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Distance, globalization, and international trade

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HIGHLIGHTS

- We offer solutions to the 'distance puzzle' and the 'missing globalization puzzle' in trade.
- On average, the effect of distance on trade fell by 10% between 1986 and 2006.
- The effects of globalization on trade vary widely across the 69 nations in our sample.
- The relationship between the gains from globalization and income is U-shaped.
- Globalization benefited middle income countries the most.

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ABSTRACT

For a long time globalization could be seen everywhere but in gravity estimates. We offer evidence how globalization affects manufacturing trade over the period 1986–2006 and show that, on average, the effect of distance has fallen whereas the effects of proximity and regional trade agreements have increased over time. We also document substantial cross-country heterogeneity in the extent to which distance elasticities have changed. Countries in the middle of the per-capita income distribution have seen the steepest fall in distance coefficients. At the same time, distance as a trade friction has not lost its bite for a number of low income countries, which may jeopardize their integration into global markets. We present suggestive evidence that the heterogeneous change in distance elasticities is related to secular shifts in the composition of exports.

1. Introduction and motivation

Economists are in agreement that physical distance is the most robust proxy for international trade costs, cf. Anderson and van Wincoop (2004) and Head and Mayer (2014), and there is hardly any empirical trade model that does not obtain economically strong and statistically significant negative estimates of the effect of distance on bilateral trade. Yet, there has been a long debate – which is still ongoing – about the fact that the estimates of the effects of distance in empirical gravity equations fail to capture the effects of globalization and remain constant over time. The latter has been dubbed the 'distance puzzle' in international trade.[1] Coe et al. (2002) generalize this result to define the 'missing globalization puzzle' as "the failure of declining trade-related costs to be reflected in estimates of the standard gravity model of bilateral trade" (p.1). Many economic studies have attempted to resolve the 'distance puzzle' with mixed success.[2]

The contributions of this paper are threefold. First, we extend the methods of Yotov (2012) to more comprehensively account for

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[1] Disdier and Head (2008) perform a meta-analysis with a rich data set of 1467 distance estimates to conclude that "the estimated negative impact of distance on trade rose around the middle of the century and has remained persistently high since then. This result holds even after controlling for many important differences in samples and methods" (p.37).

[2] The distance puzzle has been of significant interest to researchers. See Buch et al. (2004), Carrère and Schiff (2005), Brun et al. (2005), Boulhol and de Serres (2010), Lin and Sim (2012), Yotov (2012), Carrère et al. (2013) and Larch et al. (2016).

intra-national trade costs, and we offer robust evidence that on average the effect of distance on international trade has indeed fallen over time. Second, we demonstrate that our methods apply more broadly to capture the impact of globalization through changes in the effects of other standard gravity variables such as contiguity and regional trade agreements (RTAs). Thus, we contribute to the so-called 'missing globalization puzzle'. Finally, we allow for estimates of the effect of distance on trade to vary at the individual country level. In so doing, we obtain the novel finding that the effects of globalization have been uneven, favoring middle income countries the most and seemingly bypassing some of the poorest nations in our sample.

Relying on the properties of the structural gravity model, Yotov (2012) argues that the 'distance puzzle' is resolved when the effect of distance on international trade are measured relative to the effect of distance on *intra-national* trade.[3] A potential drawback of Yotov's analysis is that he uses distance as the only proxy for intra-national trade costs. We overcome this issue by employing a rich set of country-specific fixed effects for internal trade, which not only allow for and absorb the country-specific effects of intra-national distance but also account for any other determinants of intra-national trade, including 'home bias' effects. Employing a sample covering aggregate manufacturing trade for 69 countries over the period 1986–2006, we resolve the 'distance puzzle' and find that the effect of distance on trade has fallen, on average, by nearly 10% (−9.34%) during the period of investigation.[4]

While distance is arguably the most robust proxy for international trade costs, it is quite possible that the effects of globalization may travel through other channels as well. For example, new manufactured products (never exported before) may first be exported to adjacent countries. Similarly, global value chains may first be established regionally, thereby reinforcing trade with neighboring countries. This intuition suggests that the effects of globalization should also be reflected in increasing estimates of the effects of contiguous borders in gravity estimations. Turning to trade policy, over the past quarter century the world has witnessed a proliferation of regional trade agreements, which have become deeper and more comprehensive in nature. Accordingly, one would expect to obtain an increasing estimate of the effect of RTAs in gravity estimations.

