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Ethnic Networks, Information, and International Trade: Revisiting the Evidence

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Ethnic Networks, Information, and International Trade: Revisiting the Evidence *

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Abstract

Influential empirical work by Rauch and Trindade (REStat, 2002) finds that Chinese ethnic networks of the magnitude observed in Southeast Asia increase bilateral trade by at least 60%. We argue that this estimate is upward biased due to omitted variable bias. Moreover, it is partly related to a preference effect rather than to enforcement and/or the availability of information. Applying a theory-based gravity model to ethnicity data for 1980 and 1990, and focusing on pure network effects, we find that the Chinese network leads to a more modest amount of trade creation of about 15%. Using new data on bilateral stocks of migrants from the World Bank for the year of 2000, we extend the analysis to all potential ethnic networks. We find, i.a., evidence for a Polish, a Turkish, a Mexican, or an Indian network. While confirming the existence of a Chinese network, its trade creating potential is dwarfed by other ethnic networks.

Keywords: Gravity model, international trade, network effects, international migration.

JEL-Codes: F22, F12

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1 Introduction

Simple static and dynamic neoclassical models predict that more liberal international mobility of labor has the potential to unlock huge efficiency gains; see Moses and Letnes (2004) or Klein and Ventura (2007). These effects derive from a more efficient allocation of the global work force over countries. While hiding potentially important adverse effects in sending countries, they also abstract from gains due to increased international integration of markets driven by networks of migrants.

In an influential paper, Rauch and Trindade (2002) – henceforth R&T – use an empirical trade flow model to show that the network formed by the overseas Chinese population has a major trade creating effect. Quantitatively, they find that "*for trade between countries with ethnic Chinese population shares at the levels of prevailing in Southeast Asia, the smallest estimated average increase in bilateral trade in differentiated products attributable to ethnic Chinese networks is nearly 60%*" (p. 116). They argue that this effect is due to the reduced information costs and improved contracting conditions that networks may bring about. Compared to other determinants of bilateral trade, this effect is large. For example, R&T find that the pro-trade effect of colonial ties is only 13.8%.

The paper by R&T is widely cited. In their survey article, Anderson and van Wincoop (2004) devote substantial space to the results of R&T and argue that the ad valorem tariff equivalent of informational costs is about 6 percent. This is higher than the average tariff rate applied worldwide in recent years.[1] Using data for OECD countries, Evans (2003) argues that tariff equivalents implied by R&T are exaggerated. Existing empirical work connected to R&T makes use of a standard gravity framework. However, in the last years, the econometric modeling of bilateral trade flows has improved due to a sequence of major innovations. Most importantly, Anderson and van Wincoop (2003) have derived a testable gravity equation from the standard monopolistic competition trade model. They show that unbiased estimation of parameters requires to take the so called multilateral resistance terms into account: how strongly trade impediments between two countries reduce their bilateral trade depends crucially on the strength

[1] The WTO World Trade Report (2007) documents that for the US, Canada, and the majority of European countries, the import-weighted average applied tariff rate was 4.1 percent in 2005.

of impediments between each of these two countries with all the other countries that they trade with. This argument is clearly important when quantifying the quantitative importance of ethnic networks: how strongly such a network between two countries encourages bilateral trade depends on the costs of alternative trade routes that these two countries entertain.[2]

Besides potential omitted variable bias, the results of R&T may also suffer from misspecification. Santos Silva and Tenreyro (2006) argue and show empirically that log-linear specifications of the gravity equation may lead to inconsistent estimates if the assumed error term does not enter multiplicatively into the relationship. Liu (2008) emphasizes that this critique also applies to Tobit estimation, the estimation technique used by R&T. One way to deal with this problem is to estimate the gravity model by Poisson pseudo maximum likelihood, which robust is to the type of misspecification mentioned above.[3]

As Combes *et al.* (2005) point out, ethnic networks may affect bilateral trade not only through their effect on trade costs (information and contracting costs), but also through preferences: members of ethnic minorities abroad may derive higher utility from goods imported from countries that host their ethnic majority. It is therefore difficult to clearly disentangle the trade cost from the preference effect.[4] Separate identification, however, would be welcome, since trade-cost savings from networks free up resources and therefore represent welfare-improving efficiency improvements. The preference channel is not associated to such efficiency gains. The existence of a measurable and sizable trade-cost effect would be another – hitherto neglected – channel through which international migration leads to an improved allocation of resources worldwide.

In this paper we offer three contributions. First, we discuss the identification of the trade-cost channel of networks in a theory-based gravity model. We argue that, excluding the links of ethnic minorities with the ethnic majority country, one may minimize the preference effect and come closer to the pure trade cost effect. Second, we apply a modern approach to the data of

[2]Controlling for multilateral resistance is crucial, e.g., for the correct estimation of border effects – see the discussion in Feenstra (2004) – and, hence, for dealing with the so called border puzzle (McCallum, 1995).

[3]Liu (2008) also shows that Poisson estimation helps addressing the puzzle raised by Rose (2004) that WTO membership does not create trade.

[4]Felbermayr and Toubal (2008) is a first attempt to disentangle the trade costs and preference effects of migrants on OECD bilateral trade.

R&T. This avoids a number of problems related to the R&T approach; see Baldwin and Taglioni (2006) for a discussion of those issues.[5] Combining the first and the second point, we show that the large trade-creating effect of 60% estimated by R&T is probably two to four times too large. Most of the overestimation comes from the omission of the multilateral resistance terms; the preference channel seems to be less important.

Finally, we extend the analysis beyond R&T. Using data from the World Bank for the year of 2000, we proxy ethnic networks by the stocks of foreign-born individuals. This gives us a more narrow definition of ethnic networks, because only migration in a life-time can constitute an overseas ethnic minority. However, applying R&T's methodology, we find qualitatively similar results than for the years of 1980 and 1990 with the broader definition of ethnicity. Moreover, the World Bank allows to check for the existence of other ethnic (or better: migrant) networks. Besides the Chinese network, we document the existence of an Indian, a Turkish, or a Mexican network, to name only a few. Interestingly, in terms of trade-creating potential, the Chinese network is by far not the most important one.

Our paper is related to the literature as follows. Besides the paper by R&T, which we take as our starting point, our analysis is very close to Combes *et al.* (2005). That paper studies the role of social and business networks constituted by inter-regional migrants in France. Using a theory-based gravity approach, they find that these regional networks are quantitatively important and that they may contribute toward an explanation of the border puzzle introduced by McCallum (1995). Our paper is also related to a large literature on the direct effect of migration on bilateral trade. Gould (1994), Head and Ries (1998), Girma and Yu (2000), and Wagner *et al.* (2002) study the trade promoting role of immigration into the U.S. or Canada. Dunlevy (2006) and Bandyopadhyay *et al.* (2008) document a pro-trade effect of migration on the exports of US states. While the older literature usually focuses on bilateral trade of one anchor country with many trade partners, Felbermayr and Jung (2008) extend the analysis to the full matrix of sending and receiving countries and identify a strong causal effect of bilateral migration on bilateral trade between Southern and Northern countries.

[5] Baldwin et al. (2008) document the quantitative importance of these problems in a study on the effect of the Euro on trade and investment.

The remainder of this paper is structured as follows. Section 2 introduces the theoretical framework and discusses our econometric approach. Section 3 provides a detailed look at the data. Section 4 and 5 contain our results while section 6 offers concluding remarks. The Appendix further details regression results .[6]

2 Econometric specification

2.1 A theory-based gravity model

We assume the existence of representative household with CES preferences over domestic and imported varieties of some differentiated good. Different to the standard treatment, we use the utility function proposed in Combes *et al.* (2005) which introduces source-country specific weights a_{ij}. These weights capture the particular attachment of country $i's$ household to imports from country j. We may use this slightly modified utility function in the multi-country monopolistic competition model of international trade proposed by Anderson and van Wincoop (2003), henceforth A&vW. Utility maximization under the appropriate aggregate budget constraint, market clearing, and the assumption that iceberg trade costs T_{ij} and preference weights a_{ij} are symmetric $(T_{ij} = T_{ji}; a_{ij} = a_{ji})$, the (c.i.f.) value of bilateral imports M_{ij} can be written as

$$M_{ij} = \frac{Y_i Y_j}{Y_w} \left(\frac{T_{ij}}{a_{ij}} \right)^{1-\sigma} \left(\tilde{P}_i \tilde{P}_j \right)^{\sigma-1}, \tag{1}$$

where the price indices $\tilde{P}$ solve $\left(\tilde{P}_j\right)^{1-\sigma} = \sum_{i=1}^{C} (Y_i/Y_w) (T_{ij}/a_{ij})^{1-\sigma} \left(\tilde{P}_i\right)^{\sigma-1}$; see Feenstra (2004) for the details of the derivation. A&vW call $\tilde{P}_i$ indices of multilateral resistance because they depend on the trade costs of country i with all countries in the world, the number of which is given by C. The variables Y_i denote GDP of country i, the subindex w refers to the world. The elasticity of substitution in the underlying CES utility function is given by σ. We will be interested by the determinants of T_{ij} in general, and by the cost of obtaining information in particular. Following the literature, we assume that T_{ij} is a log-linear function of its determinants.

[6] Our data, program codes, and further results can be downloaded from `http://team.univ-paris1.fr/teamperso/toubal/papers/fjt08.7z`

The central insight of A&vW is that the volume of trade between i and j depends not only on the trade costs between i and j but on the entire distribution of trade costs between i and j and *all other countries* of the world. How strongly T_{ij} restricts trade between i and j depends on the costs that affect trade with alternative partners. Hence, in the estimation we have to deal with the $\tilde{P}_i$ terms. We also have to decide about the appropriate econometric estimation technique. Finally, in order to make the role of networks explicit, we need to model T_{ij} and a_{ij}. We deal with the first two issues first and relegate the modeling of trade costs and preferences into section 2.2.

The multilateral resistance terms $\tilde{P}_i$ are essentially unobserved since they do not correspond to official CPI deflators. A&vW show how one can solve for the $\tilde{P}_i$ terms numerically and use them in an iterative estimation strategy. They demonstrate that the failure to control for multilateral resistance typically biases the absolute value of estimated trade cost variables upwards. R&T recognize the problem of multilateral resistance (without mentioning the issue) by adding an ad-hoc remoteness term to their regressions. Ex ante, it is unclear whether this is sufficient to deal with omitted variable bias. In our regressions, we follow Feenstra (2004) who argues that the use of importer and exporter specific fixed effects in a simple OLS model leads to very similar results than A&vW's strategy but is technically much less demanding. We opt for this strategy, which is now common in virtually all gravity applications. In order to save on degrees of freedom, we do not allow for separate role for importer and exporter fixed effects; rather, we will use country dummies which, nevertheless, fully control for all purely country-specific variables such as the $\tilde{P}_i$ terms; see Baier and Bergstrand (2007) for a similar strategy.[7]

Traditionally, the gravity literature estimates a log-linear version of (1). In non-stochastic form, the relationship between the multiplicative constant-elasticity model (1) and its log-linear additive formulation is trivial. This does no longer hold if trade flows are measured with error. Santos Silva and Tenreyro (2006) warn that heteroskedastic residuals do not only lead to inefficiency of the log-linear estimator, but also cause inconsistency. This is because of Jensen's

[7]R&T do not overtly address the issue of multilateral resistance. They implicitly deal with it in an ad hoc way by introducing a variable called remoteness.

inequality which says that the expected value of the logarithm of a random variable is different from the logarithm of its expected value, i.e., $E(\ln M_{ij}) \neq \ln E(M_{ij})$. Then, $E(\ln M_{ij})$ not only depends on the mean of M_{ij}, but also on higher moments of the distribution. Thus, heteroskedasticity in the residuals, which on a first glance only affects efficiency of the estimator, feeds back into the conditional mean of the dependent variable, which, in general, violates the zero conditional mean assumption on the error term needed to guarantee consistency.

To be more precise, consider that the true model can be represented as $M_{ij} = \exp(\beta X_{ij}) + \epsilon_{ij}$. Then, estimating a log-linear model of the form $\ln(M_{ij}) = \beta X_{ij} + \ln(\eta_{ij})$ would imply that $\eta_{ij} = 1 + \epsilon_{ij}/\exp(\beta X_{ij})$. Hence, $E[\eta_{ij}|X_{ij}]$ can only be independent of X_{ij} for the special case $\epsilon_{ij} = \exp(\beta X_{ij})\nu_{ij}$, where ν_{ij} is a random variable statistically independent of X_{ij}. In general, this requirement is violated.

