



# Openness and income: The roles of trade and migration<sup>☆</sup>



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## ABSTRACT

This paper explores the relationship between openness to trade, immigration, and income per person across countries. To address endogeneity concerns we extend the instrumental-variables strategy introduced by Frankel and Romer (1999). We build predictors of openness to immigration and to trade for each country by using information on bilateral geographical and cultural distance (while controlling for country size). Since geography may affect income through other channels, we also control for climate, disease environment, natural resources, and colonial origins. Most importantly, we also account for the roles of institutions and early development. Our instrumental-variables estimates provide evidence of a robust, positive effect of openness to immigration on long-run income per capita. In contrast, we are unable to establish an effect of trade openness on income. We also show that the effect of migration operates through an increase in total factor productivity, which appears to reflect increased diversity in productive skills and, to some extent, a higher rate of innovation.

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## 1. Introduction

Interactions with other countries can be a powerful engine of economic development and technological change, especially for small countries (Alesina et al., 2000, 2005; Frankel and Romer, 1999). For several decades economists have focused on a country's openness to trade, measured by policies (as in Sachs and Warner, 1995; Lucas, 2009), or by trade flows as a share of GDP (as in Frankel and Romer, 1999; Rodrik, 2000; Alcalá and Ciccone, 2004) to quantify the importance of cross-country interactions on income. They realized early on, however, that openness to trade could be a consequence, as much as a cause, of high income per person across countries. To address this endogeneity, Frankel and Romer (1999) (FR from now on) proposed using cross-country variation in trade flows arising from bilateral geography in order to identify the causal effects of trade openness on income per capita. Subsequent works by Rodriguez and Rodrik (2001) and others

have pointed out that the exclusion restriction behind this identification approach is likely to be violated unless one controls for other channels through which geography is likely to affect income per capita, such as natural endowments, climate, disease environment, colonization history, and so on. Rodrik et al. (2004) further argued that once one controls for institutional quality, neither geography nor trade matter much in determining a country's income per person.

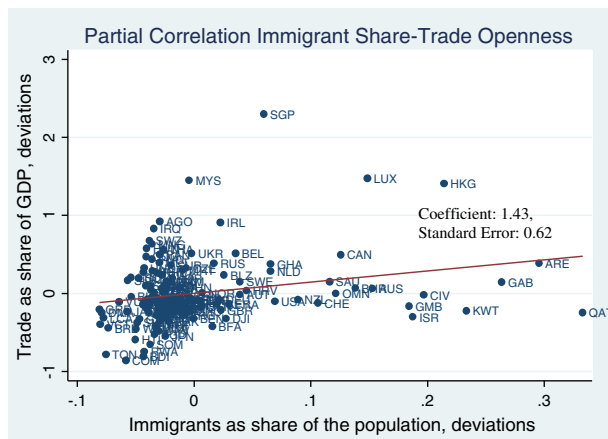
There is yet another potential problem with the approach proposed by FR. Trade openness is correlated with openness to migration.<sup>1</sup> Furthermore bilateral migration flows are well explained by a gravity relationship, just like trade flows (Mayda, 2007; Clark et al., 2007; Grogger and Hanson, 2011). Hence, the original specification used by FR may also suffer from a potential omitted-variables problem. Geographical proximity and accessibility also affect other forms of bilateral interactions between countries such as flows of ideas, technology and investments. However, unless these interactions are perfectly disembodied (and hence hard to measure), such flows would be

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<sup>1</sup> Fig. 1 reports the partial correlation between trade as a share of GDP and the foreign-born share across the 146 countries included in the Frankel and Romer (1999) sample. Each variable is a residual, after we control for country size (measured by the logarithms of population and area) to purge its effect on openness to trade and migration. The Figure illustrates a clear positive and significant (but far from perfect) correlation between openness to trade and to migration.



Note: The data are relative to 147 countries in year 2000. We plot the residuals after adjusting by log population and log area. The sources and construction of the trade as share of GDP and of the foreign-born share are described in the text.

**Fig. 1.** Migration share and trade share. Note: The data are relative to 147 countries in year 2000. We plot the residuals after adjusting by log population and log area. The sources and construction of the trade as share of GDP and of the foreign-born share are described in the text.

reflected in the mobility of goods (including capital goods) and of people. Thus we focus our analysis on these two vehicles of globalization.

This paper extends the approach proposed by FR using a new global immigration dataset and estimates the effects of economic openness, jointly considering migration and trade, on income per person. The first step in the analysis is to produce gravity-based predictors for both trade and migration. Our predictors are based on bilateral regressions that separately fit migration and trade flows on the basis of proxies for bilateral geographical and cultural distance. By examining jointly the roles played by these two dimensions of globalization, our work extends the recent analysis of the effect of trade and it connects with the research by economic historians on the First Globalization era.<sup>2</sup>

We also recognize that a country's geographic location may have a direct effect on income per capita (besides its effect through the channels of trade and migration), which threatens our instrumental-variables strategy. While it is infeasible to perfectly control for all possible channels in a cross-sectional setting, we consider the most plausible suspects and directly control for them in our econometric specifications. Namely, we explicitly account for the roles of climate, natural resources, disease environment, colonial origin, early development, and, perhaps most importantly, the quality of institutions. In a series of influential papers, Hall and Jones (1999), Acemoglu et al. (2001), Rodrik et al. (2004) and many others, have argued that institutions are the main factor accounting for cross-country disparities in income per capita.

