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# The Local Impact of University Decentralization in France

Paul Charruau

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# The Local Impact of University Decentralization in France <sup>\*</sup>

February 16, 2024

We measure the effects on the local human-capital accumulation of the "New Universities" created as part of the U2000 Plan implemented in France in the early 1990s. Using the synthetic control method, we show that, on average, the opening of "new universities" has led to a significant increase in the local share of higher-educated people (not including those in school) by 4 points within 27 years (17% increase from the counterfactual level), though the positive impact seems not automatic and differs across cases. These effects did not occur from a regional displacement effect and imply attraction mechanisms of higher-educated population that go beyond a mere students' decision to stay in the zone where they went to university. Exploring local implications in terms of employment and demographics, we show that local human capital accumulation in treated areas comes with employment growth and an increase of the young population, plus gains in skilled employment.

Keywords: Human Capital, Regional Development, Higher Education, Public Policy Evaluation

JEL Classification: J24, O18, I25

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\*Declarations of interest: none.

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# 1 Introduction

Concentration of human capital within a region is widely acknowledged to increase local growth, wages and productivity, innovation, or population and employment agglomeration ((Marshall, 2013; Barro, 1991; Glaeser et al., 1995, 2004; Florida et al., 2008). The agglomeration of population with some higher education is a source of local knowledge spillovers (Rauch, 1993; Acemoglu and Angrist, 2001; Moretti, 2004a,b; Rosenthal and Strange, 2004; Charruau, 2024). In light of this common understanding, the question of how to create, attract and retain higher-educated population has become a central issue for local policymakers. In this paper, we focus on the most natural political response: the creation of local research universities. We exploit the natural experience of the University 2000 Plan implemented in France in the early 1990s to evaluate whether the creation of nine universities campus in small-sized cities lead to an increase in the concentration of human capital (share of higher-educated people – not including those in school) in the commuting-zone of the site, compared to a counterfactual situation.

The enthusiasm and heavy involvement of local authorities at the time of the U2000 program reveals their high expectations regarding the impact of these universities on local development. Central and local government archives from that time reflect these expectations, notably in regard to job creation and the attraction and retention of a skilled population – and the spillovers that go with them.<sup>1</sup> While such effects are not surprising, it is not clear that they actually exist. There may also be conceivable scenarios in which a local university is only a stepping stone towards major cities for graduates or pre-graduates, making them more prone to move and gradually depopulate small university town (Fabre, 2023). The creation of a local university may therefore impacts exclusively individual paths,<sup>2</sup> but with no substantial effect in terms of local agglomeration and human capital gains, failing to fit into its local socio-economic environment. Very recently, Lee (2021) show that the opening of a second research university in Ulsan (Korea) did not significantly change the local share of college graduates.<sup>3</sup> Beyond these considerations,

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<sup>1</sup>See in particular Datar (1998), Duport (2008), Poulain (1997), and the report of the *Comité National d'Evaluation des établissements publics à caractère scientifique, culturel et professionnel* (CNE, 1997, 1996a, 1999, 1996b).

<sup>2</sup>Litterature on the geography of educational and social inequalities show that better access to higher-education, and specifically the distance from university, plays a major role in terms of university attendance (Frenette, 2009; Spiess and Wrohlich, 2010; Fabre, 2023), and promotes equality of opportunity and social mobility for individuals (Dherbécourt, 2015; Howard and Weinstein, 2022).

<sup>3</sup>Although the author recalls that analyzing only a single university in this specific location has limitations in

the literature on the local impacts of higher-education establishments demonstrates the positive influence of universities on various regional economic outcomes, such as innovation, employment, and investment (Drucker and Goldstein, 2007; Andersson et al., 2009; Valero and Van Reenen, 2019; Lee, 2019).

To date, two aspects remain unclear on the universities' capacity to foster local human capital, against which this paper attempts to fill the research gap. First, the literature has mainly examined the local effects of universities presence based on the intensive margin. The general question is whether a larger exposure to higher-education establishment (or university's activities) causes a larger concentration of human capital. In contrast, very few works investigate whether the creation of universities has increased the number of university graduates in the mid/long term, which we answer using causal inference method suited to policy evaluation. Second, no causal evaluation explores the case-by-case heterogeneity of the human capital effects of universities. Although, few papers show heterogeneous impacts depending on the type of institutions, the commonly-used difference-in-difference (DiD) methods do not allow to investigate whether university creations always induce a substantial positive impact, even comparing very similar establishments, whether the average effect is not driven by the "best performers", or whether there are potential cases of negative effects. Third, we attach particular importance to the analysis of university creation in the context of small-sized cities. This clarifies the question of whether human capital accumulation is the prerogative of large cities (with a necessary floor size for the appearance of agglomeration effects) or whether the expected development levers also appear in smaller local contexts.

Isolating the effects of universities on local outcomes poses a significant challenge due to the intertwined development of universities and their local economies over time. Our methodological contribution is based on the policy evaluation of a national investment and modernization program in 1990, known as "University 2000 Plan" or "U2000", which came in response to new impulse in French higher education establishments in the 1980s. This program led to the creation of four "new universities" outside the Paris region (spread over 10 campuses). We use nine campus of these "new universities" to study the role of such creations on local economies. U2000

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terms of external validity, this encourages cautious about the self-evident reality that the creation of an university leads to local human capital gains.

program constitutes an ideal natural experiment for two main reasons. First, its top-down, centralized designation process based on the need for re-balancing the map of higher-education, and its composite financing system avoids potential endogeneity arising from the fact that "better" or "richer" localities may have greater chance to be selected for the program.<sup>4</sup> Second, because new-universities campus were opened during the same period in different sites and different local contexts, our estimated average effects suffer less from external validity issues, while the specific effects for each case give the opportunity to identify and analyze potential heterogeneity across location (using synthetic control method).

Using harmonized population-census data for the period 1968-2017, we implement the synthetic control method (SCM) developed by Abadie and Gardeazabal (2003); Abadie et al. (2010, 2015) in the context of comparative case studies. This technique allows us to go further than the parallel trends assumption of the difference-in-difference (DiD) method, applying a matching approach to create a better counterfactual. SCM may be a more satisfactory solution in view of the relatively small number of treated units. In our case, it is relevant for its capacity to account for time-varying unobserved effects, and to examine separately nine affected areas, where the creation of "new universities" may have heterogeneous impacts. The question of statistical inference is evaluated using placebo tests. We also run several robustness checks to test the sensitivity of our results and eliminate some doubts on the SCM implementation. In particular, we run a standard DiD model to confirm SCM estimated average treatment effect – and to take into account potential other contemporaneous shocks that may influence local human capital accumulation in the post-treatment period.<sup>5</sup>

We give evidence that the creation of "new universities" has a substantial positive impact on local development by increasing human-capital accumulation. On average, the creation of "new universities" increased the local higher-educated population share by 4 points within about 25 years. This represents a 18% increase from the counterfactual level: the average share of higher-

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<sup>4</sup>In fact, the treated areas are located in regions with a GDP per capita below the national average in 1990 - around 80% of the national average. Moreover, their average budget per capita at the departmental-level does not exceed the national average - on average 2,905 francs per capita compared to 2,920 francs in 1990.

<sup>5</sup>Keeping in mind that many local shocks may also come from university creation, we check for the influence of local labor demand shocks linked to urban tax-free zones creation (ZFU program), easier access to the area (through rail development), new preference for the proximity of the sea and potential spillovers coming from the proximity with other dense and dynamic local labor markets.

educated population (not including those in school) reached 24% in "new university" zones in 2017, while it would have been 20% without the U2000 Plan. This represents almost 8,000 higher-educated individuals on average, considering observed population in 2017. We measure notable heterogeneity across zones. In six cases,<sup>6</sup> the local higher-educated population share is significantly larger as a result of the founding of the "new university," with an effect between 2 p.p. and 7 p.p. reaching 2017 (which represents between 8% and 47% of the respective counterfactuals). In the three other cases, we cannot confidently conclude that there exists a significant "new university" effect on local human-capital accumulation. Our results remain valid after additional robustness tests. We also show that the effects do not occur only because of the students who are trained and stay in the area afterwards, but also through mechanisms of attraction or retention of an older higher-educated population. Finally, we find no evidence of a regional displacement effect that would have negatively impacted neighbor areas with universities before the program.

We then analyze the potential implications for other outcomes related to local demographics and employment. This allows us to discuss few potential conditions behind the heterogeneity of the human capital impact. We show that, in the "successful" zones, human-capital gains co-occurred with positive effects in terms of local employment density, the share of young population, and the share of executives and top management (E&TM) workers. This suggests that the fixation of human capital thrives on the attraction of relatively young population in areas where there is a demand for high-skilled labor.

The rest of the paper is organized as follows. Section 2 discusses the related literature. Section 3 develops the empirical methodology based on SCM. Section 4 gives information on the context and data. Section 5 presents the estimation results. Section 6 presents robustness checks on alternative SCM and Diff-in-Diff method. We explore potential implications for local employment in Section 7. Section 8 discusses the heterogeneity of the effects. 9 concludes.

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<sup>6</sup>The Lens, Béthune and Douai sites of the Artois University, the Calais site of the Littoral-Opal-Coast University, La Rochelle University, and the Lorient site of Bretagne-Sud University.

## 2 Related literature

A large literature has studied the potential influence of universities on local economies. Drucker and Goldstein (2007) provide a review of this literature, mostly based on US cases. Their survey points to some evidence of a positive correlation between universities and regional economic development, but, given the paucity of data, endogeneity issues are generally not fully addressed. Following the pioneer works of Jaffe et al. (1993); Jaffe (1989), innovation has been generally emphasized in this literature. Drawing on the consequences of a university decentralization program in Sweden in the late 20th century, Andersson et al. (2004, 2009) show that education funding influenced regional development in terms of innovation and productivity. Several recent papers exploit a public policy development of universities of applied sciences in Switzerland in the mid-1990s to show that it positively affects local innovation and R&D quantity and quality (Pfister et al., 2021; Schlegel et al., 2022; Lehnert et al., 2020). Due to the specificity and availability of data, the impact on innovation indicators is beyond the scope of this paper. We still draw on the methods and intuitions of these analysis, but we focus here on the effects in terms of local human capital. Nevertheless, our paper may contribute to this literature as accumulation of local human capital is a potential mechanism through which the university causes innovation. Kantor and Whalley (2014) and Hausman (2022) show that local skills strengthen the universities' effects on non-education labor income and between-industry growth differences in employment and wages. The role of graduates concentration is also broader than its innovation consequences, influencing the local economies through agglomeration effects and spillovers (Rauch, 1993; Acemoglu and Angrist, 2001; Moretti, 2004b,c; Rosenthal and Strange, 2004), but also contributing to the leadership and attractiveness of an area (Drucker and Goldstein, 2007).

Regarding the impact of universities on local human-capital levels, Blackwell et al. (2002); Huffman and Quigley (2002); Winters (2011); Abel and Deitz (2012) all show a positive relationship between higher-education institutions and the distribution of human capital. At a global level, Valero and Van Reenen (2019) develop a worldwide database on universities and show that increases in the number of universities have positive impacts on future regional growth, with some of the effects coming via human capital (and innovation) channel. Generally, analyses of the local or regional effects of universities are based on university activities indicators (such



as the number of publications, students or professors, or R&D expenditures, patent citations, etc.), and do not allow for the identification of a counterfactual without university establishment – comparisons between regions are made on the basis of the size of the universities they host. Moreover, the mentioned papers use caution as they do not provide evaluation methods that sufficiently address the endogeneity issues, due to unobservable characteristics and the coincidence of economic development and university evolution or enlargement, to permit the identification of causal effects.

To our knowledge, while they do not focus on local human-capital accumulation, a few recent studies use causal inference methodology to estimate the influence of universities on local economic development – i.e. using estimates of a counterfactual situation. Using a Swedish university reform in 1999, which granted "research university" status to some universities, Bonander et al. (2016) implement the synthetic control method and find no convincing evidence of an effect on regional growth and development. Lee (2019, 2021) uses synthetic control method to analyze two openings of new universities, one in the US and one in Korea. He finds a positive impact on local employment ten years after the 2005 opening of the Merced campus of the University of California, and he shows that the opening of the Ulsan National Institute of Science and Technology in 2009 increased manufacturing employment through the entry of new firms.

Lastly, a recent paper by Russell et al. (2022) gives evidence of a strong relationship between the presence of local college and the local educational attainment. Using OLS regression, they compare the current levels of college attainment in two type of US county: (i) counties that won a college as part of a site selection experiment using historical data on the establishment of U.S. colleges from 1839 to 1954; and (ii) “runner-up” counties that were strongly considered to become the site of a new college during that site selection experiment. Winning a college is associated with a 14 percentage point increase (58% relative to control group) in the share of the over 25 population with a bachelor’s degree or higher in 2018. They also propose a 2SLS estimates using the success or failure in the historical site selection experiments as an instrument for the college exposure today. They find that having at least one college in the county today increases the BA college attainment rate by 53.2 percentage points. Through its close research question, our paper complements the work of Russell et al. (2022) by different

aspects. First, we go further than their methodological contribution by applying an evaluation-specific causal inference method. Beyond the snapshot of a larger concentration of human capital caused by larger exposure to higher-education establishment, our method allows to demonstrate the efficiency of higher-education development policy and gives evidence of the evolutionary influence of university creation on local accumulation of human capital. Second, it allows to consider the potential heterogeneity depending on the location (not only the type of college). Third, regarding external validity, the French context gives more comparable investigation for other medium countries (in terms of population and geography), such as European neighbors, relative to the US case. Moreover, the relatively recent period of the U2000 plan, and the areas targeted (small-cities), carry lessons for current local development policies.

Research on the decentralization of universities in France is rare. Several reports and political or sociological studies have examined the implementation, evolution, and implications of the higher-education decentralization period of the 1990s, but we know of no empirical investigation of the local impact of the creation of the "new universities". We nevertheless mention the ongoing research of Nimier-David (2023) which uses the same natural experiment to quantify the impact of college expansion on local economic development, in particular on firm creation (increased by 10% on average) helped with the increase in the supply of educated workers. Interestingly, while this work includes all type of higher-education expansion (new establishment or new departments in IUT, IUP, university satellites and engineering schools) in all type of areas (including largest cities with old universities), it shows that the impact on firm entry is larger in less dense areas. This supports the importance which we have attached to the analysis of university creation in the context of small-sized cities.

## **3 Empirical Analysis**

### **3.1 The synthetic control method**

To investigate the causal relationship between the creation of universities and local human-capital accumulation, we use the synthetic control method (SCM) developed in Abadie and Gardeazabal (2003) and Abadie et al. (2010, 2012) in the context of comparative case studies.

This empirical approach is based on the computation of a synthetic control zone to reproduce the counterfactual, i.e. the situation of the zone where the new university is located if the creation had not occurred. The key principle of this method is that using a weighted average of potential control zones (those that did not receive the treatment) is better than controlling with a specific zone alone or an average of all the control zones. We use panel data to form a synthetic control zone by computing a specific weight (ranged between 0 to 1) for each of the zones in the set of potential controls. These weights are chosen to ensure that the new control will reflect as closely as possible the treated-zone according to several local factors and trends in the period before the university’s creation (called the pre-intervention or pre-treatment period). Once the synthetic control zone is matched, the outcome variable is extrapolated to the post-intervention period with the parameter estimates and the effect of the university’s creation is quantified as the difference between the treated and the synthetic zone values. See online appendix B for a formal discussion on the SCM.

Furthermore, rather than matching the synthetic control on pre-intervention averaged outcome, we fit synthetic control based on trends in the outcome variable.<sup>7</sup> When forcing the construction of synthetic control to match trends, meaning the dynamics, in the outcome variable,<sup>8</sup> we are able to measure the growth deviation caused by the treatment – compared to the one that would have occurred in the absence of the treatment. We will keep the level of the share of higher-educated people (not including those in school) in the last pre-treatment period (1990) in our set of matching variables. This strategy aims to take into account the dynamics towards mass higher-education over our analysis period and to avoid comparing zones with similar average level of human capital during the 1968-1990 period, but with very different dynamics. Moreover, the transformation of the outcome variable prior the estimation (normalized or demeaned) ensures that *i*) the pre-intervention trajectory of the outcome can be approximated by a convex combination of donor pool units; *ii*) the attenuation of bias resulting from unit-level, time variant unobserved confounds when the pretreatment fit is imperfect (Ferman and Pinto, 2021; Abadie, 2021; Wiltshire, 2022). Our confidence in the validity of the counterfactual is improved by exploiting these pre-intervention trends to compute the synthetic control (we will

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<sup>7</sup>See Galiani and Quistorff (2017) for methodology and Stata implementation.

<sup>8</sup>Each zone’s outcome is normalized so that it takes the value 1 in the last pre-treatment period (1990).

comment the results without normalization or using demeaned data in Section 5).

### 3.2 Inference and Robustness

Following Abadie and Gardeazabal (2003); Abadie et al. (2010, 2015), the statistical significance of synthetic control method results is determined by running placebo tests (see online appendix B for details). A *p-value* of 0.10 for a specific year indicates that, when the treatment is fictively reassigned at random among the donor pool, the probability of obtaining an estimate at least as large as the one obtained for the treated-zone is 10%. More briefly, there is a probability of 10% that the measured effect would happen by chance.

Our identification methodology and the placebo tests are valid under the assumption of no similar university-effects in the potential control units. These university-effects could appear in the untreated-zones for two main reasons. First, because of spillovers effects. The "new university" creation could affect the outcome not only in the treated-zone but also in the neighboring employment-zones. We therefore conduct a robustness check by running the same synthetic control method but with a new donor pool that does not include the zones neighboring the "new universities" zones. The second reason is because U2000 also led to the decentralization of small satellite universities in many commuting-zones of our donor pool. They may have similar positive effects in their areas. Therefore, the magnitude of our effects could be underestimated. Another robustness check is based on an alternative donor pool that excludes the zones with this type of decentralized secondary university.

Finally, although the SCM addresses omitted variable bias by controlling for time-variant unobservables, one concern remains in the identification if other contemporaneous shocks influence spatial sorting of highly educated individuals in the post-treatment period. To mitigate this concern, we construct a standard Difference-in-Difference (DD) model including covariates to control for several post-treatment shocks.

## 4 Context and Data

### 4.1 Background

Medieval cities played a crucial role in the creation and development of the first universities in France, as local social elites expected a great deal from these institutions (Verger, 1986). However, it was not until the second half of the 20th century that governmental education policies took into account the role of universities in regional development. Most modern universities were reformed or created in the late 1960s. Afterwards, in the late 1980s, French higher education received a new impulse with the opening of smaller local universities, as a result of local authorities' initiatives. As these efforts were somewhat scattered and disorganized, the central government announced a national investment and modernization program in 1990, known as "University 2000 Plan" or "U2000," to support these local initiatives. Notably, the program led to the creation of eight "new universities" (spread over fifteen sites), including four outside the Paris region.

We give further information on the historical background and the U2000 Plan in online appendix A. The primary factor that affected the deliberation at the central level was based on the need for re-balancing the map of higher-education in France. That relatively top-down, centralized designation process, with a composite financing system, means that the location decision may be as good as random assignment. Some concerns on the fact that "new universities" location is not completely random will be tested in online appendix G. In fact, we verify that local politicians did not play a critical role in the localization decisions, which may create endogeneity bias due to favorable local political climate.