Santos Silva and Tenreyro (2006) solve these problems by estimating the gravity equation multiplicatively (without taking the logarithm on M_{ij}) and allowing for heteroskedasticity. Their proposed estimator is equivalent to the Poisson pseudo-maximum likelihood estimator (PML), the most commonly used conditional mean specification of which is $E(M_{ij}|X_{ij}) = \exp(\beta X_{ij})$. Coefficients can be explained as elasticities if the dependent variable is in level and covariates X_{ij} are in logs. It is worthy to note that country fixed effects can be included in the PML model as a control for multilateral resistance terms.

Santos Silva and Tenreyro (2006) justify the hypothesis that conditional variance is proportional to the conditional mean for the Poisson model, although the Poisson regression is consistent even when the variance function is misspecified.[8]

Liu (2008) argues that the problem of inconsistency due to heteroskedasticity also applies to the Tobit estimator, which has been used by R&T. Moreover, they use the log of total bilateral trade $\ln[(M_{ij} + M_{ji})/2]$ as the dependent variable, which would be correct only if the theoretical assumption of perfect symmetry in trade costs $\tau_{ij} = \tau_{ji}$ was to be taken literally and the error terms were symmetric, too.

[8] Using nonparametric tests, Henderson and Millimet (2008) recommend estimation of the gravity model in levels. Wooldridge (2002, p.676) emphasizes "while the leading application is to count data, the fixed effect Poisson estimator works whenever the conditional mean assumption holds. Therefore, the dependent variables could be a nonnegative continuous variable, or even a binary response if we believe the unobserved effect is multiplicative...".

2.2 The role of networks

We now need to formalize the role of ethnic (or: migrants') networks. While there is little doubt that such networks may play an important role in conveying important information about the trading opportunities between countries, there is no apparent consensus in the existing literature as to how such networks are to be defined and modeled.

We define as the k-ethnic network the set of bilateral links between all countries in the world maintained by members of the ethnicity k. In other words, there are as many ethnic networks as there are ethnicities in the world. In our empirical work, we will assume that every ethnicity is associated to exactly one country in the world.[9] Moreover, most of our analysis concentrates on the most sizable ethnic network studied by R&T: that of Chinese.

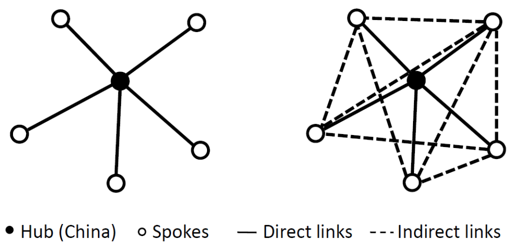

Figure 1: Direct and indirect links in a network of countries.

Figure 1 illustrates a stylized network of six countries. The single star in the left panel depicts the Chinese ethnic network. It illustrates the links between the hub (China), illustrated by a full black circle, and its spokes (other countries), depicted by hollow circles. *Through the hub*, all spokes are linked with each other. The right-hand panel in Figure 1 depicts some of the bilateral trade links between the six countries. The solid lines coincide with the ethnic network which will affect trade relationships directly. We therefore use the term *direct* links. Bilateral trade flows between spokes are illustrated by dashed lines. Since the ethnic network affects those flows only through links to the same hub, we talk about *indirect* links. For simplicity, we assume that each ethnic (or migrant) network is associated to a single hub, but this need not be so in all cases. The strength of the link between any spoke i and the hub is measured by the share of individuals with ethnicity k in the total resident population of spoke i, and denoted by s_{ik}.

[9]Obviously, the number of ethnicities is much larger than the number of independent countries since there are many ethnicities without their own state, e.g., the Kurds. We abstract from this possibility.

Clearly, ethnic networks can foster trade along the direct links. They also, however, potentially affect trade between spokes i and j. This is the case, because migrants with ethnicity k residing in spoke i convey information on trading opportunities with migrants of the same ethnicity residing in spoke j, i.e., information about one country is made available through the k-network. Indirect k-ethnic links between spokes are measured by $N_{ij}^k = s_{ik}s_{jk}$, for all i, j, k.[10] The k-ethnic network is then just the vector N^k that collects all elements N_{ij}^k for all i and j.

Following R&T, we assume that trade costs T_{ij} are a function of geographical measures related to transportation costs (distance, adjacency), of variables related to trade policy (membership in regional trade agreements), a variable measuring cultural proximity (common language), and one related to historical ties (joint colonial past). Central to our analysis, T_{ij} also depends on the network variable defined above. We assume that the trade cost function can be linearized. Collecting all variables other than the network into the (row) vector $\mathbf{X}_{ij}$, we may therefore posit $\ln T_{ij} = \xi_T' \mathbf{X}_{ij} - \sum_k \nu_T^k N_{ij}^k$, where ξ is a vector of coefficients, N_{ij}^k measures the strength of the k-ethnic network (CHINSHARE in R&T), and ν_T^k is the associated coefficient measuring the effect of the k-ethnic network on trade costs (expected to be positive). Evidence in favor of $\nu_T^k > 0$ would suggest that the network lowers informational or contractual costs, thereby encouraging trade through lower total trade costs. This is the *trade cost channel* of networks which R&T focus on in their paper.

Similarly, we may posit that country $i's$ cultural, political, or geographical proximity to country j increases the weight of goods imported from i, so that $\ln a_{ij} = \xi_a' \mathbf{X}_{ij} + \sum_k \nu_a^k N_{ij}^k$, where ν_a^k is expected positive. Evidence for $\nu_a^k > 0$ would be in line with the existence of a *preference effect* of ethnic networks.

Employing these specifications for T_{ij} and a_{ij} in (1), and using non-overlapping sets of country dummies μ_i and μ_j to control for all country-specific variables, we have

$$\begin{aligned} M_{ij} &= \exp\left\{ \ln(Y_i Y_j) + (\sigma - 1)\left(\xi_a' - \xi_T'\right)\mathbf{X}_{ij} + \sum_k (\sigma - 1)\left(\nu_a^k + \nu_T^k\right) N_{ij}^k + \mu_i + \mu_j \right\} + \epsilon_{ij}, \\ &= \exp\left\{ \ln(Y_i Y_j) + \bar{\xi}' \mathbf{X}_{ij} + \sum_k \bar{\nu}^k N_{ij}^k + \mu_i + \mu_j \right\} + \epsilon_{ij}. \end{aligned} \tag{2}$$

[10] Note that $N_{ij}^k \leq N_{kj}^k$, $j, i \neq k$.

Clearly, the estimated coefficients $\bar{\xi}'$ and $\bar{\nu}^k$ will reflect the elasticity of substitution σ as well as the effect of X or the network on trade costs *and* preferences. In other words, there is a twofold identification problem. First, the identification of the *total* network effect is impossible without external information about σ. Second, the trade cost and the preference channels are typically confounded.

At this point, we want to make two observations. First, R&T run equation (2) on different dependent variables: trade in differentiated goods, trade in reference-price goods, and trade in exchange-traded goods. This classification being directly related to the degree of substitutability σ, there are no clear predictions concerning the comparison between parameter estimates $\bar{\xi}'$ and $\bar{\nu}^k$ obtained from these different regressions. For example, even if the trade cost and the preference channel could be separated, for a given strength of the network effect ν_T^k, the estimated coefficient $(\sigma - 1)\,\nu_T^k$ would be large for homogeneous goods since the degree of substitutability is high and low for differentiated goods. The opposite may be true if, for given σ, ν_T^k varies across the groups of goods. However, neither σ nor ν_T^k can be assumed constant over those subaggregates of goods so that the naive comparison of coefficients obtained from different regressions is problematic.

Second, in general, any estimate of $\bar{\nu}^k$ reflects the preference and trade cost effect of the k-ethnic network.[11] However, the following observation may help in the separate identification of the channels. Any ethnic (or migrant) network consists of direct and indirect links. Direct links are those that relate an individual of ethnicity k residing in country i to another individual of the same ethnicity *at the hub*, namely country k. Indirect links, in turn, relate the individual to another one of the same ethnicity in country $j \neq k$. If migrants (or their offspring) have special preferences for goods produced in country k, then direct links will reflect the preference channel along with information channel. The preference channel should, however, not be so important

[11] R&T conceptually decompose the trade cost channel into an 'contractual enforcement' and an 'informational' component. They try to isolate the informational part by distinguishing between differentiated, reference-priced and exchange-traded goods. Their identifying assumption is that network improve contractual enforcement for all categories of goods, but information is only relevant for differentiated goods. Hence, the difference between the network estimates for differentiated and exchange-traded goods reflects information; see also Anderson and van Wincoop (2004). We do not wish to push this interpretation, since equation (2) shows that estimated coefficients would also reflect systematic differences in elasticities of substitution across categories of goods, which are essentially unobserved. Rather, we subsume both effects under 'trade costs'.

in indirect links, since these do not relate to the country of origin. Rather, indirect links should only reflect the information channel.[12]

There is another advantage of looking at indirect links: it may well be that citizens of country k move to country i (and vice versa) as a response to some positive shock to the trading potential between the two countries. Then, the direct ethnic link $s_{ik}s_{ki}$ would be endogenous to the volume of bilateral trade. In contrast, the indirect links $s_{ik}s_{kj}$ would not be affected.[13]

Summarizing, our econometric approach differs from R&T in the following ways:

1. In all of our specifications, the dependent variable is the log (or level, depending on the model) of *imports* rather than the log (or level) of the arithmetic average over imports and exports. This implies that we have two observations per country pair instead of only one. This increases the degrees of freedom, but requires to control for correlation of error terms within each pair.

2. We control for the multilateral resistance terms and all other country-specific determinants of trade costs, policy, history, etc., by including a complete set of *country fixed-effects*. This strategy also mitigates spurious correlation concerns driven, e.g., by language etc..

3. Our preferred specification is a *Poisson (pseudo) maximum likelihood* approach with country fixed-effects.

4. Since the comparison of results by commodity group is complicated by a (potentially) varying degree of substitutability, we also show results for aggregate trade,

5. Besides computing the total network effect, as R&T do, we present *direct* and *indirect* effects for the case of measuring the strength of network in shares, where the latter are supposed to be more informative about the pure trade cost channel.

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[12] R&T propose a similar strategy in a section where they measure the strength of networks in levels rather Chinese ethnic population shares.

[13] Clearly, any combinations of $s_{ik}, s_{jk}, s_{ki}, s_{kj}$ would satisfy this criterion.

3 Data

3.1 Trade data

R&T estimate the effect of Chinese ethnic networks on different dependent variables: trade in differentiated goods, trade in reference-priced goods, and trade in exchange-traded goods. This classification requires trade data at the level of the four-digit Standard Industrial Trade Classification (SITC) Revision 2, which can be downloaded from the United Nations Commodity Trade Statistics Database (UN Comtrade).

Since the raw data are incomplete in time, country, and commodity coverage, several attempts have been made to recompile the data, thereby allocating exports to unspecified regions, and correcting for entrepôt trade. The correct identification of trading partners seems to be an important issue, which is also recognized by R&T.

Statistics Canada has constructed the World Trade Database (WTDB), covering the years 1970-1997. Feenstra (2000) concludes that the "method of dealing with entrepôt trade seems to be adaptable to the situation of an entrepôt country as the Netherlands. [...]. It does not seem to cover the case of entrepôt trade countries such as Hong Kong or Singapore" (p. 4). In order to assess the severity of the problem, Feenstra (2000) compares the total value of U.S. imports from China and Hong Kong, respectively, from Statistics Canada and U.S. Census data, and finds these values to be "reasonably close" (p. 7) up until 1983.

R&T have made use of an early version of the WTDB. Unfortunately, this data is no longer distributed by the NBER. A slightly revised version covering the years 1980-1997 is made available by Robert Feenstra, and can be downloaded as UCD-Statistics Canada Trade Data. The data differ from those used by R&T, because they do not contain zero trade flows. Rather, trade flows below 1,000 thousand U.S. dollar are coded as missing.

Robert Feenstra also provides a newer dataset (NBER-UN World Trade Data), covering the years 1962-2000. Data for early years (1962-1983) are taken from UN Comtrade, making adjustments for country codes only. For the latter years (1984-2000), data only cover 72 countries, and are adjusted in several ways. Most importantly, Feenstra et al. (2005) revise Chinese exports shipped through Hong Kong.[14]

In order to take advantage of all the corrections made, we utilize the UCD-Statistics Canada Trade Data for 1980, and the NBER-UN World Trade Data for 1990 and 2000. We restrict our sample to the 63 countries used by R&T. Unfortunately, the 72 reporting countries in the NBER-UN World Trade Data do not completely overlap the 63 countries of interest, such that we do not have the full trade flow matrix.[15]

3.2 Migration data

Data on Chinese ethnic networks for 1980 and 1990 is taken from R&T. In order to check the existence of migrant networks, we utilize the World Bank international bilateral migration stock database which is available for 226 countries and territories and is described in detail by Parsons et al. (2007). Rather than including all persons with any Chinese ancestry, the World Bank data comprise migrants which have been born in China and now reside in a foreign country. While the migration data are broken down by receiving country, the data make no reference to the time at which migration has taken place (Parsons et al., 2007, p. 4). It allocates the total outstanding stock of 175.7 million international migrants over sending and receiving countries.