Motivated by these intuitive hypotheses, we allow for time-varying effects of all gravity variables in our main specifications. Two findings stand out. First, consistent with the 'missing globalization puzzle' argument of Coe et al. (2002), we obtain (positive but) *decreasing* estimates of the effects of both contiguity and RTAs in our baseline specification that only employs international trade flows. However, these results are reversed, i.e. estimates on contiguity and RTAs are *increasing* over time in line with our expectations, once the effects of contiguity and RTAs are measured relative to intra-national trade flows.

We capitalize on our methods to allow for heterogeneous effects of globalization on trade across the countries in our sample. Our main findings characterize the cross-country heterogeneity with which globalization has affected countries' international trade. First, countries in the middle of the global per-capita income distribution have benefited the most from globalization, whereas economies at either end of the income distribution have not benefited from globalization to the same extent. Second, there are also interesting differences within groups. Within high income countries, distance elasticities of OECD members have fallen twice as much as those of other high-income non-OECD economies. This is consistent with trends such as production fragmentation, from which the oil-exporting economies, albeit rich, are more insulated than OECD economies. At the opposite end, there is substantial heterogeneity amongst low income countries too. Whilst China – formally a low income country – is recording the largest fall in distance elasticity in the entire sample, globalization has largely bypassed the poorest economies such as Malawi, Niger, Senegal or Nepal. Overall, the finding that on average globalization has had a positive effect on the countries in our sample is encouraging. At the same time, this average effect hides substantial cross-country heterogeneity; in particular, the finding that geographic distance as a trade friction has not lost its bite for a number of low income countries, thereby jeopardizing their international integration, may be a cause for concern.

We also present preliminary evidence of the forces that could potentially be at the heart of the observed differential response of countries at different income levels. Specifically, we find a significant negative relationship at the country level between the fall in distance elasticity and (i) the ratio of air-to-rail transportation as a proxy for the shift towards higher value-to-weight goods in a country's export bundle; (ii) the structure of merchandise exports; (iii) the value of high-tech/ICT goods in export bundles; and (iv) inward investment flows. These findings provide strong suggestive evidence that the changes in estimated distance gravity coefficients that we obtain are indeed reflecting economic globalization effects.

2. Theoretical background and empirical strategy

The effects of bilateral distance on international trade are traditionally estimated with the empirical gravity equation, which has established itself as the workhorse framework in international trade. Deriving structural gravity is beyond the scope of this paper.[5] For our purposes it is sufficient to summarize the gravity equation of trade in its most general form:

$$X_{ij,t} = G_t \frac{\pi_{i,t}\chi_{j,t}}{T_{ij,t}}, \quad \forall i, j. \tag{1}$$

Here $X_{ij,t}$ denotes exports from source i to destination j at time t; $T_{ij,t}$ denotes all bilateral frictions between i and j, which may include transportation costs, trade policies, etc.; $\pi_{i,t}$ and $\chi_{j,t}$ capture all possible exporter and importer characteristics, respectively, e.g. country size and multilateral resistance terms of Anderson and van Wincoop (2003). Finally, G_t is a gravity constant whose structural interpretation is as a function of the value of output in the world at time t.

Three simple steps translate equation (1) into an estimating specification: (i) use standard gravity variables, including the logarithm of bilateral distance ($\ln DIST_{ij}$) and indicators for contiguous borders ($CNTG_{ij}$), common language ($LANG_{ij}$), colonial ties ($CLNY_{ij}$), and regional trade agreements (RTA_{ij}) to proxy for bilateral trade costs;[6] (ii) add an error term; and (iii) estimate gravity with the

[3] Yotov (2012) recognizes that since the structural gravity system is homogeneous of degree zero, it can only identify relative trade costs. Thus, studies that use only international trade data cannot resolve the distance puzzle because the effects of globalization on some international pairs are estimated relative to the effects of globalization on other international pairs. Yotov's simple solution to the 'distance puzzle' is to measure the effect of distance on international pairs relative to the effect of distance on internal trade.

[4] An important feature and an advantage of our data set is that it includes data on international and intra-national trade flows that are consistent with each other. This is ensured by employing *gross* production value data in order to construct intra-national trade as the difference between production and total exports. Availability of *gross* production value data predetermined our focus on aggregate manufacturing and the time coverage of our sample.

[5] We refer the reader to Anderson (2011), Costinot and Rodríguez-Clare (2014), and Larch and Yotov (2016) for recent surveys of the theoretical gravity literature.

[6] Anderson and van Wincoop (2004) offer a thorough survey of trade costs and their relation to gravity.