Figure 1 shows the location of French universities within metropolitan France. The country is divided into 304 employment-zones<sup>9</sup> (or commuting-zones). The green dots indicate the locations of old universities (the 43 cities with a least one university that existed before the U2000 Plan). Most of these universities are located in Paris or in large cities.<sup>10</sup>

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<sup>9</sup>According to INSEE, an employment-zone (called a commuting-zone in this paper) is a geographical area within which most of the labor force lives and works, and in which establishments can find the majority of the labor force necessary to fill the jobs on offer. Limitations are based on commuting flows in order to limit the presence of inter-zone daily migration. It is therefore a spatial scale adapted to local studies, especially for evaluating the economic development or population-composition of localities.

<sup>10</sup>34 are located in the 40 largest employment-zones in terms of total population in 1982. The list of universities in 1982, sorted by population size of the employment-zone (with their ranking among the 304 French employment-

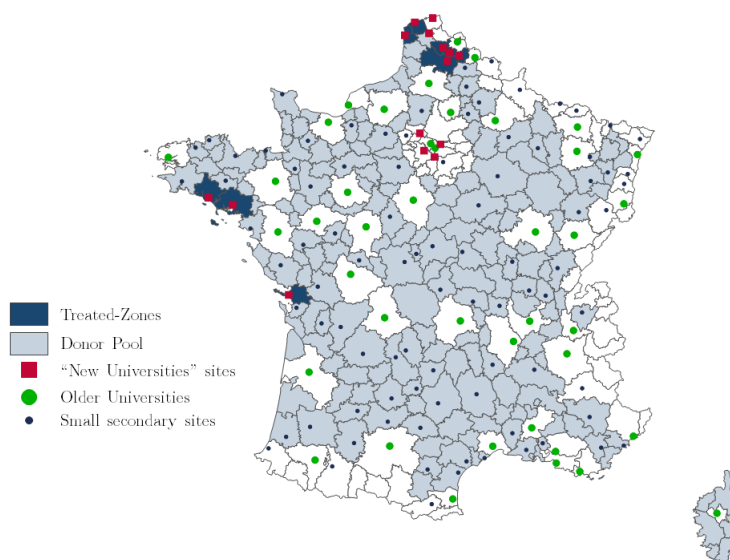


Figure 1: Location of Universities in France, 1968-2014

From 1990 to 1995, the U2000 plan led to the creation of eight "new universities" ("*Universités nouvelles*"), with campuses located in 15 employment-zones – identified by red squares in Figure 1. These "new universities" are full-service, autonomous, and multidisciplinary institutions with serious ambitions regarding academic research. In addition, the program led to the creation or enlargement of around 50 small secondary universities<sup>11</sup> (decentralized satellite universities that depends on a larger one and in which the course offerings and possibilities for research are limited). They are identified by small blue dots on Figure 1. Due to more accessible data and information about the decision and creation processes, we chose to focus on the impact of "new universities" only. Moreover, we exclude the Parisian "new universities" from our analysis because of their close proximity to the large and historical Parisian universities, situated in a region where skilled population flows are very significant, with all the potential spatial spillovers into adjacent areas that they entail.

We therefore focus on: the University of Artois; the Bretagne-Sud University; the University

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zones in parentheses): Paris (1); Lyon (2); Marseille (4); Orsay (5); Bordeaux (6); Toulouse (7); Nantes (8); Rouen (9); Lille (10); Grenoble (11); Saint-Étienne (12); Rennes (13); Nice (14); Nancy (15); Toulon (16); Strasbourg (17); Clermont-Ferrand (18); Metz (19); Tours (21); Créteil (22); Brest (23); Le Havre (25); Caen (26); Montpellier (27); Orléans (28); Mulhouse (29); Avignon (31); Le Mans (32); Angers (34); Dijon (35); Amiens (36); Valenciennes (37); Limoges (38); Reims (39); Pau (42); Poitiers (46); Aix (50); Besançon (57); Perpignan (60); Chambéry (70); Compiègne (91); Saint-Denis (143); Corte (303).

<sup>11</sup>Many other creations of this type emerged in the 2000s. In total, around a hundred zones had a small secondary university in 2014.

of Littoral Opal Coast; and the University of La Rochelle.<sup>12</sup> Except for the latter, the campuses of each of these universities are located in at least two cities in different employment-zones (as can be seen in Figure 1). We exclude two campuses of the University of Littoral Opal Coast of our main analyze: Saint-Omer, because this satellite did not receive university students before the 2000's and should rather be regarded as a decentralized secondary university satellite; and Dunkerque, because of its direct proximity to the Belgian border, which implies potential spillovers and migration flows that are difficult to take into account.<sup>13</sup> We end up with nine treated-zones identified by dark blue areas in Figure 1. Comparing the deviation of higher-educated population share in "new universities" zones (on average) from the national average, we find only a small convergence: the share increased from 7% in 1990 to 24% in 2017 where "new universities" were created, whereas the average in all employment-zones increased from 8% to 24%. After the restriction on our set of potential controls (see below), the average local share of higher-educated population in the donor pool increased from 7% to 21%. This suggest a small positive impact of "new universities" on local education level (around 3 p.p.).

## 4.2 Sample

The sample is restricted to employment-zones in metropolitan France and we choose to exclude three types of potential controls from our donor pool: zones with pre-existing universities; Parisian zones; and border zones.<sup>14</sup> Because the synthetic control aims to reproduce the situation that would have occurred without the universities' creation, we obviously discard from our sample the 39 zones with at least one "old" university (those that existed before the 1990s). Also, the Parisian zones (specifically, zones in the region of Ile-de-France) are relatively complex in design and structure because of the proximity to Paris, and may bias the synthetic control method. These 20 zones are indeed characterized by larger inter-zone population flows, especially higher-educated worker flows, and many important historical universities are located in

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<sup>12</sup>The University of Artois is located in Arras, Béthune, Douai and Lens. The Bretagne-Sud University in Lorient and Vannes. The University of Littoral Opal Coast in Boulogne-sur-mer, Calais, Dunkerque and Saint-Omer. And the University of La Rochelle has a unique campus in La Rochelle.

<sup>13</sup>We still discuss the effects in the Dunkerque case in online appendix.

<sup>14</sup>Therefore, we also exclude from our treated group the Parisian "new-universities" and the border zone of Dunkerque where University of Littoral have a campus.

the region, with potential spillover effects between areas.<sup>15</sup> Similarly, because of international population flows (in particular higher-educated population), the comparisons with border zones are delicate (and the progressive establishment of the Schengen area during our sample period may exacerbate the issue). Moreover, these zones may benefit from spillovers from zones across the border, potentially with universities of their own. For these reasons, we also discard from our donor pool the 45 border zones.

In the end, our dataset is a balanced panel of 209 employment-zones from 1968 to 2017. It includes 9 zones with "new universities" (our treated-zones), 98 zones with at least one decentralized secondary satellite dependent on a proper university,<sup>16</sup> and 138 zones without any university establishment, as defined by the annual regional atlas of higher education, i.e. a university site that provides higher education leading to a national degree (excluding technical diplomas (DUT) and engineering degrees).<sup>17</sup> We choose to keep the employment-zones with secondary satellites in our donor pool in order to keep much more potential control in our donor pool. We therefore expect more appropriate synthetic controls. Due to their small size compared to "new universities" (in terms of students,<sup>18</sup> course-offerings, grade level, and research activities), and their non-autonomous status, we expect very smaller local effects – if they were non zero. Consequently, we assume that zones with small secondary universities are, by comparison, similar to "empty" zones.<sup>19</sup>

### 4.3 Data and variables

Data on universities' localization, creation dates, and student population at the university level are drawn from the annual *Regional Atlas of student population*, published by the Ministry of Higher Education and Research between 1993 and 2017, and the multiple university evaluation

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<sup>15</sup>According to Aliaga (2015), the region of Ile-de-France is characterized by a very strong polarization of employment and important flows between the municipalities in the Parisian area of influence. Consequently, using the same parameters as for other regions would lead to construct a single big employment-zone (equivalent to Paris' area of influence). A specific method is instead used in the case of Ile-de-France, with further work on home-to-work flows, and a limitation of the distance effect (many long commute distances), that provides for smaller employment-zones based on local employment hubs.

<sup>16</sup>Including Saint-Omer.

<sup>17</sup>A zone with only small University Institutes of Technology (IUT) is not considered as a university area.

<sup>18</sup>The enrollment for the year 1995/96 was on average 500 university students in secondary satellites, compared to 2,300 on average in our nine new-university zones for this same year.

<sup>19</sup>A robustness test is based on an alternative donor pool without these type of zones.



reports produced by the National Evaluation Committee since 1984. Employment-zone-level data on population, skills, employment, activity, and other local attributes are drawn from harmonized population census data for the years 1968, 1975, 1982, 1990, 1999, 2009, 2014 and 2017. The employment-zones are defined by the geography applicable in 2016.<sup>20</sup> We therefore have four pre-intervention years, and four years of post-intervention data for our analysis of "new universities," all of which were established in the 1990s.

Our main outcome variable of interest is the share of population (not in school, and aged 16 and over) with higher education diplomas (a minimum of two years of study after the *baccalauréat*). As introduced in subsection 3.1, given the strong upward trend in higher education during our analysis period, we normalized our outcome variable. We force the synthetic control to match trends in the higher-educated population share by scaling each zone's outcome variable so that it takes the value 1 in the last pre-intervention period (1990).<sup>21</sup> We therefore focus on the variations in local human-capital accumulation.

For each treated zone, recall that donor pool weights are computed in order to obtain a synthetic zone that best reflects the values of a set of matching variables in the treated-zone before the creation of the "new university" (over the 1968-1990 period).<sup>22</sup> Given the available data in the INSEE population census, the set of matching variables includes usual predictors of local human capital and some controls for the local factors that may underlie the "new universities" designation: scaled share of higher-educated people - aged 16 and more and not including those in school (our outcome variable); this share of higher-educated population in 1990, the last pre-treatment period ; share of managers and professionals in the employed population (aged 25-54); employment rate (in population aged 25-54); employment and population density; unemployment rate; participation rate (25-54); four sectoral shares of employment (Agriculture/Manufacturing/Construction/Services); shares of population by age group (0-14; 15-24; 25-39; 40-64; 65 and more); and distance from the nearest pre-existing university. These predictors are averaged over the pre-treatment period in the SCM.

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<sup>20</sup>INSEE redesigned the boundaries of employment-zones in 2010. We adjusted the geography for former periods using the 2010 table of correspondence, which provides a consistent basis for comparing local outcomes over time.

<sup>21</sup>We still keep the higher-educated population share level in 1990 as a matching variable.

<sup>22</sup>Because there was no significant announcement effect before 1990, we assume the absence of anticipation effects before treatment, such that the pre-treatment indicators are exogenous and not affected by the (future) university opening.

## 5 Results

For the sake of brevity, we present the detail of the computation of each syntetic control in online appendix C, with information on fit and balance. The close fit for the preperiod local human capital variable and the good balance that we obtain for the predictors indicate that we find, in each case, a combination of other commuting-zones that reproduces the local context of the university zone before the U2000 plan.

### 5.1 Impacts of "new university" creation

Figure 2 shows the effects of "new university" creations on local human-capital accumulation. The blue thick line illustrates the aggregate average effect, whereas dark lines represent each treated-zone's specific effect. The synthetic control estimator of university impact is provided by the gap between the solid lines and the horizontal zero-effect dashed line. Beginning after the

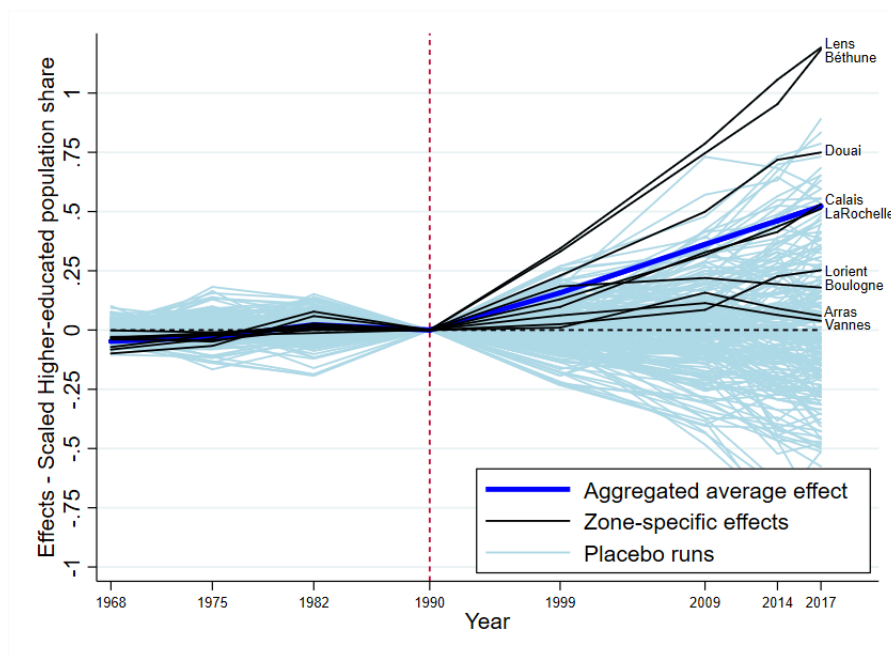


Figure 2: Local Human-Capital Effects in "New Universities" Zones

1990 census, the diverging movement of the treated-zones' average line confirms that, following the creation of "new universities," the local share of higher-educated population grew faster in those areas compared to the synthetic control. On average, the creation of "new universities" increased the local human-capital accumulation by 16 p.p. within around 7 years, by 36 p.p.

within 15 years, by 46 p.p. within 20 years, and by 52 p.p. within 25 years. At a mean of 7% in 1990, these estimates indicate that the share of higher-educated population is on average 1 point greater in those zones in 1999, 3 points greater in 2009 and 2014, and 4 points greater in 2017, as a result of the "new universities" creation.<sup>23</sup> This represents a 18% increase from the counterfactual level,<sup>24</sup> and a bonus of around 8,000 higher-educated individuals on average, considering observed population in 2017 (see Figure 3 for effects in terms of population level).<sup>25</sup>

Light-blue lines of Figure 2 represent all the fictive placebo runs.<sup>26</sup> The probability that the estimation of the average aggregated impact has arisen purely by chance is nil. However, case-by-case lines show important heterogeneity in the effects. Logically, the smaller the estimated impact, the bigger the probability that estimation has happened by chance. Overall, we can credibly conclude that there exists a positive impact of "new university" creation on local human-capital accumulation in six of the U2000 Plan candidates: the Lens, Béthune and Douai sites of the Artois University, the Calais site of the Littoral Opal Coast University, La Rochelle

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<sup>23</sup>Higher-educated population share level in 1990 times the estimated growth difference between treated-zones and synthetic control.

<sup>24</sup>For information, we have also estimated the average treatment effect using two alternative methods: a model that does not transform the outcome variable prior the estimation, and a model that transform the outcome variable by demeaning over the pre-treatment period. For reasons of brevity and clarity, we do not present detail about these models, given their poor performance in terms of fit & balance, compromising the reading and interpretation of the results. First, when we do not transform the outcome variable, the average fit is much poorer. Overall, the estimated average effect of treatment is lower (0.25 percentage points) and not significant (in view of placebo tests). However, applying the bias correction proposed by Abadie and L'Hour (2021); Ben-Michael et al. (2021) to correct for the possibility of discrepancies between the predictor variable values in each treated unit and its synthetic control donors, we obtain results comparable to our main model. Average treatment effect is about 2.5 percentage points, 13% of the counterfactual (see Wiltshire (2022) for details on this correction and implementation using STATA). Second, when we transform our outcome variable by demeaning (instead of normalizing) the data, this leads to similar positive average treatment effect, but smaller in magnitude (7% of the counterfactual), and with much poorer pre-intervention fit. Again, when applying bias correction, we find much more similar results compared to our main model, with a positive effect of treatment about 15% of the counterfactual.

<sup>25</sup>The average population in the treated zones is about 200,000 in 2017. The estimated counterfactual situation indicates 20% of higher-educated people in 2017, which represents about 40,000 people considering observed population in 2017. This corresponds therefore to a difference of about 8000 higher-educated people compared to the observed average population of higher-educated people in 2017 (47,500). We may want to compare this amount with the mechanical increase of university employees in the new-university-zones. Data from the Ministry for Higher-Education and Research shows that each new-university's campus employed on average 220 teachers in 2017 (we have divided the numbers equally between the campuses when data was only available for the new university as a whole). When we extend to all the university employees (teachers and BIATSS), which may include less qualified workers, the average is around 430 workers by campus in 2017.

<sup>26</sup>Along with the treatment effects, placebo effects are the gaps between values of outcome variable for each placebo-zone versus its synthetic control. As detailed in online appendix B.2, we also run time-placebo tests. We run our synthetic control model with a fictive date of intervention. In order to have enough matching periods, we reassign the "new university" creations as if they had occurred in 1982. Figure F.1 in online appendix F shows no significant effect from the hypothetical "new university" creations between 1982 and 1990 (despite the good pre-intervention fit). This enhances the credibility of our previous results.

University, and, to a lesser degree, the Lorient site of Bretagne-Sud University.<sup>27</sup> In the cases of Boulogne-sur-mer, Arras and Vannes, the estimated effects fail to deviate from the zero-line after 25 years – and the dark lines are not sufficiently unusual compared to the placebo effects distribution. .

Table 1: Higher-educated Population Share : 1990 vs. 2017

	1990	2017			
		Counterfactual		Estimated Gains	Observed
<b>Average</b>	7%	20%	+	<b>4 p.p.</b> (0,00)	= 24%
<b>Béthune</b>	6%	15%	+	<b>7 p.p.</b> (0,00)	= 22%
<b>Lens</b>	5%	12%	+	<b>5 p.p.</b> (0,00)	= 17%
<b>Douai</b>	7%	17%	+	<b>5 p.p.</b> (0,01)	= 22%
<b>La Rochelle</b>	9%	25%	+	<b>5 p.p.</b> (0,06)	= 30%
<b>Calais</b>	6%	18%	+	<b>3 p.p.</b> (0,06)	= 21%
<b>Lorient</b>	8%	24%	+	<b>2 p.p.</b> (0,18)	= 26%
<b>Boulogne</b>	7%	21%	+	<b>1 p.p.</b> (0,23)	= 22%
<b>Arras</b>	8%	25%	+	<b>1 p.p.</b> (0,37)	= 26%
<b>Vannes</b>	9%	29%	+	<b>0 p.p.</b> (0,41)	= 29%

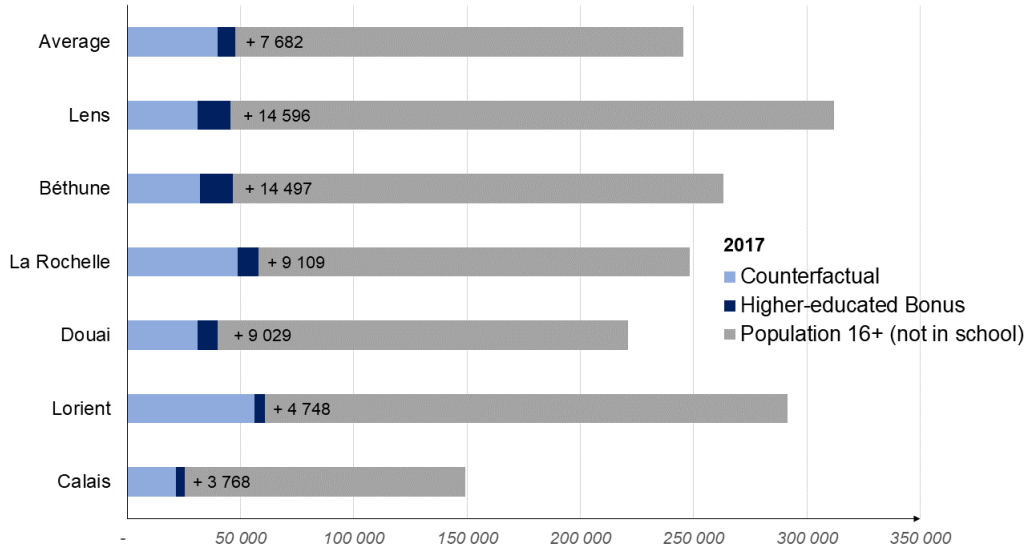
*Notes.* The magnitude of the "new university" impact is measured as the outcome deviation of the "new university" zone in comparison to the counterfactual. For example, as a result of the creation of La Rochelle University in 1993, the local share of higher-educated population (aged 16 and more, not including students) is greater by 5 points in 2017 (30% compared to 25% for the synthetic control). The *p*-values in brackets indicate the probability that the related result would happen purely by chance. For a distribution of 200 placebos, a 10% *p*-value means that only 20 placebo-zones show an estimated effect greater than the given treated-zone.