Both the Chinese ethnic and the migration network cover Chinese citizens residing abroad and naturalized citizens of Chinese descent. Whereas the Chinese ethnic network also captures descendants of Chinese parents, people born who have just been born in China without being of Chinese ancestry add to the Chinese migrant network. In any case, the focus of the migrant network is on people who have moved during their lifetime.[16]

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[14] Feenstra et al. (2005) estimate the value-added in Hong Kong on re-exports, and reduce the value of imports from China and increase the value of imports from Hong Kong by this amount. The markup calculation is described in detail in Feenstra et al. (1999), and discussed in Feenstra et al. (2005).

[15] Countries and data availability are listed in the Appendix. In order to come from trade data on four-digit SITC level to trade by commodity group, we make use of the Rauch (1999) classification. In order to save space, we focus on the 'liberal' aggregation which maximizes the number of SITC categories classified as either exchange-trade or reference-priced goods in case of ambiguities. R&T compare results for 'liberal' and 'conservative' aggregation rules and find no qualitative and quantitative difference.

[16] This criterion is often not met in case of the Former Soviet Union, Yugoslavia, and Czechoslovakia, where the break-ups of former states have "produced" migrants. However, our analysis does not cover these countries. Moreover, Parsons et. al (2007) states that "the return of Hong Kong to Chinese sovereignty in 1997 did not reduce the number of migrants" (p. 9).

The World Bank matrix also allows for examining the role of other networks in a similar way. In absolute values, Mexico is the top sending country with more than 10.1 million of its natives living abroad. However, 92.6% of emigrants go to neighboring countries. This ratio is 18.4% for India, the second largest sending country with about 9.0 million of its natives abroad, 42.2% for China (fourth largest expatriate population, 5.8 million), 6.2% for Turkey (10th largest expatriate population, 3.0 million), or 13.2% for Morocco (12th largest expatriate population, 2.6 million).[17]

3.3 Other data

Data on population in 2000 and GDP come from the World Development Indicators (WDI).[18] Data on geographical and cultural proximity like distance, use of a common official language, colonial ties, and common colonizer are taken from the CEPII. Following R&T, we include dummies for common membership in the EEC and EFTA for 1980 and 1990. In 2000, we additionally control for common membership in NAFTA and MERCOSUR, which seem to be the most important regional free trade agreements at that time.

4 Results

In this section, we present results for the effect of Chinese networks on trade. The discussion of other potential networks is relegated to the next section. Following R&T, we start with looking at the effect of country pairs trading along the direct *and* indirect links. While this strategy disallows to distinguish between preference and trade cost channel, we proceed with a decomposition of the average effect. In order to make transparent how our estimation strategy impacts on the trade creation of Chinese ethnic networks in Southeast Asia (where the network is quantitatively strong), we also decompose the average effect along the lines of strong and weak networks.

[17] This collection reflects the largest sending countries for which we find network effects in our empirical analysis below.

[18] Unfortunately, WDI do not cover Taiwan which is therefore excluded from our analysis. It turns out that the replication of R&T's results does not hinge on the inclusion of Taiwan.

We do not only present the estimated coefficients, but also compute implied trade creation and associated ad valorem tariff equivalents. We do this in order to make our results comparable to the results presented by R&T and A&vW, respectively.

4.1 The direct and indirect effect of the Chinese network on aggregate bilateral trade

We start the discussion of our results by looking at aggregate bilateral trade. Hence, the dependent variable records the total value of imports of country i from country j. In later tables, we will disaggregate bilateral trade flows into the groups of exchange-trade, reference-priced, and differentiated goods, as proposed by R&T.

The first three columns in Table 1, (A1) to (A3), show the effect of the Chinese ethnic network on the value of bilateral trade, without distinguishing between direct and indirect network links. The list of controls is identical to R&T. This implies that we also use the product of *per capita* GDPs, despite the fact that the standard theoretical derivations of the gravity equation do not allow any role for this variable.[19] Column (A1) replicates R&T for the case of aggregate trade and the year of 1980. The coefficients on standard gravity covariates appear with signs and magnitudes comparable to those found by R&T and other studies: the coefficients on the product of GDPs and distance are close to -1 and 1, respectively. The dummies controlling for common membership in regional trade agreements (EEC, EFTA) yield implausible results (this is common, see Baier and Bergstrand, 2007). Common language and colonial ties have large and significant effects, and the adjacency dummy is not statistically significant.

[19] With non-homothetic preferences, there would be a natural role for per capita income in gravity equations.

Table 1: The Chinese network in aggregate trade

Dependent variable: Aggregate trade			1980					1990					2000		
	(A1)	(A2)	(A3)	(A4)	(A5)	(B1)	(B2)	(B3)	(B4)	(B5)	(C1)	(C2)	(C3)	(C4)	(C5)
	OLS	FE-OLS	FE-PML	FE-OLS	FE-PML	OLS	FE-OLS	FE-PML	FE-OLS	FE-PML	OLS	FE-OLS	FE-PML	FE-OLS	FE-PML
CHIN	4.589***	0.853**	0.982**			4.526***	1.259***	1.816***			5.757***	1.711**	3.335*		
	(7.24)	(2.45)	(2.35)			(8.53)	(2.60)	(4.69)			(3.86)	(2.07)	(1.76)		
CHIN*(1-DIR)				1.062**	0.517				0.943**	0.473				102.5***	44.01
				(2.41)	(1.21)				(2.52)	(1.00)				(2.61)	(1.53)
CHIN*DIR				0.747*	1.121**				1.416**	2.037***				1.782**	3.514*
				(1.77)	(2.44)				(2.23)	(5.40)				(2.13)	(1.85)
ln(GDP_i GDP_j)	0.947***	1.135***	0.945***	1.135***	0.945***	0.876***	0.909***	0.859***	0.909***	0.838***	1.013***	1.050***	0.860***	1.049***	0.860***
	(42.72)	(27.43)	(35.36)	(27.42)	(35.36)	(51.36)	(20.73)	(14.49)	(20.73)	(13.79)	(66.62)	(31.26)	(29.69)	(31.27)	(29.71)
ln(PGDP_i PGDP_j)	0.345***	-0.0142	0.0462	-0.0154	0.0528	0.231***	0.00165	0.0148	0.00321	0.0285	0.133***	0.0786*	0.170***	0.0782*	0.169***
	(11.84)	(-0.29)	(1.45)	(-0.31)	(1.57)	(12.17)	(0.04)	(0.30)	(0.08)	(0.57)	(7.42)	(1.70)	(4.28)	(1.69)	(4.24)
ln(DISTANCE)	-1.080***	-1.124***	-0.699***	-1.123***	-0.703***	-0.935***	-0.992***	-0.569***	-0.993***	-0.586***	-1.148***	-1.197***	-0.538***	-1.192***	-0.536***
	(-16.88)	(-19.65)	(-17.41)	(-19.48)	(-17.17)	(-19.47)	(-23.58)	(-15.20)	(-23.49)	(-15.31)	(-25.48)	(-28.38)	(-15.27)	(-28.19)	(-15.09)
ADJACENT	-0.0463	0.0762	0.438***	0.0785	0.431***	0.431**	0.450**	0.794***	0.446**	0.750***	-0.0603	-0.0923	0.355***	-0.0804	0.362***
	(-0.20)	(0.34)	(3.65)	(0.35)	(3.56)	(2.36)	(2.32)	(9.02)	(2.30)	(8.38)	(-0.33)	(-0.47)	(3.34)	(-0.41)	(3.40)
EEC	-0.673***	-1.735***	-0.107	-1.734***	-0.111	-0.109	-0.347**	0.513***	-0.348**	0.494***	-0.147	-0.593***	0.577***	-0.589***	0.577***
	(-3.96)	(-8.82)	(-0.72)	(-8.81)	(-0.74)	(-0.96)	(-2.32)	(4.38)	(-2.33)	(4.22)	(-1.51)	(-5.19)	(4.83)	(-5.16)	(4.83)
EFTA	0.133	0.0338	0.385**	0.0341	0.386**	-0.458***	-0.0563	0.354**	-0.0563	0.365**	0.548	0.981	-0.744**	0.983	-0.745**
	(0.65)	(0.18)	(2.24)	(0.19)	(2.25)	(-2.95)	(-0.31)	(2.39)	(-0.31)	(2.48)	(0.72)	(1.17)	(-1.96)	(1.17)	(-1.96)
NAFTA											0.173	0.626	0.908***	0.632	0.908***
											(0.29)	(0.81)	(4.50)	(0.82)	(4.51)
MERCOSUR											0.0964	0.837	1.874***	0.840	1.871***
											(0.18)	(1.50)	(12.11)	(1.51)	(12.09)
LANGUAGE	0.573***	0.528***	0.237**	0.528***	0.238**	0.496***	0.514***	0.0688	0.514***	0.0769	0.604***	0.640***	0.212**	0.632***	0.206**
	(4.46)	(4.22)	(2.20)	(4.22)	(2.22)	(5.06)	(5.35)	(0.87)	(5.34)	(0.98)	(6.85)	(6.94)	(2.48)	(6.82)	(2.39)
COLOTIE	0.631***	0.657***	0.157	0.656***	0.157	0.523***	0.453***	0.0840	0.453***	0.0753	0.433***	0.437***	0.0883	0.442***	0.0905
	(2.99)	(3.12)	(1.27)	(3.12)	(1.26)	(3.02)	(3.00)	(0.73)	(3.00)	(0.65)	(2.91)	(2.79)	(0.75)	(2.82)	(0.77)
ln(REMOTE)	0.858***					0.710***					1.098***				
	(6.36)					(6.35)					(11.15)				
R2	0.641	0.722	0.904	0.722	0.904	0.719	0.793	0.930	0.793	0.931	0.753	0.817	0.930	0.817	0.930
Trade creation (%)															
CHIN	1.445	0.267	0.307			1.307	0.362	0.522			0.176	0.0523	0.102		
CHIN*(1-DIR)				0.333	0.162				0.271	0.136				3.183	1.354
CHIN*DIR				0.234	0.351				0.407	0.586				0.0545	0.107
Tariff equivalent (%)															
CHIN	0.205	0.0382	0.0439			0.186	0.0517	0.0745			0.0251	0.00747	0.0146		
CHIN*(1-DIR)				0.0475	0.0231				0.0387	0.0194				0.448	0.192
CHIN*DIR				0.0334	0.0502				0.0581	0.0836				0.00778	0.0153

N=2520 in 1980, N=2795 in 1990, and N=3259 in 2000. All regressions include a constant. FE-OLS and FE-PML include country dummies. Observations clustered by (undirectional) country-pair. Robust t statistics in parenthesis. *, **, *** indicate significance at the 1%, 5%, and 10% level, respectively. Trade creation (%) and ad valorem tariff equivalents (%) evaluated at the respective sample means. Elasticity of substitution is eight.

The variable of interest is $CHIN$. The coefficient obtained under OLS without fixed effects in column (A1) yields a point estimate of 4.589 and a robust, cluster-corrected, t-value of more than 7, which is comparable to results for trade by commodity group reported by R&T.[20] That effect amounts to total trade creation of about 1.5%, if assuming that $CHIN$ moves from zero to the sample average.[21] In terms of ad valorem tariff equivalents, the estimated network effect is equivalent to a hypothetical tariff reduction of about 0.2 percentage points.[22] This is much smaller than the headline result of 60% trade creation or, equivalently, 6% tariff equivalent, discussed by Anderson and van Wincoop (2004), which focus on differentiated goods, and relate to the effect of the network when both concerned countries have *large* (i.e., larger than 1%) ethnic chinese populations. Table 9 columns (A1) and (B1) replicate the findings by R&T.

Column (A2) includes country-specific fixed effects to deal with multilateral resistance. This changes the usual gravity covariates only modestly, with the exception of common EEC membership and colonial ties. In sharp contrast, the network effect drops to 0.853 and is only about 19% as big as the one obtained without fixed effects. Statistical significance, however, is maintained, with a t-value of 2.45. The amount of trade creation or the tariff equivalents are scaled downwards to 0.3% and 0.04%, respectively.[23] Finally, column (A3) replaces OLS estimation with Poisson (pseudo) maximum likelihood (PML). Compared to (A2), the heteroskedasticity-robust approach does not lead to important further changes and has only minor effects on the accuracy of the estimate.

