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# International Migration and Export Flows: Evidence from the People's Republic of China

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Since China's opening to international trade, the rapid growth of the country's export sector has been coupled by an intensification of migratory outflows of ethnic Chinese. The literature has already stressed the beneficial role of migration in enhancing bilateral trade. The present paper applies a gravity model in order to capture the impact of migration on Chinese exports for a relatively long period of time (1995-2017) where significant developments take place. We estimated four regressions, each of them confirming the positive network effects of migration for boosting export growth. Apart from the main finding, it appears that the role of institutional and geographical proximity can prove to be complementary for trade enhancement. The results finally suggest mixed effects due to the countries' import openness, indicating that China's free trade agreements acts as a substitute for smoothing trade competition from third countries.

*Keywords*: China, Migration, Export Flows, Gravity Equation, Trade Agreements
*JEL Classification*: C51, F13, F22

## I. INTRODUCTION

The opening of the People's Republic of China to the international trade has been marked by the shift in the national economic policy starting from the 1980s, as well as the establishment of special economic zones (SEZ) in the eastern coastal regions of the country in the 1990s. The country's accession to the World Trade Organization (WTO) in December 2001 comes ten years after joining the Asia-Pacific Economic Cooperation Forum (APEC, 1991). China is nowadays a trading partner of almost all countries worldwide and one of two major international trading powers, along with the United

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States of America, although the latest developments reveal an ongoing shift to a growth model which would be less dependent on intensive import demand (Kang and Liao, 2016; Lardy, 2016). From the export side, China's high rates of export growth seem to have narrowed as well in recent years, showing signs of a possible upcoming stabilization.

Among the factors lying behind the enhancement of bilateral trade between countries, the literature often refers to the role of migrant networks in facilitating the market penetration of products originating from the migrants' country of origin. The period of colonization in the 19th century was at the same time the starting point of the most important migratory flows outside the Chinese territory. As for the more recent period, the study of data on international migrant stock reveals a comparatively stronger increase of the overseas Chinese population in Oceania and Europe. This development led to the quadrupling of the Chinese migrant stock in Oceania, as well as a threefold increase of the corresponding population on the European continent between 1995 and 2017, according to the UN data. However, this evolution does not radically change the distribution of the Chinese migrant stock at the international level, taking into account that about the half of the total population of the overseas Chinese remains in Asia, while another one third is located on the American continent (UN-DESA, Population Division, 2017).

The main purpose of this paper is to enrich the relevant literature which examines the relationship between trade and migratory flows originating from the exporter countries. The applied gravity model aims also to provide novel empirical evidence since it refers to a long period of time (1995-2017) where significant changes take place, including China's strategic shift to international trade and the rapid growth of the country's export sector, along with the WTO accession in 2001. The added value of the present study also lies in the fact that the Chinese population has been characterized by significant mobility outside the country's borders after the implementation of open policy by Deng Xiao Ping, since the UN data reveal a doubling of the Chinese migrant stock from five to about ten million people between 1995 and 2017 (UN-DESA, Population Division, 2017). Some additional contributions could be considered the study of the interaction between geographical and institutional proximity. The WTO accession by an increasing number of countries can prove to increase the degree of interconnectivity between them since they share the same international trade rules. For that reason, we included in the analysis an additional

variable in order to capture the effect of increasing interconnectivity among WTO members on Chinese merchandise exports.

## II. LITERATURE

The gravity equation is a common analytical tool for modelling international trade flows, inspired by the Newton's gravitational law. It was first applied by Tinbergen (1962) and Pöyhönen (1963), while the first theoretical approaches were made by Anderson (1979), Bergstrand (1985) and Helpman and Krugman (1985). Since then, the augmented form of the gravity equation has become an important tool for conducting empirical research, by introducing a wide typology of country-pair proxies, namely geographical (distance, contiguity, insularity, landlockedness, etc.), economic (per capita GDP), demographic (population size, migrant stock), institutional (GATT/WTO membership, free trade agreements, etc.) and many other proxies.

Distance serves as a measure for assessing the impact of transport costs on trade flows, thus the estimated coefficients traditionally take a negative sign in gravity equations (see, for example, Kucera and Sarna, 2006; Caporale et al., 2015; Čipkutė, 2016). The incomes of trade partner countries are considered as necessary exogenous variables towards the estimation of gravity equations (Bergstrand, 1985). The per capita GDP variable is the most commonly used proxy representing the purchasing power of exporter and importer countries (Sohn, 2005) or even their level of development (Vlontzos and Duquenne, 2008). Countries characterized by relatively higher levels of purchasing power have the potential to facilitate their export activities more effectively, while at the same time, their imports rise according to the relatively higher consumption needs of their internal markets. In gravity equations, the estimated coefficients are expected to take positive signs (Sheng et al., 2012). The introduction of the population size variable is an alternative way to represent countries' market size, given that the GDP variable is intrinsically affected by the export and import values' variability. The elasticity for population size usually takes a positive sign, as commonly reported (Didier and Koenig, 2016; Haidar and Mirjalili, 2016).