Our analysis produces the following main findings. First, our gravity-based predictors appear to be highly relevant when appropriate controls for the direct effect of geography are included in the specification. Even though the predictor for the share of immigrants performs better than the predictor for the trade share, we are able to identify fairly well the roles of both trade and migration on income per capita. Second, our two-stage least-squares estimates imply that the share of immigrants in the population has a significant and robust estimated effect on long-run income per capita, although there is substantial uncertainty around its exact magnitude. On the basis of our point estimates, we find a qualitatively large effect: a 10 percentage-point difference in the share

of foreign born in the population, which is close to the standard deviation in our sample, is associated with differences in income per person by a factor close to 2. If we attach a causal interpretation to this coefficient it would imply that if Japan, with a foreign-born share below 1% in year 2000, adopted a degree of openness to immigration equal to that of the US (about 11% of foreign born in 2000) its long-run income per capita would double. To the contrary, we do not find a robust effect of trade openness once we control for other effects of geography. We also show that our finding of the positive effect of migration is clearly distinct from the effects of early development and institutional quality, which we also document.

Then we empirically investigate the mechanism behind our main finding. First, we show that the estimated effect of migration on income operates mainly by increasing total factor productivity (TFP). Next, we show that underlying this finding there is a positive diversity effect. Namely, we show that the degree of diversity by country of origin within the immigrant population has an additional positive effect on income per person. Our interpretation is that diverse immigration expands the set of differentiated skills in the labor force. Finally, we also provide some suggestive evidence indicating that immigration appears to increase innovation activity, as measured by patents. This may also account for a part of the TFP effect that we uncovered. It may also imply that immigrants bring new ideas to a country, along with a wider set of skills.

While our results are consistent with immigration playing an important role in increasing productivity, two important caveats are in order. First, our cross-sectional approach is unable to control for persistent country-specific unobserved characteristics that may affect income. Short of longitudinal data, we cannot fully rule out the possibility of omitted-variable bias.<sup>3</sup> Second, disembodied flows of knowledge that affect productivity and are also influenced by geography may bias our estimates of the effect of migration (and trade). While we interpret our instrumental-variables estimates throughout the paper as uncovering causal effects, these two caveats should always be kept in mind.

There is a vast theoretical literature linking several aspects of openness (or globalization) to income levels and growth.<sup>4</sup> Some authors emphasize the role of openness to trade in promoting innovation, technological diffusion and catch-up (Grossman and Helpman, 1991; Rivera-Batiz and Romer, 1994; Eaton and Kortum, 1996; Lucas, 2009, to name a few). Others have focused on the effect of market size via trade on innovation and growth. Acemoglu (2003) has argued that the size of the market can affect the speed (as well as the direction) of technological adoption. Matsuyama (1992) and Galor and Mountford (2008) have argued that market size may encourage specialization and learning by doing. Finally, Weil (2005) has focused on the efficiency gains experienced by firms subject to international competition.

More closely related to this paper are empirical studies that estimate the effects of openness to trade on income per capita. We have already discussed the important contribution by FR, extended by Alcalá and Ciccone (2004), Noguera and Siscart (2005), and others, and the critiques by Rodrik (2000), Rodriguez and Rodrik (2001), and Rodrik et al. (2004).<sup>5</sup> As summarized earlier, the literature is inconclusive. Several authors have reported positive and significant effects of trade openness on income while others have raised concerns about the robustness of those findings. Two important recent contributions to this debate provide evidence based on longitudinal data. Feyrer (2009a) provides within-country estimates of the effect of trade on income that exploit the rising importance of international trade carried by air, particularly for country pairs that are connected by relatively short air routes

<sup>2</sup> Economic historians have argued that migration was an important vehicle for economic convergence in terms of factor prices and income levels between the 1870s and World War I, the so-called First Globalization era (Taylor and Williamson, 1997; Taylor, 1997a, 1997b). The sustained increase in international migration flows since the early 1990s has rekindled the interest in the role of migration in accounting for cross-country differences on income per capita. Recently, Putterman and Weil (2010) have argued that migration played an important role in the early economic development of many countries and that its effects have been extremely persistent.

<sup>3</sup> Feyrer (2009a, 2009b) shows that longitudinal data is very important to identify the effects of trade on income. These papers are reviewed below.

<sup>4</sup> For excellent textbook treatments of openness and economic growth, see Acemoglu (2009) chapters 18 and 19, on the roles of knowledge diffusion and trade; Barro and Sala-i-Martin (2004) chapter 8, discuss technology diffusion and endogenous growth. Weil (2005), chapter 11, describes the relationship between economic growth and openness.

<sup>5</sup> An influential early contribution was Sachs and Warner (1995) who analyzed the effect of trade policies (over the period 1965–1990) on economic growth.

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