



The Local Impact of University Decentralization in France

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The Local Impact of University Decentralization in France ^{*}

Working paper

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We measure the effects on human-capital accumulation at the local level of the "new universities" created as part of the U2000 Plan implemented in France in the early 1990s. Established in 1990, this national program resulted in the creation of eight universities (spread over 15 sites), including four outside the Paris region (over 10 sites). Using the synthetic control method, we show that the opening of "new universities" has led to a significant increase in the local share of higher-educated people (not including those in school). On average, the creation of "new universities" increased this share by 3 p.p. within 25 years, though the effect differs across cases. Our estimates provide reliable results in six of the treated-zones, with positive effects between 2 and 5 p.p. within 25 years (which represents around 8,000 more higher-educated individuals on average, in comparison with the counterfactual). Moreover, exploring the employment implications of "new universities" creation, we found credible evidence that, on average, human-capital gains co-occurred with gains in skilled employment.

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

JEL Classification: J24, O18, I25

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1 Introduction

Since Marshall (1890), the question of the influence of human-capital accumulation on regional economic development has generated intensive research. Concentration of human capital within a region is widely acknowledged to increase local growth, wages and productivity, innovation, or population and employment agglomeration (Marshall (1890); Lucas (1988); 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). In light of this common understanding, the question of how to create, attract and retain skilled 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.

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 use eight campus of these "new universities" to study the role of such creations on local economies. U2000 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.¹ Second, because new research universities were opened during the same pe-

¹In 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.

riod 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.

The enthusiasm and heavy involvement of local authorities at the time of the 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.² 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. The creation of a local university may therefore impacts exclusively individual paths,³ 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.⁴

Thirty years later, we use the natural experience of U2000 Program to precisely measure the local effect local effects of the creation of "new universities", taking the advantage of several openings in different areas which can be considered as "empty" in terms of higher-education before the program. In particular, did the university's creation lead to an increase in the concentration of human capital in the employment-zone of the site, compared to the counterfactual situation?

Using the synthetic control method, this paper estimates a significant increase in the local share of higher-educated people (not including those in school) caused by the "new universities" creation in the 1990s as part of the French U2000 program. Furthermore, exploring the employ-

²See 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).

³Litterature 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), and promotes equality of opportunity and social mobility for individuals (Dherbécourt, 2015).

⁴Although the autor recalls that analyzing only a single university in this specific location has limitations in terms of external validity, this encourages cautious about the self-evident reality that the creation of an university leads to local human capital gains.

ment implications of "new universities" creation, we found credible evidence that, on average, human-capital gains co-occurred with gains in skilled employment.

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. More recently, 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.

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 role for higher-education institutions in the creation, attraction, and retention 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 channels.

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.) rather than on the creation of new sites, and thus 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 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. Regarding the US, also using the synthetic

control method and event study analysis, Liu (2015) examines the designation of US land-grant universities in the 1860s and finds a positive effect on local population density and local manufacturing output per worker. Lastly, 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.

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 "new universities."

Statistical evidence. Figure 1 shows the location of French universities within metropolitan France. The country is divided into 304 employment-zones (or commuting-zones).⁵ 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.⁶

From 1990 to 1995, the U2000 plan led to the creation of eight "new universities" (*"Universités nouvelles"*) 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 universities⁷ (decentralized satellite universities that depends on a larger one and in which the

⁵According to INSEE, an employment-zone (also called a commuting-zone) 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. It is therefore a spatial scale adapted to local studies, especially for evaluating the economic development or population-composition of localities.

⁶34 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-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).

⁷Many other creations of this type emerged in the 2000s. In total, around a hundred zones had a small secondary university in 2014.