Columns (A4) and (A5) decompose the total network into direct (involving mainland China) and indirect links (not involving China as a trade partner). The dummy variable DIR takes the value of one if the bilateral relationship involves China and zero otherwise. Using fixed-effects in an OLS model, the direct effect comes with an estimate of 0.747 and the indirect one with 1.062, both estimated at satisfactory (though not excellent) statistical precision. Using the fixed-effects

[20] As R&T point out, the Tobit and OLS without fixed effects yield qualitatively and quantitatively comparable results.

[21] The formula employed is $100 \times \left[\exp\left(\bar{\nu} \times \overline{CHIN}\right) - 1\right]$, where $\bar{\nu}$ is the obtained coefficient and $\overline{CHIN}$ the sample mean; see R&T. Summary statistics are shown in the Appendix.

[22] The formula employed is $100 \times \bar{\nu} \times \left[\exp\left(\overline{CHIN}\right) - 1\right] / (\sigma - 1)$. We use the same assumption on σ as Anderson and van Wincoop (2004), i.e. $\sigma = 8$.

[23] This is less than 19% smaller due to the non-linearity of the trade cost function.

PML model, we do not find any evidence for the indirect effect any more. This finding suggests that the preference channel is probably quantitatively more important than the information channel. However, also the preference channel is associated to a fairly modest amount of trade creation (0.35%) and equivalent to a small tariff (0.05%).

Columns entitled (B1) to (B5) repeat the exercise for the year of 1990. The sample composition and the total number of observations is different, but the estimated coefficients are mostly qualitatively and quantitatively similar to those obtained for 1980. However, looking at our preferred specifications (B3) and (B5), we find a larger role for the Chinese network. The total effect now amounts to trade creation of 0.5% and to a tariff equivalent of 0.07% (both about 70% larger than in 1980). This effect is virtually entirely driven by the direct effect. The overall conclusions from 1980 remain robust: the network effect is dramatically reduced when using fixed effects, its economic significance is small, and the total effect is mostly driven by the direct effect.

The remainder of the table turns to the year 2000 where we use data on bilateral stocks of foreign born individuals rather than on ethnic populations. The network variable, constructed as the product of shares in each of the two trading countries' populations, is smaller than for ethnic populations since the concept of foreign-born status is more narrow than that of ethnicity. It is therefore not surprising that the estimated network coefficients are larger. However, when evaluated at the sample mean, the associated amounts of trade creation or the tariff equivalents are again small. The total effect yields trade creation of 0.1% (column C3) with marginal statistical significance. There is no evidence for an indirect effect, and the direct effect, though statistically significant, is small. Note that the estimated coefficient of the indirect effect obtained under FE-OLS (C4) is huge (102.5). That number, together with the estimated for the direct effect, is not plausible, since it opens an interval that does not encompass the average (total) effect found in column (C2). We may conclude that it is crucial to use the PML strategy since the bias due to potential misspecification of the error structure can be large. However, it is qualitatively not important whether ethnic networks are measured using data on overseas ethnic populations (as for years 1980 and 1990), or on populations of foreign born individuals.

4.2 The Chinese network by commodity group

In Table 2, we present the trade creation and tariff equivalent results and the significance level of the associated coefficients for different product categories. We only report the estimation results from the FE-OLS and FE-PML specifications.[24]

The upper third of the table refers to the group of exchange-traded goods; the second to the group of reference-priced goods; and the third to differentiated goods. It is natural to suppose that the underlying degrees of substitutability differ in those groups. Since exchange-traded goods are show-cases for homogeneous goods such as steel, corn, or ore, the elasticity of substitution can be expected to be much larger than in the group of differentiated goods. These differences are taken into account when computing the ad valorem tariff equivalents associated to each network coefficient.

According to R&T, one may expect that the network effect should be largest for commodity goods, smaller for reference-priced goods, and minimum for goods traded on organized exchanges. This conjecture does no longer generally hold true when the gravity equation is estimated in a theory-consistent way by including fixed-effects. In columns (A1) and (B1), exchange-traded goods yield the largest trade-creation effects and tariff equivalents.[25] It is, therefore, no longer meaningful to draw on the comparison of the coefficients obtained with different trade categories using the R&T network variable to disentangle the respective roles of the information and contract-enforcement channels as R&T propose to do.

The intuition that migrants convey trade-relevant information on differentiated goods that are not already captured by the price system bears nicely out in column (C1). The network variable in this column is different from the one used by R&T. We are studying the network effect of China-born residents living overseas in 2000. In terms of economic magnitudes, trade

[24]Trade creation effects and tariff equivalents correspond to columns (A3)-(A5), (B3)-(B5) and (C3)-(C5) of Table 7 in Appendix B. Notice that the results in Table 7 confirms the pattern that OLS without fixed effects typically overestimates the size of the network effect. Interestingly, this problem is particularly severe in the case of differentiated goods where the mere inclusion of these effects cuts the estimate by at least the factor 5 (and makes it disappear in the year 1990); compare columns (A1) and (A2) of Table 7 in Appendix B. Using Poisson has little quantitative effect on the obtained estimates but can have a strong effect on the precision. Similar observations can be made regarding the years 1990 and 2000.

[25]It follows from Table 7 in Appendix B, columns (A3) and (B3), that also the points estimates are largest for exchange-traded goods.

Table 2: The Chinese network in different commodity groups

	(A1)	1980 (A2)	(A3)	(B1)	1990 (B2)	(B3)	(C1)	2000 (C2)	(C3)
	FE-PML	FE-OLS	FE-PML	FE-PML	FE-OLS	FE-PML	FE-PML	FE-OLS	FE-PML
Exchange-traded goods									
Trade Creation (%)									
CHIN	0.935***			0.763***			0.0860		
CHIN*(1-DIR)		0.791***	0.939**		0.682***	0.835**		2.893	3.876
CHIN*DIR		1.076***	0.934***		1.025***	0.753***		0.109***	0.103
Tariff Equivalent (%)									
CHIN	0.0491***			0.0401***			0.00453		
CHIN*(1-DIR)		0.0416***	0.0493**		0.0358***	0.0438**		0.150	0.200
CHIN*DIR		0.0565***	0.0490***		0.0538***	0.0538***		0.00573***	0.00544
Reference-priced goods									
Trade Creation (%)									
CHIN	0.390***			0.326**			0.0500		
CHIN*(1-DIR)		0.931***	0.127		0.584***	-0.201		4.182***	1.575
CHIN*DIR		0.605**	0.427**		0.503**	0.416***		0.0654***	0.0579
Tariff Equivalent (%)									
CHIN	0.0278***			0.0233**			0.00357		
CHIN*(1-DIR)		0.0663***	0.0091		0.0416***	0.0144		0.293***	0.112
CHIN*DIR		0.0432**	0.0305**		0.0359**	0.0297***		0.00467***	0.00413
Differentiated goods									
Trade Creation (%)									
CHIN	0.265			0.590***			0.124*		
CHIN*(1-DIR)		0.314*	0.0330		0.260**	0.104		1.626	1.137
CHIN*DIR		0.156	0.340**		0.282	0.656***		0.0676***	0.128*
Tariff Equivalent (%)									
CHIN	0.0523			0.147***			0.0310*		
CHIN*(1-DIR)		0.0784*	0.00827		0.0649**	0.0260		0.403	0.283
CHIN*DIR		0.0390	0.0850**		0.0706	0.164***		0.0169***	0.0319*

N=2114, N=2127, N=2377 in 1980 for exchange-traded goods, referenced-priced goods and differentiated goods; N=2372, N=2377, N=2533 in 1990 and N=2741, N=2914, N=3025 in 2000, respectively. All regressions inlcude the full list of covariates as shown in Table 1, and a constant (all omitted). FE-OLS and FE-PML include country dummies. Observation clustered by (undirectional) country-pair. *, **, ***, indicate significance of the coefficient at the 1\%, 5\% and 10\% level, respectively. Trade creation and ad valorem tariff equivalent at the respective sample means. Elasticity of substitution is 20, 15, and 5 for exchange-traded goods, referenced-priced goods and differentiated good, respectively.

creation and tariff equivalents for the group of differentiated goods are comparable to the ones obtained for aggregate trade.

Finally, we distinguish again between direct and indirect network effects, see columns (A2), (A3), (B2), (B3), (C2), and (C3). Across all categories of goods, the FE-OLS tend to yield more statistically significant results than Poisson. Also, the trade-creation effects and tariff equivalents are often smallest for differentiated goods and largest for exchange-traded ones, with the exception of the estimates for the year 2000 (with a more narrow definition of the network). In the latter case, we find convincing evidence only for the direct effect, but not for the indirect one. Moreover, in all cases, the trade creation effects are small and never exceed 1%.

Table 3: Strong versus weak network links: Ethnic Chinese and aggregate trade

	1980			1990			2000		
	(A1)	(A2)	(A3)	(B1)	(B2)	(B3)	(C1)	(C2)	(C3)
	FE-PML	FE-OLS	FE-PML	FE-PML	FE-OLS	FE-PML	FE-PML	FE-OLS	FE-PML
Trade Creation (%)									
CHIN*(1-L)	0.817			1.334***			-0.148		
CHIN*(L)	14.68***			28.79***			3.190		
CHIN*(1-L)*(1-DIR)		1.057	1.340**		1.310**	1.300**		4.455**	0.677
CHIN*(1-L)*DIR		-1.890	-0.528		0.0146	1.199*		-1.055***	-0.136
CHIN*L*(1-DIR)		14.84***	12.84**		14.59	12.71**		274.2***	70.63*
CHIN*L*DIR		6.975	14.82***		18.17**	31.25***		1.947*	3.727*
Tariff Equivalent (%)									
CHIN*(1-L)	0.116			0.189***			0.0212		
CHIN*(L)	2.064***			3.816***			0.451		
CHIN*(1-L)*(1-DIR)		0.150	0.190**		0.186**	0.185**		0.623**	0.0964
CHIN*(1-L)*DIR		-0.273	-0.0756		0.00209	0.170*		-0.151***	-0.0194
CHIN*L*(1-DIR)		2.085***	1.834**		2.054	1.804**		18.95***	7.672*
CHIN*L*DIR		1.016	2.083***		2.518**	4.102***		0.277*	0.525*

N=2520 in 1980, N=2975 in 1990, N=3253 in 2000. All regressions inlcude the full list of covariates as shown in Table 1, and a constant (all omitted). FE-OLS and FE-PML include country dummies. Observation clustered by (undirectional) country-pair. *, **, ***, indicate significance at the 1 , 5 and 10 level, respectively. Trade creation and ad valorem tariff equivalent at the respective sample means. Elasticity of substitution is 20, 15, and 5 for exchange-traded goods, referenced-priced goods and differentiated good, respectively.

4.3 Strong versus weak network links: Ethnic Chinese and aggregate trade

Next, Table 3 replicates the key findings of R&T for aggregate trade; results for different categories follow in Table 4. To do so, we distinguish between strong and weak network links. Strong link are defined as those for which in both trading countries the share of ethnic Chinese exceeds 1% of the population. Weak links are made up by the complementary set. We define by L a dummy that takes the value of 1 in the former case and zero in the latter. We may further distinguish between direct and indirect effects as in Tables 1 and 2.[26]

In Table 3, we augment the R&T standard specification by country specific fixed-effects. In this theory-consistent estimation, strong network links increase trade in 1990 by at most 29% with a tariff equivalent of at most 3.8%; for the years of 1980 and 2000, the effects are smaller or non-existent. Weak networks perform worse.

Compared to the R&T results, we find much smaller network effects when estimated in a theory-consistent framework. However, with aggregate bilateral trade as the dependent variable,

[26] The estimated coefficients are presented in columns (A3)-(A5), (B3)-(B5) and (C3)-(C5) of Table 8 in Appendix B.

there is evidence for a substantial and significant effect when focusing on strong links and the broadly defined ethnic network. In 2000, where the more narrow criterion of China-born is used to constitute the foreign Chinese network, we do not find any evidence for a Chinese network anymore, regardless of the intensity of links. This is striking; compare to column (C3) in Table 1 where we have found a (marginally) significant average network effect. The reason for this apparent inconsistency may lie in the lack of linearity in the network effect, so that the effects of weak and strong links estimated in Table 3 do not average up to the total effect found in Table 1.