The zone-specific gains related to "new university" creation are displayed in Table 1. In the six cases for which we can credibly conclude on a substantial positive impact, the SCM

<sup>27</sup>In the case of Lorient, we tolerate a *p*-value of 20% because our test suffers from a low number of fake placebos, that show a pretreatment RMSPE no more that two times the RMSPE of Lorient case. In fact, only 2 placebo-zones among 10 show an estimated effect greater than the Lorient zone. If we choose to keep all the placebo tests that show a pretreatment RMSPE no more than three times the RMSPE of Lorient SCM, the *p*-value drops to 7%, with 2 placebos among 29 that show an estimated effect larger than the effect of the treated zone. Figure 2 plots all possible placebo effects, for all the donor pool, regardless of the fit quality in the pre-intervention period. As explained in online appendix B.2, lack of fit in placebo runs could bias the inference tests. Figure E.1 in online appendix E displays the zone-specific placebo test graphics for each treated-zone, excluding the placebo runs that show a pre-intervention RMSPE at least four times larger than the pre-intervention RMSPE of the corresponding treated-zone. The associated year-specific *p*-values are reported in Table D.1.

particular effect of treatment within about 25 years goes from 2 p.p. in Lorient to 7 p.p. in Béthune (which represents between 8% and 47% of the respective counterfactuals). In terms of population the corresponding bonus ranges from about 4,000 higher-educated people in Calais to about 14,500 in Lens and Béthune, considering observed population in 2017 (see Figure 3).

Figure 3: Higher-educated Population Share in Total Population in 2017 (not in school 16+)



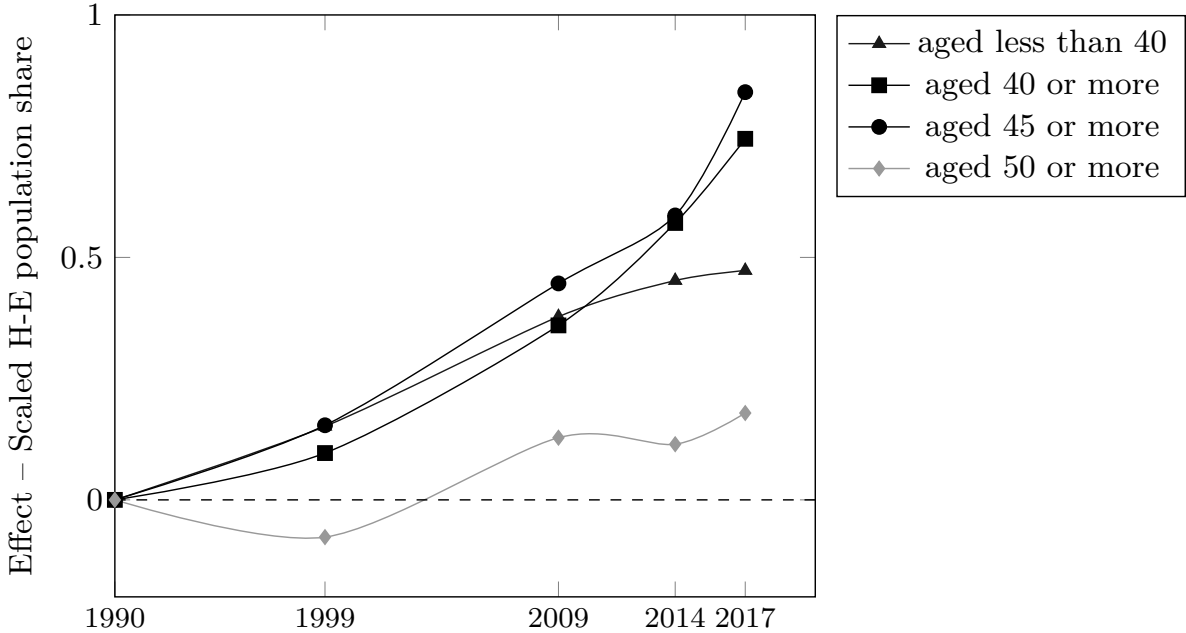
## 5.2 Higher-educated people by age groups

Our SCM based on aggregated data helps us to identify the causal effects of the creation of new-universities, but it does not provide information about the mechanisms underlying local human-capital accumulation. In particular, we do not know if the new universities create and/or attract and/or maintain higher-educated population in their zones. On one hand, newly-higher-educated individuals may decide to stay and work in the zone where they went to university, but, on the other hand, the presence of a new university may be a positive catalyst that attracts higher-educated migrants, who went to university elsewhere.

To shed light on this question, we use data on the share of higher-educated people depending on their age groups. We isolate higher-educated individuals that were already too old in 1990 to have been trained in the newly created university. We compute three groups of older higher-educated individuals (not in school): 50 years old and more; 45 years old and more; and 40 years old and more. Indeed, we can safely assume that people aged 23 in 1990 (i.e. 50 in 2017)

had already made their educational location choices at the time of the treatment. It is therefore very unlikely that the "50 and more" age-group includes former students of the new-universities in 1999, 2009, 2014 and 2017. Same for the group "45 and more" for the periods before 2017 and for the group "40 and more" before 2009.

Figure 4: Local Human-Capital Effects by age groups



We run the same SCM using these age-dependent human capital outcomes. Figure 4 shows that the creation of new-universities does not substantially impact the share of higher-educated individuals aged 50 and more. This suggests that local human capital accumulation is not the result of the attraction of the oldest higher-educated people. However, looking at the shares of higher-educated aged 40 or 45 and more, we find a positive and substantial impact of treatment even in 2009 and 2014. Since these age-groups are too old in these periods to have been trained in the newly-created universities, we can deduce that the creation of new-universities generates local human capital accumulation, not only because of the students who are trained and stay in the area afterwards, but also through mechanisms of attraction or retention of an older higher-educated population.

### 5.3 Regional Displacement Effect

We may ask whether the new universities effects on the local human capital accumulation are driven by some regional displacement effects. In other words, the human capital accumulation in the treated zones may lead to consequent reductions in human capital elsewhere in the region, which would not have occurred if the intervention had not been made. In particular, students may have relocated towards the new-universities inducing less enrollment in nearby existing universities, and potentially less human capital accumulation in their areas.

A way to test the existence of regional displacement effects is to run our SCM design keeping only the zones with a pre-existing university, and define the treatment as the creation of a new-universities within 200 kilometers.<sup>28</sup> All the existing universities have benefited from the modernization and renovation U2000 plan during the 1990s. But, in fact, there is no reason why existing universities closer to the new-universities should have received more (or less) fundings than the others – and there is nothing in the official records that goes in this direction (see Datar (1998)).

Figure 5 shows the effects on the local human capital accumulation in pre-existing-university areas of the creation of a new-university within 200 kilometers. We clearly see that the effects is on average relatively greater in areas close to new-universities. Although it is difficult to identify the origins for this advantage, these results indicate that there is no regional displacement effect that would negatively impact areas that had universities before the program.

We must note however that the zone of Poitiers seems to have been negatively impacted compared to its counterfactual beneficiary of U2000. This suggests a negative displacement effect for Potiers with the creation of the nearby new-university of La Rochelle, which may capture human capital that would be localized in Poitiers in the absence of the creation. Indeed, in this specific case, the displacement effect seems more likely as the two universities of La Rochelle and Poitiers are located in small-sized cities, both relatively far from the major cities, which may therefore be in greater competition regarding the regional distribution of human capital.

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<sup>28</sup>The zones with a pre-existing university that experienced a creation of a new-university within a radius of 200 kilometers are Amiens, Angers, Bordeaux, Brest, Lille, Nantes, Poitiers, Reims, Rennes, Rouen, and Valenciennes.

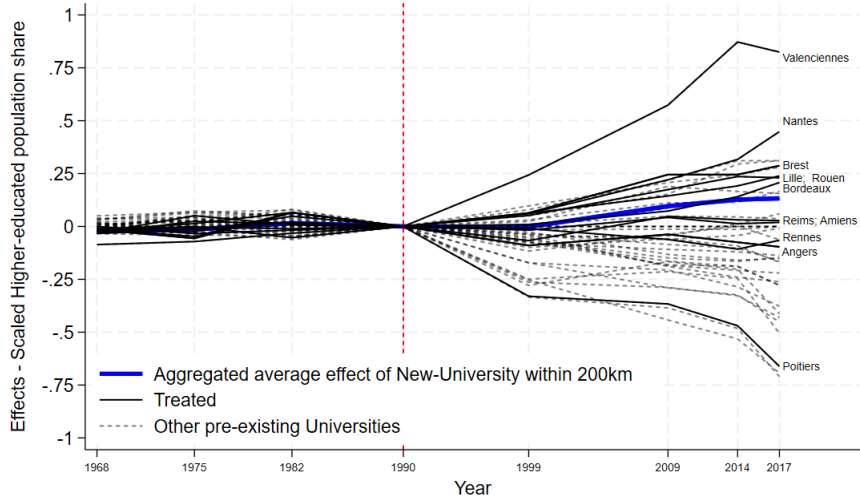


Figure 5: Local Human-Capital Effects in University Zones nearby the New-Universities

## 6 Robustness

**Endogeneity issue.** Placebo tests confirm that our results are not a mere statistical construction. However, inference analysis may not fully eliminate the uncertainty that those results do not arise from a potential endogeneity bias due to favorable local political climate. Indeed, a plausible alternative hypothesis is that powerful local politicians – with strong networks within the central government – were elected around the time of U2000 Plan and managed to obtain national funds to create "new universities" in their towns. If this change in local government also strongly affected the local economic dynamics afterwards, our estimated impacts could be the result of this new local leadership (which also made possible the university's creation) rather than of the "new university" creation itself. Discussion and robustness tests in online appendix G demonstrate that our results are not driven by any local political changes. In particular, several official documents note that in the cases of "new universities," local politicians did not play a critical role in the localization decisions. Moreover, only one of our treated zones had elected a new mayor around the period of the U2000 decisions, which rules out the hypothesis that the arrival of an influential mayor at the moment of U2000 negotiations led to both a university's establishment and the accumulation of human capital afterwards. Finally, we show that the SCM results are not different in zones that experienced a mayoral change just after the treatment, compared to others.



**Spatial spillovers bias.** As detailed in online appendix B.2, to further gauge the sensitivity of our results, we conduct additional analyses with alternative donor pools.

Table 2: Average Human Capital Gains (percentage points) - Donor Pool Comparisons

	1999	2009	2014	2017
<b>Donor Pool 1 (Benchmark)</b>	1.1 (0.000)	2.6 (0.000)	3.3 (0.000)	3.7 (0.000)
<b>Donor Pool 2</b>	1.1 (0.000)	2.5 (0.000)	3.2 (0.000)	3.6 (0.000)
<b>Donor Pool 3</b>	1.1 (0.000)	2.2 (0.000)	3.1 (0.000)	3.6 (0.000)
<b>Donor Pool 4</b>	1.1 (0.000)	2.3 (0.000)	3.2 (0.000)	3.7 (0.000)

*Notes.* We provide the synthetic control results for our four different donor pools for the four census. Results are computed the same way as in Table 1. The magnitude of the "new university" impact is measured as the outcome deviation (in percentage points) of the "new university" zone in comparison to the counterfactual. The p-values in brackets indicate the probability that the related result would happen purely by chance. Donor Pool 1 includes 200 placebos, Donor Pool 2 includes 179 placebos (= Donor Pool 1 without "new universities" neighboring zones), Donor Pool 3 includes 107 placebos (= Donor Pool 2 without zones with small secondary university satellites), and Donor Pool 4 includes 119 placebos (= Donor Pool 1 without zones with small secondary university satellites).

First, the creation of "new universities" may affect the outcome not only in the treated-zone but also in other control zones, especially in the neighboring employment-zones. For example, if the creation of La Rochelle University led to an increase of qualified population in the neighboring zones, the inclusion of these zones in the donor pool may underestimate the effect for the La Rochelle zone. Conversely, if the university's creation attracts higher-educated population from the neighboring zones, our estimates may be overstated. Even if our choice of employment-zones as the spatial unit for our analysis reduces the necessity for this caveat,<sup>29</sup> we still have concerns about this no-spillover assumption. We therefore run a similar synthetic control method but with a second donor pool (DP2), which excludes the neighboring zones of "new universities" zones.

Secondly, we conduct a third set of specifications based on a third donor pool (DP3), which excludes zones with decentralized secondary university sites. Indeed, if these small university satellites comparably affect the local higher-educated population share of their zones, we may underestimate the impact of "new universities" by keeping these zones in the potential controls.

<sup>29</sup>Recall that employment-zones are based on the assumed flows of movement from residence to work, so this spatial designation already takes into account some spillovers effects, as compared to a city-level designation.

Additionally, we run a last synthetic control method with a fourth donor pool (DP4), which excludes zones with decentralized secondary university sites, but keep the neighboring zones of "new universities" zones.

Table 2 summarizes the effects of the "new universities" for the four treatment periods (with associated *p-values*), depending on our four different donor pools. The results do not differ from the previous estimates with Donor Pool 1. We also check the sensitivity of our main results to changes in the donor zones weights and find very similar results (see online appendix G for details).

**Alternative Diff-in-Diff method - Control for other contemporaneous shocks.** One concern remains in the identification if other contemporaneous shocks influence spatial sorting of highly educated individuals in the post-treatment period. To mitigate this concern, we present in Table 3 the results of standard Difference-in-Difference (DD) model including covariates to control for post-treatment shocks. In particular, we check for the influence of local labor demand shocks linked to urban tax-free zones creation (ZFU program<sup>30</sup>), easier access to the area (through rail development<sup>31</sup>), new taste for local amenities such as the proximity of the sea<sup>32</sup> that might attract higher-educated workers in the new university areas, and potential spillovers coming from the proximity with other dense and dynamic local labor markets (measured by market potential<sup>33</sup>).

The difference-in-differences design uses the same initial donor pool than SCM (9 treated zones and 200 untreated) and estimates the average effect of new universities creation based on the following equation:

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<sup>30</sup>The *Zones Franches Urbaines* (ZFU) program announced in 1996 have led to the creation of 38 urban tax-free zones in 1997, 41 in 2004 and 15 in 2006. Four of our treated zones were concerned by the program: Calais (1997), Lens (2004), Douai (2004) and La Rochelle (2004). This policy was designed to revitalize economic activity and promote social and professional integration in some vulnerable suburban areas. Tax credits were granted to firms settling in these ZFUs, resulting in local employment improvement (Charnoz, 2014; Briant et al., 2015).

<sup>31</sup>Due to a lack of available local data on the chronological development of the Train Express Regional (TER), we focus on high-speed train TGV network. Since its introduction between Paris and Lyon in 1981, the French high-speed rail network, initially centered on Paris, has gradually expanded to connect many French cities with the construction of new lines to the south, west, north and east of France.

<sup>32</sup>Most of the treated zones are located near the sea (see map 1).

<sup>33</sup>Following Harris (1954), the market potential variable for a zone  $z$  is computed as the sum of each other local labor market's density ( $Dens_{i \neq z}$ ) divided by the distance separating this other zone  $i$  and  $z$ :  $PM_z = \sum_{i \neq z}^n \frac{Dens_i}{distance_{i-z}}$ .

Table 3: DiD estimations of new university impact on scaled higher-educated population share

Scaled Higher-educated population share						
	(1)	(2)	(3)	(4)	(5)	(6)
<b>Impact of the university creation</b>	0.277*** (0.0444)	0.173*** (0.0454)	0.173*** (0.0383)	0.227*** (0.0390)	0.200*** (0.0396)	0.177*** (0.0396)
Tax-free Zones	-	-	-	-0.178*** (0.0270)	-0.183*** (0.0268)	-0.192*** (0.0268)
Distance to TGV station	-	-	-	0.004 n.s. (0.0010)	0.009 n.s. (0.0107)	0.010 n.s. (0.0107)
Distance to the sea						
x1975	-	-	-	-	-0.005 n.s. (0.0124)	-0.003 n.s. (0.0123)
x1982	-	-	-	-	0.005 n.s. (0.0128)	0.006 n.s. (0.0128)
x1990	-	-	-	-	-0.010 n.s. (0.0124)	-0.010 n.s. (0.0123)
x1999	-	-	-	-	-0.012 n.s. (0.0124)	-0.013 n.s. (0.0124)
x2009	-	-	-	-	-0.029*** (0.0124)	-0.033*** (0.0124)
x2014	-	-	-	-	-0.040*** (0.0124)	-0.044*** (0.0124)
x2017	-	-	-	-	-0.049*** (0.0124)	-0.053*** (0.0124)
ln Market Potential	-	-	-	-	-	-0.968*** (0.2902)
All SCM covariates	Yes	No	No	No	No	No
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Zone fixed effects	No	No	Yes	Yes	Yes	Yes
Observations	1,672	1,672	1,672	1,672	1,672	1,672
R <sup>2</sup>	0.17	0.02	0.98	0.98	0.98	0.98

Notes. This Table presents Diff-in-Diff estimation results based on equation 1. The data sample contains 1,672 observation (9 treated + 200 untreated zones  $\times$  8 periods). Each column is a separate regression. Column (1) reports the regression including all the covariates used in the SCM: share of managers and professionals in the employed population (aged 25-54); employment rate (in population aged 25-54); employment and population density; unemployment rate; participation rate (25-54); four sectoral shares of employment (Agriculture/Manufacturing/Construction/Services); shares of population by age group (0-14; 15-24; 25-39; 40-64; 65 and more). As these covariates are potential bad controls, the rest of the columns exclude these variables. All specifications include a constant term.

Variables of distance are divided by 100.

Coefficients are reported with robust standard errors in parenthesis. \*\*\*, \*\*, and \* indicate significance at the 0.01, 0.05, and 0.1 levels.

$$Y_{zt} = \alpha + \gamma Post_{zt} \times NewUni_z + \theta X_{z,t} + \eta_z + \delta_t + \epsilon_{zt} \quad (1)$$

where  $Y_{zt}$  is our outcome of interest (scaled share of higher-educated people - aged 16 and more and not including those in school) for the zone  $z$  in year  $t$ . We are interested in the interaction term between the dummy variable for post-treatment observations ( $Post_{zt}$ ) and a

variable taking the value one if the zone  $z$  is a new-university-zone, zero otherwise ( $NewUni_z$ ).  $X_{z,t}$  is a set of covariates including our controls for other contemporaneous shocks.  $\eta_z$  and  $\delta_t$  are zone fixed effects and year fixed effects.  $\epsilon_{zt}$  are the errors terms.