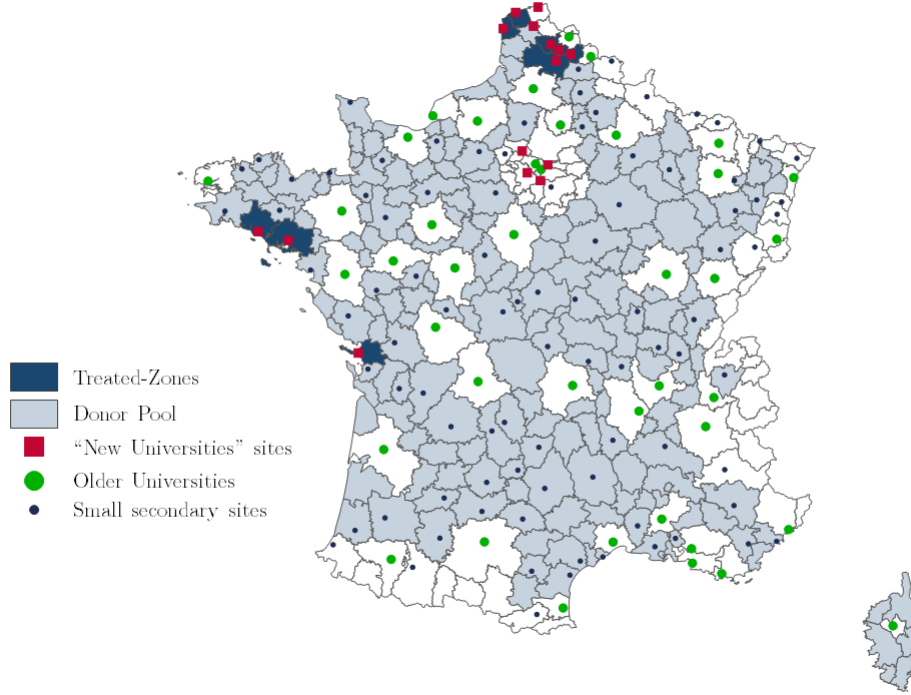


Figure 1: Location of Universities in France, 1968-2014

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. In addition, we chose to 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,⁸ the Bretagne-Sud University,⁹ the University of Littoral Opal Coast,¹⁰ and the University of La Rochelle.¹¹ 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,

⁸Located in Arras, Béthune, Douai and Lens.

⁹Located in Lorient and Vannes.

¹⁰Located in Boulogne-sur-mer, Calais, Dunkerque and Saint-Omer.

¹¹Located in La Rochelle.

because of its direct proximity to the Belgian border, which implies potential spillovers and migration flows that are difficult to take into account.¹² We end up with nine treated-zones identified by dark blue areas in Figure 1.

The identification strategy is to compare employment-zones where "new universities" were established (called the treated zones) with other employment-zones where no university-related effects have occurred (called the untreated-zones, which comprise a set of potential controls). Before any statistical analysis, Figure 2 shows average trends in the share of higher-educated population (not including those in school) in France for different categories of employment-zones over the period 1968-2014. If we compare the deviation of higher-educated population share in "new universities" zones (on average) from the national average (respectively the black line and the blue line in Figure 2), 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%. However, this gives no real indication of the impact of the creation of "new universities," precisely because some other employment-zones had pre-existing universities, and experienced a large growth in their average share (dashed red line on Figure 2). This first comparison certainly underestimates the potential effect of the creation of "new universities." It is more appropriate to compare the outcome trajectory of "new universities" with that of a group that exclude zones with pre-existing universities and zones that experienced unusual population and human-capital flows over the period, such as the Parisian and adjacent areas (green line of Figure 2). This group is defined as our "donor pool": a set of potential controls used to construct the counterfactual. In this group, the average local share of higher-educated population increased from 7% to 21%. On average, this graph thus suggests a small positive impact of "new universities" on local population skills (around 3 p.p.).

Methodology. "New university" locations are not completely random. Moreover, the impacts of the creation of "new universities" could be heterogeneous according to the zones of their respective locations. To address these main empirical challenges, we implement the synthetic control method 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

¹²We still discuss the effects in the Dunkerque case in Appendix.

