated inputs (Levchenko, 2007; Nunn, 2007; Chor, 2010; Feenstra et al., 2013). Therefore we expect that firms that are more dependent on contract enforcement will perform better in markets with more similar institutions.

Following Nunn (2007) and Chor (2010), and based on Rauch (1999)'s 'liberal' classification of products into homogeneous, reference-priced, and differentiated categories, we construct a firm specific contract dependence variable. Accordingly, the contract intensity of an industry is the share of the constituent products in the composition of the industry's input use that is classified as differentiated on the premise that it is inherently more difficult to specify and enforce the terms of contractual agreements for such products. After determining the contract intensity of each exported

good at 6-digit (HS) classification level, we aggregate it at the firm level, capturing the technological characteristics of each firm and measuring the degree of dependence on contract enforceability. Specifically, we construct an export value weighted composite institutional dependence index for each firm *i* in year *t* as follows:

$$ID_{it} = \sum_{pt} \left(\frac{v_{ipt}}{\sum_{pt} v_{ipt}} * ID_p \right)$$

where $\frac{v_{ipt}}{\sum_{pt} v_{ipt}}$ is the export share of product *p* of firm *i* at year *t;* ID_p is the institutional dependence for product *p* exported by firm *i* at year *t* (Chor, 2010; Alfaro et al., 2019).

Next, we introduce this variable (after normalizing with a mean of zero and standard deviation of one) as an interactive term in our benchmark regressions and examine the heterogeneous effect of institutional similarity on export structure, conditioned on firms' dependence on contract enforceability. We report results for the main variables of interest in columns (1)-(4) in Table 10, and present full results in the Appendix. We find that firms that are more dependent on contract enforceability tend to export more skill-intensive goods to markets that are more similar in institutional development. The results still hold when we control for country-year FE in columns (3)-(4). Consistent with Nunn (2007), we also find that firms that are more dependent on external institutions export more sophisticated products.

<Insert Table 10 here>

5. Robustness analysis

In this section we conduct a full set of robustness tests. First, we revisit the omitted variable bias, which has been a major challenge in the literature. Particularly, we want to make sure that we are indeed separating the effects of institutional differences from other characteristics of destination countries. In our benchmark regressions, in addition to destination country GDP and bilateral gravity variables, we included country-year fixed effects, which controlled for all destination country

specific and time variant factors. However, once we include these fixed effects, it is no longer possible to identify the *InstSim* variable separately. To address this issue and also to further examine the omitted variable bias, we add additional destination-year specific control variables, which, as previous research suggests, might be correlated both with the institutional similarity variable and export sophistication, including the following: arable land per person, human capital index, real capital stock per worker, real GDP per capita, labor market regulation index, total population, private credit to GDP radio, rule of law index, percentage of secondary schooling, and aggregate TFP level at current PPP (USA=1). Additionally, we include bilateral real exchange rates, real exchange rate volatility, and average tariff rate applied to Chinese exports in a given destination. Our main results remain unchanged after including these additional controls one by one or altogether. We report these results in the Appendix.[12]

Second, to control for the omitted variable bias we also include an income similarity variable measured as $RGDPPCSim_{China,t} = -\log |RGDPPC_{China,t} - RGDPPC_{jt}|$ so that higher values indicate increasing real 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 predictor of export sophistication. Furthermore, we find that income similarity is significantly less important for the export sophistication choice of higher productivity 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 and that this effect is decreasing in TFP. In fact, the coefficient estimates remained almost the same as those in benchmark estimates. These results are reported in the Appendix.