Results reported in columns (1) to (6) of Table 3 show that DiD method similarly concludes on a strongly significant positive effect of new universities creation on the local accumulation of higher-educated people. For comparison and robustness purposes, we first present in column (1) of Table 3 a DD model where  $X_{z,t}$  contains all the matching variables used in the SCM model. We confirm a positive and very significant impact of new universities creation on the local accumulation of human capital. However, the problem with this specification is that many (if not all) of the control variables are very likely to be themselves outcomes of the treatment (see next section 7). They thus are bad controls since they represent indirect effects of new universities on the local concentration of graduates. We exclude this set of controls in the other robustness specifications (columns (2) to (6)).<sup>34</sup>

Our preferred specification, which includes three controls for local post-treatment shocks (tax-free zone indicator, distance to the nearest TGV station and the interaction of the distance to the sea with year indicators) plus year and zone fixed effects, is presented in column (5) of Table 3. We estimate that, on average, the creation of a new university increased the local human-capital accumulation by 20 percentage points. Note that the value of this impact decreases to 18 percentage points when we add our additional control of market potential (see column(6)). However, because the U2000 program was national in scope, and in particular it financed the modernization of major historical universities in big French cities, it had a direct influence on this market potential variable, which may also represents a bad control in the DiD specification.

We finally run a difference-in-differences event-study design to evaluate treatment effects in the different pre- and post-treatment periods. We include the same controls as in column (5) of Table 3. Estimation results are reported in online appendix. Compared to SCM, event study results plot on Figure 6 show very similar progressive increase of the outcome variable after the

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<sup>34</sup>To alleviate the issue of bad controls, we also include these variables using lagged values from the pre-treatment period, or the means over the pre-treatment period. Results are smaller in magnitude with these two alternative specifications. The difference in difference estimator is 0.20 with lagged variables and 0.17 with means.

Figure 6: Event study estimates of the impact of new universities creation



Notes. This graph plots the coefficients for interaction terms between year dummies and treatment status obtained from an event-study difference-in-differences design. The graph is based on our preferred model, which includes a dummy for tax-free zone, controls for distance to the nearest TGV station, an interaction between year and distance to the sea, zone fixed effects, and year fixed effects. Confidence intervals are represented at the 95% level.

creation of new universities in the 1990s. This reinforces our confidence that the main SCM results are not driven by post-treatment specific shocks affecting the treated zones.

## 7 Exploring the Employment and Demographics Implications of the Creation of "New Universities"

Although the principal analysis is designed to explore the effects of university creations on local accumulation of human capital, our results raise questions about other aspects of universities' local impact, in particular about their effect on employment levels. As mentioned above, local authorities hoped that universities would produce positive direct and indirect effects on local employment. In particular, the creation and attraction of a skilled population was expected to translate into more skilled jobs on the labor market, with spillovers effects on general employment and economic activity.

Therefore, having shown the positive effects of "new university" creation on local human-capital accumulation, the question that naturally arises is whether the founding of these universities and the associated human-capital accumulation in the local labor pool have led to labor and demographics changes at the local level. Using precisely the same synthetic control method,

we also explore the U2000 program's impact on employment density, unemployment, the share of executives and top management positions, the share of services or manufacturing jobs, the net migration and the share of young population in the local labor markets. Figures J.1 to J.7 (in online appendix) depict the estimated average treatment effects using SCM and DiD.

**Employment Density** On average, the creation of "new universities" increased the growth of local employment density by 6 p.p. within around 7 years, and this gap remains stable within 15 years (6 p.p.), and 20 years (7 p.p.), and reaches 8 p.p within 25 years (placebos test gives a *p-values* of around 3%). DiD model confirms this result, with an average treatment effect of 9 p.p. in the last period (see graph (b) on Figure J.1). SCM estimates indicate that the employment density is on average 7 jobs greater in those zones in 2017 as a result of "new universities" creation, which represents an increase of 8% compared to the counterfactual in 2017. Those results therefore indicate that university creations rather had a short-term impact on local density, presumably due to the immediate direct effects from university-building, new demand from students and university workers, and the new appeal of university city status. The estimated gap with the counterfactual slowly increased in the second decade of the universities' existence, suggesting no substantial cumulative long-term spillover effects on local employment density.

**Unemployment** On average, the creation of "new universities" reduced the growth of local unemployment by 10 p.p. by 1999. However, this effect is no longer statistically credible after 15, 20 and 25 years (based on a threshold of 10%). The first period estimate indicates that the unemployment rate in those zones is on average lower by 1.3 p.p. by 1999, which represents a decrease of -10% compared to the counterfactual. The treatment seems to have had no real long-term effect on local unemployment. Although we found a significant reduction in unemployment by 1999, this immediate impact disappears in the subsequent periods, suggesting a temporary shock in "new university" zones that subsides in the next period returning to the counterfactual trend.

The estimation based on DiD methodology are surprisingly different. Graph (b) of Figure J.2 show a more progressive slowdown of the unemployment rate. The average treatment effect

does not cancel after the first post-treatment period, but it continues to increase in magnitude reaching about -15% of the counterfactual level in 2017. This difference may come from a small violation of the parallel trend between controls and treated zones, where the unemployment rates are on average higher and grow faster in the pre-treatment period.

**Share of Executives and Top Management positions** On average, "new universities" creation increased the growth of the local share of executives and top management position (E&TM) by 10 p.p. within around 7 years, 16 p.p. within 15 years, 10 p.p. within 20 years, and 21 p.p. within 25 years. The share of E&TM in those zones is progressively larger on average, rising to a difference of 1.7 p.p. in 2017, which represents an increase of 17% compared to the counterfactual. DiD model confirms the positive impact on E&TM employment, but smaller in magnitude, with an effect of about 8% of the counterfactual level within 25 years, and some doubt on the parallel trends assumption. The impact of the creation of "new universities" on the share of local E&TM is analogous to the impact on local human-capital accumulation. This is a first element in answering the question of whether human-capital gains have actually translated into high-skilled employment at the local level.

**Share of Service and Manufacturing Employment** The creation of new-universities does not lead to substantial modification of the share of service sector or the share of manufacturing sector in total local employment. SCM or DiD models show similar trend before and after treatment in the treated zone compared to the counterfactual. Both methods are unsatisfactory in the case of manufacturing employment – poor pre-treatment fit with SCM and no parallel trends with DiD.

**Net Migration.** SCM model fails to find a good counterfactual when we analyze the impact in terms of net migration (difference between the number of person who enter the commuting-zone and the number who leave between two periods in our sample) – in percentage of the local population. DiD model suggests no substantial changes in net migration compared to the counterfactual situation.

**Young population shares.** On average, the creation of new-universities mitigates the decrease of the younger population. Figure J.7 shows the direct impact, beginning in the first post-treatment year, on the share of 15-24 years old population – most probably due to new students enrolled in "new-universities". This gap slightly decreases afterwards. We also find a positive impact of new-universities creation on the share of 25-34 years old population. The increase with respect to the counterfactual is more progressive and begin to be substantial after 2009. This suggests that part of the new students boom arrived with the creation of the new university stay in the commuting-zone after higher-education, but we are not able to distinguish it from the young immigration.

## 8 Case-by-case heterogeneity in human capital effect

The identification of the precise causes of the heterogeneity in the impact of new-universities creation on local human capital is beyond the scope of this paper, requiring supplementary data and ad-hoc methodological strategy. In particular, with too few observations (9 treated-zone) basic OLS regressions suffer from lack of statistical power to identify significant preconditions that determine the future effects of new-universities creation (such as the distance from pre-existing university, the size and the organization of the campus or some local characteristics). Nevertheless, we discuss here preliminary results based on correlations and identify paths for reflection for further analysis.

First, we look at the heterogeneity in the zone-specific treatment effects for each local outcome comparing them with the effects in terms of human capital accumulation. Figure 7 plots the particular treatment effects by period for each treated-zone.<sup>35</sup> While the synthetic control method shows a relatively good match in the pre-treatment period when averaging over all the treated zones (see previous section and graphs in online appendix J), it actually smooths out some of the heterogeneity in the match for each specific treated zone. In contrast with the synthetic controls in the main outcome of higher-educated population share, which showed a very good match for all the treated zones, for the other employment and demographic outcomes,

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<sup>35</sup>Table J.1 in online appendix presents the pre-rmspe, the effect (with % of the counterfactual) in the last period (2017) and the associated p-value for each outcome and each treated zone.



Table 4: Correlation between treatment effects (in % of the counterfactual)

	Share 15-24	Share 25-39	Unemployment	Share E&TM	Density	Manufacturing	Services
Human Capital	53%	82%	14%	55%	64%	19%	38%

*Notes.* This Table presents the pairwise correlation coefficients between the human capital effect (in % of the counterfactual) and the effects in terms of other outcomes (in % of the counterfactual). The computation does not include cases with poor pre-treatment fit.

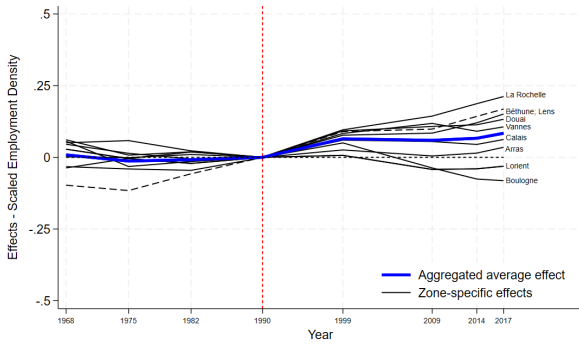
case-by-case results should be interpreted with some caution, keeping an eye on the pre-RMSPE value. Thus, we do not discuss cases for which the pre-rmspe is at least 150% greater than the average pre-rmspe in the whole donor pool – dashed lines in the graphs of Figure 7.

As in the analysis of human capital accumulation, case-by-case results indicate important heterogeneity in every outcomes. Table 4 displays the correlation coefficients between the human capital effect (in % of the counterfactual) and other effects. Human capital effects are more correlated with the impact in terms of population aged 25-39 and density, and to a lesser extent, with the share of executives and young population aged 15-24.

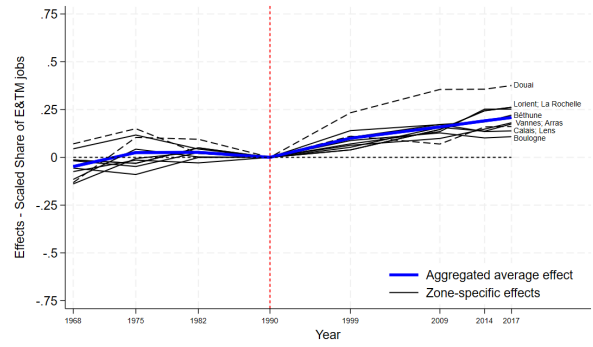
Looking at the last period (2017), the effect of new-universities creation on employment density seems higher in zones where we measure a significant improve in the local human capital. On average, the density is 10% higher compared to the counterfactual in the zones of Lens, Douai, La Rochelle, Calais and Lorient, but only 1% in Arras, Boulogne-sur-mer and Vannes. Moreover, considering the case-by-case computed *p-values*, only Lens, Douai and La Rochelle show a substantial positive effect (less than 10% chances that it happens only by chance). This suggests that gains in local human capital come with employment growth in the new-university zone. In contrast, we detected no effects in terms of human capital in zones where the employment density did not rise (or even slightly decreased in the case of Boulogne-sur-mer) following the new-university creation.

Next, the increase in the share of 25-39 population, as a result of new-universities creation, is greater in the zones where new-universities have a substantial impact on local human capital. On average, the effect on the 25-39 share represents 11% of the counterfactual in Lens, Béthune, Lorient and Douai, whereas it is 3% in Arras, Boulogne-sur-mer and Vannes. Placebo tests confirm the confidence in the positive impact only in the cases of Douai, Béthune and Lens, where new-universities increased substantially the local human capital accumulation. Note,

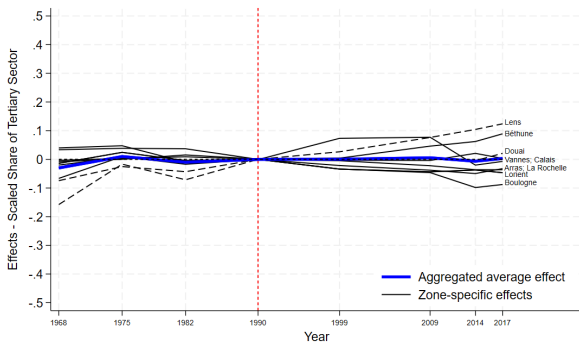
Figure 7: Case-by-case Treatment Effects – Other Outcomes



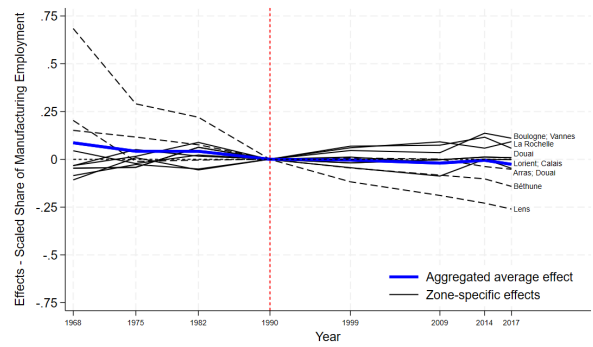
(a) Employment Density



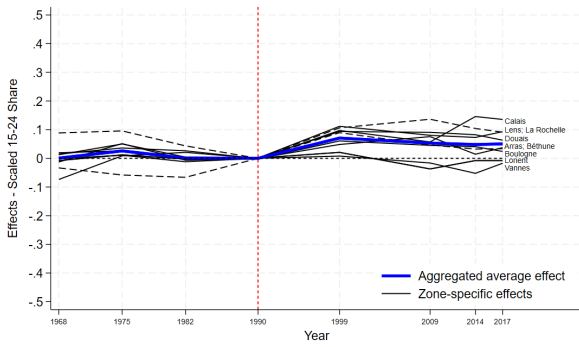
(b) Share of E&TM jobs



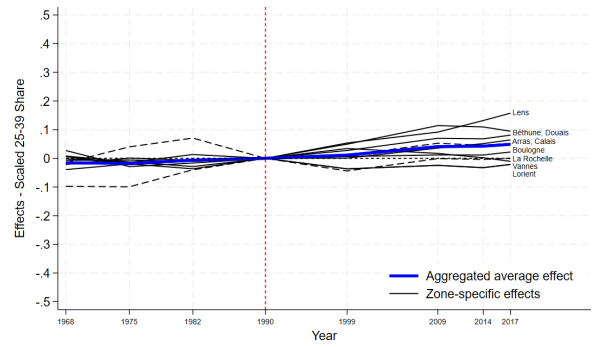
(c) Share of Services Sector



(d) Share of Manufacturing Sector



(e) Share of Population aged 15-24



(f) Share of Population aged 25-39

Notes. These Figures present the case-by-case estimations and placebo runs related to the effects of new-universities creation on different outcomes (scaled to 1 in 1990).

however, that the impact is also substantial in Arras, where the new-university creation had no impact on the human capital accumulation. This correspondence between the accumulation of local human capital and the increase in the share of 25-39 population may confirm the intuition that the fixation of human capital is due to the attraction of relatively young higher-educated population.

We find similar results looking at the share of younger population aged 15-24. On average, the effect on the 15-24 share represents 10% of the counterfactual in Douai, Calais, La Rochelle and Lorient, whereas it is 2% in Arras, Boulogne-sur-mer and Vannes. Again placebo tests confirm that the positive impact is significant only in the cases of Douai, Calais and La Rochelle, where new-universities increased substantially the local human capital accumulation. This is in keeping with the fact that the effect of new-universities on local human capital accumulation depends on their capacity to attract young population of students.

Finally, the effect in terms of E&TM employment share seems slightly higher in the zones where new-universities have a substantial impact on local human capital. On average, the effect on E&TM represents 17% of the counterfactual in Lens, Béthune, Lorient and La Rochelle, whereas it is 12% in Arras, Boulogne-sur-mer and Vannes. Moreover, placebo tests corroborate the substantiality (p-values 15% or less) of the positive impact only in the case of Béthune, La Rochelle and Lorient, where new-universities increased substantially the local human capital accumulation. This relation gives some insights on the fact that human capital may fix locally where there is a demand for high-skilled labor.

## 9 Conclusion

Local and regional authorities' initiatives for developing higher education in the late 20th century were supported by the national program "University 2000," using a new decentralizing approach. The engagement of local actors reveals a vision of the university as an important economic development lever, in particular because it is expected to boost human-capital accumulation in the locality. We examined the causal effects of "new universities" creation on local share of higher-educated population (aged 16 and more and not including students) by implementing the synthetic control method, using census data over the 1968-2017 period. The results

show that, on average, the creation of "new universities" increased the higher-educated population share by 4 points within 25 years. This represents a 18% increase from the counterfactual level.

Our study confirms the validity of local actors' expectations, regarding university-creation as a vector of local development. In addition to its well-known role in reducing on social and geographical inequalities for individuals, university decentralization in small-sized areas has a positive impact on local development by increasing human-capital accumulation. However, we measure notable heterogeneity across zones. In six cases, the local higher-educated population share is significantly larger as a result of the "new university" creation, with an effect between 2 p.p. and 7 p.p. within 25 years (which represents between 8% and 47% of the respective counterfactuals). In the three other cases, we cannot confidently conclude that there exists a significant "new university" effect on local human-capital accumulation. Further analysis (potentially exploiting more detailed local data with annual approach) would be necessary to understand this heterogeneity precisely. Nevertheless, we provide some initial responses comparing the impact in terms of various employment and demographic outcomes. Indeed, we show that local human capital accumulation in new-university zones comes with employment growth and an increase of the young population. Moreover, human-capital gains in the "successful" areas co-occurred with gains in skilled employment (executives and top management positions), providing some arguments against the idea that there is a mismatch between higher-education demand and supply in medium-sized cities containing universities.

The synthetic control method helps us to identify the causal effects of a university's creation, but it gives very few information about the mechanisms underlying local human-capital accumulation. Using data on higher-educated people by age group, we nonetheless provide some evidence that the "new universities" have created mechanisms of attraction of higher-educated population that go beyond a mere students' decision to stay in the zone where they went to university. Finally, we show that local human capital accumulation most likely did not occur from a regional displacement effect that would have negatively impacted neighbor areas with universities before the program.

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# Online Appendices

## A Historical Background

### A.1 The History of French Universities

The French higher-education system reflects centuries of development and reforms. After the creation of the earliest universities in the Middle Ages (first in Paris, Angers, Orléans, Montpellier, and Toulouse (Verger, 1986)), the French universities moved from ecclesiastical supervision to state supervision. Universities took the form of local guilds<sup>36</sup> attached to cities. Afterwards, the French Revolution led universities into a deep crisis, and indeed to their dissolution in 1793 – along with the entire guild system.

There followed more than 150 years without truly autonomous regional universities. Indeed, in 1806, the Napoleonic imperial university system established a highly centralized state-controlled organization. The state minister imposed vertical control on some faculties (theology, law, medicine, humanities and sciences), which were re-formed on the old medieval model, with a relatively small and unclear role (Musselin, 2012). These faculties were not really detached from secondary-education institutions (Karady, 1986). Although new higher-education centers progressively emerged in Aix, Bordeaux, Caen, Dijon, Douai, Grenoble, Lyon, Nancy, Poitiers, Rennes, and Strasbourg (Ver, 1986), the number of students remained very low during the 19th century, and few courses were offered (Antoine Prost 1968). Some reforms were implemented during the late 19th century, but this was negligible when compared to the massive transformation that took place in the mid-20th century.