Assessing the effect of migration on trade raises questions of substitutability or complementarity between trade flows and the movement of production factors. According to Markusen (1983), the new trade theory is conditioned by a complementarity relationship between trade and migratory flows. This is also the case for many other empirical studies (Gould, 1994; Head and Ries, 1998; Peri and Requena-Silvente, 2010;

Genc et al., 2011; Bratti et al., 2012; Briant et al., 2009). Migrant stock is considered to have a positive effect on boosting bilateral trade between countries of origin and destination through networks deployed between immigrants and their compatriots at home (Rauch and Trindade, 2002). Ehrhart et al. (2012) highlight their crucial role in facilitating access to information related to the recipient country's market risks and opportunities. Briant et al. (2009) report a more significant impact of migration on trade when immigrant populations come from countries with less developed institutions. In the case of Greek oil exports, Vlontzos and Duquenne (2008) also report the positive impact of Greek migration on trade flows. The impact of migration on trade has been questioned in many empirical studies (Karayil, 2007; Felbermayr et al., 2012; Aleksynska and Peri, 2014; Bratti et al., 2012; Haidar and Mirjalili, 2016).

Landlockedness is considered as a "resistance" factor for bilateral trade flows, as countries lacking access to the sea often depend heavily on their political relations with transit countries, as well as their transportation infrastructure and costs (Grigoriou, 2007). The reported coefficients usually take negative signs (Kucera and Sarna, 2006; Felipe and Kumar, 2010; Chen and Li, 2014). Insularity seems to function more often as a "barrier" for bilateral trade flows, taking into account that island countries naturally do not serve as transit countries for trade as other coastal countries. In gravity equations, the coefficients are expected to also take negative signs (Kucera and Sarna, 2006).

The accession to the WTO or the establishment of free trade agreements (FTA) between countries seems to have a positive effect on bilateral trade. Making use of common institutional instruments and a common trading "language" can facilitate trade flows between countries. The empirical findings on countries' accession to the WTO often confirm this theoretical assumption (Chan and Au, 2007; Chang and Lee, 2011). However, as indicated in some other studies, the impact of WTO accession seems to be uneven between developed and developing countries (Subramanian and Wei, 2003; Kurihara, 2012) or rather inexistent (Eicher and Henn, 2009). Being a member of the APEC consultation forum seems to have a positive effect on bilateral trade between its members (in the case of South Korea, see Sohn, 2005), while Eicher and Henn (2009) support that their estimated positive coefficients for representing the impact of countries' APEC participation on trade could be probably due to other unobservable factors.

At the level of trade structures, Metulini et al. (2014) confirm a positive effect of migration on trade that is larger for differentiated goods than for homogeneous ones. The concept of multilateral resistance has long been introduced into the methodological

framework of the gravity model analysis (for example, Behar and Nelson, 2012; Head and Mayer, 2013; Cipollina et al., 2016). According to the relevant literature, there exists an indirect effect of relative trade costs with other countries on bilateral trade (Anderson and van Wincoop, 2003). Finally, and in order to reveal inward multilateral resistance effects, De Bruyne et al. (2013) take into account for interdependencies in trade flows by using a proxy that measures import openness, given that countries being generally more open to imports are more likely to be similarly open to each of their trade partners.

## III. MODEL SPECIFICATION

In the estimated model, we define Chinese export value as a log-linear function of geographic, institutional, demographic and economic factors. The following function is a generalized form of the regressions estimated below:

$$\begin{aligned}\text{Ln } EXP_{cit} = {} & \beta_0 + \beta_1 \ln(distance)_{ci} + \beta_2(island)_i + \beta_3(landlocked)_i \\ & + \beta_4 WTO_{it} + \beta_5 WTON_{it} + \beta_6 APEC_{it} + \beta_7 FTA_{it} \\ & + \beta_8 \ln(population)_{it} + \beta_9 \ln(migrant\ stock)_{it} + \beta_{10} \ln(GDPpc)_{it} \\ & + \beta_{11} \ln(import\ openness)_{it} + \beta_{12}(product\ diversification)_{it} \\ & + \gamma_1 T_{1995} + \gamma_2 T_{2000} + \gamma_3 T_{2005} + \gamma_4 T_{2010} + \gamma_5 T_{2015} + \gamma_6 T_{2017} + \varepsilon_{ci}\end{aligned}$$