Third, we examine the sensitivity of our findings to measurement error in export sophistication, institutional development, and TFP. The results are reported in Table 11. In columns (1)-(6) we report results using 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 is in our benchmark estimations. Particularly, we construct: i) PRODY-2 index, which uses time-varying export and real GDP per capita values (column 1); ii) PRODY-3 index, which uses the average exports over time for each country and uses time varying real GDP values (column 2); iii) PRODY-4 index, which uses the average real 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 real GDP per capita in the PRODY calculation (column 4); v) Michaely Index-1, which is based on the export-weighted real 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 (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 real 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) (Lall-1) using time varying real 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 the dependent variable (Lall-2). In all these measures, the use of time-varying trade and the time-varying real 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 the

main variables but provide full results in the Appendix. In all eight sets of regressions using alternative measures of export sophistication, our main results remain intact.

<Insert Table 11 here>

Next, we test the sensitivity of results to different measures of institutional development, including the following: i) international country risk guide composite political risk index (*ICRG*), 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) institutional quality index from Polity IV (*Polity IV*); iii) a factor variable constructed using the factor analysis on our six governance indicators;[13] and iv) the institutional similarity index ($Inst_{sim}$) 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 results from these exercises are reported in Table 12 and confirm our earlier findings. As an additional test, instead of using a composite index with equal weights for each of the six components of the WGI, 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 Appendix.

<Insert Table 12 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 of the estimation method, are reported in the Appendix and confirm our previous results.

Fourth, to examine the sensitivity of our findings to sample selection bias, 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 limit the influence of WTO accession of China in 2001. Sixth, we drop petroleum related industries (CIC 25) because of their differing 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.

Finally, we experiment with alternative specifications. First, we exclude either *RGDP* or *Legal Origin* variables, or both, as they might be endogenous to institutional development. Second, we drop firm size in order to better identify the effect of TFP. After these exercises, the results remained unchanged. Third, to rule out the concern that firm productivity is affected by destination country's institutional development, we interact destination's institutional similarity with firm's initial productivity and then examine how firms with high vs. low productivity respond differently.

6. Conclusion

Firm and country heterogeneity plays a key role in shaping exporter behavior. In this paper we contribute to the literature by studying the effects of institutional similarity and firm heterogeneity (in productivity, ownership structure, openness, destination remoteness, product variety, export

skewness, and dependence on contract enforcement) on export sophistication. The empirical analysis reveals several novel stylized facts 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, this effect is significantly less pronounced for higher productivity firms. These two findings complement recent research that emphasizes the importance of institutional differences in international trade through both demand and supply side factors. Furthermore, these results are consistent with the finding that developing country firms enjoy a comparative advantage in less developed institutional environments.

Our results also highlight the importance of other sources of firm heterogeneity. First, we find that compared to public firms, private, joint-venture and foreign firms export more sophisticated products, and are less sensitive to institutional similarity. Second, firms that are export oriented export more sophisticated products and are more sensitive to institutional similarity. Third, while we do not detect any difference in export sophistication based on distance of export markets, firms that export to further destinations are less sensitive to institutional differences. Fourth, multiproduct firms and firms with lower export skewness export more sophisticated products and are more sensitive to institutional similarity. Fifth, the effect of institutional similarity is asymmetric as it is less important when firms export to countries with better institutions. Sixth, firms that are more dependent on contract enforceability export more sophisticated products, and more so to markets that have similar institutions.

Overall, we show that institutional similarity between home and destination countries is a significant determinant of firm-product level export dynamics when firms can choose what to export across destinations. Demand side factors through preference similarity, perceived quality bias, and product recognition, among others, are also likely to contribute to these effects. Using extensive robustness checks we confirm that firm or destination specific and time variant other observable or

unobservable factors are not driving our findings. We also show that institutional similarity effect we uncover is not a substitute for the income similarity effect that is found in recent literature. Overall, our findings allow us to a better understanding of the behavior of higher productivity and multiproduct firms in a developing country context. We expect future theoretical work to incorporate these stylized facts in formal modeling of bilateral trade patterns.

Endnotes

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

[2] Institutional distance is shown to be a significant cause of non-tariff barriers in trade and financial flows (Hofstede, 2001; Papaioannou, 2009; Liu et al., 2019).