The fundamental renewal of French universities followed in the wake of the events of May 1968, starting with the "Faure Law" of November 1968, which was rooted in three main socio-economic movements (Passeron, 1986): the first wave of the democratization of higher education; the social diversification of the demand for higher education; and the divergence between education and job opportunities. This law provided for considerable changes in the geography of French universities, with the creation of modern universities and the restoration of the autonomy of regional universities (in terms of organization, pedagogy, and finances). At the end of the

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<sup>36</sup>*Corporations* in French.

1970s, however, many people still lacked access to higher education, and regional inequalities and vertical state control remained relatively strong. The "Faure Law" was therefore reinforced with the "Savary Law" of 1984, which established new operating rules for French universities, and broadened their scope (Duport, 2008).

The map of French universities went through another major transformation in the late 20th century, with a period of higher-education decentralization in mid-sized and small cities. This decentralization movement was given impetus by a second wave of democratization and thus an increase in student numbers – partly due to pro-secondary-education national policies – and by the active involvement of local actors. Primarily on the initiative of local representatives, beginning in the 1980s, a number of small secondary universities were founded, scattered all around the country. In the context of a general movement towards decentralization, and a second phase of higher-education democratization,<sup>37</sup> these local establishments emerged most often without the consultation or participation of the central government (Filâtre, 2003; Ferréol, 2010).

In response to this surge of interest among local authorities, the national government introduced the University 2000 Plan in 1990 (also called "U2000"). This program aimed to consolidate and guide the movement towards the decentralization of universities, and achieved, *inter alia*, the creation of eight "new universities," which constitute an interesting natural experiment for investigating the impact of university decentralization on the local accumulation of human capital.

## A.2 The University 2000 Plan

Announced in May 1990 by Lionel Jospin, then the Minister for Education, Youth and Sport, University 2000 was intended to address the territorial imbalance and the expected surge of new students by supporting and regulating universities' delocalization through a program of construction and renovation (Datar, 1998; Felouzis, 2001). U2000 also resolved various qualitative mismatches in terms of social inclusion and the diversification of instruction, but geographical

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<sup>37</sup>This second democratization period affected the generation born in 1960-1977, and was mostly due to the sharp increase in secondary education for these age groups. Several education reforms increased the rate of baccalaureate graduates by 30 percentage points within 15 years (Albouy and Tavan, 2007).

realignment through financial assistance represented its most immediate and dominant thrust. Moreover, the key issues identified at the national conference for higher education in 1990<sup>38</sup> included a territorial focus, indicating that the university has a crucial role to play in local economic development (Poulain, 1997).

U2000's financial outlay represented more than 32 billion francs (7.2 billion euros in 2015), half of it paid by regional and local authorities, and involved 1.5 billion square meters of developed area from 1991 to 1995. (Datar, 1998). The ex-post financial results for the 23 *académies* outside *Ile-de-France* and *DOM-TOM* determined that around 21 billion francs were allocated (4.2 billion euros in 2015) – 41% of which was state-funded. Note, however, that the program did not affect only new delocalized establishments, and that a major portion (17 billion francs) of the budget was allocated for the strengthening of pre-existing universities.

University openings can be divided into two main categories: small secondary universities and "new universities." The first type is defined here based on the *"Atlas régional des effectifs d'étudiants,"* the main source of data on university establishments. "Secondary university" (or decentralized satellite university) refers to the relocation to a new site of one or more university programs leading to a national degree (excluding technical diplomas and engineering degrees). These small satellite universities are dependent on a larger one and their course-offerings and research activities are limited.<sup>39</sup> In contrast, the larger "new universities" (*"Universités nouvelles"*) are full-service, autonomous, and multidisciplinary universities. From the opening, those institutions offer graduate degrees and show serious ambitions in terms of academic research. The creation of eight "new universities" was approved by U2000. Four of them were built in the Paris region, in order to ease the congestion of Parisian universities and to revitalize neighboring cities. Of the four others, two multipolar universities are located in the north of France, the University of Artois and the University of Littoral Opal Coast, and two in the west, the University of La Rochelle and the dual-site Bretagne-Sud University.

Regardless of the type of establishment, the archives of the central and local authorities and political reports on the U2000 Plan underline the enthusiasm and the high expectations of local

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<sup>38</sup>"Assises nationales de l'enseignement supérieur," 26-29th of June 1990.

<sup>39</sup>As explained in the introduction, we will not analyze this type of university decentralization, but will rather focus on the "new universities."

actors regarding the founding of these universities, as they foresaw a significant impact on local economic development (see in particular Datar (1998), Duport (2008), Poulain (1997), and the reports of the *Comité National d'Evaluation des établissements publics à caractère scientifique, culturel et professionnel*). Apart from the structural role of university facilities in an urban area – and the image they reflect beyond it – local actors expected a wide range of spillovers from universities, notably job-creation and the attraction and retention of a higher-educated population (Datar, 1998). Therefore, many local actors were heavily involved in the negotiations. The multiplication of stakeholders, at many levels, led to relatively complex negotiations and designation processes. Each founding was the result of specific partnership frameworks, involving multiple participants and organizations, which were either expressly created or pre-existing (local authorities, regional elected representatives, European Union actors, civic organizations, local persons of influence).<sup>40</sup> Several *ex-ante* studies were conducted in some cases, but they were mostly focused on town planning and architectural aspects, or on the living and economic conditions for future students. Prior analysis of local needs and potential economic and demographic impacts are very rare, which suggests that these considerations were not decisive in the designation process. The documentation that most often guided the selection of sites were statistical projections, at the regional-level, of expected enrollments by 1995 and 2000 (Datar, 1998).

At the end, while each founding of a "new university" has involved many stakeholders, at many levels, the primary factor that affected the deliberation at the central level was based on the need for re-balancing the map of higher-education in France. This resulted in a relatively top-down, centralized designation process with a composite financing system, which from a statistical point of view, avoids potential endogeneity arising from the fact that "better" or "richer" localities may have greater chance to be selected for the program. In fact, the treated areas are located in regions with a GDP per capita below the national average in 1990 - around

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<sup>40</sup>The fact that many documents indicate that, in the designation process, the completion of a decentralization project often depended on few powerful local personalities, such as the city mayor or regional councilor, may pose some endogeneity questions. However, in the case of "new universities," which are relatively more documented, it appears that the political influence games were less decisive, and were subject to a more top-down, centralized designation process based on the need for re-balancing the map of higher-education in favor of locations where the demand for higher education exceeded the capacity of the existing facilities (Duport, 2008; Aust, 2007; Datar, 1998; CNE, 1996a, 1997, 1996b, 1999). See Section 6 for endogeneity issues discussion.

80% of the national average. Moreover, their average budget per capita at the departmental-level does not exceed the national average - on average 2,905 francs per capita compared to 2,920 francs in 1990.

### A.3 The "New Universities"

As presented in Table A.1, the four "new universities" that we analyze were created in the 1990s with campuses in eleven employment-zones.

**La Rochelle University** Located in the employment-zone of the same name in western France, on the Atlantic coast, with a total population of almost 190,000 in 1990,<sup>41</sup> it was created by decree on January 20, 1993. Before its establishment, the nearest universities were Nantes University and Poitiers University, in the same "*Académie*," both about 120 km away from La Rochelle. The history of higher education in La Rochelle began with the creation of an University Institutes of Technology (IUT) in 1968, and the establishment of a local satellite of the Poitiers Faculty of Law in 1974 (comprising around 300 students) (CNE, 1997). But, it was not until the creation of the "new university" that La Rochelle became a real university town. The "new university" had around 2,400 students in 1993-94, its first academic year, and around 100 professors in 1995 (CNE, 1997). For the cohort 2011-2012, the completion rate for a *licence* (three-year undergraduate program) in three to four years were 42%.

**Bretagne-Sud University** This institution was created by decree on February 7, 1995 in the two neighboring employment-zones of Lorient and Vannes (containing around 260,000 inhabitants each in 1990) situated in the western region of Bretagne (Brittany). This "new university" differs from the others in that it had a pre-independence phase, beginning in 1990, during which the two locations were considered as separate decentralized satellites of nearby Brest and Rennes Universities, respectively, before joining forces to develop into a full-service dual-site university. The first secondary university satellites (for non-technical disciplines) were delocalized in Lorient in 1990 and in Vannes in 1969. Before Bretagne-Sud's creation, the nearest universities were Brest University (around 110 km and 150 km from Lorient and Vannes, respectively),

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<sup>41</sup>Population data comes from the INSEE census.



Table A.1: The U2000 Plan's "New Universities"

		Nb of Students		Total Population		Higher-educated Share	
		First-year	2014	1990	2014	1990	2014
<b>Artois University</b>	1991						
Arras		2812	4156	229320	243453	8%	24%
Béthune		541	1156	290484	293015	6%	19%
Douai		345	1400	247176	246731	7%	20%
Lens		777	1797	376756	363016	5%	15%
<b>Bretagne-Sud University</b>	1995*						
Lorient		2144	3732	269360	295087	8%	24%
Vannes		1588	2987	254355	342335	9%	27%
<b>Littoral Opal Coast University</b>	1991						
Boulogne-sur-mer		1892	3122	158848	161400	7%	20%
Calais		1021	1963	153513	170055	6%	19%
Dunkerque		2392	4148	262715	253553	7%	20%
Saint-Omer**		0**	199	109510	118103	6%	19%
<b>La Rochelle University</b>	1993	2429	6340	189673	242601	9%	27%

*Note.* Numbers of university students exclude technical and engineering students. Students data come from annual *Atlas régional de l'enseignement supérieur* provided by the French Ministry of Higher Education, Research and Innovation. Population data are harmonized census data from INSEE.

\*Pre-independent phase during 1990-1995.

\*\*Saint-Omer did not receive university students before the 2000s (only Institute of Technology students).

Nantes University (150km and 100km) and Rennes University (130 km and 95 km). In 1996, the University of Bretagne-Sud had 2,965 students in Lorient and 2,679 in Vannes, and around 80 professors (excluding IUT)(CNE (1999)). Although the Lorient site is larger, it was decided not to designate either campus as the seat of the university; rather, the headquarters are shared between the two sites. For the cohort 2011-2012, the completion rate for a *licence* (three-year undergraduate program) in three to four years were 47%.

**University of Artois** This institution was created by decree on November 7, 1991 as a multipolar university located in the four neighboring employment-zones of Arras, Béthune, Douai, and Lens, which respectively had total populations of around 230,000, 290,000, 250,000, and 380,000 in 1990. Like its neighbor the University of Littoral, the University of Artois aimed to strengthen the higher-education supply in the dense northern region. These different sites already had some higher-education experience, with small secondary satellites having been created in Arras in 1988, and in Lens and Béthune in 1990. The campus of Artois University has the distinction of being located very near to the historical University of Lille (around 30-40 km), the more recent Valenciennes University (30-60 km), and to Picardie University in Amiens (60-80

km) – and is also not far from the sites of the "new university" of Littoral (less than 100 km). This proximity is mostly explained by the inability of the pre-existing higher-education network to handle the strong demographic growth in this particularly dense region. In 1993, in its second academic year, Artois University had around 120 professors and 4,500 students, around 2,800 in Arras, which is the seat of Artois University, 540 in Béthune, 780 in Lens, and 350 in Douai. For the cohort 2011-2012, the completion rate for a *licence* (three-year undergraduate program) in three to four years were 33%.

**University of the Littoral Opal Coast** It was created by decree on November 7, 1991. Like its Artois counterpart, the multipolar university of Littoral was constructed based on existing decentralized secondary satellites of Lille University, primarily to address congestion issues in the region. The University of Littoral is situated in the far north employment-zones of Calais (total population of around 153,000 in 1990), Dunkerque (around 263,000), and Boulogne-sur-mer (around 159,000).<sup>42</sup> The headquarters of the university are located in Dunkerque, but Calais was the first zone with a small secondary university satellite in 1976, followed by Dunkerque and Boulogne in 1985 and 1987. The nearest main university is the University of Lille, which is around 65 to 100 km from the different sites. In its second academic year, in 1993, the "new university" of Littoral had 1,892 university students in Boulogne, 1,021 in Calais, and 2,392 in Dunkerque. Recall that we will not consider this last site of Dunkerque in our analysis as it may bias the results due to the border spillovers. There were around 140 professors in 1995 (CNE (1996b)). For the cohort 2011-2012, the completion rate for a *licence* (three-year undergraduate program) in three to four years were 41%.

## B The synthetic control method

### B.1 Treated zone compared to synthetic control zone

Following formal discussion in Abadie et al. (2010, 2015), suppose there is a sample of  $(J + 1)$  employment-zones indexed by  $j$ , among which zone  $j = 1$  is the case of interest (i.e. is affected

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<sup>42</sup>The University of the Littoral Opal Coast includes also a site in Saint-Omer, but this satellite did not receive university students before 1999 (excluding technical students). Therefore, we do not consider the site of Saint-Omer as a real 1990's "new university," but rather as a decentralized secondary university satellite.

by the program) and the rest of zones ( $j = 2$  to  $j = J + 1$ ) constitute the potential controls<sup>43</sup> (or the donor pool, which is not subject to program shock).

Assume that the sample is a balanced panel including pre-intervention periods,  $T_0$ , and post-intervention periods,  $T_1$ , with  $T = T_0 + T_1$ , and  $T_0$  not necessarily equal to  $T_1$ . Then the zone  $j = 1$  is exposed to the program (the location of a university site) during periods  $T_0 + 1, \dots, T$ , and the program has no impact during the period  $1, \dots, T_0$ . The program effect for the treated-zone at time  $t = T_0 + 1, \dots, T$  is given by

$$\alpha_{1t} = Y_{1t}^I - Y_{1t}^N \quad (2)$$

with  $Y_{1t}^I$  and  $Y_{1t}^N$  the treated-zone's outcome with and without intervention, respectively.  $Y_{1t}^N$  is obviously not directly observable. We need an estimate of  $Y_{1t}^N$  to measure the  $\alpha_{1t}$ .

The synthetic control model assumes that the outcome  $Y_{jt}^N$  is given by :

$$Y_{jt}^N = \delta_t + \theta_t X_j + \lambda_t \mu_j + \epsilon_{jt} \quad (3)$$

where  $\delta_t$  is an unknown common factor with constant factor loadings across units;  $X_j$  is a vector of observed covariates (not affected by the intervention) and  $\theta_t$  the associated vector of parameters;  $\mu_j$  is a vector of unobserved factor loadings and  $\lambda_t$  the unknown common factors; and  $\epsilon_{jt}$  are unobserved transitory shocks with zero mean.

Considering now  $W = (w_2, \dots, w_{J+1})'$  a  $(J + 1)$  vector of weights, with  $0 \leq w_j \leq 1$  and  $w_2 + \dots + w_{J+1} = 1$ , each set of weights  $W$  defines a possible synthetic control. Abadie et al. (2010) show that, as long as there are  $(w_2^*, \dots, w_{J+1}^*)'$  such that

$$\sum_{j=2}^{J+1} w_j^* Y_{jT_0} = Y_{1T_0} \quad \text{and} \quad \sum_{j=2}^{J+1} w_j^* X_j = X_1 \quad (4)$$

the mean of the difference in outcomes between the treated and the synthetic control unit ( $Y_{1t}^N - \sum_{j=2}^{J+1} w_j^* Y_{jt}$ ) will be close to zero. Then

$$\hat{\alpha}_{1t} = Y_{1t} - \sum_{j=2}^{J+1} w_j^* Y_{jt} \quad (5)$$

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<sup>43</sup>If more than one zone is exposed to the program, the method can be applied successively to each treated zone. We describe the method only in the case of a unique treated-zone without a loss of generality.

is an unbiased estimator of  $\alpha_{1t}$ . The synthetic control estimator of the impact of university location is given by the gap between the value of the outcome variable for the treated-zone and the value of the same outcome for the synthetic control at that period.

The conditions of equation 4 very rarely hold exactly in the data. In practice, the synthetic control unit is selected so that these conditions hold approximately. Therefore, the value of  $W$  is chosen such that the characteristics of the synthetic control best reproduce the characteristics of the treated-zone over the period. With  $X_1$  a  $(k \times 1)$  vector containing the values of pre-intervention characteristics of the treated-zone – that we aim to match – and  $X_0$  a  $(k \times J)$  matrix collecting the values of these variables for the potential control zones.<sup>44</sup> The optimal weights  $W^*$  are chosen to minimize the magnitude of the difference between pre-intervention characteristics of the treated-zone and synthetic control ( $X_1 - X_0W$ ). Abadie and Gardeazabal (2003) and Abadie et al. (2010, 2012) choose the weights that minimize

$$\sum_{m=1}^k v_m (X_{1m} - X_{0m}W)^2 \quad (6)$$

where  $v_m$  is a weight that reflects the relative importance of the  $m$ -th matching variable regarding their predictive power of the outcome variable.

We can evaluate the "quality" of the synthetic control zone by examining its degree of "fit" and "balance". The fit corresponds to the closeness of the treated-zone and its synthetic control zone in the pre-intervention period. We can appreciate this fit on the graphical representations that plot values of the outcome variable in each census for the treated-zone and its synthetic control (a superposition of the two respective lines suggest a perfect match). More precisely, the pre-intervention fit is evaluated by the root mean square prediction error (RMSPE) of the synthetic control estimator. It measures the lack of fit, i.e. how far on average the error is from 0 over the pre-treatment period (low RMSPE indicates a better control), and is defined as

$$RMSPE = \left( \frac{1}{T_0} \sum_{t=1}^{T_0} \left( Y_{1t} - \sum_{j=2}^{J+1} w_j^* Y_{jt} \right)^2 \right)^{1/2} \quad (7)$$

The degree of balance on predictors is given by the comparison between values of pre-treatment

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<sup>44</sup>The set of pre-intervention variables may include the pre-intervention values of the outcome variable.

characteristics for each treated-zone and the computed values of these characteristics for its synthetic control. Small gaps between the respective covariates suggest a better match.

Cavallo et al. (2013) and Galiani and Quistorff (2017) extend the synthetic control method to allow multiple events, i.e. for more than one unit to experience treatment. With their development, it is possible to run new estimates that aggregate the zone-specific effects into an average effect.

Let us now consider a sample of  $G$  treated-zones indexed by  $g$ , and  $J$  potential control zones where the treatment never occurred. As explained above we can estimate the effects  $\hat{\alpha}_{gt}$  for each of the treated-zones.<sup>45</sup> The estimated average effect over all the  $G$  treated-zones is given by

$$\bar{\alpha}_t = \frac{1}{G} \sum_{g=1}^G \hat{\alpha}_{gt} \quad (8)$$

## B.2 Inference

**In-space Placebos** Following Abadie and Gardeazabal (2003); Abadie et al. (2010, 2015), the statistical significance of synthetic control method results is determined by running placebo tests. That means iteratively re-estimating the model using each zone of the donor pool as a false treated-unit ("in space-placebo" implementation). This provides a distribution of placebo effects, i.e. the set of estimated gaps for all the placebo zones. Comparing this distribution with the estimated effect of the initial treated-zone allows us to appreciate whether or not the results are driven entirely by chance. In our case, that is to say to study whether the estimated effect of a "new university" creation is important relative to the distribution of the effects estimated for the zones not exposed to this creation. If we find many placebo effects as large as the effect of the initial treated-zone, then it is quite plausible than this initial effect was observed by chance. Therefore, estimates do not provide significant evidence of "new university" impact on the outcome variable. In space-placebo test are graphically represented by plotting the effect gaps for the treated-zone together with the effect gaps for each of the placebo runs.