The dependent variable $EXP_{cit}$ denotes the merchandise exports' total value from China towards a partner country $i$ in year $t$. We introduce some of the most common geographical variables such as distance between China and each trade partner (*distwces* variable, CEPII), as well as two proxies for island and landlocked countries. The introduced dummies *WTO*, *APEC* and *FTA* aim to capture the impact of institutional changes, such as WTO accession, APEC partnership or the conclusion of free trade agreements. There exists, however, a variable that links the institutional to the geographic component: The *WTON* dummy variable represents the number of WTO neighboring countries of a WTO trade partner, thus taking zero values when the latter a) is not a WTO member or at least not yet, b) is a WTO member but also an island country, c) is a WTO member but none of its neighbors is a WTO member. We could therefore claim that this proxy has the advantage of combining both the impact of geographical and institutional proximity, with the aim of capturing the effect of the constantly improving interconnectivity between WTO member states.

The introduced demographic variables represent the total population size and migrant stock of Chinese nationals in each trade partner, so as to assess the impact of market size and attractiveness. It should be noted that the observations of the estimated model do not refer to all the years between 1995 and 2017, but exclusively the years 1995, 2000, 2005, 2010, 2015 and 2017. This is because data on migrant stock (UN-DESA, Population Division, 2017) were previously estimated for each five years. The trading partners' development levels over time are represented here by the usual per capita GDP variable. In order to check for inward multilateral resistance of trading partners, we introduce a proxy for import openness, calculated as the ratio of the trading partner's total imports to GDP, given that, *ceteris paribus*, open countries to imports are generally expected to be similarly open to imports from China. Finally, the product diversification index for imports takes 0 to 1 values. Higher values show greater divergence from the world import pattern, which is generally the case for relatively less open economies to international trade. The dependent variable, as well as the five explanatory variables for distance, population size, migrant stock, per capita GDP and import openness are all expressed in natural logs. The time dimension is expressed by the $T_t$ dummy variables, taking the 1 value for each of the corresponding years during the 1995-2017 period, otherwise zero.

Data on export flows, import openness and product diversification index derive from the UN COMTRADE / UNCTADStat database. Export values are further converted in 2010 constant US dollars by own calculations. Data on each trading partner's population size, as well as those related to Chinese migrant stock by country of destination, derive from the UN-DESA Population Division and UNCTAD secretariat estimates. Estimations on per capita GDP regarding trading partner countries are available in the World Bank database, calculated in constant 2011 international dollars (PPP). All necessary information regarding WTO and APEC membership of China's trading partners is obtained from the official WTO and APEC websites, respectively, while the database of the Asia Regional Integration Center (ADB) provides data on China's free trade agreement conclusions with other countries. Finally, the distance data derive from the GeoDist database of CEPII (distwces variable – CEPII, 2017; Mayer and Zignago, 2011).

# IV. ESTIMATION RESULTS

The sample includes 989 observations regarding Chinese merchandise exports towards 176 trade partner countries (Appendix B) at international level in years 1995, 2000, 2005, 2010, 2015 and 2017, while the remaining 67 observations were excluded due to missing data. As regards the issue of zero values in the case of the Chinese migrant stock variable, and in order to convert values into natural logarithms, we decided to transform the initial variable $x$ into a variable of $x+c$ form. With an aim to avoid interference of the constant $c$ in our coefficient estimations, we checked the relevance of the specific method by comparing regression results for different values of the constant $c$ (Appendices C and D). The applied methodology for treating zero values is thus considered satisfactory if the estimated coefficients are not fundamentally differentiated by the choice of the constant value (Burger et al., 2009). In this context, we tested three alternative constant values (c = 0.1, c = 0.5 and c = 1) for each of the four estimated regressions, from which we finally selected the constant c = 1 (Table 1).

The present study reports on four estimated regressions (1-4) based on the general gravity equation described above, listed here according to their goodness-of-fit (Table 1). In order to check for robustness our four reported regressions, we applied a standard bootstrap methodology for resampling into a large number of samples (1000). This non-parametric statistical inference method is characterized by less restrictive application conditions (Palm, 2002) and is commonly practiced in the case of gravity models (for example, Cipollina et al., 2016). At the level of the estimation results, all introduced geographic factors prove to exert a negative effect on exports, the signs of distance coefficients being consistent with those reported in the literature (for example, Porojan, 2001; Melitz and Toubal, 2014). Similarly, all the estimated coefficients for insularity and landlockedness take negative signs, as shown in many empirical studies (Chen and Li, 2014; Santos Silva and Tenreyro, 2006; Haidar and Mirjalili, 2016).