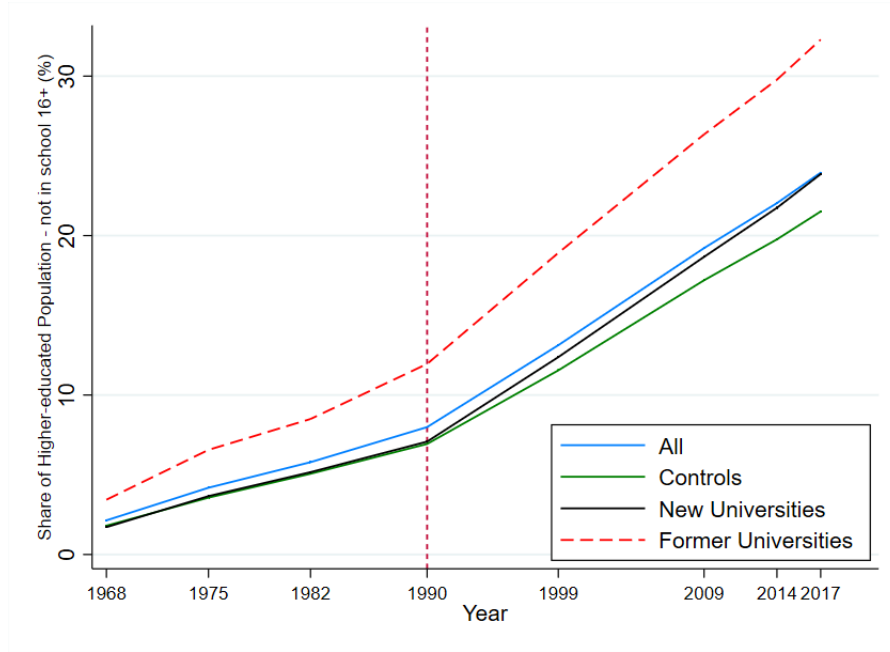


Figure 2: Trends in Higher-educated Population Share in France, 1968-2017

trends assumption of the difference-in-difference method, using a matching approach to create a better counterfactual. The synthetic control method is based on the idea that using a weighted average of potential control zones is better than controlling with a specific zone alone, or an average of all the untreated zones. We construct a synthetic control zone for each treated zone by selecting potential controls in the donor pool and giving them a weight depending on a set of pre-intervention matching variables – including our outcome of interest. These matching variables are chosen based on usual predictors of local human capital and some controls for the factors that may underlie the designation of the location of "new universities." In our case, the synthetic control method is relevant for its capacity to account for time-varying unobserved effects, and to examine separately several affected areas, where the creation of "new universities" may have heterogeneous impacts.

The question of statistical inference is evaluated using placebo tests. Those tests aim to evaluate whether our estimated results are driven by chance. We re-run the synthetic method for fictive placebos to see if the magnitude of the results are indeed different from our real treated-zones results.

Finally, we run several robustness checks to test the sensitivity of our results and elimi-

nate some doubts on the SCM implementation. In particular, we run a standard Difference-in-Difference model to confirm SCM results and to take into account potential other contemporaneous shocks that may influence local human capital accumulation in the post-treatment period.¹³

Main results Using harmonized population-census data for the period 1968-2017, the synthetic control method makes it possible to conclude that the creation of "new universities" has a significant positive impact on local development, by increasing human-capital accumulation. This finding is further corroborated with the additional difference-in-differences event-study design.

On average, the creation of "new universities" increased the local higher-educated population share by 4 points within 27 years. This represents a 17% increase from the counterfactual level: the average share of higher-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 an increase of more than 7,300 higher-educated individuals on average.

We measure notable heterogeneity across zones. In six cases,¹⁴ 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. within 27 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. Our results remain valid after additional robustness tests.

The analysis of potential implications for employment shows that human-capital gains co-occurred with positive effects on local employment density and the share of white-collar workers, on average, in the treated zones, suggesting that local human-capital accumulation actually resulted in more skilled employment at the local level. Using the same synthetic control method with the same data, we show that average employment density in the treated zones is 5%

¹³Keeping 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.

¹⁴The 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.

higher in 2017 compared to the counterfactual (although we found no convincing long-term impact on local unemployment on average, only a short-term deviation of 8% compared to the counterfactual level in 1999). In addition, "new university" creation increased the population share of white-collar workers by 1.6 points within 25 years, on average, in the treated zones. This represents a 16% increase from the counterfactual level.

The rest of the paper is organized as follows. Section 2 retraces the historical background of French universities and describes the U2000 Plan's implementation. Section 3 develops the empirical methodology and the data. Section 4 presents the estimation results. Section 5 presents robustness checks on alternative SCM and Diff-in-Diff method. Finally, we explore potential implications for local employment in Section 6.

2 Historical Background

2.1 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 guilds¹⁵ 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

¹⁵ *Corporations* in French.

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 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,¹⁶ 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*,

¹⁶This 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).

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.

2.2 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; Georges, 2001). U2000 also resolved various qualitative mismatches in terms of social inclusion and the diversification of instruction, but geographical realignment through financial assistance represented its most immediate and dominant thrust. Moreover, the key issues identified at the national conference for higher education in 1990¹⁷ 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.¹⁸ In contrast, the larger "new universities" (*"Universités nouvelles"*)

¹⁷"Assises nationales de l'enseignement supérieur," 26-29th of June 1990.

¹⁸As explained in the introduction, we will not analyze this type of university decentralization, but will rather

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 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).¹⁹ 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

focus on the "new universities."

¹⁹The 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 5 for endogeneity issues discussion.

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 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.

2.3 The "New Universities"

As presented in Table 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 1990,²⁰ 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%.

²⁰Population data comes from the INSEE census.