It is therefore possible to compute the corresponding *p-values* (i.e. significance levels) of these placebo tests. The *p-values* directly derive from the quantitative comparison of the distribution

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<sup>45</sup>Unlike Galiani and Quistorff (2017), we keep here the  $t$  subscript as the treatment period is the same for all the treated zones in our data-base.

of placebo effects and the initial estimates. They are the proportions of placebo effects that are at least as large as the main effect for each post-treatment period. Let  $\hat{\alpha}_{j,t}^{PL}$  be the estimated effect for the post-treatment period  $t$  when control zone  $j$  is assigned to a placebo treatment at the same time as the "real" treated-zone. This effect is estimated using the exact same procedure as for  $\hat{\alpha}_{1t}$ . Then *p-values* are computed as

$$p - value_t = Pr(|\hat{\alpha}_{j,t}^{PL}| \geq |\hat{\alpha}_{1t}|) = \frac{1}{J} \sum_{j=2}^{J+1} I(|\hat{\alpha}_{j,t}^{PL}| \geq |\hat{\alpha}_{1t}|) \quad (9)$$

A *p-value* of 0.10 for a specific year indicates that, when the treatment is fictively reassigned at random among the donor pool, the probability of obtaining an estimate at least as large as the one obtained for the treated-zone is 10%. More briefly, there is a probability of 10% that the measured effect would happen by chance.

However, in the same way that the treated-zone estimates can be artificial if the synthetic control method does not sufficiently fit the pre-intervention characteristics, lack of fit in placebo runs could bias the inference tests. A solution is to drop the inaccurate placebos in order to better appreciate the exceptional nature of the treated-zone results. In our placebo test, we choose to exclude the placebo runs that show a pre-intervention RMSPE at least four times as large as the pre-intervention RMSPE of the real treated-unit.

In the case of multiple treated-zones, as explained in Cavallo et al. (2013), the average smooths out some noise in the estimate, and we need to account for this in the inference verification. They proposed constructing a distribution of average placebos  $\bar{\alpha}_t^{PL}$  constructed from all possible averages where a single placebo estimate is picked from each treated-zone's placebo test ( $\hat{\alpha}_{gt}^P$ ), and then averaging over the picked placebos (ten in our case). In total, there is a set of  $N_{\overline{PL}} = \prod_{g=1}^G J_g$  possible placebo averages. We restrict again the pool to the placebos that show sufficiently good match quality (i.e. at most twice the fit of the treated-zones match). Formally we have

$$p - value_t = Pr(|\bar{\alpha}_t^{PL}| \geq |\bar{\alpha}_t|) = \frac{1}{N_{\overline{PL}}} \sum_{i=1}^{N_{\overline{PL}}} I(|\bar{\alpha}_t^{PL(i)}| \geq |\bar{\alpha}_t|) \quad (10)$$

where  $i$  indexes a possible placebo average.

**In-time Placebos** Abadie et al. (2015) also propose a second in-time placebo test. In the

same way as for the previous in-space placebo tests, in-time placebo tests are fictive estimate runs where the treatment is assigned in a period that differs from the real one. The validity of the initial results is questioned if estimates also show significant effects for dates when the treatment did not occur.

## C Computing Synthetic Controls

Although the general upward trend in outcome variable is observed in all cases, the pre-intervention trajectory in treated-zones (black lines on Figure C.1 graphs) responds to slightly different patterns than the other zones' average (i.e. zones without "new universities," the blue line on Figure C.1 graphs) or the donor pool average (the dashed line on Figure C.1 graphs). As stated previously, these groups, taken as a whole, may not provide suitable comparisons for each treated-zone. The pre-treatment trajectories of the higher-educated population share (index 1 in 1990) in the synthetic control zones displayed on Figure C.2 confirm that this method provides a better counterfactual. In contrast with Figure C.1, lines of a treated-zone and its synthetic control are nearly always superposed over the pre-intervention period. These results are confirmed by the low values of the RMSPE and the balance of predictors presented in Table C.1. Pre-treatment characteristics of each treated-zone are more closely aligned with the respective synthetic controls than the donor pool's average. For each synthetic control, Tables 6 to 15 in the online appendix display the computed weights for each zone of the donor pool.

### C.1 Trends in Higher-educated Population Share 1968-2017

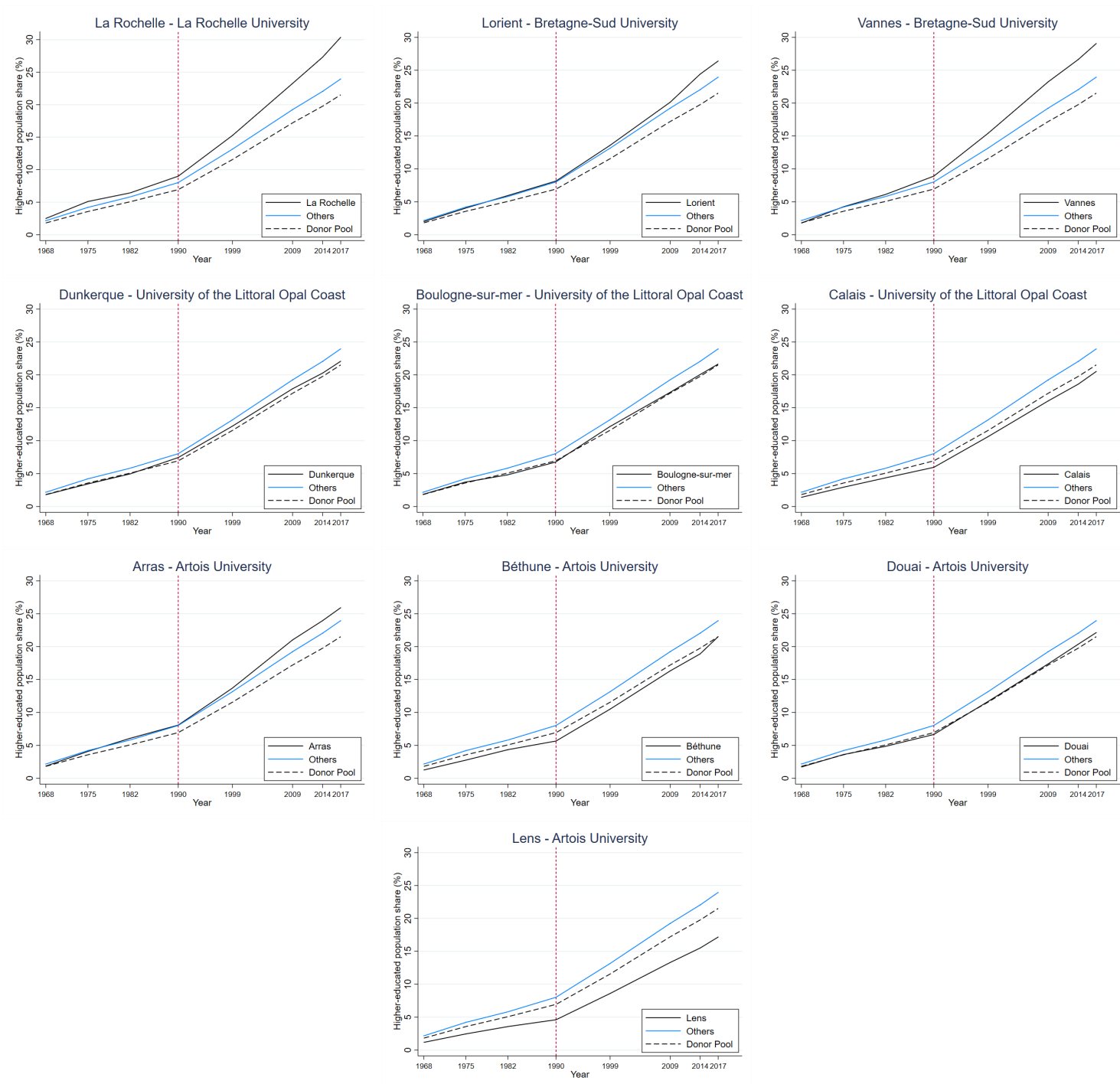


Figure C.1: Trends in Higher-educated population share 1968-2017

## C.2 Fit & Balance



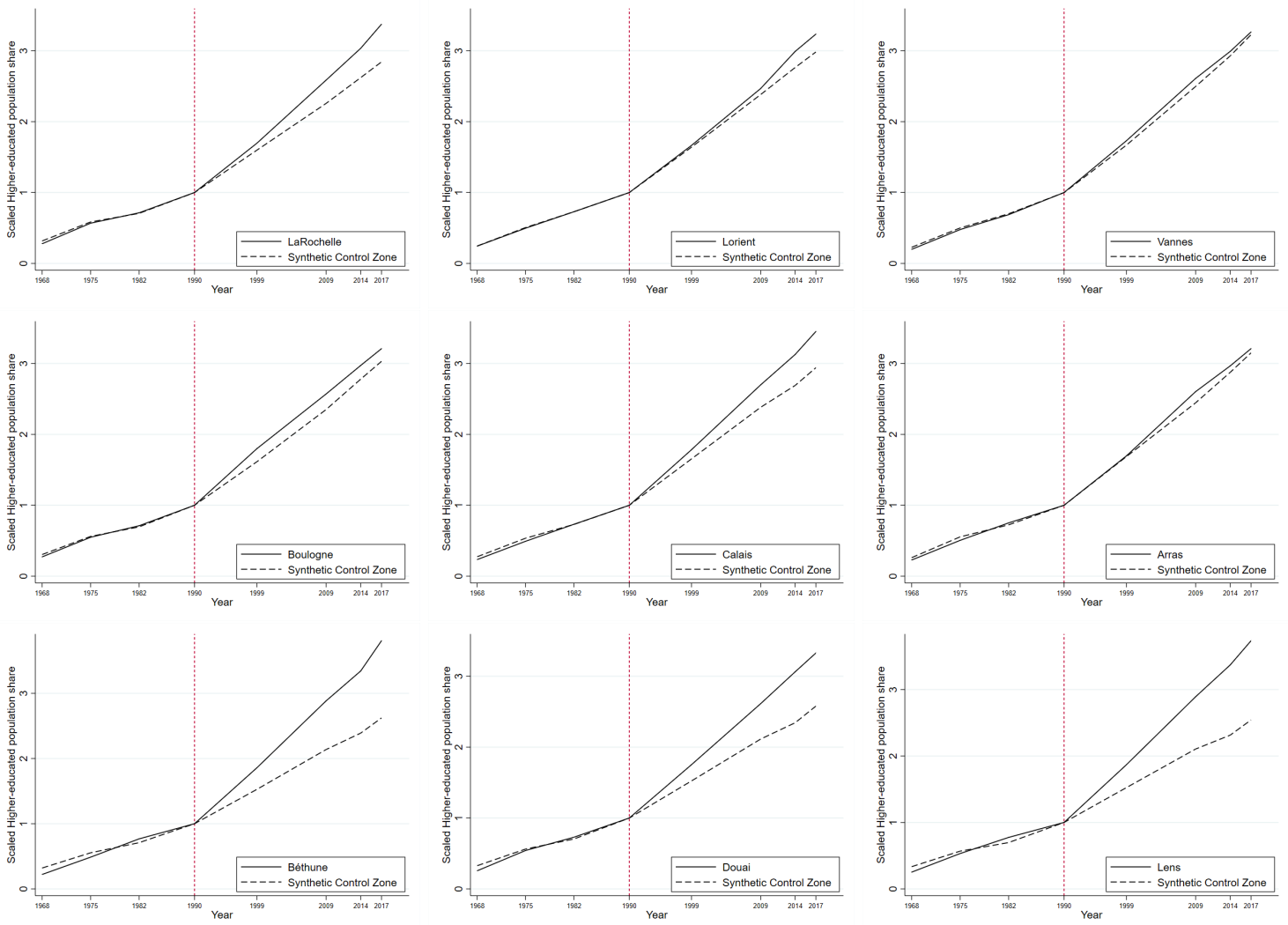


Figure C.2: Trends in Higher-educated population share 1968-2017 (Scaled in 1990) - Synthetic Control Comparisons (Scaled in 1990)

Table C.1: Fit &amp; Balance of synthetic controls

	Donor Pool	Arras		Béthune		Boulogne		Calais		Douai	
		<i>obs</i>	<i>SC</i>	<i>obs</i>	<i>SC</i>	<i>obs</i>	<i>SC</i>	<i>obs</i>	<i>SC</i>	<i>obs</i>	<i>SC</i>
RMSPE (pretreatment)		<b>0.033</b>		<b>0.067</b>		<b>0.019</b>		<b>0.029</b>		<b>0.041</b>	
Scaled Higher-educated population share (outcome)	0.63	0.62	0.63	0.62	0.65	0.63	0.64	0.61	0.64	0.63	0.65
Higher-educated population share in 1990	7%	8%	7%	6%	9%	7%	8%	6%	8%	7%	9%
Professionals employment share	6%	7%	7%	5%	7%	7%	7%	6%	7%	6%	7%
Population density (log)	3.5	4.1	4.1	5.5	4.9	4.9	4.9	4.7	4.7	5.7	5.0
Jobs density (log)	2.7	3.2	3.2	4.5	4.1	4.0	4.0	3.9	3.9	4.8	4.2
Unemployment	5%	4%	5%	5%	7%	7%	7%	7%	7%	6%	7%
Employment rate	73%	70%	70%	59%	64%	65%	65%	65%	66%	61%	65%
Participation rate	77%	74%	74%	63%	70%	70%	70%	70%	71%	66%	70%
Services	46%	53%	53%	45%	50%	56%	56%	47%	48%	48%	50%
Agriculture	19%	16%	16%	6%	3%	9%	9%	8%	8%	3%	3%
Manufacturing	25%	23%	23%	40%	36%	26%	26%	35%	35%	42%	35%
Construction	10%	8%	9%	9%	12%	8%	9%	10%	10%	7%	12%
0-14	23%	25%	24%	25%	26%	27%	24%	28%	26%	26%	26%
15-24	15%	16%	16%	16%	16%	17%	15%	17%	16%	17%	16%
25-39	19%	20%	20%	19%	23%	20%	20%	20%	21%	20%	24%
40-64	28%	26%	27%	27%	27%	25%	28%	24%	26%	26%	26%
65 and more	20%	17%	17%	17%	12%	15%	17%	16%	14%	15%	11%
Distance	62	44	51	33	35	103	34	94	41	30	31

	Donor Pool	Dunkerque		La Rochelle		Lens		Lorient		Vannes	
		<i>obs</i>	<i>SC</i>	<i>obs</i>	<i>SC</i>	<i>obs</i>	<i>SC</i>	<i>obs</i>	<i>SC</i>	<i>obs</i>	<i>SC</i>
RMSPE (pretreatment)		<b>0.065</b>		<b>0.022</b>		<b>0.059</b>		<b>0.005</b>		<b>0.020</b>	
Scaled Higher-educated population share (outcome)	0.63	0.59	0.65	0.64	0.65	0.64	0.65	0.62	0.62	0.59	0.61
Higher-educated population share in 1990	7%	7%	9%	9%	9%	5%	9%	8%	8%	9%	7%
Professionals employment share	6%	7%	7%	8%	8%	5%	7%	7%	6%	6%	6%
Population density (log)	3.5	5.2	5.0	4.4	4.4	6.5	5.0	4.4	4.4	3.9	3.9
Jobs density (log)	2.7	4.4	4.2	3.6	3.6	5.5	4.3	3.6	3.6	3.1	3.1
Unemployment	5%	6%	7%	6%	6%	7%	8%	6%	6%	5%	5%
Employment rate	73%	65%	65%	70%	70%	57%	65%	70%	70%	73%	73%
Participation rate	77%	70%	70%	75%	74%	61%	70%	74%	74%	77%	77%
Services	46%	53%	52%	61%	61%	44%	51%	52%	52%	50%	50%
Agriculture	19%	6%	5%	9%	9%	1%	2%	15%	15%	24%	24%
Manufacturing	25%	33%	32%	20%	19%	45%	35%	22%	22%	14%	14%
Construction	10%	9%	11%	10%	10%	10%	12%	11%	11%	12%	12%
0-14	23%	29%	26%	24%	22%	27%	26%	24%	24%	25%	23%
15-24	15%	17%	16%	16%	15%	17%	16%	15%	15%	16%	15%
25-39	19%	22%	23%	20%	20%	19%	24%	19%	20%	19%	20%
40-64	28%	24%	26%	27%	28%	27%	26%	28%	28%	27%	28%
65 and more	20%	12%	13%	18%	19%	14%	10%	17%	17%	18%	18%
Distance	62	68	32	121	32	28	28	110	49	92	61

Notes. In each case, the 'quality' of the synthetic control is given by the comparison between average values of pre-treatment observed characteristics for the treated-zone (*obs.*) and the estimated values of these characteristics for its synthetic control (*SC*) (i.e. the balance on predictors) and the root mean square prediction error (RMSPE) of the synthetic control estimator (i.e. the fit of the outcome variable for the pre-intervention period). The set of pre-intervention characteristics include: scaled higher-educated population share, index 1 in 1990 (the outcome variable); higher-educated population share in 1990; share of managers and professionals in employed population (aged 25-54); employment rate (in population aged 25-54); employment and population density; unemployment rate; participation rate (25-54); four sectoral shares of employment (Agriculture/Manufacturing/Construction/Services); shares of population by age group (0-14; 15-24; 25-39; 40-64; 65 and more); and distance from the nearest pre-existing university.

## D Estimated Effects by Zone with *p-values*

Table D.1: Estimated gains (percentage points) with corresponding  $p$ -values

	1999	2009	2014	2017
<b>Average</b>	1.1 (0.000)	2.6 (0.000)	3.3 (0.000)	3.7 (0.000)
<b>Béthune</b>	1.9 (0.000)	4.2 (0.000)	5.4 (0.000)	6.7 (0.000)
<b>Lens</b>	1.6 (0.000)	3.6 (0.000)	4.9 (0.000)	5.5 (0.000)
<b>Douai</b>	1.5 (0.02)	3.3 (0.01)	4.8 (0.005)	5.0 (0.015)
<b>La Rochelle</b>	0.9 (0.14)	3.0 (0.062)	3.7 (0.073)	4.8 (0.057)
<b>Calais</b>	0.8 (0.112)	1.9 (0.086)	2.6 (0.066)	3.0 (0.061)
<b>Lorient</b>	0.2 (0.313)	0.7 (0.333)	1.9 (0.146)	2.1 (0.188)
<b>Boulogne</b>	1.2 (0.038)	1.5 (0.13)	1.3 (0.211)	1.2 (0.227)
<b>Arras</b>	0.1 (0.425)	1.3 (0.205)	0.7 (0.31)	0.5 (0.365)
<b>Vannes</b>	0.6 (0.226)	1.0 (0.247)	0.6 (0.355)	0.3 (0.409)

*Notes.* We summarize our results for each treated-zone and for the aggregate average. We use synthetic control estimates and higher-educated population share in 1990 at the local level to report specific impact in terms of human-capital gains after U2000 Plan. The magnitude of the "new university" impact is measured as the outcome deviation of the "new university" zone in comparison to the counterfactual. For example, as a result of the creation of La Rochelle University in 1993, the local share of higher-educated population is greater by 4,8 points in 2017 (30,4% compared to 25,6% for the synthetic control). The  $p$ -values in brackets indicate the probability that the related result would happen purely by chance. For a distribution of 200 placebos, a 10%  $p$ -value means that only 20 placebo-zones show an estimated effect greater than the given treated-zone.