The positive correlation between Chinese export and migratory flows is reflected in all estimated regressions. The migrant stock coefficients are statistically significant at 1% level. We could argue that the specific factor incorporates the comparative advantages of large-scale economies which are generally more effective in attracting migrant populations. It also includes the facilitating effect of networks, the positive role of formal and informal ties between migrants and their compatriots at home, as reported in the literature (Rauch and Trindade, 2002). The sign is consistent with those reported in many recent and relevant studies (Sangita, 2013; Aleksynska and Peri,

2014; Haidar and Mirjalili, 2016). According to the relevant literature, the causal relationship between trade and migration lies in the reduction of fixed costs of exporting (see, for example, Peri and Requena-Silvente, 2010; Bratti et al., 2012). Felbermayr et al. (2012) are also in line with the causal interpretation of trade enhancement due to direct and indirect networks developed through the migration process. We argue that this causal link becomes even stronger in the case of China, considering that the expatriate Chinese are very often and at the same time buyers and sellers of Chinese imported products worldwide. This fact, in turn, facilitates the bridging of the significant language barriers that exist between China and its partners and is therefore conducive to bilateral trade.

Sharing the same institutional rules for international trade facilitates the quality of the direct networks established between countries of origin and destination. Policies undertaken seem to contribute to this goal. The coefficients for WTO membership and APEC partnership take positive signs and they are statistically significant at 1% and 5% levels. China's trading partners' entry to WTO or/and APEC seems to positively affect Chinese merchandise exports, as also shown in Chang and Lee (2011), Caporale et al. (2015) or Eicher and Henn (2009). Apart from the commonly reported positive impact of countries' accession to the WTO on strengthening their external trade, the results suggest that the Pacific Ocean trade routes are clearly of great importance for Chinese merchandise exports, bearing in mind that some of the major international trade powers are also APEC members (United States, Canada, and the Russian Federation).

The gradual increase of WTO members over the past two decades contributes to the ongoing expansion of an uninterrupted trade space where common rules are in place. In our study, the *WTON* variable introduced in the first regression demonstrates that optimizing interconnection networks between countries, due to geographical and institutional proximity, matters for bilateral trade. We shall bear in mind, though, that the statistically significant coefficient at 1% level for WTO network effects shown in regression 1 is expected to capture mainly the impact of the geographical adjacency to the detriment of the institutional proximity in future studies, as long as the process of countries' WTO accession goes on and thus the number of WTO members increases but inevitably at a slower pace in the years to come. However, we consider that the introduction of the specific variable is well suited to the present study as the latter refers to a period of more than twenty years where a significant number of countries joined the WTO, including China.

Higher values of the product diversification index imply greater divergence from the world pattern (UNCTADStat, 2017). The specific variable proves to be statistically significant at 1% level in the third regression. The negative sign indicates that countries whose range of imported products does not differ significantly from the world import pattern are more likely to import from China as well, at the same time as the product diversification index for Chinese exports is in constant decline throughout the period under study (from 0.478 in 1995 to 0.413 in 2017, UNCTADStat database).

Table 1. Results (c = 1)