[3] 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.

[4] 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). The perpetual inventory method is based on Brandt et al. (2012).

[5] We cleaned the raw data following Brandt et al. (2012). The tobacco industry is excluded as it is highly regulated. Domestic currency values are converted to the USD using average exchange rates.

[6] 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.

[7] 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.

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

[9] For a similar application of this index, see Jarreau and Poncet (2012), Zhu and Fu (2013), and Eck and Huber (2016).

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

[11] In the Appendix, we also experimented with a gap dummy equaling one if the destination country has 0.2, 0.5 or one standard deviation better institutions.

[12] We find that depreciations, lower volatility and higher tariffs increase export sophistication.

[13] 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 Appendix.

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., 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.

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

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.

Castro, L. Li , B.G., Maskus, K.E, Xie, Y. 2016. Fixed Export Costs and Export Behavior, *Southern Economic Journal* 83(1), 300-320.

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

Chor, D. 2010. Unpacking Sources of Comparative Advantage: A Quantitative Approach. *Journal of International Economics*, 82(2), 152-167.

Copeland, B., Kotwal, A., 1996. Product Quality and the Theory of Comparative Advantage. *European Economic Review* 40, 1747-1760.

Crino, R., Epifani, P. 2012. Productivity, Quality and Export Behaviour. *The Economic Journal* 122(565), 1206-1243.

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.

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

Greenaway, D., Kneller, D. 2007. Firm Heterogeneity and Foreign Direct Investment. *Economic Journal* 117(517), 134-161.

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

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

Hofstede, G., Hofstede, G.J., and Minkov, M. 2010. *Cultures and Organizations: Software of the Mind*. Revised and Expanded 3rd Edition. New York: McGraw-Hill.

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. *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: Cambridge.

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*:* Cambridge.

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.

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

Liu, A., Lu, C., and Wang, Z. 2018. The roles of cultural and institutional distance in international trade: Evidence from China's trade with the Belt and Road countries. C*hina Economic Review Forthcoming*. https://doi.org/10.1016/j.chieco.2018.10.001

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

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

Melitz, M.J., Ottaviano, G.I., 2008. Market Size, Trade, and Productivity. *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. 2007. Relationship-Specificity, Incomplete Contracts and the Pattern of Trade. *Quarterly Journal of Economics* 122(2), 569-600.

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

Observatory of Economic Complexity, 2019. Trade Data. Accessed January 15, 2019. http://atlas.media.mit.edu/en/resources/data/

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

Papaioannou, E. 2009. What drives international financial flows? Politics, institutions and other determinants. *Journal of Development Economics* 88, 269–281.

Rauch, P.E. 1999. Networks Versus Markets in International Trade. Journ*al of International Economics* 48, 7-35.

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.

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
(ln) 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
(ln) RGDP	1,022,551	12.66	1.91	3.96	16.37
(ln) 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
(ln) Output	1,055,385	-1.68	1.32	-9.02	9.25
(ln) Age	1,044,483	2.02	0.72	0	4.04
(ln) Wage	1,054,617	2.54	0.59	-5.20	8.75
(ln) Capital Intensity	1,052,862	3.68	1.26	-5.86	10.14
Openness	1,055,385	0.86	15.64	0.00	1625.86
(ln) Remoteness	1,055,318	8.82	0.44	3.70	9.87
(ln) Export Value	1,055,385	10.62	2.05	-0.03	19.94
(ln) 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: *ln* is natural log. *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 measured by perpetual inventory method divided by total employment). *Openness* is the

