TRADE AND ECONOMIC GROWTH

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The degree of openness of a country tends to be found to be a robust determinant of growth in GDP per capita in cross-country and panel growth regressions. Furthermore, Ben-David (1996) shows that trade incentivizes income convergence (among groups of trading partners). From a theoretical point of view, international trade allows for specialization through comparative advantages, the exploitation of increasing returns from larger markets and incentivizes technology diffusion.

Most of the empirical literature on economic growth does not explicitly deal with the issue of potential endogeneity of trade measures. In particular, countries whose incomes are high for reasons others than trade may just trade more. On the other hand, the effect of trade on technology adoption may induce nonlinearities in the relationship between openness and economic growth.

In this note we will describe modern developments in the assessment of these two empirical issues in cross-country growth regressions. We will also review the main contributions to the empirical assessment of technology adoption through trade. We focus on how to deal empirically with endogeneity issues and nonlinearities in the trade-growth link, as well as the assessment of technology diffusion through trade.

Openness and economic growth: the role of geography

A simple scatterplot of GDP per capita growth against trade openness (measured as total trade over GDP) depicts a significant positive relationship between trade and economic growth. Figure 1 presents these variables for all countries for which Penn World Table data are available in the period 1970-2000.

In order to isolate the pure effect of trade on growth, some studies use variation in trade policy as an instrument or alternative variable for trade openness (e.g., Easterly, 1993). Since market-oriented trade policies do not tend to take place isolated from other market-oriented domestic policies, such instrumental variables are not necessarily suitable instruments, since they
are correlated with the error term in the growth equation. Frankel and Romer (1999) propose using the effect of geographical variables on trade in order to obtain instrumental variables for openness.

The underlying model used by Frankel and Romer (1999) assumes that income in a country \( Y_i \) is affected by international \( (T_i) \) and within-country trade \( (W_i) \). Within-country trade is assumed to depend on the size of the country \( (S_i) \) and international trade is assumed to depend on geographical proximity measures \( (P_i) \). Assuming a log-linear relationship, this implies that

\[
\ln Y_i = \alpha_0 + \alpha_1 T_i + \alpha_2 S_i + \varepsilon_i, \tag{1}
\]

where \( \varepsilon_i \) is not necessarily uncorrelated with \( T_i \) but \( P_i \) can be used as an instrument for the international trade variable. The literature on gravity models for international trade provides geographical variables which can be used to evaluate the exogenous effect of trade on economic growth. Typical examples of such variables are the distance between country pairs and dummy variables for landlocked countries or countries sharing a common border.

Using a sample of 150 countries, Frankel and Romer (1999) find a stronger effect of trade on economic growth after accounting for endogeneity using geographical variables as instruments. The interpretation of this result is that the volume of goods traded among countries may underestimate the growth effects linked to international openness and the technology adoption effects which are associated with it.

**Nonlinearities in the trade-growth link**

Papageorgiou (2002), Huang and Chang (2006) and Papageorgiou (2006) find evidence that sets of countries with different openness levels tend to differ in the statistical model relating economic growth to other economic variables. Crespo Cuaresma and Doppelhofer (2007) evaluate the existence of nonlinearities caused by trade openness in the presence of model uncertainty. The econometric model put forward in Crespo Cuaresma and Doppelhofer (2007) is

\[
\gamma_i = \alpha + \sum_{k=1}^{n} \beta_k x_{k,i} + \sum_{j=1}^{m} \left[ (\alpha_j^* + \sum_{k=1}^{n} \beta_{jk}^* x_{k,i}) I(z_{ji} \leq \tau_j) \right] + \varepsilon_i, \tag{2}
\]

where \( I(\cdot) \) is an indicator variable, taking value one if the argument is true and zero otherwise, \( \gamma_i \) is economic growth for country \( i \) in the period 1970-2000, the \( x \)-variables are potential determinants of economic growth and the \( z \)-variables are variables which may cause nonlinearities in the relationship. The model in (2) hypothesizes different elasticities for the covariates depending on whether some variable is above or below a threshold level. In particular, the parameter associated with \( x_k \) equals \( \beta_k \) for countries in which some other variable \( (z_j) \) is above some threshold values and equals \( \beta_k + \beta_{jk}^* \) if \( z_j \) is below that threshold.

Crespo Cuaresma and Doppelhofer (2007) use 21 variables as possible covariates in the \( x \)-group, corresponding to those found robustly related to growth in Sala-i-Martin *et alia* (2004). The initial level of GDP per capita and the proportion of years that the economy is open according to the criteria in Sachs and Warner (1995) are used as \( z \)-variables.

Crespo Cuaresma and Doppelhofer (2007) use Bayesian model averaging methods to assess the uncertainty about the covariates, the variables triggering the nonlinear effect and the threshold values in (2). They find strong nonlinear effects caused by the length of the openness period, that render the effects of the East Asian dummy and African dummy unrobust for relatively closed and open countries, respectively.
The empirics of trade and technology adoption

Coe and Helpman (1995) and Coe et alia (1997) propose that the rate of return of R&D is not only high in the investing countries, but also in their trading partners. Imitation, cross-border learning of production methods and the increase in variety of intermediate products and capital equipment are just three possible arguments for such an effect.

Coe et alia (1997) estimate such an effect for the R&D investments embodied in trade flows between developed and developing countries. The specification used, which has been carried out to many other studies, hypothesizes that the level of total factor productivity in developing country \( i \) at time \( t \) (\( A_t \)) depends on the foreign R&D capital stock embodied in the trade flow to country \( i \) (\( S_t \)), the share of machinery and equipment imports from industrial countries in GDP (\( M_t \)) and the secondary school enrollment ratio (\( E_t \)),

\[
\ln A_{it} = \alpha_0 + \alpha_1 \ln S_{it} + \alpha_2 \ln M_{it} + \alpha_3 \ln E_{it} + \varepsilon_{it}. \tag{3}
\]

Using data for 77 developing countries for the period 1971-90, Coe et alia (1997) estimate (3) in first differences and find significant north-south technology spillovers. Furthermore, the interaction of the human capital variable and the share of machinery and equipment imports from industrial countries in GDP with the technology spillover also plays an important role when modelling the effect of trade on technology adoption. On the methodological side, it should be noted that the trending nature of the variables in (3) would imply that this specification is to be interpreted as a (panel) cointegration relationship among them. The development of panel cointegration methods is however relatively recent, so such specifications tend to be estimated in first differences in earlier studies, such as Coe et alia (1997).
References