| | Reg. (1) | Reg. (2) | Reg. (3) | Reg. (4) |
|---|---|---|---|---|
| Independent Variables | $EXP_{cit}$ N=989 | $EXP_{cit}$ N=989 | $EXP_{cit}$ N=989 | $EXP_{cit}$ N=989 |
| Constant | 23.821 | 26.135 | 13.473 | 0.723 |
| Distance | -1.026 (-8.712)[a] | -0.830 (-7.852)[a] | -0.552 (-5.865)[a] | -0.382 (-5.509)[a] |
| Per capita GDP | 0.564 (10.309)[a] | 0.398 (7.295)[a] | | 0.713 (20.772)[a] |
| Population size | | | 0.737 (25.921)[a] | 0.905 (33.684)[a] |
| Migrant stock | 0.140 (7.860)[a] | 0.189 (10.859)[a] | 0.137 (9.319)[a] | 0.093 (8.828)[a] |
| Island | | -2.272 (-14.182)[a] | | |
| Landlocked | -0.976 (-6.239)[a] | -1.217 (-7.868)[a] | -1.305 (-12.158)[a] | -0.943 (-10.268)[a] |
| WTO | 0.423 (2.017)[b] | 0.705 (3.458)[a] | | 0.315 (2.561)[b] |
| WTO network effect | 0.354 (13.239)[a] | | | |
| APEC | 1.219 (6.264)[a] | 1.381 (7.312)[a] | 0.527 (4.865)[a] | |
| Import openness | -0.473 (-4.030)[a] | -0.734 (-6.296)[a] | 0.561 (6.110)[a] | 0.614 (7.716)[a] |
| Product diversification | | | -4.202 (-6.412)[a] | |
| FTA | 0.528 (2.622)[b] | | -0.357 (-2.506)[b] | |
| $T_{1995}$ | | -2.274 (-11.642)[a] | -2.374 (-18.122)[a] | -1.968 (-16.304)[a] |
| $T_{2000}$ | | -1.889 (-10.956)[a] | -1.822 (-15.881)[a] | -1.595 (-16.273)[a] |
| $T_{2005}$ | | -0.680 (-4.664)[a] | -0.724 (-6.935)[a] | -0.587 (-6.888)[a] |
| $T_{2010}$ | 0.672 (4.760)[a] | | | |
| Adjusted $R^2$ | 0.538 | 0.680 | 0.788 | 0.843 |
| F-test | 115.853[a] | 191.778[a] | 334.668[a] | 532.423[a] |
| Durbin-Watson | 1.657 | 1.955 | 1.984 | 1.978 |

Note: All variables except dummies are expressed in natural logarithms. Estimations use White's heteroskedasticity-consistent covariance matrix estimator. t-Statistics are in parentheses. The superscript *a* means p< 0.01, *b* means p<0.05.

Tracking the effect of multilateral resistance leads to different results among the estimated regressions, since the coefficients for import openness take mixed signs. In this case we could claim that the negative signs in regressions 1 and 2 describe competition effects, unlike the positive signs shown in regressions 3 and 4 which rather reflect complementarity effects, which means in the latter case that more open economies to international trade are similarly open to Chinese exports. At the same time, the FTA dummy for joint membership in a free trade agreement appears statistically significant in regressions 1 and 3, although it receives different signs. When comparing the coefficients of the variables for import openness and the conclusion of free trade agreements between the first and the third regression, we can discern a reversal of the corresponding signs. For example, in the case of competition effects on Chinese exports (regression 1), the conclusion of FTA between China and its trading partners seems to be beneficial to smooth multilateral trade resistance effects. On the contrary, when import openness of trading partners appears to be complementary to Chinese exports, then the bilateral conclusion of preferential agreements loses importance at the level of national trade policy.

## V. CONCLUSIONS

The present study examined the relationship between bilateral trade and migration in the case of China between 1995 and 2017, which is a relatively long period of time characterized by the establishment of the special economic zones, WTO accession in 2001 and the rapid growth of the country's export sector. Along with the doubling of Chinese migrant stock during the same period of time according to UN data, China appears as a unique case for providing empirical evidence on the well-studied relationship between trade and migratory flows.

The four estimated regressions derived from the augmented gravity equation provide empirical evidence regarding the effect of migration on the intensity and direction of Chinese merchandise exports. A set of variables regarding policy effects and multilateral relative costs were also introduced into the reported regressions in order to avoid omitted variable bias. The findings first confirm the role of geographical distance, insularity and landlockedness as "resistance factors" for exports. An opposite effect is shown on the positive signs reported for trading partners' WTO accession and APEC membership. Moreover, the findings show that there exists a reinforcing effect of continuously improved interconnectivity among WTO members to Chinese exports.

In our study, it appears that the conclusion of free trade agreements acts as a substitute for smoothing the impact of competition from third countries. Once again, the empirical evidence confirms the positive effect of migration on Chinese merchandise exports, the estimated coefficients being statistically significant in all four regressions presented here. Besides, the role of direct and indirect network effects has been widely reported in the relevant literature, facilitating bilateral trade even in the case of weak institutions. We might perhaps claim that, especially in the case of the expatriate Chinese, the firm desire to preserve the links with the long-standing Chinese culture, and whatever this entails, is also depicted in their everyday consumer life, without underestimating the country's long tradition in trade. What is likely to influence any relevant studies on the determinants of Chinese exports in the future, it is probably the inauguration of new land trade routes linking Asia with Europe, a development that can eventually alter the discouraging effect of the trading partners' lack of access to the sea. However, any further intensification of migratory flows of ethnic Chinese towards the continents of the southern hemisphere is expected to maintain the vital importance of maritime trade routes.