share of total exports in total output; *Remoteness* is the trade-weighted average of geographical distance (km) of all trade partners; *Export value* is real total export value of a firm in USD; *Number of Products* is the number of 6-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* refers 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)	(4)	(5)
$InstSim_{jt}$	0.002***	0.003***	0.003***		
	(0.000)	(0.000)	(0.0003)		
$InstSim_{jt}$ *TFP_{it}		-0.001***	-0.001***	-0.001***	-0.001***
		(0.000)	(0.0003)	(0.0003)	(0.0003)
TFP_{it}			-0.002		-0.002
			(0.002)		(0.002)
$lnRGDP_{jt}$	0.002***	0.002***	0.002***		
	(0.000)	(0.000)	(0.0002)		
$lnDistance_{jt}$	-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	0.0003		
	(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***	0.033***		
	(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	0.0001		
	(0.001)	(0.001)	(0.001)		
PTA_{jt}	0.007***	0.008***	0.008***		
	(0.001)	(0.001)	(0.001)		
$lnOutput_{it}$			-0.001		-0.001
			(0.001)		(0.001)
$lnAge_{it}$			-0.005***		-0.005***
			(0.002)		(0.002)
$lnWage_{it}$			-0.002		-0.002
			(0.002)		(0.001)
$lnCapital_{it}$			-0.001		-0.001
			(0.001)		(0.001)
Constant	9.389***	9.379***	9.436***	9.390***	9.462***
	(0.006)	(0.006)	(0.027)	(0.0001)	(0.026)
Industry FE	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	Yes	No	Yes
Year FE	No	No	Yes	No	No
Firm-year FE	Yes	Yes	No	Yes	No
Country-year FE	No	No	No	Yes	Yes
# of Countries	178	178	178	188	188
# of Firms	55,414	44,735	44,331	44,857	44,453
R-sq (Adj)	0.837	0.841	0.828	0.841	0.828
N	1,022,449	839,798	829,550	840, 203	846,433

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*, *Firm-year FE,* and Country-year FE refer to industry, firm, year, firm-year, and country-year fixed effects. *R-sq (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: Effects of Ownership Structure

	(1)	(2)	(3)	(4)
$InstSim_{jt}$	0.007***	0.006***		
	(0.001)	(0.001)		
$InstSim_{jt}$ *TFP_{it}	-0.001***	-0.001***	-0.001***	-0.001***
	(0.00004)	(0.00003)	(0.0003)	(0.0003)
TFP_{it}		-0.002		-0.003
		(0.002)		(0.002)
$InstSim_{jt}$* $Domestic_{it}$	-0.005***	-0.003**	-0.004***	-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)
$InstSim_{jt}$* $Foreign_{it}$	-0.005***	-0.004***	-0.005***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
$InstSim_{jt}$* $Joint_{it}$	-0.005***	-0.004***	-0.005***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
$Domestic_{it}$		0.037***		0.037***
		(0.012)		(0.012)
$Foreign_{it}$		0.026*		0.025*
		(0.014)		(0.014)
$Joint_{it}$		0.024*		0.024*
		(0.014)		(0.014)
Constant	9.379***	9.409***	9.388***	9.434***
	(0.006)	(0.028)	(0.001)	(0.028)
Industry FE	Yes	Yes	Yes	Yes
Firm FE	No	Yes	No	Yes
Year FE	No	Yes	No	No
Firm-year FE	Yes	No	Yes	No
Country-year FE	No	No	Yes	Yes
Gravity	Yes	Yes	No	No
Firm-Year Controls	No	Yes	No	Yes
# of Countries	178	178	188	188
# of Firms	43,164	42,804	43,280	42,920
R-sq (Adj)	0.842	0.828	0.841	0.828
N	830,176	822,051	831,551	837,485

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 8: 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)						
$InstSim_{jt}$ *$lnRemote_{it}$			-0.004***	-0.004***				
			(0.001)	(0.001)				
$lnRemote_{it}$				-0.003				
				(0.002)				
$InstSim_{jt}$ *$lnProduct_{ijt}$					0.004***	0.003***		
					(0.001)	(0.0004)		
$lnProduct_{ijt}$					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
# of Countries	178	178	178	178	178	178	178	178
# of Firms	44,735	44,717	44,313	44,735	44,331	44,735	44,735	44,331
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 (weighted) average remoteness of trade partners, *Product* is (log) number of firm-year-destination specific exported products, and *Skew* is firm-year-destination specific export skewness measured by HHI. For other variable definitions, refer to Table 1 and 5.

