CEPII

CENTRE
D'ÉTUDES PROSPECTIVES
ET D'INFORMATIONS
INTERNATIONALES

STRUCTURAL GRAVITY EQUATIONS WITH INTENSIVE AND EXTENSIVE MARGINS

Matthieu Crozet & Pamina Koenig

NON-TECHNICAL SUMMARY

Since the 1960s, gravity equations have been intensively used in empirical analyses of international trade. This relationship relates econometric bilateral trade flows to the economic size of partner countries and the geographical distance between them. Gravity equations, even in their simplest form, do very good job: they capture a very large part of the variations of trade flows between countries, and provide detailed studies of globalization. Giving an estimate of the "normal" volume of trade between countries, they offer the possibility of identifying countries that report a relatively low level of trade intensity, and thus assess the importance of the barriers to trade. For instance, gravity equations allows to evaluate the "border effects", the impact of monetary integration and exchange-rate stabilization on trade flows, the importance of cultural proximity and of institutions on trade relations, etc.

Despite their obvious usefulness, gravity equations have long been criticized for lacking theoretical background. However, much progress has been made in this area in recent years. Trade models with monopolistic competition show that the effect of distance, which is the key variable in gravity equation, is directly related to price elasticity. Thus, in industries producing relatively homogeneous goods, trade should decay drastically with distance. More recently, models with imperfect competition and heterogeneous firms deeply changed the interpretation of gravity equations (Chaney, American Economic Review, 2008). In these models, lower transport costs (i.e. lower distance) increases bilateral trade through an increase of both trade margins: the number of exporting firms (the extensive margin) and the mean value of individual shipments (the the intensive margin).

In these models, the influence of distance on bilateral trade results from a combination of three parameters, which affect both margins: the distance elasticity of transportation costs, the price elasticity and the degree of firm heterogeneity. Our paper presents a complete decomposition of a structural gravity equation derived from Chaney's (2008) model. Using individual export data for a large number of French firms between 1986 and 1992, we estimate the impact of distance on both trade margins. This leaves us with estimates of the three key parameters of the model, at the industry level. The empirical method controls for unobservable importing countries characteristics. To do this, we introduce importing country fixed effects, so that our measure of distance is specific to each exporting firm. Consequently, the identification of the model relies on distances within the French territory, between exporters' location and the border.

This work leads to two sets of conclusions. First, it provides empirical evidence in favor of recent models of international trade. Indeed, our estimated parameters are consistent, for 27 out of 34 industries, with the theoretical model. Second, this exercise shows the importance of considering trade margins and the degree of firm heterogeneity to analyze the consequences of trade barriers. Some industries, producing hardly transportable goods, are very sensitive to changes in transportation costs; but tariffs may have very marginal impact on them. Above all, our results reveal that the impact of trade barriers depends greatly on sectors' industrial organization. Depending on the degree of firm heterogeneity, the adjustments of production to a change in trade barriers will be mainly channeled rather by entry / exit of firms or by changes in individual exports. Hence, trade policies may affect market structures very differently according to industries. For instance, we show that the effect of trade barriers on aggregate trade is very comparable for steel processing and chemicals. However, for chemicals the increase in trade comes mostly from the entry of new exporters (the intensive margin accounts only for 18.6% of the increase in total trade), while over 42% of the increase in trade results from an increase in incumbents' market share for steel processing. Thus, our structural exploration of Chaney's model reveals that taking firm heterogeneity into account is of crucial importance to assess the real impact of trade liberalization measures on industry dynamics.