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

		Nb of Students		Total Population		Higher-educated Share	
		First-year	2014	1990	2014	1990	2014
Artois University	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%
Bretagne-Sud University	1995*						
Lorient		2144	3732	269360	295087	8%	24%
Vannes		1588	2987	254355	342335	9%	27%
Littoral Opal Coast University	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%
La Rochelle University	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).

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), 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).²¹ 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

²¹The 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.

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%.

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 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.

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 by the program) and the rest of zones ($j = 2$ to $j = J + 1$) constitute the potential controls²² (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

²²If 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.

$j = 1$ 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

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

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 α_{1t} .

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

$$Y_{jt}^N = \delta_t + \theta_t X_j + \lambda_t \mu_j + \epsilon_{jt} \quad (2)$$

where δ_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 θ_t the associated vector of parameters; μ_j is a vector of unobserved factor loadings and λ_t the unknown common factors; and ϵ_{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

$$\sum_{j=2}^{J+1} w_j^* Y_{jT_0} = Y_{1T_0} \quad \text{and} \quad \sum_{j=2}^{J+1} w_j^* X_j = X_1 \quad (3)$$

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

$$\hat{\alpha}_{1t} = Y_{1t} - \sum_{j=2}^{J+1} w_j^* Y_{jt} \quad (4)$$

is an unbiased estimator of α_{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 3 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.²³ 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

$$\sum_{m=1}^k v_m (X_{1m} - X_{0m}W)^2 \quad (5)$$

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.

Furthermore, rather than matching the synthetic control on pre-intervention averaged outcome (and predictors), we fit synthetic control based on trends in the outcome variable.²⁴ When forcing the construction of synthetic control to match trends in the outcome variable,²⁵ we are able to measure the growth deviation caused by the treatment – compared to the growth rate that would have occurred in the absence of the treatment. This strategy aims to take into account the trend 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. 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. Our confidence in the validity of the counterfactual is improved by exploiting these pre-intervention trends to compute the synthetic control.

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,

²³The set of pre-intervention variables may include the pre-intervention values of the outcome variable.

²⁴See Galiani and Quistorff (2017) for methodology and Stata implementation.

²⁵Each zone's outcome is scaled so that it takes the value 1 in the last pre-treatment period (1990).

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

$$RMSPE = (\frac{1}{T_0} \sum_{t=1}^{T_0} (Y_{1t} - \sum_{j=2}^{J+1} w_j^* Y_{jt})^2)^{1/2} \quad (6)$$

The degree of balance on predictors is given by the comparison between values of pre-treatment 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.²⁶ The estimated average effect over all the G treated-zones is given by

$$\bar{\alpha}_t = \frac{1}{G} \sum_{g=1}^G \hat{\alpha}_{gt} \quad (7)$$

3.2 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

²⁶Unlike 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.

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 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

$$p - value_t = Pr(|\hat{\alpha}_{j,t}^{PL}| \geq |\hat{\alpha}_{1t}|) = \frac{1}{J} \sum_{j=2}^{J+1} I(|\hat{\alpha}_{j,t}^{PL}| \geq |\hat{\alpha}_{1t}|) \quad (8)$$

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 ($\hat{\alpha}_{gt}^{PL}$), 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

$$p - value_t = Pr(|\bar{\alpha}_t^{PL}| \geq |\bar{\alpha}_t|) = \frac{1}{N_{\overline{PL}}} \sum_{i=1}^{N_{\overline{PL}}} I(|\bar{\alpha}_t^{PL(i)}| \geq |\bar{\alpha}_t|) \quad (9)$$

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.

Robustness Finally, 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.

3.3 Data

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 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 2016.²⁷ 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.

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.²⁸

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).

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 the region, with potential spillover effects between areas.²⁹

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.

Finally, 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 de-

²⁷INSEE 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.

²⁸Therefore, we also exclude from our treated group the Parisian "new-universities" and the border zone of Dunkerque where University of Littoral have a campus.

²⁹According 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.

centralized secondary satellite dependent on a proper university,³⁰ 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).³¹ 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, course-offerings, grade level, and research activities), and their non-autonomous status, we expect very smaller local effects. Consequently, we assume that zones with small secondary universities are, by comparison, similar to "empty" zones.³²

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).³³ 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).³⁴ 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;

³⁰Including Saint-Omer.

³¹A zone with only small University Institutes of Technology (IUT) is not considered as a university area.

³²A robustness test is based on an alternative donor pool without these type of zones.

³³We still keep the higher-educated population share level in 1990 as a matching variable.

³⁴Because 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.

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.