## E In-Space Placebo Tests by Zone

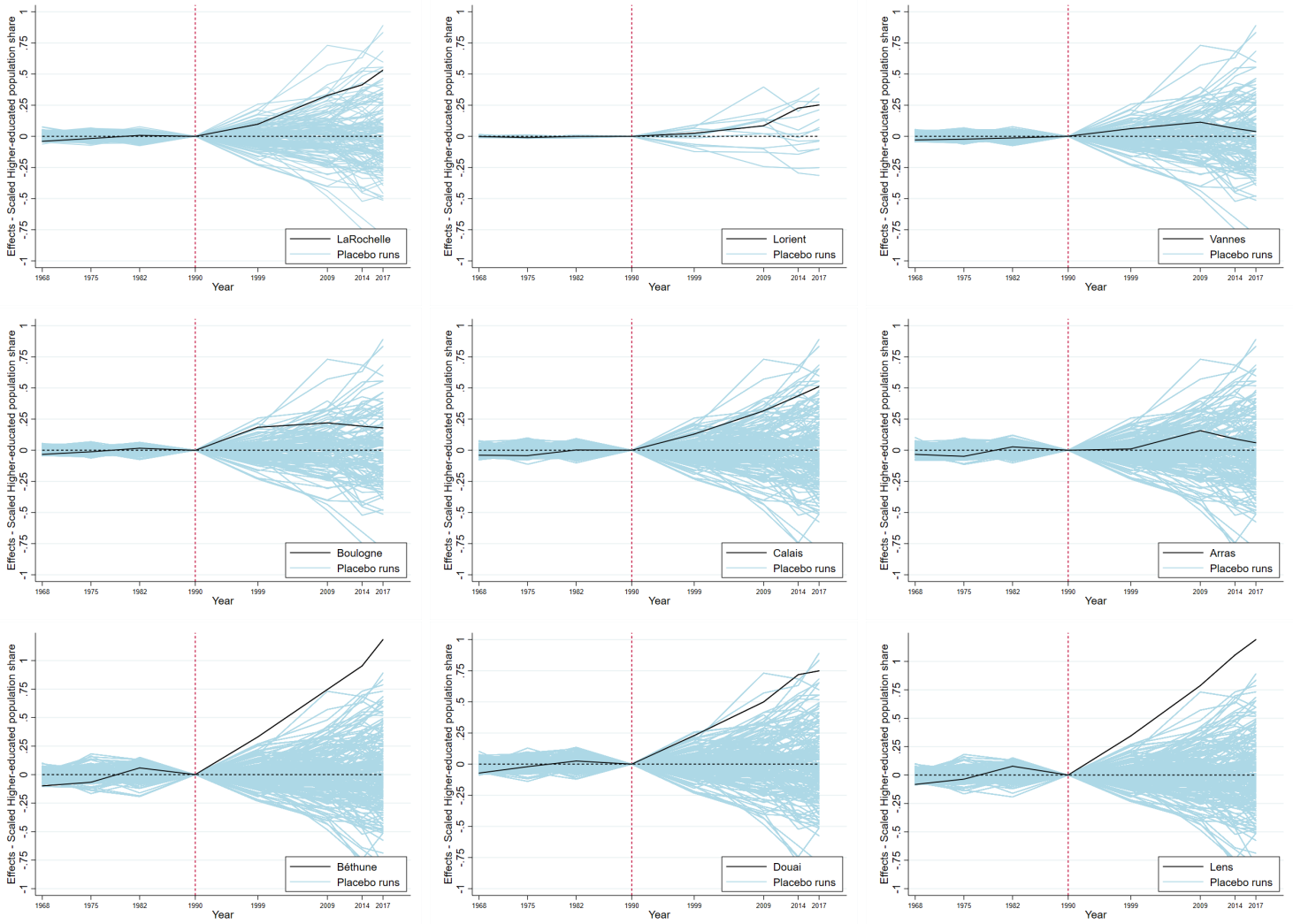


Figure E.1: Gaps in scaled higher-educated population share - treated-zone vs. placebo tests ( $<2 \times \text{RMSPE}$ )

## F In-Time Placebo Tests

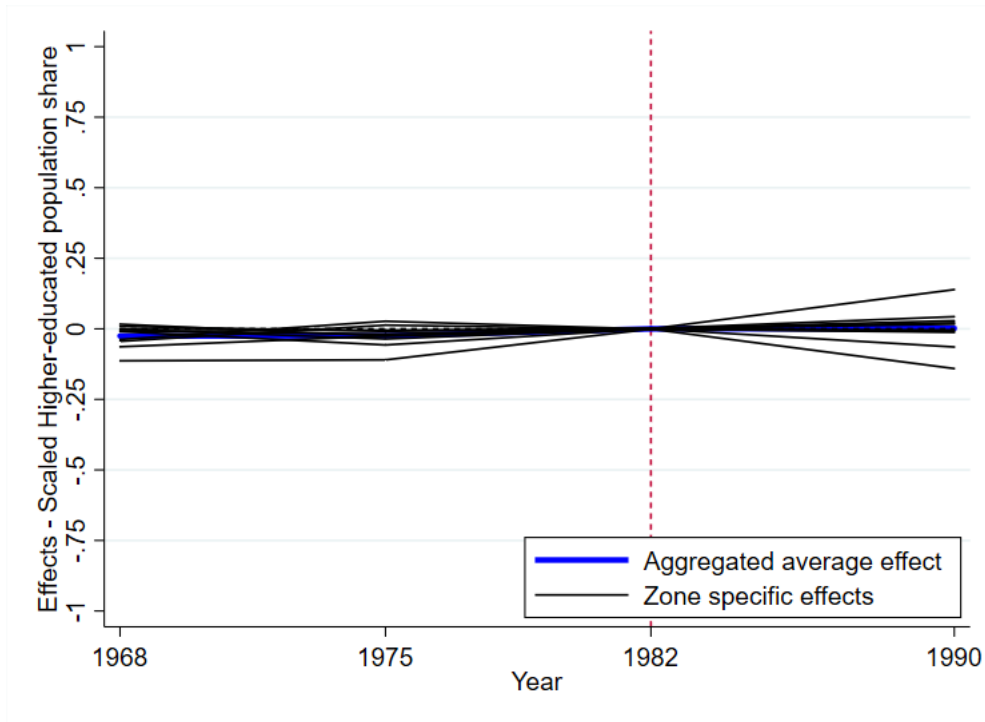


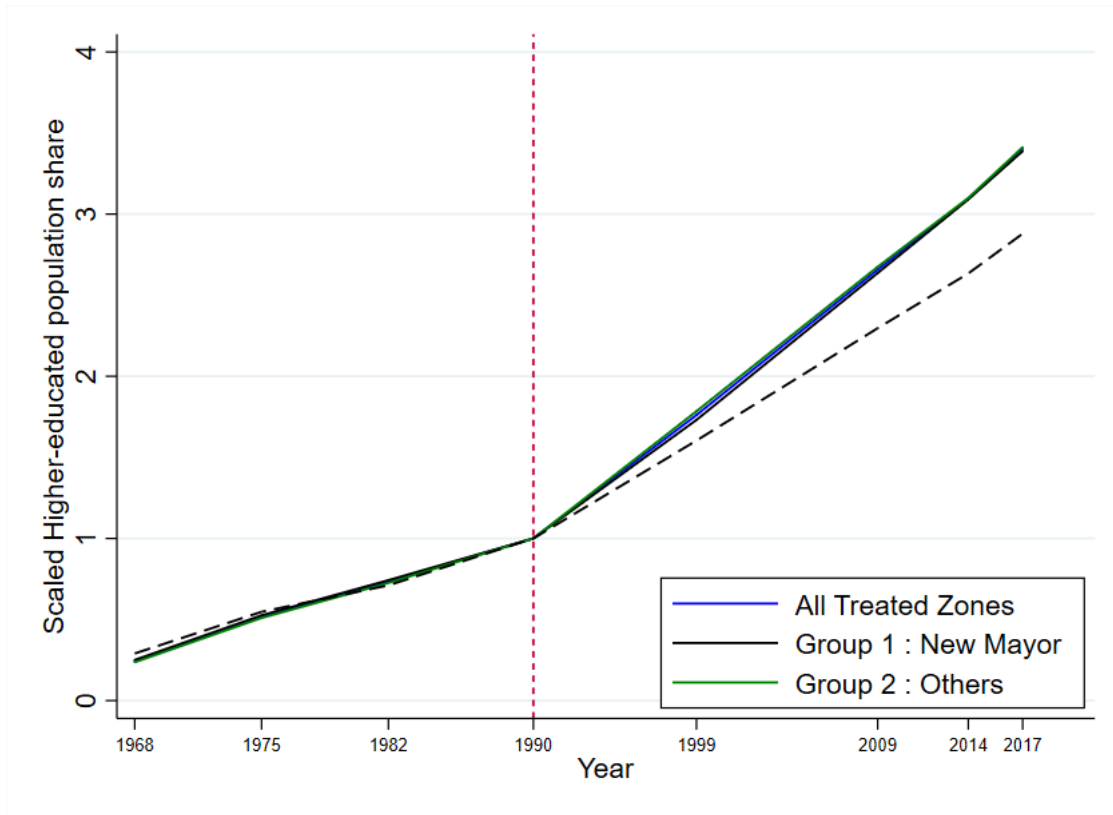
Figure F.1: Local Human Capital Effects in "New Universities" Zones: Placebo 1982

## G Additional Robustness Tests

**Potential endogeneity due to local political climate.** Several official documents note that in the cases of "new universities," which represent relatively large public investments compared to smaller secondary university satellites, local politicians did not play a critical role in the localization decisions, which from the central government's perspective were driven by regional planning issues above all. In addition, a simple glance at the national and municipal election history in our treated zones is enlightening regarding the heterogeneity and complexity of potential political connections and affiliations between the local and national levels during this period. Over 1986-2000, around the time of the U2000 Plan, France had seven prime ministers, nine governments, and three periods of cohabitation at the national level (Mitterrand-Chirac 1986-1988, Mitterrand-Balladur 1993-1995, and Chirac-Jospin 1997-2002).<sup>46</sup> These many political changes may have encumbered the policy influence-games between local and central authorities over a medium or long-term period.

<sup>46</sup>Cohabitation in France's dual-executive governmental system occurs when the president represents a different political tendency than the majority party in the National Assembly. The president then appoints a prime minister in the opposition to form a government.

Figure G.1: Local Human-Capital Effects in Treated Zones: Group 1 vs. Group 2

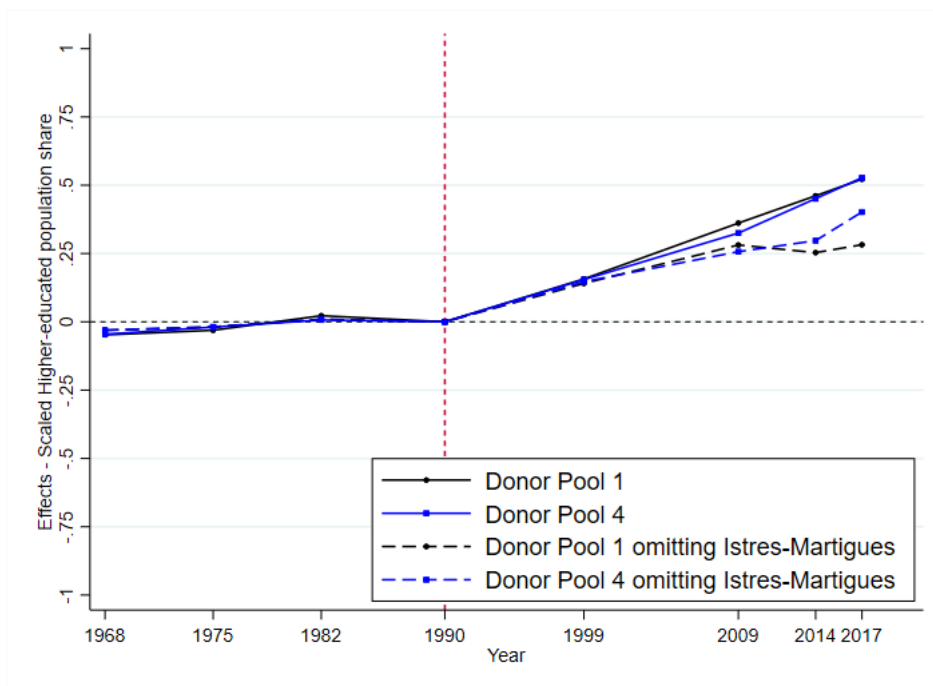


Moreover, only one of our treated zones, Boulogne, had elected a new mayor around the period of the U2000 decisions, specifically in the municipal elections of 1989 (Jean Muselet, right wing). However, he has not remained in place throughout the post-treatment period in the zone of Boulogne-sur-mer, which does not benefit in a significant way from the university's creation, in terms of human-capital accumulation. This can therefore rule out the hypothesis that the arrival of an influential mayor at the moment of U2000 negotiations led to both a university's establishment and the accumulation of human capital afterwards.

One last concern is that the election of a new mayor in a "new university" zone between the last pre-treatment date and the first post-treatment date, though unrelated to the university's creation, could entail a radical change in political governance, and thus act as a shock affecting local human-capital accumulation. In this case, our estimated impacts could in fact be the result of this coincidental event rather than of the creation of the "new university."<sup>47</sup> This is the case in

<sup>47</sup>A radical change in local authorities seems to be the only shock that would be sufficiently important to muddy the predicted effects and not be captured by the SCM. In particular, other changes in the local economies, such as the entries and exits of firms, do not contradict our results as long as i) they are correlated with local

Figure G.2: Sensitivity of Local Human-Capital Effects: omitting Istres - Martigues



four of our treated zones: a new mayor was elected in Arras in 1995, in Lens and Lorient in 1998, and in La Rochelle in 1999. We therefore check whether those zones provide different estimated results than the other treated zones. Figure G.1 shows that when we aggregate the SCM results according to the zone's mayoral change, we do not see any difference in the estimates. This strengthens our conviction that our results are not driven by any local political changes.

**Donor Pool weights** Another concern comes from the sensitivity of our main results to changes in the donor zones weights. In particular, we see in the following tables of online appendix H that the synthetic controls for the cases of Lens, Béthune and Douai are mainly computed on the basis of a unique control zone: Istres - Martigues. We run additional robustness checks by excluding this zone of our donor pool. By doing so, we accept a sort of breach in the synthetic control method by two aspects: we interfere in the computation of the best synthetic

socioeconomic dynamics which are controlled for in the SCM, ii) they may be indirect effects of the universities' creation. Nonetheless, when observing the historical economic forces in the treated zones, especially in the "successful" areas in terms of human-capital accumulation gains, no common phenomena, such as the building of major infrastructure or the founding of large companies, took place in our treated zones in the 1990s. There remain questions, however, regarding the opening of the Eurotunnel in 1994, which may have affected the human-capital accumulation in the zone of Calais (its French terminal), and the neighboring zone of Boulogne. On average, in these two zones, the effect of university creation is lower compared to the other zones' average, suggesting that the potential disruption represented by the Eurotunnel's opening do not drive the results.

units, potentially sacrifice some goodness of fit and balance, and we create specification-searching problem. When we rerun the SCM using Donor Pool 1, but excluding the zone of Istres - Martigues, for the interest cases of Lens, Béthune and Douai, weights are now positive for two control zones: Le Creusot (around 60% of the synthetic control) and Sète (about 40%). We still estimate a strong positive effect of universities creation but that substantially decreases in value for the last two periods. However, the two control areas of Le Creusot and Sète host secondary university satellites which also benefit from U2000 program. Table G.2 shows that when using Donor Pool 4 (or Donor Pool 3), which excludes these potential "bad donors", but omitting the zone of Istres - Martigues, estimates are much more similar to our main effects.



## H Synthetic Weights by Zone

Table H.1: La Rochelle University

<b>Employment-Zones</b>	<b>Donor Pool 1</b>	<b>Donor Pool 2</b>	<b>Donor Pool 3</b>
Châlons-en-Champagne	0.245	-	-
Tergnier	0	0.006	0.009
Honfleur	0	0.506	0.557
Lunéville	0.115	-	-
Dinan	0	0.287	0.240
Bourg-en-Bresse	0.146	-	-
Sète	0.267	-	-
Cannes - Antibes	0.227	-	-
Istres - Martigues	0	0.201	0.194

Table H.2: Arras - Artois University

<b>Employment-Zones</b>	<b>Donor Pool 1</b>	<b>Donor Pool 2</b>	<b>Donor Pool 3</b>
Châlons-en-Champagne	0.244	-	-
Tergnier	0	0.313	0.371
Avranches	0	0.003	0
Bayeux	0	0.218	0.299
Saint-Lô	0.146	-	-
Saint-Omer	0.254	-	-
Berk-Montreuil	0	0.308	-
Dinan	0	0.126	0.223
Rodez	0.088	-	-
Sète	0.241	-	-
Ajaccio	0	0	0.04
Ghisonaccia - Aléria	0.018	0.032	0.067

Table H.3: Lorient - Bretagne Sud University

<b>Employment-Zones</b>	<b>Donor Pool 1</b>	<b>Donor Pool 2</b>	<b>Donor Pool 3</b>
Tergnier	0	0.063	0.088
Avranches	0	0.057	0.081
Granville	0	0.151	0.102
Saint-Lô	0.038	-	-
Berck - Montreuil	0.233	0.047	-
Châteaubriant	0	0.057	0
Dinan	0	0.314	0.346
Guingamp	0	0	0.039
Carhaix-Plouguer	0	0.027	-
Quimper	0.266	-	-
Fougères	0.064	-	-
Saint-Malo	0.011	-	-
Nîmes	0.014	-	-
Agde - Pézenas	0	0.028	0.043
Sète	0.114	-	-
Istres - Martigues	0.242	0.314	0.294
Draguignan	0.004	-	-
Fréjus - Saint-Raphaël	0.018	0	0
Ajaccio	0	0	0.006

Table H.4: Vannes - Bretagne Sud University

<b>Employment-Zones</b>	<b>Donor Pool 1</b>	<b>Donor Pool 2</b>	<b>Donor Pool 3</b>
Bayeux	0	0.014	0.07
Coutances	0.022	0.184	0.116
Saint-Lô	0.307	-	-
Berck - Montreuil	0	0.129	-
Dinan	0	0.355	0.437
Saint-Malo	0.36	-	-
Vitré	0.081	0.194	0.231
Saint-Flour	0.069	0	0
Fréjus - Saint-Raphaël	0.082	0.075	0.049
Porto-Vecchio	0.058	0	0
Bastia	0	0.026	0.071
Ghisonaccia - Aléria	0.023	0.022	0.029

Table H.5: Lens - Artois University

<b>Employment-Zones</b>	<b>Donor Pool 1</b>	<b>Donor Pool 2</b>	<b>Donor Pool 3</b>
Alès	0	0	0.05
Istres - Martigues	1	1	0.95

Table H.6: Boulogne - Littoral University

<b>Employment-Zones</b>	<b>Donor Pool 1</b>	<b>Donor Pool 2</b>	<b>Donor Pool 3</b>
Tergnier	0.199	0	0.014
Saint-Omer	0.104	-	-
Dinan	0	0.178	0.163
Alès	0	0.009	0.005
Bagnols-sur-Cèze	0.072	0	0
Agde - Pézenas	0	0.153	0.155
Sète	0.451	-	-
Istres - Martigues	0.125	0.657	0.647
Salon-de-Provence	0.051	-	-
Ajaccio	0	0.003	0.015

