THE IMPACT OF HIGH SPEED RAILWAYS IN THE EVOLUTION OF FRENCH JOBS: A DIFFERENCE-IN-DIFFERENCES APPROACH

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EXTENDED ABSTRACT

The opening of the first High Speed Railway (HSR) line in France in 1982 marked a turning point of the French inter-urban transportation. The reduction of CO2 emission and the gain of the commuting time between cities among several other reasons, have supposed to make, from HSR, a sustainable transportation mode from an environmental and economic perspective. Indeed, this enhancement of inter-urban transportation is supposed to have a direct effect on the economic development of each city. The increasing of the productivity regions that benefit from HSR is expected to be translated by job creation and by higher levels of income.

Empirical and theoretical researches suggest that investment in transport infrastructure have a significant contribution on job creation and a positive impact on productivity and hence, on economic growth (Antle 1983; Baffes and Shah 1993; Donaldson 2010; Ortega and Monzon 2012). Nevertheless, the existence of this virtuous circle has been also contested by several researchers (Albalate and Bel 2012, Haynes 1997, Melo 2013).

In order to enrich the debate and to step up discussion of matter relating to HSR in France, this paper focuses on the evaluation of the direct impacts of the French High Speed Railways network on the job evolution in the 231 largest urban units (UU). An ex-ante and ex-post of the evolution of employment rate on each UU will be explained with respect to the connection to different kinds of public transports (highways, trains) but specially, with respect to the presence of HSR service.

The originality of this research consists on the compilation of a very rich dataset designed by authors which allows implementing the adequate methodology for empirical exercise. Indeed, the panel data mixes a large set of socio economic variables of each UU before and after the opening of a HSR station and a detailed travel-time matrix which take into account the accessibility to every kind of transportation network from every UU. In addition, the heterogeneity of economic dynamics of each UU is also taken into account. It means that this study considers the fact that economic dynamics of some UU may depend, or not, mostly on external or on internal markets (on the economy of other UU). This categorization is capital to understand the different impacts that HSR may have on the evolution of job market of each UU along the time. The precedent classification of economic dynamic is “Economic Based Theory”.

As indicated, this research is focused to establish the possible causal effect (negative or positive) of High Speed railways on France with respect to the evolution on employment on the biggest 231
French urban units. In order to identify a possible causal relationship between the HSR presence and its effect on employment, this article decided to implement “Difference in Differences” method.

This methodology, that has become very widespread since the work by Ashenfelter and Card (1985) and then deepened by other researchers like Millainathan (2004), Hansen (2007a, b) among others, has as principal objective to determine the causal relationship between the implementation of a policy (construction of HSR) and its possible outputs (on employment) on different groups. The purpose of this technique is to evaluate the impact of a policy on an output over different groups in two time periods. Those groups are indexed by treatment status. One part of the sample is supposed to be beneficiary of the treatment in the second period but not in the first period; it represents the treatment group. The other part of the sample is supposed to not benefit from the policy on either period but, even if they are not influenced by the policy, their characteristics are very similar; it represents the control group.

Mathematically, the outcome of interest for this study (employment evolution on UU\(i\), \(Y_i\)) is denoted by:

\[
Y_i = \alpha + \beta T_i + \gamma t_i + \delta(T_i, t_i) + \theta X_i + \epsilon_i
\]  

With:

\(\alpha\) = constant term

\(\beta\) = treatment group specific effect

\(T_i\) = binary variable: \(T = 0,1\) where 0 indicates urban units \(i\) that do not benefit from HSR system and 1 indicates zones \(i\) beneficiary from HSR station

\(\gamma\) = time trend common to control and treatment groups

\(t_i\) = the two time periods: 0 represents the time period before the implementation of the policy and 1 represents the time period after the implementation of the policy

\(\delta\) = diff-diff estimator which represents the true effect of the opening of HSR

\(\theta\) = effect of some explicative variables or covariates

\(X_{ni}\) = n explicative variable of each UU \(i\).

\(\epsilon_i\) = random unobserved “error”. It supposes that the error term is on average zero: \(E[\epsilon_i] = 0\) and that it is not correlated to other variable of the equation.

As it is shown on equation 1, the number of jobs on each UU\(i\), is denoted by the output \(Y_i\) over a sample of 231 different UU. The diff-diff estimator \(\delta\) is defined as the difference in average output in the treatment group before and after the opening of HSR line (those that beneficiary by HSR) minus the difference in average output in the control group before and after the opening of HSR on each UU (those that do not benefit from HSR).

Regarding the diff-diff estimator, it takes the following form:

\[
\delta = Y_1^T - Y_0^T - (Y_1^C - Y_0^C)
\]  

(2)
Where:

\( Y_0^T \) and \( Y_1^T \) denote the sample averages of the outcome for treatment group before and after the HSR opening. \( Y_0^C \) and \( Y_1^C \) denote the samples averages of the outcome for control group before and after the HSR opening.

To verify if employment on the UU served by the different HSR lines is determined by the opening of the HSR line, Equation 1 is regressed. After the regression of Equation 1, the significance of \( \delta \) is tested in order to have the significance of the estimator. It will indicate if there are also differences of the number of jobs between treatment and control groups after and before the opening of the HSR line and if there is a positive or negative impact of the HSR station on employment rates on each UU.

Finally, a discussion about the adoption of fixed or random effects of the treatment and of covariates will be subject on the corpus of this research.

Numerous results are expected from this research. First off all, it is expected that HSR has a direct impact on the evolution of job market of every French UU. Nevertheless, impacts depend on the economic activity of each UU. These results may shed some light and allow the identification of some specific characteristics of UU that must be taken into account before undertake the construction of some type of infrastructures in different regions.

**Keywords:** High Speed Railways, Urban Units, heterogeneity of economic dynamics, difference in differences