Table 3 further decomposes the network effects into direct and indirect ones. Across all specifications, we find positive effects for the strong network and for both direct and indirect links. Considering the non-linear estimation strategy FE-PML, we find large trade creation effects and associated tariff equivalents for direct and strong links, ranging from 13 to 71% and from 1.8 to 7.7%, respectively. Interestingly, the more narrowly defined migrant network yields stronger effects than the broader ethnic network.

4.4 Strong versus weak network links: Ethnic Chinese in different commodity groups

The final step, presented in Table 4, looks separately at different categories of goods, but otherwise replicates Table 3.[27]

Neither the ranking of estimates across categories of goods nor their absolute magnitudes are robust to the inclusion of country-fixed effects, neither in 1980 or in 1990. Drawing on the preferred estimates (FE-PML), we find that increasing the size of the network from zero to the sample mean for strong links yields trade creation of about 14% for differentiated goods and a tariff equivalent of 3.4%. Trade creation is larger for exchange-traded goods, but the tariff

[27] The estimated coefficients are presented in columns (A3)-(A5), (B3)-(B5) and (C3)-(C5) of Table 9 in Appendix B. Notice that the results presented in columns (A1), (B1) of Table 9 in Appendix B are comparable with R&T. In the OLS specification, we find the intuitive ranking of coefficients across differentiated, exchange-traded, and reference-priced goods. For differentiated goods, we find the headline trade creation of almost 65% that R&T report in the abstract of their paper. The associated tariff equivalent is higher (13%) than the one computed by Anderson van Wincoop (2004) using the results and data of R&T because we are using a lower elasticity of substitution (5 instead of 8).

equivalent is lower due to a higher assumed elasticity of substitution (20) for the latter category of goods.

We may now summarize the main results obtained from a theory-consistent view on the trade flow implications of the Chinese ethnic network.

1. **Controlling for multilateral resistance is important.** Without doing so, the quantitative importance of the Chinese ethnic network is overestimated, at least by a factor of two. The omitted variable bias is therefore positive, which signals a positive correlation between the degree of multilateral remoteness of both the importer and the exporter and the size of the Chinese network. Besides controlling for the unobserved resistance terms, our fixed-effects estimation also deals with other country-specific and time-invariant determinants of bilateral trade that may correlate with the size of the network. The overall stance of policies toward the rest of the world (e.g., overall trade policy, overall restrictions to migration, etc.) is such a candidate determinant.

2. Poisson estimation (PML) is immune to misspecification of the error term in the empirical form of the gravity equation. It turns out that point estimators of the network coefficients are usually not strongly affected by misspecification bias. However, in several cases the PML affects the estimated standard errors. Usually, **PML makes results more plausible**; however, it also makes it more difficult to find robust network effects.

3. **Direct network links amount to almost all the trade creation** due to ethnic networks. Indirect links are rarely statistically and economically significant. One way to interpret this result is that the preference channel of ethnic networks dominates the trade cost channel. There is also evidence in favor of threshold effects in the sense that network links need to be strong enough to be visible in the data and to matter economically.

4. We do not find overwhelming empirical support for an intuitive ranking of estimated network effects across different categories of goods. Put differently, while we find evidence for a Chinese network effect in aggregate data and for exchange-traded goods, we do not find it for differentiated goods, where the effect is supposed to be strongest. This sheds **doubts on the overall usefulness of R&Ts identification strategy** which

Table 4: Strong versus weak network links: Ethnic Chinese in different commodity groups

	1980			1990			2000		
	(A1)	(A2)	(A3)	(B1)	(B2)	(B3)	(C1)	(C2)	(C3)
	FE-PML	FE-OLS	FE-PML	FE-PML	FE-OLS	FE-PML	FE-PML	FE-OLS	FE-PML
Exchange-traded goods									
Trade Creation (%)									
CHIN*(1-L)	-0.359			-0.424			-1.098**		
CHIN*(L)	28.77***			27.45***			1.044		
CHIN*(1-L)*(1-DIR)		0.951	1.200		0.631	-0.639		3.581	-0.482
CHIN*(1-L)*DIR		-0.137	-3.538**		0.834	-0.125		-0.435	-1.060*
CHIN*L*(1-DIR)		28.64***	39.64***		28.05***	29.35**		200.9	181.1
CHIN*L*DIR		37.30***	26.72**		43.32***	27.21***		3.693**	1.922
Tariff Equivalent (%)									
CHIN*(1-L)	-0.0189			-0.0224			-0.0581		
CHIN*(L)	1.405***			1.352			0.0549		
CHIN*(1-L)*(1-DIR)		0.0498	0.0628		0.0331	-0.0337		0.185	-0.0254
CHIN*(1-L)*DIR		-0.00720	-0.190**		0.0437	-0.00658		-0.0229	-0.0561*
CHIN*L*(1-DIR)		1.399***	1.855***		1.378***	1.434**		5.829	5.469
CHIN*L*DIR		1.761***	1.316**		2.005***	1.341***		0.192**	0.101
Reference-priced goods									
Trade Creation (%)									
CHIN*(1-L)	0.329			1.031**			0.717***		
CHIN*(L)	12.92**			17.01***			2.214*		
CHIN*(1-L)*(1-DIR)		2.982***	0.635		1.652***	1.123*		6.455***	3.820**
CHIN*(1-L)*DIR		0.655	-0.130		-0.263	0.472		-0.630*	0.692**
CHIN*L*(1-DIR)		39.66***	6.268		28.69***	-0.660		433.8***	170.7**
CHIN*L*DIR		23.11**	13.92**		21.41***	19.69***		2.785***	4.158***
Tariff Equivalent (%)									
CHIN*(1-L)	0.0235			0.0733**			0.0511***		
CHIN*(L)	0.915**			1.189***			0.157*		
CHIN*(1-L)*(1-DIR)		0.210***	0.0452		0.117***	0.0798*		0.447***	0.268**
CHIN*(1-L)*DIR		0.0467	-0.00928		-0.0188	0.0336		-0.0451*	0.0493**
CHIN*L*(1-DIR)		2.517***	0.458		1.909***	-0.0501		12.03***	7.149**
CHIN*L*DIR		1.567**	0.982**		1.469***	1.360***		0.197***	0.292***
Differentiated goods									
Trade Creation (%)									
CHIN*(1-L)	1.180*			1.547**			-0.297		
CHIN*(L)	13.87**			33.21***			2.687		
CHIN*(1-L)*(1-DIR)		0.934*	1.435*		1.409***	1.323*		3.876**	0.540
CHIN*(1-L)*DIR		-0.405	-0.0711		-0.530	1.780		-0.190	-0.366
CHIN*L*(1-DIR)		13.23	7.675		14.27	11.61		114.9**	54.05
CHIN*L*DIR		5.634	14.81**		12.01	36.29***		2.787***	3.916
Tariff Equivalent (%)									
CHIN*(1-L)	0.293*			0.384**			-0.0743		
CHIN*(L)	3.428**			7.599***			0.666		
CHIN*(1-L)*(1-DIR)		0.232*	0.356*		0.350***	0.329*		0.951**	0.135
CHIN*(1-L)*DIR		-0.102	-0.0178		-0.133	0.441		-0.0474	-0.0916
CHIN*L*(1-DIR)		3.280	1.951		3.535	2.910		19.23**	10.86
CHIN*L*DIR		1.446	3.645**		3.006	8.203***		0.691***	0.965

N=2114, N=2127, N=2377 in 1980 for exchange-traded goods, referenced-priced goods, and differentiated goods, N=2372, N=2377, N=2533 in 1990, and N=2741, N=2914, N=3025 in 2000, respectively. All regressions include the full list of covariates as shown in Table 1, and a constant (all omitted). FE-OLS and FE-PML include country dummies. Observations clustered by (undirectional) country-pair. Robust t statistics in parenthesis. *, **, *** indicate significance of the coefficient at the 1%, 5%, and 10% level, respectively. Trade creation (%) and ad valorem tariff equivalents (%) evaluated at the respective sample means. Elasticity of substitution is 20, 15 and 5 for exchange-traded, reference-priced, and differentiated goods, respectively.

distinguishes between the contract enforcement and the information channel of ethnic networks.

5 Other migrant networks

R&T have studied the quantitative implications of the Chinese ethnic network in a traditional gravity framework. We have qualified the picture using more recent econometric techniques. One of the underlying assumptions of this work is that the Chinese network is the most influential amongst the large number of potential other ethnic (or migrant) networks. In this section, we look at a large number of potential networks and, using the same econometric setup than for the Chinese network, test for their existence.

In particular, for any network k, we compute the tariff equivalent of increasing the size of the network (the product of population shares $s_{ik}s_{jk}$ of migrants in i and j coming from country k. We focus on aggregate trade and on the total effect (without differentiating between strong and weak and between direct and indirect links). For each network k, we run a separate regression. Since we have information about the location of individuals born in country k only for the year of 2000, all regressions refer to this year. Detailed results are found in Appendix C.

The upper part of Figure 2 represents the point estimates obtained for each network from separate regressions as dark circles. It also plots the 1.96 standard deviations band around those coefficients as dashed lines. All estimates shown are statistically significant at least at the 1% level. The figure shows that the Chinese network is not at all the most important one in terms of the trade cost reduction that it entails. The lower part of the figure, which records the total sizes of emigrant networks in million individuals, shows that the Chinese network is also not the largest one in terms of the emigrant population.

The most powerful network seems to be that of Moroccans, of whom about 2 million live abroad. The associated tariff equivalent is close to 0.1%, which is, of course, still extremely small compared to real-life tariffs, or to other estimated trade barriers (compare, e.g., to the border effect identified in Anderson and van Wincoop, 2003). The second and the third most powerful networks are those of the Polish and the Ghanaese, respectively. The largest emigrant

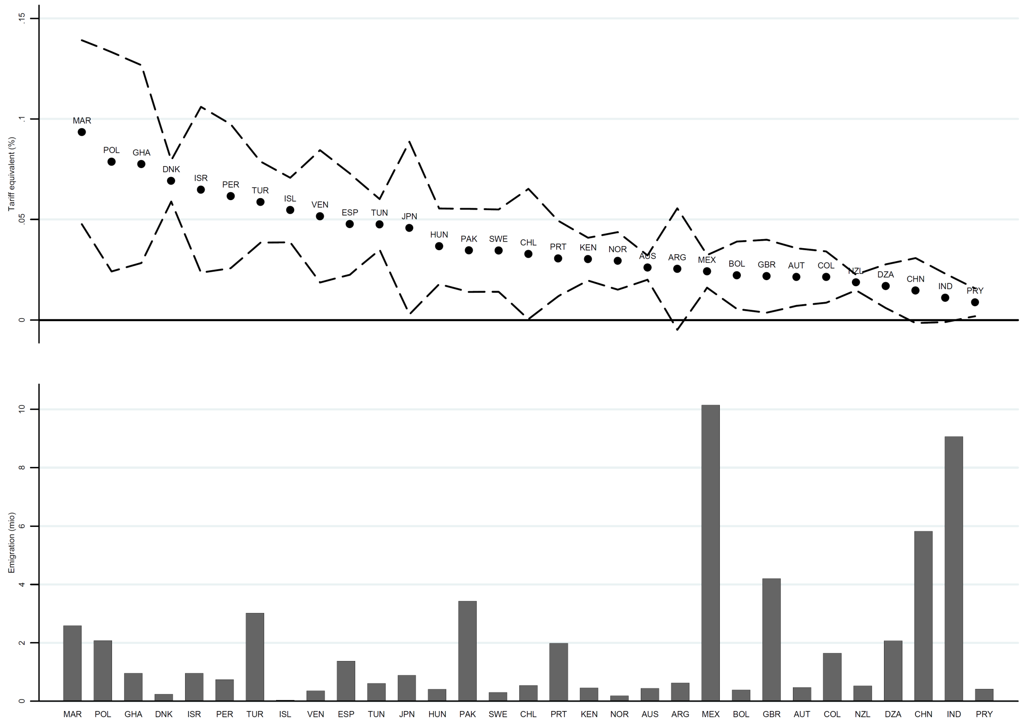

Figure 2: Tariff equivalents of different migrant networks (aggregate trade, total effects).

stock in the world is the Mexican one, with almost 10 million individuals. That network seems to be relevant for trade creation, albeit at a tariff equivalent inferior to 0.05%. The second largest sending country, India, is associated to an even weaker network, with a measurable yet quantitatively negligible network effect.