# APPENDIX A. VARIABLES AND DATA SOURCES

| Variable | Definition | Source |
|---|---|---|
| $EXP_{cit}$ | Chinese exports' value in 2010 constant US dollars | UN COMTRADE, UNCTAD, IMF, Eurostat, converted in 2010 constant US dollars by own calculations |
| $distance_{ci}$ | Distance between China and each trading partner | CEPII GeoDist database (2017), *distwces* variable |
| $island_i$ | Dummy for island countries, 0 or 1 | Own calculations |
| $landlocked_i$ | Dummy for landlocked countries, 0 or 1 | Own calculations |
| $WTO_{it}$ | Dummy for a trade partner's Accession to the WTO, 0 or 1 | Own calculations, data available in: https://www.wto.org/ |
| $WTON_{it}$ | Number of WTO neighboring countries of a WTO trade partner | Own calculations, data available in: https://www.wto.org/ |
| $APEC_{it}$ | Dummy for a partner's APEC membership, 0 or 1 | Own calculations, data available in: https://www.apec.org/ |
| $FTA_{it}$ | Dummy for a trade partner's free trade agreement with China, 0 or 1 | Asian Development Bank, Asia Regional Integration Center, data available in: https://aric.adb.org/fta-country |
| $population_{it}$ | Population size of China | UN DESA Population Division, UNCTAD secretariat estimates (2018) |
| $migrant\ stock_{it}$ | Chinese migrant stock | United Nations database, POP/DB/MIG/Stock/Rev.2017 |
| $GDPpc_{it}$ | Trading partner's per capita GDP (PPP) in constant 2011 international dollars | World Bank, 2018 (last update: 25/7/2018) |
| $import\ openness_{it}$ | Ratio of trading partner's imports to GDP | UN COMTRADE, UNCTAD (2019) and own calculations |
| $product\ diversification_{it}$ | Trading partner's product diversification index | UN COMTRADE, UNCTAD (2019) |
| $T_{1995}$- $T_{2017}$ | Time dummies, value 1 for the observation year, otherwise 0 | Own calculations |

# APPENDIX B. NUMBER OF OBSERVATIONS BY TRADE PARTNER

| | | | |
|---|---|---|---|
| Afghanistan (4) | Dominica (5) | Lebanon (6) | Rwanda (6) |
| Albania (5) | Dom. Republic (6) | Lesotho (5) | St. Kitts & Nevis (3) |
| Algeria (6) | Ecuador (6) | Liberia (6) | Saint Lucia (5) |
| Angola (6) | Egypt (6) | Libya (5) | St. Vin. & Grenadines (3) |
| Antigua and Barbuda (5) | El Salvador (6) | Lithuania (6) | Samoa (6) |
| Argentina (6) | Eq. Guinea (6) | Luxembourg (5) | S. Tome & Principe (3) |
| Armenia (6) | Estonia (6) | Madagascar (6) | Saudi Arabia (6) |
| Australia (6) | Ethiopia (6) | Malawi (5) | Senegal (6) |
| Austria (6) | Fiji (6) | Malaysia (6) | Seychelles (5) |
| Azerbaijan (6) | Finland (6) | Maldives (6) | Sierra Leone (5) |
| Bahamas (6) | France (6) | Mali (6) | Singapore (6) |
| Bahrain (6) | Gabon (6) | Malta (6) | Slovakia (6) |
| Bangladesh (6) | Gambia (5) | Marshall Islands (5) | Slovenia (6) |
| Barbados (5) | Georgia (6) | Mauritania (6) | Solomon Islands (6) |
| Belarus (6) | Germany (6) | Mauritius (6) | South Africa (5) |
| Belgium (5) | Ghana (6) | Mexico (6) | Spain (6) |
| Belize (5) | Greece (6) | Micronesia (6) | Sri Lanka (6) |
| Benin (6) | Grenada (4) | Mongolia (6) | Sudan (2) |
| Bhutan (5) | Guatemala (6) | Morocco (6) | Suriname (6) |
| Bolivia, Pl. State of (6) | Guinea (6) | Mozambique (6) | Eswatini (5) |
| Bosnia & Herzeg/na (6) | Guinea-Bissau (5) | Myanmar (6) | Sweden (6) |
| Botswana (5) | Guyana (5) | Namibia (5) | Switzerland (6) |
| Brazil (6) | Haiti (5) | Nauru (2) | Tajikistan (6) |
| Brunei Darussalam (6) | Honduras (6) | Nepal (6) | North Macedonia (5) |
| Bulgaria (6) | Hungary (6) | Netherlands (6) | Thailand (6) |
| Burkina Faso (4) | Iceland (5) | New Zealand (6) | Togo (6) |
| Burundi (6) | India (6) | Nicaragua (6) | Tonga (4) |
| Cabo Verde (3) | Indonesia (4) | Niger (5) | Trinidad and Tobago (5) |
| Cambodia (6) | Iran (6) | Nigeria (6) | Tunisia (6) |
| Cameroon (6) | Iraq (6) | Norway (6) | Turkey (6) |
| Canada (6) | Ireland (6) | Oman (6) | Turkmenistan (6) |
| Central Afr. Rep. (6) | Israel (6) | Pakistan (6) | Tuvalu (3) |
| Chad (6) | Italy (6) | Palau (3) | Uganda (6) |
| Chile (6) | Jamaica (6) | Panama (6) | Ukraine (6) |
| China, Hong Kong (6) | Japan (6) | Papua New Guinea (6) | UAE (6) |
| Colombia (6) | Jordan (6) | Paraguay (6) | United Kingdom (6) |
| Comoros (5) | Kazakhstan (6) | Peru (6) | U.R. of Tanzania (6) |
| Congo (6) | Kenya (6) | Philippines (6) | United States (6) |
| Costa Rica (6) | Kiribati (5) | Poland (6) | Uruguay (6) |
| Côte d'Ivoire (6) | Korea, Republic of (6) | Portugal (6) | Uzbekistan (6) |
| Croatia (6) | Kuwait (6) | Qatar (5) | Vanuatu (5) |
| Cyprus (6) | Kyrgyzstan (6) | Rep. of Moldova (6) | Viet Nam (6) |
| Czechia (6) | Laos (6) | Romania (6) | Zambia (6) |
| Denmark (6) | Latvia (6) | Russian Federation (6) | Zimbabwe (6) |