Table 9: 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***
		(0.0004)	(0.0003)
TFP_{it}			-0.002
			(0.002)
Constant	9.388***	9.378***	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
Gravity	Yes	Yes	Yes
Firm-year controls	No	No	Yes
# of Countries	178	178	178
# of Firms	55,414	44,735	44,331
R-sq (Adj)	0.837	0.841	0.828
N	1,022,449	839,798	829,550

Notes: *, **, and *** refer to significance at 10%, 5% and 1% levels. Standard errors in parenthesis are clustered at firm-year level. Gravity variables are added but not reported. Positive institutional gap dummy (*D*) 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.

Table 10: Industry Heterogeneity and Firm Dependence on Contract Enforcement

	(1)	(2)	(3)	(4)
$InstSim_{jt}$	0.003***	0.003***		
	(0.0004)	(0.0003)		
$InstSim_{jt}$ *TFP_{it}	-0.002***	-0.002***	-0.001***	-0.001***
	(0.0004)	(0.0003)	(0.0003)	(0.0003)
TFP_{it}		-0.002		-0.002
		(0.002)		(0.002)
$InstSim_{jt}$* ID_{it}	0.001**	0.001**	0.001***	0.001***
	(0.0003)	(0.0003)	(0.0003)	(0.0003)
ID_{it}		0.027***		0.026***
		(0.005)		(0.005)
Industry FE	Yes	Yes	Yes	Yes
Firm FE	No	Yes	No	Yes
Year FE	No	Yes	No	No
Firm-year FE	Yes	No	Yes	No
Country-year FE	No	No	Yes	Yes
Gravity	Yes	Yes	No	No
Firm-Year	No	Yes	No	Yes
# of Countries	178	178	188	188
# of Firms	43,735	44,331	44,857	44,453
R-sq (Adj)	0.841	0.828	0.841	0.828
Obs	839,798	829,550	840,203	846,433

Notes: Notes: *, **, and *** refer to significance at 10%, 5% and 1% levels. Standard errors in parenthesis are clustered at firm-country level. All regressions include the same (unreported) set of country level controls (*Country-controls*) as in previous tables. *ID* is the institutional dependence variable. For other variable definitions, refer to Table 1.

Table 11: Alternative Measures of Export Sophistication

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	PRODY-2	PRODY-3	PRODY-4	PRODY-5	Michaely-1	Michaely-2	Lall-1	Lall-2
InstSim	0.003***	0.003***	0.003***	0.002***	0.002***	0.005***	0.001***	0.004***
	(0.0004)	(0.0003)	(0.0004)	(0.0003)	(0.0003)	(0.001)	(0.0003)	(0.0003)
*InstSim*TFP*	-0.001***	-0.001***	-0.001***	-0.001***	-0.0004	-0.001	-0.0003	-0.001***
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.001)	(0.0003)	(0.0003)
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
# of Countries	178	178	178	178	178	178	178	178
# of Firms	44,735	44,735	44,735	44,735	44,735	41,566	44,735	44741
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 12: 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***
	(0.00003)	(0.00004)	(0.00003)	(0.00003)
*InstSim*TFP*	-0.002***	-0.001**	-0.001***	-0.001***
	(0.00004)	(0.00004)	(0.00004)	(0.00004)
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
# of Countries	131	154	178	178
# of Firms	44,654	44,731	44,735	44,735
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* is the Polity IV index, *Factor Variable* is the factor analysis of the WGI index's six sub components, and *Kogut-Singh* is the Kogut and Singh index using the six subcomponents of the WGI index. For other variable definitions, refer to Tables 1, 5 and 6.