6 Conclusions

In this paper we have revisited the important work by Rauch and Trindade (R&T, 2002) on the trade-enhancing role of Chinese ethnic networks. Those authors have found that for countries with ethnic Chinese populations shares at the levels prevailing in Southeast Asia, the smallest estimated average increase in bilateral trade in differentiated products attributable to ethnic Chinese networks is nearly 60%. This estimate is obtained by the authors using a traditional gravity model. Recent advances by Anderson and van Wincoop (2003) and Santos Silva and Tenreyro (2006) allow to estimate the network effect in a more theory-consistent and robust way.

Using the econometric techniques proposed in the modern literature, we confirm the existence of a Chinese network effect. However, in terms of magnitudes, the trade creation associated to the network is at most half as big as the one computed by R&T. Moreover, we fail to find the intuitive size ranking of network coefficients across differentiated, reference-priced, and exchange-traded categories of goods. This is not overly surprising since the theory-based gravity model signals that the estimated coefficients confound the elasticity of substitution with the trade-cost elasticity of networks, so that comparing across categories of goods is not an ideal identification strategy. Focusing on indirect network links (i.e., links that relate two trading partners other than China) in order to mitigate endogeneity concerns and to reduce the role of preferences as compared to information, we find that the average network effect is very small (and, indeed, often indistinguishable from zero).

We also investigate other than the Chinese ethnic network. To do so, we use recent data on bilateral stocks of foreign-born individuals provided by the World Bank for the year of 2000 and a total of about 200 countries. Using this data, which implies a more narrow definition of an ethnic network, we conduct a comprehensive quest for the existence of network effects in trade data. Focusing on average effects, we document the existence of a large number of networks. Judging by the obtained size of coefficients and the size of the involved emigrant population, the most relevant are the Moroccan, the Polish, the Turkish, the Pakistan, the Mexican, the British, the Chinese and the Indian networks. However, in all of these cases, the amount of trade creation due to these networks is very small.

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Appendix

A List of countries and summary statistics

Table 5: List of countries included in the regressions

Country	ISO-Code	Reporter (1990, 2000)	Country	ISO-Code	Reporter (1990, 2000)
Algeria	DZA	YES	Kuwait	KWT	YES
Argentina	ARG	YES	Libyan Arab Jamahiriya	LBY	YES
Australia	AUS	YES	Malaysia	MYS	YES
Austria	AUT	YES	Mexico	MEX	YES
Belgium-Luxembourg	BEL	YES	Morocco	MAR	YES
Bolivia	BOL	NO	Netherlands	NLD	YES
Brazil	BRA	YES	New Zealand	NZL	YES
Canada	CAN	YES	Nigeria	NGA	YES
Chile	CHL	YES	Norway	NOR	YES
China	CHN	YES	Pakistan	PAK	YES
Colombia	COL	YES	Paraguay	PRY	NO
Denmark	DNK	YES	Peru	PER	YES
Ecuador	ECU	YES	Philippines	PHL	YES
Egypt	EGY	NO	Poland	POL	YES
Ethiopia	ETH	NO	Portugal	PRT	YES
Finland	FIN	YES	Saudi Arabia	SAU	YES
France	FRA	YES	Singapore	SGP	YES
Germany	DEU	YES	South Africa	ZAF	YES
Ghana	GHA	NO	Spain	ESP	YES
Greece	GRC	YES	Sudan	SDN	NO
Hong Kong	HKG	YES	Sweden	SWE	YES
Hungary	HUN	YES	Switzerland	CHE	YES
Iceland	ISL	NO	Taiwan	TWN	NO
India	IND	YES	Thailand	THA	YES
Indonesia	IDN	YES	Tunisia	TUN	YES
Iran, Islamic Republic of	IRN	YES	Turkey	TUR	YES
Ireland	IRL	YES	United Kingdom	GBR	YES
Israel	ISR	YES	United States of America	USA	YES
Italy	ITA	YES	Uruguay	URY	NO
Japan	JPN	YES	Venezuela	VEN	YES
Kenya	KEN	NO	Yugoslavia	YUG	YES
Korea, Republic of	KOR	YES			

Note: In 1990 and 2000, bilateral tade flows are only available if at least one of the trading partners is a trade data reporting country. The restriction comes from the NBER-UN World Trade Data.

Table 6: Summary statistics

	1980		1990		2000	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Aggregate trade						
Trade	10.55008	2.83535	10.97026	2.55616	11.44128	2.75705
CHIN	0.00313	0.04150	0.00287	0.03893	0.00031	0.00823
CHIN*(1-L)	0.00010	0.00051	0.00014	0.00082	0.00002	0.00014
CHIN*L	0.00303	0.04150	0.00273	0.03893	0.00028	0.00823
N	2520		2795		3253	
Exhange-traded goods						
Trade	9.17629	2.88275	9.66701	2.36043	9.82783	2.51934
CHIN	0.00370	0.04528	0.00333	0.04218	0.00036	0.00896
CHIN*(1-L)	0.00011	0.00055	0.00015	0.00088	0.00002	0.00015
CHIN*L	0.00360	0.04529	0.00318	0.04218	0.00034	0.00896
N	2114		2378		2745	
Reference-priced goods						
Trade	8.84966	2.60053	9.70924	2.33574	10.19298	2.49671
CHIN	0.00369	0.04515	0.00324	0.04154	0.00034	0.00870
CHIN*(1-L)	0.00010	0.00053	0.00015	0.00087	0.00002	0.00015
CHIN*L	0.00359	0.04516	0.00309	0.04154	0.00032	0.00869
N	2127		2453		2916	
Differentiated goods						
Trade	9.24913	2.94396	9.97873	2.70043	10.59338	2.85541
CHIN	0.00330	0.04272	0.00315	0.04088	0.00033	0.00854
CHIN*(1-L)	0.00010	0.00052	0.00015	0.00085	0.00002	0.00014
CHIN*L	0.00320	0.04272	0.00300	0.04088	0.00031	0.00854
N	2377		2533		3025	

B Details to Chinese networks (Tables 2 to 4)

Table 7: The Chinese network in different commodity groups (Details to Table 2)

Dependent variable: Trade by commodity group															
			1980					**1990**					**2000**		
	(A1)	(A2)	(A3)	(A4)	(A5)	(B1)	(B2)	(B3)	(B4)	(B5)	(C1)	(C2)	(C3)	(C4)	(C5)
	OLS	FE-OLS	FE-PML	FE-OLS	FE-PML	OLS	FE-OLS	FE-PML	FE-OLS	FE-PML	OLS	FE-OLS	FE-PML	FE-OLS	FE-PML
Exchange-traded goods															
CHIN	3.743***	2.635***	2.513***			3.607***	2.474***	2.277***			1.880*	2.272**	2.388		
	(6.86)	(4.27)	(3.23)			(4.47)	(5.17)	(3.91)			(1.85)	(2.06)	(1.40)		
CHIN*(1-DIR)				2.128***	2.522**				2.034***	2.490**				79.21	105.6
				(3.17)	(2.13)				(3.34)	(2.37)				(0.93)	(1.42)
CHIN*DIR				2.890***	2.510***				3.052***	2.244***				3.023***	2.870
				(3.88)	(2.92)				(6.24)	(3.74)				(2.61)	(1.62)
Trade creation (%)															
CHIN	1.396	0.981	0.935			1.212	0.830	0.763			0.0677	0.0819	0.0860		
CHIN*(1-DIR)				0.791	0.939				0.682	0.835				2.893	3.876
CHIN*DIR				1.076	0.934				1.025	0.753				0.109	0.103
Tariff equivalent (%)															
CHIN	0.0731	0.0515	0.0491			0.0635	0.0436	0.0401			0.00356	0.00431	0.00453		
CHIN*(1-DIR)				0.0416	0.0493				0.0358	0.0438				0.150	0.200
CHIN*DIR				0.0565	0.0490				0.0538	0.0395				0.00573	0.00544
Reference-priced goods															
CHIN	3.318***	1.930***	1.054**			3.806***	1.530***	1.003**			4.863***	1.513**	1.466		
	(9.78)	(3.58)	(2.21)			(8.65)	(3.62)	(2.32)			(3.48)	(2.03)	(1.25)		
CHIN*(1-DIR)				2.509***	0.344				1.793***	-0.619				120.1***	45.80
				(4.09)	(0.57)				(3.58)	(-0.71)				(2.85)	(1.01)
CHIN*DIR				1.635**	1.153**				1.544**	1.278***				1.916***	1.696
				(2.13)	(2.39)				(2.57)	(3.36)				(2.64)	(1.37)
Trade creation (%)															
CHIN	1.232	0.715	0.390			1.243	0.498	0.326			0.166	0.0516	0.0500		
CHIN*(1-DIR)				0.931	0.127				0.584	-0.201				4.182	1.575
CHIN*DIR				0.605	0.427				0.503	0.416				0.0654	0.0579
Tariff equivalent (%)															
CHIN	0.0876	0.0510	0.0278			0.0884	0.0355	0.0233			0.0119	0.00369	0.00357		
CHIN*(1-DIR)				0.0663	0.00910				0.0416	0.0144				0.293	0.112
CHIN*DIR				0.0432	0.0305				0.0359	0.0297				0.00467	0.00413
Differentiated goods															
CHIN	4.634***	0.633*	0.802			5.078***	0.872	1.867***			9.186***	2.017***	3.770*		
	(9.69)	(1.84)	(1.63)			(7.73)	(1.23)	(4.03)			(5.46)	(2.61)	(1.80)		
CHIN*(1-DIR)				0.949*	0.100				0.824**	0.330				49.11	34.41
				(1.82)	(0.17)				(2.38)	(0.58)				(1.44)	(1.52)
CHIN*DIR				0.472	1.029**				0.896	2.077***				2.057***	3.890*
				(1.02)	(1.99)				(0.88)	(4.39)				(2.61)	(1.85)
Trade creation (%)															
CHIN	1.540	0.209	0.265			1.611	0.275	0.590			0.302	0.0663	0.124		
CHIN*(1-DIR)				0.314	0.0330				0.260	0.104				1.626	1.137
CHIN*DIR				0.156	0.340				0.282	0.656				0.0676	0.128
Tariff equivalent (%)															
CHIN	0.383	0.0523	0.0662			0.400	0.0687	0.147			0.0754	0.0166	0.0310		
CHIN*(1-DIR)				0.0784	0.00827				0.0649	0.0260				0.403	0.283
CHIN*DIR				0.0390	0.0850				0.0706	0.164				0.0169	0.0319

N=2114, N=2127, N=2377 in 1980 for exchange-traded goods, referenced-priced goods, and differentiated goods, N=2372, N=2377, N=2533 in 1990, and N=2741, N=2914, N=3025 in 2000, respectively. All regressions include the full list of covariates as shown in Table 1, and a constant (all omitted). FE-OLS and FE-PML include country dummies. Observations clustered by (undirectional) country-pair. Robust t statistics in parenthesis. *, **, *** indicate significance at the 1%, 5%, and 10% level, respectively. Trade creation (%) and ad valorem tariff equivalents (%) evaluated at the respective sample means. Elasticity of substitution is twenty, fiveteen, and five for exchange-traded, reference-priced, and differentiated goods, respectively.