Note: The distinction between China and Hong Kong SAR is carried out for statistical purposes.

# APPENDIX C. RESULTS (C = 0.5)

| | Reg. (1) | Reg. (2) | Reg. (3) | Reg. (4) |
|---|---|---|---|---|
| Independent Variables | $EXP_{cit}$ N=989 | $EXP_{cit}$ N=989 | $EXP_{cit}$ N=989 | $EXP_{cit}$ N=989 |
| Constant | 23.989 | 26.371 | 13.634 | 0.748 |
| Distance | -1.042 (-8.846)[a] | -0.847 (-9.106)[a] | -0.561 (-5.947)[a] | -0.390 (-5.601) [a] |
| Per capita GDP | 0.574 (10.523)[a] | 0.406 (8.740)[a] | | 0.718 (21.060) [a] |
| Population size | | | 0.740 (26.027)[a] | 0.909 (33.984)[a] |
| Migrant stock | 0.123 (7.441)[a] | 0.171 (12.739)[a] | 0.124 (9.109)[a] | 0.084 (8.613)[a] |
| Island | | -2.288 (-17.771)[a] | | |
| Landlocked | -0.978 (-6.248)[a] | -1.217 (-9.275)[a] | -1.307 (-12.149)[a] | -0.943 (-10.268)[a] |
| WTO | 0.427 (2.027)[b] | 0.714 (4.361)[a] | | 0.317 (2.573)[a] |
| WTO network effect | 0.359 (13.352)[a] | | | |
| APEC | 1.263 (6.454)[a] | 1.428 (9.859)[a] | 0.551 (5.015)[a] | |
| Import openness | -0.479 (-4.068)[a] | -0.744 (-7.399)[a] | 0.561 (6.063)[a] | 0.615 (7.670)[a] |
| Product diversification | | | -4.273 (-6.526)[a] | |
| FTA | 0.543 (2.680)[a] | | -0.350 (-2.442)[b] | |
| $T_{1995}$ | | -2.277 (-14.737)[a] | -2.378 (-18.092)[a] | -1.969 (-16.258)[a] |
| $T_{2000}$ | | -1.893 (-13.414)[a] | -1.825 (-15.862)[a] | -1.596 (-16.245)[a] |
| $T_{2005}$ | | -0.681 (-5.360)[a] | -0.725 (-6.928)[a] | -0.587 (-6.879)[a] |
| $T_{2010}$ | 0.672 (4.747)[a] | | | |
| Adjusted $R^2$ | 0.535 | 0.681 | 0.787 | 0.843 |
| F-test | 114.608[a] | 189.381[a] | 332.523[a] | 530.399[a] |
| Durbin-Watson | 1.662 | 1.961 | 1.989 | 1.981 |

Note: All variables except dummies are expressed in natural logarithms. Estimations use White's heteroskedasticity-consistent covariance matrix estimator. t-Statistics are in parentheses. The superscript *a* means p< 0.01, *b* means p<0.05.