Table H.7: Calais - Littoral University

<b>Employment-Zones</b>	<b>Donor Pool 1</b>	<b>Donor Pool 2</b>	<b>Donor Pool 3</b>
La Vallée de la Bresse	0	0.149	0.139
Tergnier	0	0.158	0.145
Cambrai	0.088	-	-
SaintOmer	0.299	-	-
Les Herbiers	0	0.001	0.009
Alès	0.108	0.045	0.066
Agde - Pézenas	0.033	0.108	0.102
Sète	0.021	-	-
Istres - Martigues	0.458	0.539	0.539

Table H.8: Béthune - Artois University

<b>Employment-Zones</b>	<b>Donor Pool 1</b>	<b>Donor Pool 2</b>	<b>Donor Pool 3</b>
Le Creusot - Montcea	0.100	-	-
Alès	0.068	0.339	0.409
Istres - Martigues	0.832	0.661	0.591

Table H.9: Douai - Artois University

<b>Employment-Zones</b>	<b>Donor Pool 1</b>	<b>Donor Pool 2</b>	<b>Donor Pool 3</b>
Le Creusot - Montceau	0.075	-	-
Alès	0	0.084	0.158
Istres - Martigues	0.925	0.916	0.842

# I Diff-in-Diff Event Study Design

Table I.1: Dynamic DD estimations of new university impact on scaled higher-educated population share

	(1)
Pre new-universities creation	
t=1968	-0.007 n.s. (0.0760)
t=1975	0.009 n.s. (0.0760)
t=1982	0.010 n.s. (0.0761)
Post new-universities creation	
t=1999	0.095 n.s. (0.0762)
t=2009	0.195*** (0.0767)
t=2014	0.244*** (0.0768)
t=2017	0.285*** (0.0768)
Tax-free Zones	-0.191*** (0.0269)
Distance to TGV station	0.009 n.s. (0.0107)
Distance to the sea	
x1975	-0.004 n.s. (0.0126)
x1982	0.006 n.s. (0.0130)
x1990	-0.010 n.s. (0.0126)
x1999	-0.015 n.s. (0.0126)
x2009	-0.029** (0.0126)
x2014	-0.039*** (0.0126)
x2017	-0.047*** (0.0127)
Year fixed effects	Yes
Zone fixed effects	Yes
Observations	1,672
R <sup>2</sup>	0.97

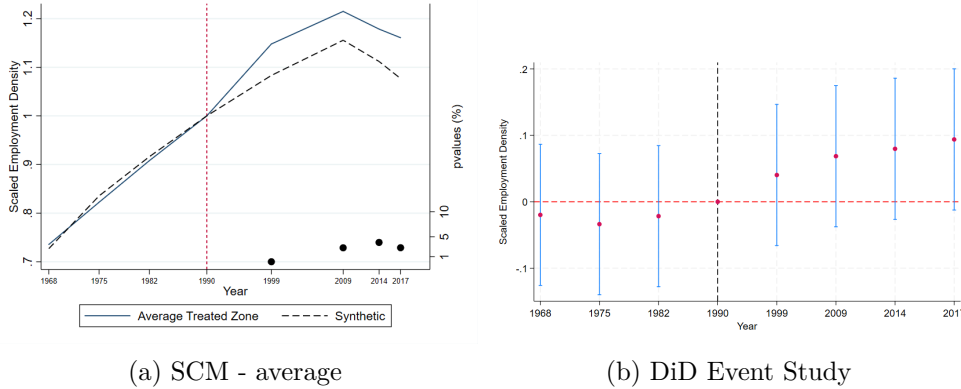
Notes. This Table presents Diff-in-Diff Event Study estimation results based on equation described in Section 6. The data sample contains 1,672 observation (9 treated + 200 untreated zones  $\times$  8 periods). Variables of distance are divided by 100.

Coefficients are reported with robust standard errors in parenthesis. \*\*\*, \*\*, and \* indicate significance at the 0.01, 0.05, and 0.1 levels.

## J Other Local Outcomes Effects by Zone

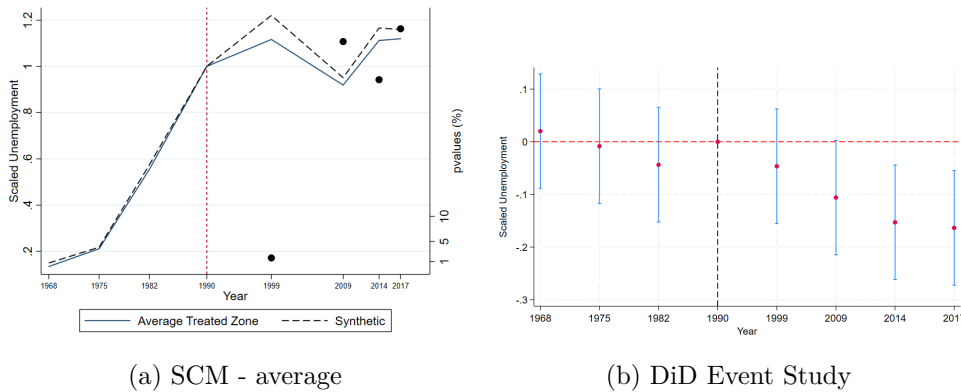
### J.1 SCM and DiD results

Figure J.1: Effects of "New Universities" Creation on Local Employment Density



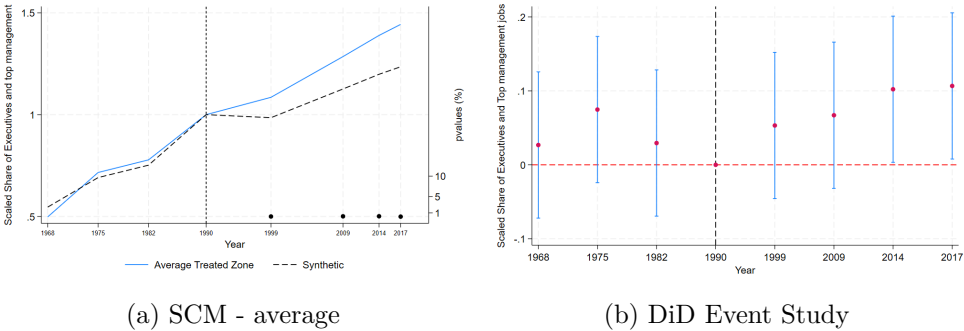
Notes. This Figure presents the estimation results of the effects of new-universities creation on local employment density (scaled to 1 in 1990). Graph (a) plots the average treatment effect using SCM. Dark dots on the right axis show the p-values computed through placebo runs. Graph (b) plots the coefficients for interaction terms between year dummies and treatment status obtained from an event-study difference-in-differences design (including zone fixed effects, and year fixed-effects). Confidence intervals are represented at the 95% level.

Figure J.2: Effects of "New Universities" Creation on Local Unemployment



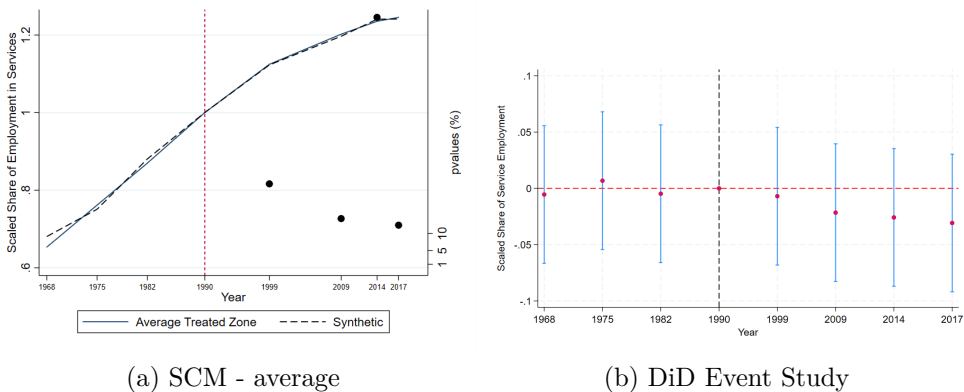
Notes. This Figure presents the estimation results of the effects of new-universities creation on local unemployment rate (scaled to 1 in 1990). Graph (a) plots the average treatment effect using SCM. Dark dots on the right axis show the p-values computed through placebo runs for each post-treatment period. Graph (b) plots the coefficients for interaction terms between year dummies and treatment status obtained from an event-study difference-in-differences design (including zone fixed effects, and year fixed-effects). Confidence intervals are represented at the 95% level.

Figure J.3: Effects of "new universities" creation on the local share of Executives and Top management jobs



Notes. This Figure presents the estimation results of the effects of new-universities creation on the share of executives and top management positions in local employment (scaled to 1 in 1990). Graph (a) plots the average treatment effect using SCM. Dark dots on the right axis show the p-values computed through placebo runs. Graph (b) plots the coefficients for interaction terms between year dummies and treatment status obtained from an event-study difference-in-differences design (including zone fixed effects, and year fixed-effects). Confidence intervals are represented at the 95% level.

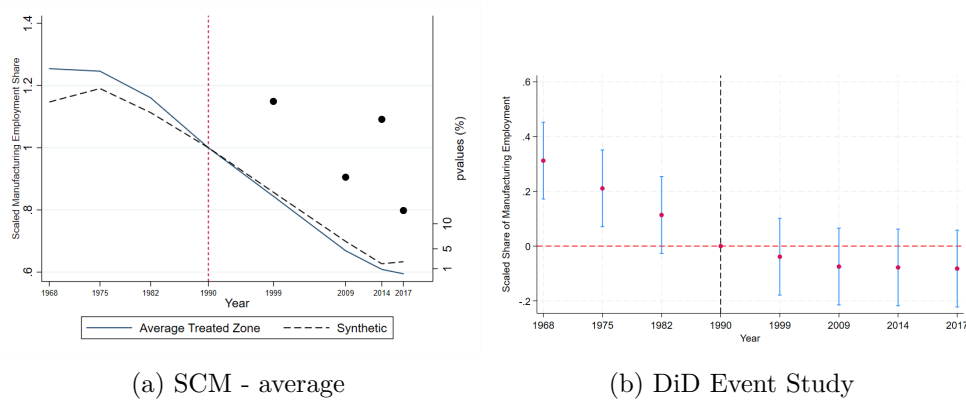
Figure J.4: Effects of "new universities" creation on the local share of Service Employment



Notes. This Figure presents the estimation results of the effects of new-universities creation on the share of service jobs in local employment (scaled to 1 in 1990). Graph (a) plots the average treatment effect using SCM. Dark dots on the right axis show the p-values computed through placebo runs. Graph (b) plots the coefficients for interaction terms between year dummies and treatment status obtained from an event-study difference-in-differences design (including zone fixed effects, and year fixed-effects). Confidence intervals are represented at the 95% level.

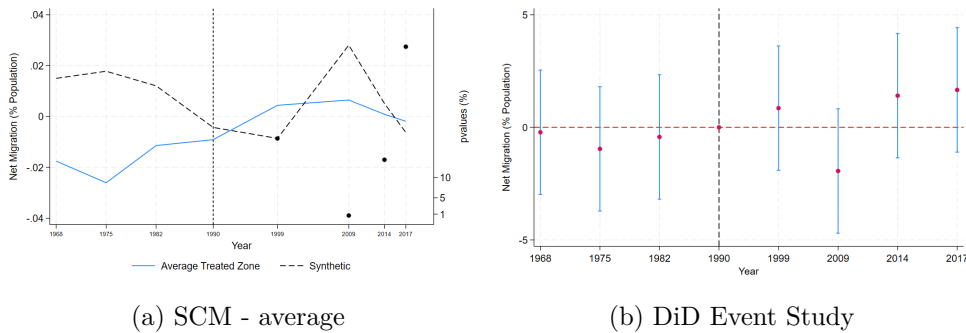


Figure J.5: Effects of "new universities" creation on the local share of Manufacturing Employment



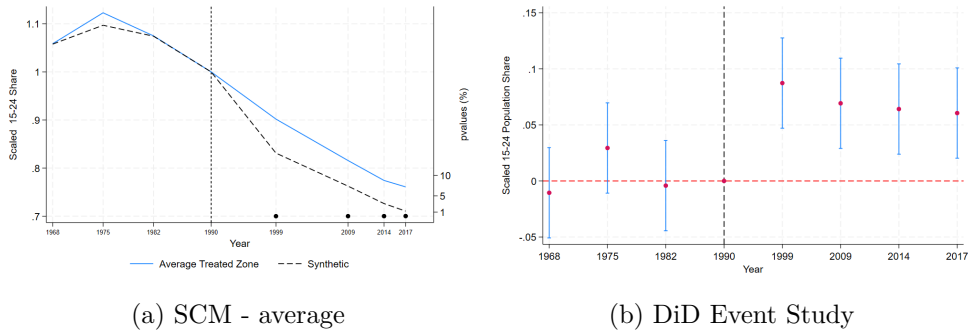
Notes. This Figure presents the estimation results of the effects of new-universities creation on the share of manufacturing jobs in local employment (scaled to 1 in 1990). Graph (a) plots the average treatment effect using SCM. Dark dots on the right axis show the p-values computed through placebo runs. Graph (b) plots the coefficients for interaction terms between year dummies and treatment status obtained from an event-study difference-in-differences design (including zone fixed effects, and year fixed-effects). Confidence intervals are represented at the 95% level.

Figure J.6: Effects of "new universities" creation on the Net Migration.



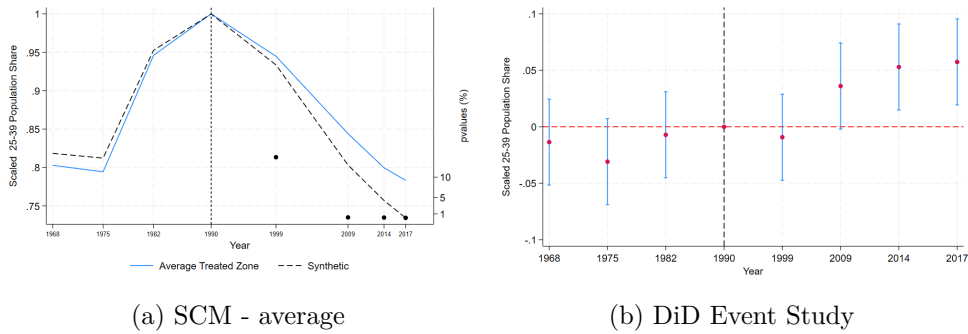
Notes. This Figure presents the estimation results of the effects of new-universities creation on the net migration – in percentage of the population – in the commuting-zone (difference between the number of immigrants and the number of emigrants). Graph (a) plots the average treatment effect using SCM. Dark dots on the right axis show the p-values computed through placebo runs. Graph (b) plots the coefficients for interaction terms between year dummies and treatment status obtained from an event-study difference-in-differences design (including zone fixed effects, and year fixed-effects). Confidence intervals are represented at the 95% level.

Figure J.7: Effects of "new universities" creation on the local share of 15-24 years old population



Notes. This Figure presents the estimation results of the effects of new-universities creation on the share of the population ages between 15 and 24 years old (scaled to 1 in 1990). Graph (a) plots the average treatment effect using SCM. Dark dots on the right axis show the p-values computed through placebo runs. Graph (b) plots the coefficients for interaction terms between year dummies and treatment status obtained from an event-study difference-in-differences design (including zone fixed effects, and year fixed-effects). Confidence intervals are represented at the 95% level.

Figure J.8: Effects of "new universities" creation on the local share of 25-39 population



Notes. This Figure presents the estimation results of the effects of new-universities creation on the share of the population aged between 25 and 39 years old (scaled to 1 in 1990). Graph (a) plots the average treatment effect using SCM. Dark dots on the right axis show the p-values computed through placebo runs. Graph (b) plots the coefficients for interaction terms between year dummies and treatment status obtained from an event-study difference-in-differences design (including zone fixed effects, and year fixed-effects). Confidence intervals are represented at the 95% level.

## J.2 Main results 25 years after treatment

Table J.1: Local Outcomes Case-by-Case Effects for the year 2017

	Pre-RMSPE	Effect Scaled	% Counterfactual	p-values (placebo tests)
<b>Employment Density</b>				
Douai	0.024	0.13	14%	10%
Arras	0.005	0.04	3%	33%
Lens	0.032	0.15	16%	8%
Béthune	0.081	0.17	17%	9%
Calais	0.033	0.06	6%	25%
Boulogne-sur-mer	0.040	-0.08	-7%	25%
Lorient	0.018	-0.03	-3%	45%
Vannes	0.034	0.11	8%	14%
La Rochelle	0.021	0.21	20%	6%
<b>Unemployment Rate</b>				
Douai	0.062	-0.06	-4%	46%
Arras	0.012	-0.03	-3%	52%
Lens	0.081	0.09	8%	25%
Béthune	0.032	0.06	6%	31%
Calais	0.047	0.06	5%	32%
Boulogne-sur-mer	0.030	-0.07	-6%	42%
Lorient	0.027	-0.15	-11%	29%
Vannes	0.027	-0.01	0%	57%
La Rochelle	0.043	-0.26	-18%	14%
<b>Share of Executives and Top management positions</b>				
Douai	0.096	0.38	32%	3%
Arras	0.028	0.17	14%	18%
Lens	0.062	0.14	12%	24%
Béthune	0.071	0.22	18%	15%
Calais	0.083	0.16	13%	21%
Boulogne-sur-mer	0.066	0.11	9%	28%
Lorient	0.030	0.26	21%	11%
Vannes	0.053	0.18	14%	19%
La Rochelle	0.041	0.25	19%	11%
<b>Share of employment in the services sector</b>				
Douai	0.045	0.02	2%	24%
Arras	0.011	-0.04	-3%	37%
Lens	0.087	0.12	10%	3%
Béthune	0.035	0.09	7%	4%
Calais	0.032	-0.01	-1%	57%
Boulogne-sur-mer	0.031	-0.09	-7%	9%
Lorient	0.014	-0.05	-4%	32%
Vannes	0.008	0.00	0%	37%
La Rochelle	0.005	-0.03	-3%	40%
<b>Share of employment in the manufacturing sector</b>				
Douai	0.103	-0.05	-9%	33%
Arras	0.027	-0.05	-7%	34%
Lens	0.388	-0.26	-38%	1%
Béthune	0.102	-0.14	-22%	7%
Calais	0.048	0.00	0%	52%
Boulogne-sur-mer	0.061	0.11	21%	15%
Lorient	0.044	0.01	1%	40%
Vannes	0.052	0.09	14%	19%
La Rochelle	0.031	0.06	10%	28%
<b>Share of the population aged 25-39</b>				
Douai	0.016	0.08	11%	9%
Arras	0.010	0.06	8%	17%
Lens	0.021	0.16	22%	5%
Béthune	0.011	0.09	13%	18%
Calais	0.072	0.05	7%	0%
Boulogne-sur-mer	0.029	0.02	3%	24%
Lorient	0.011	-0.02	-3%	43%
Vannes	0.007	-0.01	-1%	41%
La Rochelle	0.041	0.00	0%	4%
<b>Share of the population aged 15-24</b>				
Douai	0.016	0.06	9%	9%
Arras	0.008	0.04	5%	17%
Lens	0.069	0.09	13%	5%
Béthune	0.047	0.03	5%	18%
Calais	0.024	0.14	19%	0%
Boulogne-sur-mer	0.027	0.02	3%	24%
Lorient	0.007	-0.01	-1%	43%
Vannes	0.039	-0.02	-3%	41%
La Rochelle	0.025	0.09	13%	4%

Notes. We present the SCM case-by-case results for our three different employment outcomes 25 years after treatment (2017). The *p-values* indicate the probability that the related result would happen purely by chance (comparison with placebo runs, which does not include placebo effects in the pool for inference if the pre-rmspe of that control is greater than four times the pre-rmspe of the treated unit).