Table 8: Strong versus weak network link in aggregate trade (Details to Table 3)

Dependent variable: Aggregate trade			1980					1990					2000		
	(A1)	(A2)	(A3)	(A4)	(A5)	(B1)	(B2)	(B3)	(B4)	(B5)	(C1)	(C2)	(C3)	(C4)	(C5)
	OLS	FE-OLS	FE-PML	FE-OLS	FE-PML	OLS	FE-OLS	FE-PML	FE-OLS	FE-PML	OLS	FE-OLS	FE-PML	FE-OLS	FE-PML
CHIN*(1-L)	442.9***	4.793	81.16			238.3***	61.22**	94.25***			656.0***	-287.1**	-64.22		
	(5.94)	(0.08)	(1.45)			(4.74)	(2.46)	(3.54)			(4.18)	(-2.06)	(-0.37)		
CHIN*L	4.625***	0.862**	1.292***			4.593***	1.448***	2.354***			5.880***	0.701	3.059		
	(7.28)	(2.30)	(2.87)			(8.94)	(2.96)	(5.94)			(4.39)	(0.77)	(1.47)		
CHIN*(1-L)*(1-DIR)				104.8	132.7**				92.57**	91.90***				1884.1**	291.8
				(1.55)	(2.02)				(2.42)	(3.22)				(2.46)	(0.51)
CHIN*(1-L)*DIR				-190.3	-52.79				1.039	84.77*				-458.4***	-58.79
				(-1.45)	(-0.54)				(0.02)	(1.67)				(-3.37)	(-0.33)
CHIN*L*(1-DIR)				1.305***	1.148**				1.267	1.113**				128.5***	52.05*
				(2.75)	(2.41)				(1.22)	(2.30)				(3.09)	(1.65)
CHIN*L*DIR				0.636	1.304***				1.553**	2.530***				1.879*	3.564*
				(1.39)	(2.71)				(2.08)	(6.72)				(1.94)	(1.71)
Trade creation (%)															
CHIN*(1-L)	4.540	0.0481	0.817			3.406	0.864	1.334			1.529	-0.662	-0.148		
CHIN*L	63.28	9.565	14.68			63.85	16.84	28.79			6.221	0.722	3.190		
CHIN*(1-L)*(1-DIR)				1.057	1.340				1.310	1.300				4.455	0.677
CHIN*(1-L)*DIR				-1.890	-0.528				0.0146	1.199				-1.055	-0.136
CHIN*L*(1-DIR)				14.84	12.94				14.59	12.71				274.2	70.63
CHIN*L*DIR				6.975	14.82				18.17	31.25				1.947	3.727
Tariff equivalent (%)															
CHIN*(1-L)	0.634	0.00687	0.116			0.479	0.123	0.189			0.217	-0.0949	0.0212		
CHIN*L	7.389	1.377	2.064			7.447	2.347	3.816			0.867	0.103	0.451		
CHIN*(1-L)*(1-DIR)				0.150	0.190				0.186	0.185				0.623	0.0964
CHIN*(1-L)*DIR				-0.273	-0.0756				0.00209	0.170				-0.151	-0.0194
CHIN*L*(1-DIR)				2.085	1.834				2.054	1.804				18.95	7.672
CHIN*L*DIR				1.016	2.083				2.518	4.102				0.277	0.525

N=2520 in 1980, N=2795 in 1990, and N=3253 in 2000. All regressions include the full list of covariates as shown in Table 1, and a constant (all omitted). FE-OLS and FE-PML include country dummies. Observations clustered by (undirectional) country-pair. Robust t statistics in parenthesis. *, **, *** indicate significance at the 1%, 5%, and 10% level, respectively. Trade creation (%) and ad valorem tariff equivalents (%) evaluated at the respective sample means. Elasticity of substitution is twenty, fiveteen, and five for exchange-traded, reference-priced, and differentiated goods, respectively.

Table 9: Strong versus weak network link in different commodity groups (Details to Table 4)

Dependent variable: Trade by commodity group	1980					1990					2000				
	(A1)	(A2)	(A3)	(A4)	(A5)	(B1)	(B2)	(B3)	(B4)	(B5)	(C1)	(C2)	(C3)	(C4)	(C5)
	OLS	FE-OLS	FE-PML	FE-OLS	FE-PML	OLS	FE-OLS	FE-PML	FE-OLS	FE-PML	OLS	FE-OLS	FE-PML	FE-OLS	FE-PML
Exchange-traded goods															
CHIN*(1-L)	271.1***	52.23	-31.87			116.1***	34.46	-27.05			-47.71	-42.80	-432.3**		
	(2.97)	(0.60)	(-0.20)			(2.84)	(1.23)	(-0.56)			(-0.26)	(-0.28)	(-1.96)		
CHIN*L	3.784***	2.754***	2.362***			3.654***	2.587***	2.149***			1.882*	2.180*	0.981		
	(6.88)	(4.16)	(2.58)			(4.49)	(5.09)	(3.45)			(1.84)	(1.83)	(0.54)		
CHIN*(1-L)*(1-DIR)				83.97	105.9				40.03	-40.76				1377.0	-189.2
				(0.83)	(0.59)				(1.08)	(-0.57)				(1.29)	(-0.19)
CHIN*(1-L)*DIR				-12.14	-319.6**				52.82	-7.957				-170.6	-417.1*
				(-0.08)	(-1.96)				(1.54)	(-0.16)				(-1.15)	(-1.90)
CHIN*L*(1-DIR)				2.352***	3.118***				2.191***	2.281**				104.1	97.71
				(3.18)	(2.79)				(3.30)	(2.11)				(1.22)	(1.19)
CHIN*L*DIR				2.961***	2.212**				3.189***	2.132***				3.428**	1.800
				(3.75)	(2.27)				(6.06)	(3.30)				(2.52)	(0.90)
Trade creation (%)															
CHIN*(1-L)	3.103	0.590	-0.359			1.842	0.543	-0.424			-0.122	-0.109	-1.098		
CHIN*L	49.96	34.30	28.77			51.04	33.90	27.45			2.011	2.333	1.044		
CHIN*(1-L)*(1-DIR)				0.951	1.200				0.631	-0.639				3.581	-0.482
CHIN*(1-L)*DIR				-0.137	-3.538				0.834	-0.125				-0.435	-1.060
CHIN*L*(1-DIR)				28.64	39.64				28.05	29.35				200.9	181.1
CHIN*L*DIR				37.30	26.72				43.32	27.21				3.693	1.922
Tariff equivalent (%)															
CHIN*(1-L)	0.161	0.0310	-0.0189			0.0961	0.0285	-0.0224			-0.00642	-0.00576	-0.0581		
CHIN*L	2.251	1.638	1.405			2.298	1.626	1.352			0.105	0.122	0.0549		
CHIN*(1-L)*(1-DIR)				0.0498	0.0628				0.0331	-0.0337				0.185	-0.0254
CHIN*(1-L)*DIR				-0.00720	-0.190				0.0437	-0.00658				-0.0229	-0.0561
CHIN*L*(1-DIR)				1.399	1.855				1.378	1.434				5.829	5.469
CHIN*L*DIR				1.761	1.316				2.005	1.341				0.192	0.101
Reference-priced goods															
CHIN*(1-L)	344.9***	200.9***	30.93			192.7***	55.53**	66.10**			580.1***	-79.00	282.8***		
	(5.67)	(3.72)	(0.57)			(4.42)	(2.09)	(2.14)			(4.21)	(-0.67)	(2.69)		
CHIN*L	3.369***	2.365***	1.146**			3.884***	1.716***	1.367***			4.831***	1.345	2.110*		
	(10.26)	(4.32)	(2.15)			(8.99)	(3.99)	(2.88)			(3.74)	(1.64)	(1.88)		
CHIN*(1-L)*(1-DIR)				276.7***	59.61				105.6***	71.98*				2474.9***	1483.3**
				(3.86)	(0.82)				(2.88)	(1.82)				(4.16)	(2.14)
CHIN*(1-L)*DIR				61.49	-12.23				-16.98	30.32				-249.9*	272.8**
				(0.75)	(-0.16)				(-0.56)	(1.14)				(-1.90)	(2.55)
CHIN*L*(1-DIR)				3.151***	0.573				2.196***	-0.0577				161.4***	95.94**
				(4.45)	(0.78)				(3.97)	(-0.07)				(3.77)	(2.35)
CHIN*L*DIR				1.961**	1.230**				1.689***	1.565***				2.647***	3.925***
				(2.54)	(2.31)				(2.79)	(3.72)				(3.18)	(3.52)
Trade creation (%)															
CHIN*(1-L)	3.731	2.157	0.329			3.035	0.866	1.031			1.477	-0.199	0.717		
CHIN*L	42.92	28.50	12.92			56.22	21.78	17.01			5.142	1.405	2.214		
CHIN*(1-L)*(1-DIR)				2.982	0.635				1.652	1.123				6.455	3.820
CHIN*(1-L)*DIR				0.655	-0.130				-0.263	0.472				-0.630	0.692
CHIN*L*(1-DIR)				39.66	6.268				28.69	-0.660				433.8	170.7
CHIN*L*DIR				23.11	13.92				21.41	19.69				2.785	4.158
Tariff equivalent (%)															
CHIN*(1-L)	0.262	0.152	0.0235			0.214	0.0616	0.0733			0.105	-0.0143	0.0511		
CHIN*L	2.691	1.890	0.915			3.376	1.492	1.189			0.360	0.100	0.157		
CHIN*(1-L)*(1-DIR)				0.210	0.0452				0.117	0.0798				0.447	0.268
CHIN*(1-L)*DIR				0.0467	-0.00928				-0.0188	0.0336				-0.0451	0.0493
CHIN*L*(1-DIR)				2.517	0.458				1.909	-0.0501				12.03	7.149
CHIN*L*DIR				1.567	0.982				1.469	1.360				0.197	0.292
Differentiated goods															
CHIN*(1-L)	448.7***	46.25	113.2*			270.3***	48.67*	101.9**			1252.4***	51.21	-122.1		
	(5.23)	(0.94)	(1.69)			(4.48)	(1.65)	(2.28)			(6.26)	(0.36)	(-0.51)		
CHIN*L	4.669***	0.731**	1.213**			5.180***	1.029	2.490***			9.116***	2.115**	2.526		
	(9.78)	(1.97)	(2.28)			(8.22)	(1.44)	(5.81)			(6.22)	(2.50)	(1.06)		
CHIN*(1-L)*(1-DIR)				89.72*	137.5*				92.89***	87.24*				1561.3**	221.1
				(1.68)	(1.77)				(2.68)	(1.83)				(2.36)	(0.31)
CHIN*(1-L)*DIR				-39.20	-6.860				-35.26	117.1				-77.89	-150.4
				(-0.37)	(-0.09)				(-0.87)	(1.39)				(-0.60)	(-0.60)
CHIN*L*(1-DIR)				1.161**	0.691				1.158***	0.953				72.91**	41.17
				(2.08)	(1.05)				(2.97)	(1.59)				(2.03)	(1.25)
CHIN*L*DIR				0.512	1.290**				0.985	2.688***				2.619***	3.660
				(1.03)	(2.36)				(0.96)	(6.68)				(2.96)	(1.48)
Trade creation (%)															
CHIN*(1-L)	4.760	0.480	1.180			4.156	0.736	1.547			3.097	0.125	-0.297		
CHIN*L	64.86	8.143	13.87			81.60	12.59	33.21			10.04	2.244	2.687		
CHIN*(1-L)*(1-DIR)				0.934	1.435				1.409	1.323				3.876	0.540
CHIN*(1-L)*DIR				-0.405	-0.0711				-0.530	1.780				-0.190	-0.366
CHIN*L*(1-DIR)				13.23	7.675				14.27	11.61				114.9	54.05
CHIN*L*DIR				5.634	14.81				12.01	36.29				2.787	3.916
Tariff equivalent (%)															
CHIN*(1-L)	1.163	0.120	0.293			1.018	0.183	0.384			0.763	0.0312	-0.0743		
CHIN*L	13.19	2.066	3.428			15.81	3.142	7.599			2.404	0.558	0.666		
CHIN*(1-L)*(1-DIR)				0.232	0.356				0.350	0.329				0.951	0.135
CHIN*(1-L)*DIR				-0.102	-0.0178				-0.133	0.441				-0.0474	-0.0916
CHIN*L*(1-DIR)				3.280	1.951				3.535	2.910				19.23	10.86
CHIN*L*DIR				1.446	3.645				3.006	8.203				0.691	0.965

N=2114, N=2127, N=2377 in 1980 for exchange-traded goods, referenced-priced goods, and differentiated goods, N=2372, N=2377, N=2533 in 1990, and N=2741, N=2914, N=3025 in 2000, respectively. All regressions include the full list of covariates as shown in Table 1, and a constant (all omitted). FE-OLS and FE-PML include country dummies. Observations clustered by (undirectional) country-pair. Robust t statistics in parenthesis. *, **, *** indicate significance at the 1%, 5%, and 10% level, respectively. Trade creation (%) and ad valorem tariff equivalents (%) evaluated at the respective sample means. Elasticity of substitution is twenty, fiveteen, and five for exchange-traded, reference-priced, and differentiated goods, respectively.