# APPENDIX D. RESULTS (C = 0.1)

| | Reg. (1) | Reg. (2) | Reg. (3) | Reg. (4) |
|---|---|---|---|---|
| Independent Variables | $EXP_{cit}$ N=989 | $EXP_{cit}$ N=989 | $EXP_{cit}$ N=989 | $EXP_{cit}$ N=989 |
| Constant | 24.260 | 26.786 | 13.922 | 0.784 |
| Distance | -1.070 (-9.074)[a] | -0.878 (-9.447)[a] | -0.578 (-6.090)[a] | -0.405 (-5.769)[a] |
| Per capita GDP | 0.593 (10.927)[a] | 0.423 (9.084)[a] | | 0.727 (21.628)[a] |
| Population size | | | 0.746 (26.226)[a] | 0.916 (34.583)[a] |
| Migrant stock | 0.095 (6.659)[a] | 0.138 (11.928)[a] | 0.101 (8.711)[a] | 0.069 (8.197)[a] |
| Island | | -2.316 (-17.768)[a] | | |
| Landlocked | -0.984 (-6.271)[a] | -1.218 (-9.238)[a] | -1.311 (-12.132)[a] | -0.946 (-10.272)[a] |
| WTO | 0.435 (2.058)[b] | 0.734 (4.462)[a] | | 0.322 (2.609)[a] |
| WTO network effect | 0.367 (13.554)[a] | | | |
| APEC | 1.343 (6.790)[a] | 1.515 (10.317)[a] | 0.596 (5.277)[a] | |
| Import openness | -0.487 (-4.119)[a] | -0.763 (-7.517)[a] | 0.562 (5.988)[a] | 0.616 (7.596)[a] |
| Product diversification | | | -4.414 (-6.758)[a] | |
| FTA | 0.573 (2.791)[a] | | -0.334 (-2.309)[b] | |
| $T_{1995}$ | | -2.280 (-14.607)[a] | -2.385 (-18.026)[a] | -1.969 (-16.165)[a] |
| $T_{2000}$ | | -1.899 (-13.327)[a] | -1.829 (-15.816)[a] | -1.597 (-16.187)[a] |
| $T_{2005}$ | | -0.683 (-5.320)[a] | -0.728 (-6.911)[a] | -0.588 (-6.858)[a] |
| $T_{2010}$ | 0.672 (4.721)[a] | | | |
| Adjusted $R^2$ | 0.530 | 0.672 | 0.785 | 0.842 |
| F-test | 112.416[a] | 184.865[a] | 328.360[a] | 526.417[a] |
| Durbin-Watson | 1.673 | 1.972 | 1.998 | 1.986 |

Note: All variables except dummies are expressed in natural logarithms. Estimations use White's heteroskedasticity-consistent covariance matrix estimator. t-Statistics are in parentheses. The superscript *a* means p <0,01, *b* means p<0,05.

# APPENDIX E. LIST OF ISLAND COUNTRIES OR TERRITORIES

Antigua and Barbuda, Australia, Bahamas, Barbados, Brunei Darussalam, Cabo Verde, Comoros, Cyprus, Dominica, Dominican Republic, Fiji, Grenada, Haiti, Iceland, Indonesia, Ireland, Jamaica, Japan, Kiribati, Madagascar, Maldives, Malta, Marshall Islands, Mauritius, Micronesia (Federated States of), Nauru, New Zealand, Palau, Papua New Guinea, Philippines, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, Sao Tome and Principe, Seychelles, Solomon Islands, Sri Lanka, Tonga, Trinidad and Tobago, Tuvalu, Vanuatu.

# APPENDIX F. LIST OF LANDLOCKED COUNTRIES OR TERRITORIES

Afghanistan, Armenia, Austria, Belarus, Bhutan, Bolivia (Plurin. State of), Botswana, Burkina Faso, Burundi, Central African Republic, Chad, Czechia, Ethiopia, Hungary, Kyrgyzstan, Lao People's Dem. Rep., Lesotho, Luxembourg, Malawi, Mali, Mongolia, Nepal, Niger, North Macedonia, Paraguay, Republic of Moldova, Rwanda, Slovakia, Swaziland, Switzerland, Tajikistan, Uganda, Uzbekistan, Zambia, Zimbabwe.

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