The Globe as a Network: **first step in a broader agenda**

How important are transport costs for the evolution of population and income per capita across the world over the last 1000 years? My job market paper, *"The Globe as a Network: Geography and the Origins of the World Income Distribution,"* attempts to answer this question. In doing so, it takes quantitative dynamic spatial modeling in a new direction.

I build a framework in which population evolves endogenously through fertility and migration, and technology evolves endogenously through innovation and diffusion. I divide the world into 3° by 3° quadrangles and assign transport costs according to the placement of rivers, oceans and mountains. I conduct an exercise in which the only exogenous change is a historically-plausible pattern of falling land- and water-based transport costs. This exercise is able to account for a number of important features of the evolution of the income per-capita distribution over the last 1000 years, including an abrupt take-off into growth after 1800 CE with Europe in the lead and the accompanying increase in global income-per-capita inequality. Within this framework, the features of the data which account for Europe's early takeoff are its higher overall access to water transport, and the water-bias of transport cost reductions before 1800 CE.

This study is, to the best of my knowledge, the first study which uses a dynamic spatial framework to explain the evolution of income differences across countries over time. It is also the first which uses a dynamic spatial framework to explain not only the spatial distribution of economic growth, but also the transition to sustained growth from the stagnation that characterized most of the pre-modern era.

A strength of the framework I have built is that it has a general structure which can be adapted to new data and new questions. I will now discuss two new projects I plan to undertake which take advantage of this strength.

The first project aims to complete the other side of the picture drawn by my job market paper. Instead of taking a fall in transport costs as given, I will endogenize them, allowing each location to invest in transport infrastructure. As of today, I am not aware of any quantitative studies which analyze decentralized investment in transport infrastructure--this would be the first. I expect the results of this project to not only expand upon the insights gained from my job market paper, but also to provide fresh answers to a fundamental question in spatial economics: What drives the spatial agglomeration of economic activity?

The second project is motivated by the results of my job market paper, which strongly suggest a role for institutional and historical forces in shaping the evolution of the wealth of nations. What is the nature of these forces? Do they operate primarily by shaping local comparative advantage, or by changing the cost of trade and the speed of information exchange? Does their impact depend in any way on the overall level of transport costs? These are some of the questions I hope to address by integrating data on key factors such as language barriers, institutional quality, and historical shocks into the framework I have already established.

Demographic Transitions Across Time and Space

In my paper with Nezih Guner and Jesús Fernández-Villaverde titled *"Demographic Transitions Across Time and Space,"* we seek to answer the following questions: How does economic growth affect parents' fertility decisions? What impact does technology diffusion have on differences across countries in the timing of the demographic transition, the historic reduction in birth and death rates that has begun in country after country over the last century and a half? We do this using an unbalanced panel data set of birth and death rates in 188 countries over the past two centuries. Ours is one of the first studies to analyze the demographic transition with access to such a long and broad panel, and we identify a number of novel empirical regularities.

First, we use a novel econometric method to identify start and end dates for transitions in birth and death rates. We find that by any sensible metric, the average speed of transitions has increased steadily over time. Second, using these start dates to analyze the predictors of a country's entry into the transition, we find a clear link between income per capita and the start of reductions in fertility and mortality. Third, we also find evidence for a kind of demographic contagion, where the entry of a country into the transition is associated with a higher probability that its geographic neighbors will also transition. Next, we plan to investigate possible mechanisms driving these "peer effects," including the possibility that they are accounted for by the process of technology diffusion.

Other Work in Progress

Can East Asia overtake North America as the global technological leader? Borrowing some concepts and techniques from my job market paper, I plan to approach this question in a new way using a model of international innovation spillovers through trade. Exploiting data on the shifts in global patterns of trade and innovation that have been ongoing now for several decades, I hope to also provide some answers to the following questions along the way: What effect do barriers to technology diffusion have on global patterns of innovation? Can such barriers rationalize the emergence of a technology frontier in a geographically limited area? Can changes in barriers shift this frontier from one location to another?