C Details to other migrant networks (Figure 2)

	ARG		AUS		AUT		BEL		BOL		BRA	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
MIG	72.71*		140.0***		157.4***		26.60		279.3***		16.66	
	(1.65)		(8.44)		(2.92)		(0.19)		(2.60)		(0.59)	
MIG*(1-DIR)		-20272.3		36489.4**		28891.1*		-116595.0*		188388.8		-3927.4
		(-0.61)		(2.48)		(1.84)		(-1.84)		(1.48)		(-0.06)
MIG*DIR		67.09		153.2***		177.9***		-58.88		304.6***		14.19
		(1.52)		(8.19)		(3.17)		(-0.40)		(2.81)		(0.30)
Trade creation (%)												
MIG	0.178		0.183		0.150		0.0201		0.156		0.0419	
MIG*(1-DIR)		-39.07		60.96		31.66		-58.54		185.9		-9.411
MIG*DIR		0.164		0.200		0.170		-0.0444		0.170		0.0357
Tariff equivalent (%)												
MIG	0.0254		0.0261		0.0214		0.00287		0.0222		0.00599	
MIG*(1-DIR)		-7.079		6.799		3.929		-12.58		15.01		-1.412
MIG*DIR		0.0234		0.0286		0.0242		-0.00635		0.0243		0.00510

	CAN		CHE		CHL		COL		DEU		DNK	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
MIG	-537.6***		72.60		191.7**		53.49***		-3.474		362.8***	
	(-6.49)		(0.30)		(1.99)		(3.29)		(-0.22)		(13.23)	
MIG*(1-DIR)		1497948.4		334190.4**		35113.3		7731.8		-277.4		61897.8***
		(0.58)		(2.38)		(0.82)		(0.93)		(-0.31)		(5.67)
MIG*DIR		-382.7		231.0		201.2**		61.01***		-4.590		393.4***
		(-0.06)		(0.90)		(2.07)		(5.48)		(-0.30)		(14.36)
Trade creation (%)												
MIG	-0.614		0.0488		0.230		0.150		-0.0304		0.486	
MIG*(1-DIR)		2.80344e+09		845.1		52.35		24.15		-2.403		128.5
MIG*DIR		-0.437		0.155		0.242		0.171		-0.0402		0.527
Tariff equivalent (%)												
MIG	-0.0879		0.00697		0.0328		0.0214		-0.00435		0.0692	
MIG*(1-DIR)		245.0		32.09		6.015		3.090		-0.347		11.81
MIG*DIR		-0.0626		0.0222		0.0345		0.0244		-0.00575		0.0750

	DZA		ECU		EGY		ESP		ETH		FIN	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
MIG	38.49***		92.07		-10.16*		113.3***		21.78		-2.021	
	(3.05)		(0.96)		(-1.70)		(3.72)		(0.55)		(-0.18)	
MIG*(1-DIR)		-5395.6**		-173799.2***		-4600.0		-13007.8**		63118.3		39988.9***
		(-2.24)		(-3.23)		(-1.45)		(-2.10)		(1.57)		(4.95)
MIG*DIR		36.08***		51.97		-10.80*		92.82***		23.73		10.15
		(2.86)		(0.55)		(-1.78)		(2.86)		(0.59)		(0.87)
Trade creation (%)												
MIG	0.118		0.0640		-0.0285		0.334		0.0197		-0.00348	
MIG*(1-DIR)		-15.24		-70.11		-12.11		-31.84		76.83		99.16
MIG*DIR		0.111		0.0361		-0.0303		0.274		0.0214		0.0175
Tariff equivalent (%)												
MIG	0.0169		0.00914		-0.00407		0.0477		0.00281		-0.000497	
MIG*(1-DIR)		-2.362		-17.25		-1.844		-5.475		8.143		9.842
MIG*DIR		0.0158		0.00516		-0.00433		0.0391		0.00306		0.00250

	FRA		GBR		GHA		GRC		HKG		HUN	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
MIG	-7.372		9.719**		1614.1***		86.08		7.188		253.7***	
	(-0.53)		(2.35)		(3.09)		(0.71)		(0.04)		(3.82)	
MIG*(1-DIR)		1071.8		233.5*		-284870.3		-75510.0**		-46917.5		97605.1***
		(0.63)		(1.68)		(-0.89)		(-2.06)		(-0.94)		(2.60)
MIG*DIR		-5.109		10.41**		1565.6***		53.67		-29.45		296.3***
		(-0.36)		(2.50)		(2.99)		(0.45)		(-0.17)		(4.71)
Trade creation (%)												
MIG	-0.0299		0.153		0.544		0.121		0.00557		0.257	
MIG*(1-DIR)		4.441		3.737		-61.63		-65.32		-30.46		168.4
MIG*DIR		-0.0207		0.164		0.528		0.0753		-0.0228		0.300
Tariff equivalent (%)												
MIG	-0.00427		0.0218		0.0775		0.0172		0.000795		0.0367	
MIG*(1-DIR)		0.621		0.524		-13.68		-15.13		-5.190		14.10
MIG*DIR		-0.00296		0.0234		0.0752		0.0108		-0.00326		0.0428

	IDN		IND		IRL		IRN		ISL		ISR	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
MIG	-20.52*		9.146*		51.68		-558.8		2452.4***		1949.3***	
	(-1.69)		(1.80)		(1.62)		(-1.44)		(6.69)		(3.08)	
MIG*(1-DIR)		196.8		-353.1		-3490.5		14744.0		2182238.5***		-2102390.7**
		(0.20)		(-1.63)		(-0.27)		(1.24)		(5.90)		(-2.17)
MIG*DIR		-20.22		9.516*		50.07		-556.6		2604.1***		1464.7**
		(-1.63)		(1.88)		(1.59)		(-1.42)		(7.19)		(2.20)
Trade creation (%)												
MIG	-0.103		0.0773		0.0623		-0.986		0.384		0.455	
MIG*(1-DIR)		0.992		-2.940		-4.116		29.89		2917.1		-99.25
MIG*DIR		-0.101		0.0804		0.0603		-0.982		0.407		0.341
Tariff equivalent (%)												
MIG	-0.0147		0.0110		0.00889		-0.142		0.0547		0.0648	
MIG*(1-DIR)		0.141		-0.426		-0.601		3.736		48.67		-69.87
MIG*DIR		-0.0145		0.0115		0.00861		-0.141		0.0581		0.0487

Dependent variable: Aggregate trade. Estimation method: Fixed-effect PML. N=3259 in all regressions. All regressions include the full list of covariates as shown in Table 1, a dummy for common colonizer, and a set of country dummies. Observations clustered by (undirectional) country-pair. Robust t statistics in parenthesis. *, **, *** indicate significance at the 1%, 5%, and 10% level, respectively. Trade creation (%) and ad valorem tariff equivalents (%) evaluated at the respective sample means. Elasticity of substitution is eight.

	ITA		JPN		KEN		KOR		KWT		LBY	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
MIG	8.101		316.6**		634.5***		-0.628		-695.0**		-825.0	
	(0.94)		(2.09)		(5.57)		(-0.01)		(-2.57)		(-0.22)	
MIG*(1-DIR)		-2266.8*		2885646.7*		235378.1		12987.8		-795301.7*		1158791.7**
		(-1.77)		(1.81)		(1.05)		(0.35)		(-1.88)		(2.14)
MIG*DIR		-1.026		2880.9*		662.2***		10.87		-758.7***		-810.5
		(-0.10)		(1.95)		(5.65)		(0.11)		(-2.77)		(-0.22)
Trade creation (%)												
MIG	0.0606		0.321		0.212		-0.00108		-0.154		-0.0541	
MIG*(1-DIR)		-15.60	4.	81877e+14		119.6		25.09		-82.93		113.9
MIG*DIR		-0.00767		2.959		0.222		0.0187		-0.169		-0.0532
Tariff equivalent (%)												
MIG	0.00866		0.0458		0.0303		-0.000155		-0.0221		-0.00773	
MIG*(1-DIR)		-2.423		417.2		11.24		3.198		-25.26		10.86
MIG*DIR		-0.00110		0.417		0.0316		0.00268		-0.0241		-0.00760

	MAR		MEX		MYS		NGA		NLD		NOR	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
MIG	98.86***		41.25***		-0.165		164.5		39.52		247.1***	
	(4.00)		(5.83)		(-0.04)		(0.76)		(0.94)		(4.03)	
MIG*(1-DIR)		1699.5		-222.8		619.5		-19237.2		-21607.3		109563.3***
		(1.45)		(-0.35)		(0.72)		(-0.24)		(-1.14)		(14.53)
MIG*DIR		100.2***		40.95***		0.112		156.8		20.53		276.1***
		(3.99)		(5.69)		(0.03)		(0.72)		(0.48)		(4.52)
Trade creation (%)												
MIG	0.656		0.169		-0.000853		0.169		0.0841		0.206	
MIG*(1-DIR)		11.90		-0.910		3.254		-17.88		-36.84		149.2
MIG*DIR		0.665		0.168		0.000581		0.161		0.0437		0.230
Tariff equivalent (%)												
MIG	0.0934		0.0242		-0.000122		0.0241		0.0120		0.0294	
MIG*(1-DIR)		1.606		-0.131		0.457		-2.815		-6.565		13.04
MIG*DIR		0.0947		0.0240		0.0000829		0.0229		0.00624		0.0329

	NZL		PAK		PER		PHL		POL		PRT	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
MIG	106.6***		57.32***		441.6***		38.15		140.4***		71.48***	
	(9.38)		(3.29)		(3.37)		(1.64)		(2.83)		(3.20)	
MIG*(1-DIR)		3681.9		-4013.2		-261755.5*		-4827.5		-7911.7		-4227.9**
		(0.18)		(-1.56)		(-1.75)		(-1.33)		(-1.02)		(-2.12)
MIG*DIR		107.1***		54.25***		330.7**		30.70		130.4***		66.52***
		(8.77)		(3.10)		(2.54)		(1.32)		(2.61)		(2.98)
Trade creation (%)												
MIG	0.131		0.243		0.432		0.192		0.552		0.214	
MIG*(1-DIR)		4.629		-15.61		-92.24		-21.55		-26.69		-11.90
MIG*DIR		0.132		0.230		0.323		0.154		0.513		0.199
Tariff equivalent (%)												
MIG	0.0187		0.0346		0.0616		0.0274		0.0787		0.0306	
MIG*(1-DIR)		0.646		-2.425		-36.51		-3.468		-4.436		-1.810
MIG*DIR		0.0188		0.0328		0.0461		0.0221		0.0731		0.0285

	PRY		SAU		SDN		SGP		SWE		THA	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
MIG	104.3**		-4253.8*		53.79		0.237		152.9***		-86.29	
	(2.50)		(-1.85)		(1.15)		(0.00)		(3.31)		(-1.38)	
MIG*(1-DIR)		-8971.8	-1	6021445.5**		-112495.9*		99205.9**		40961.8***		87286.5
		(-0.11)		(-2.23)		(-1.84)		(2.17)		(4.05)		(1.54)
MIG*DIR		103.2**		-5232.5**		49.38		19.16		179.6***		-56.17
		(2.40)		(-2.23)		(1.08)		(0.21)		(3.78)		(-0.86)
Trade creation (%)												
MIG	0.0616		-0.601		0.0236		0.000125		0.242		-0.120	
MIG*(1-DIR)		-5.160		-100.00		-38.97		68.81		91.11		236.5
MIG*DIR		0.0610		-0.739		0.0217		0.0101		0.284		-0.0781
Tariff equivalent (%)												
MIG	0.00880		-0.0862		0.00337		0.0000179		0.0345		-0.0171	
MIG*(1-DIR)		-0.757		-324.5		-7.054		7.480		9.253		17.33
MIG*DIR		0.00871		-0.106		0.00310		0.00144		0.0406		-0.0112

	TUN		TUR		URY		USA		VEN		ZAF	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
MIG	324.7***		61.83***		-157.5*		-197.8***		749.2***		155.0	
	(7.40)		(5.70)		(-1.70)		(-5.03)		(3.07)		(1.62)	
MIG*(1-DIR)		-73522.3***		-2402.9		-5708.7		-3471.1		15129.9		61571.4***
		(-2.68)		(-1.51)		(-0.02)		(-0.40)		(0.07)		(6.01)
MIG*DIR		307.2***		57.36***		-158.1*		-205.3***		752.9***		187.5*
		(6.91)		(5.17)		(-1.65)		(-4.53)		(3.09)		(1.93)
Trade creation (%)												
MIG	0.333		0.412		-0.0571		-0.740		0.362		0.225	
MIG*(1-DIR)		-52.94		-14.75		-2.049		-12.22		7.564		144.0
MIG*DIR		0.315		0.382		-0.0573		-0.768		0.363		0.272
Tariff equivalent (%)												
MIG	0.0475		0.0587		-0.00816		-0.106		0.0516		0.0321	
MIG*(1-DIR)		-10.77		-2.280		-0.296		-1.862		1.042		12.75
MIG*DIR		0.0450		0.0544		-0.00819		-0.110		0.0518		0.0388

Dependent variable: Aggregate trade. Estimation method: Fixed-effect PML. N=3259 in all regressions. All regressions include the full list of covariates as shown in Table 1, a dummy for common colonizer, and a set of country dummies. Observations clustered by (undirectional) country-pair. Robust t statistics in parenthesis. *, **, *** indicate significance at the 1%, 5%, and 10% level, respectively. Trade creation (%) and ad valorem tariff equivalents (%) evaluated at the respective sample means. Elasticity of substitution is eight.

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