

Titre du projet :

The diffusion of technology during the last three millennia

Durée du projet :

3 years

Coordinateur(s) du projet et centre(s) de recherche impliqué(s):

Johannes BOEHM & Thomas CHANEY, Département d'Economie, Sciences Po

Danial LASHKARI, Department of Economics, Boston College

Description du projet :

Perhaps the most important question in economics is « **what drives economic growth ?** ». Early work between the 1950's and 1980's has established (both theoretically and empirically) that factor accumulation by itself is unlikely to lead to sustained growth. Since the 1990's the « endogenous growth theories » of Romer (1990, Nobel Prize 2018), Grossman and Helpman (1991), and Aghion and Howitt (1992) emphasize **technological progress and the diffusion of technology** as the drivers of perpetual growth. A large body of literature emerged that theoretically studied firm's incentives to invest in research, the associated externalities, and optimal policy.

Despite the widespread acceptance of technological change as an important driver of growth, the literature on growth and innovation more or less died out, mostly because it is incredibly hard to confront these theories with data. The emergence of microdata on firms, which helped to bring about a revolution in the field of international trade, did not help much: even though researchers were now able to study the patenting activities of firms, there is a widespread consensus that patents only cover a small share of innovative activity. The adoption of technology, which one would expect to be a large contributor to growth in less developed countries, cannot be measured through patenting at all.

In this project we attempt to study technological progress and the diffusion of technology across space using a vastly different approach, namely by **assembling data from publicly available collections of museum records**. The British Museum, the Metropolitan Museum of Art, the Victoria & Albert Museum, and many (and a growing number of) other museums across the whole world allow electronic access to their collection records, which often include metadata on holdings such as the time when the object was made, the provenance, material, techniques, and other keywords. Together, we hope that they paint a fairly comprehensive image of humanity's knowledge of materials and techniques used in the past – at least for some regions of the world.

A large part of this project will be the assembly and harmonization of data from different sources. Once harmonized, we would like to study the spatial diffusion of the use of new materials and techniques, and their relationship with trade, geography, climate, conflict, and political change. Given that most likely the geographic coverage of data will be satisfactory only for some regions, we will restrict attention to those regions.

As a first step in this agenda, we want to focus on the relationship between **trade and technology diffusion**. We identify known trade routes (land, river, and coast) and will try to find evidence supporting the view that technology diffuses through trade. In doing so, we will let ourselves be guided by the examples that the historical literature provides (e.g. gunpowder, paper, and stained glass along the Silk road, Islam through the trans-Saharan trade, etc.). We will use both formal regression analysis and visual inspection of the data (see `activités de recherche prévues` below) to find such relationships.

Once we have found reduced-form evidence that technology diffuses through trade, we will construct and estimate a general-equilibrium model of trade and diffusion. A good starting point for such a model is the work by Buera and Oberfield (2018). Once estimated, we will be able to perform counterfactuals. Which counterfactuals we will evaluate will depend on the region(s) that we focus on; and we will only be able to think about that when we know the data better.

We aim to contribute to the academic literature that studies the diffusion of technology. Due to data limitations this work is typically limited to the historical study of particular technologies (in particular among economic historians who have researched general-purpose technologies; see, e.g. Bresnahan and Trajtenberg, 1995, Rosenberg and Trajtenberg, 2004, Mokyr, 1990 and many others). The closest econometric work is by Comin and Hobijn (2004, 2010) who study the determinants of diffusion of a particular set of 20 technologies across countries, and Comin et al. (2012, unpublished) who estimate a quantitative model based on these patterns. By using extensive data from museums, we hope to cover a much broader set of technologies across a longer timeframe. We also build on the literature that constructs macro-models of technology diffusion (Buera and Oberfield, 2016, Perla et al. 2015, Benhabib et al. 2017).