4 Results

4.1 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 12 graphs) responds to slightly different patterns than the other zones' average (i.e. zones without "new universities," the blue line on Figure 12 graphs) or the donor pool average (the dashed line on Figure 12 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 13 confirm that this method provides a better counterfactual. In contrast with Figure 12, 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 5. 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 appendix display the computed weights for each zone of the donor pool.

4.2 Impacts of "new university" creation

Figure 3 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 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

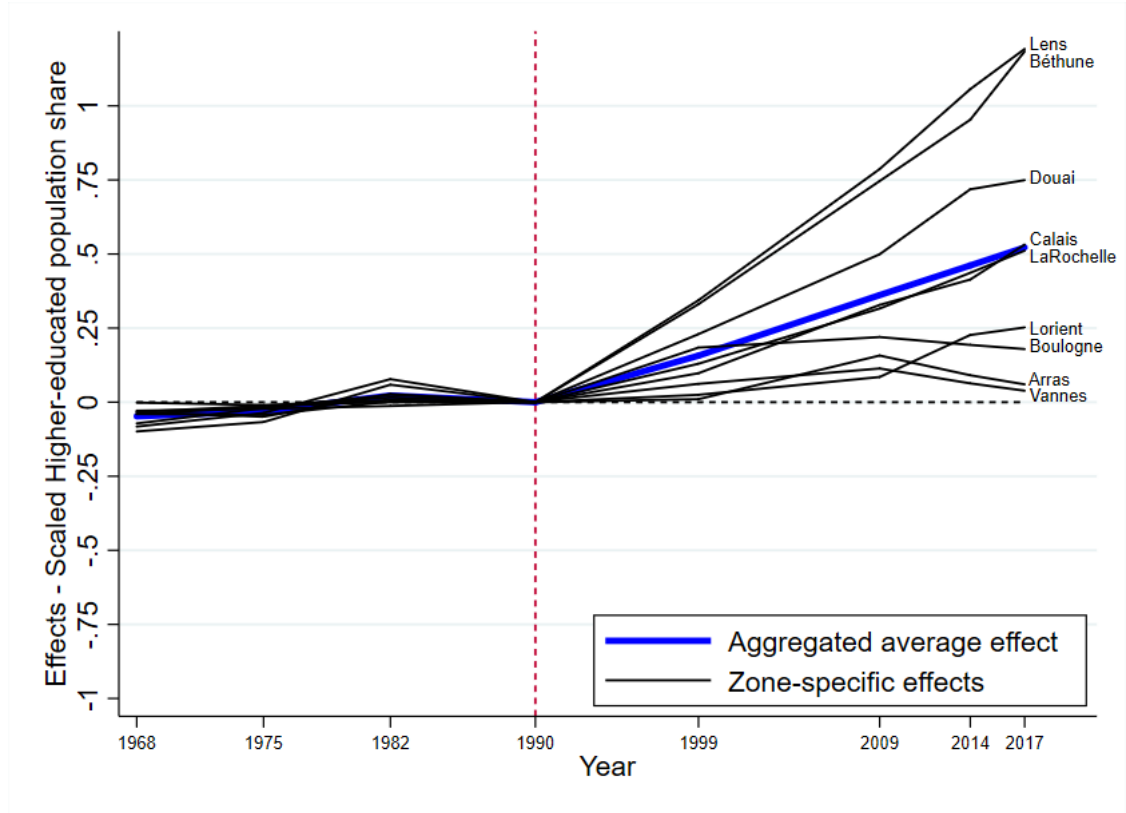


Figure 3: Local Human-Capital Effects in "New Universities" Zones

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.³⁵

Case-by-case lines show important heterogeneity in the effects. Our estimates indicate substantial positive effects in half of the cases: Lens, Béthune Douai, La Rochelle, and Calais. While the effects remain positive (respective lines above the zero-line), the group of Lorient and Boulogne zones show weaker effects. Finally, in the case of Arras and Vannes, the estimated effects fail to deviate from the zero-line after 25 years. The zone-specific gains related to "new university" creation are displayed in Table 2.

³⁵Higher-educated population share level in 1990 times the estimated growth difference between treated-zones and synthetic control.

Table 2: Higher-educated Population Share : 1990 vs. 2017

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

4.3 Placebo Tests

Figure 4 displays the synthetic control results in comparison with placebo effects distribution. Light-blue lines represent all the fictive placebo runs.³⁶ This first graphical representation confirms the credibility of previous comments on substantial positive impacts in the five cases of Lens, Béthune Douai, Calais, and La Rochelle: only a few placebo-lines (around ten at the most) show a larger effect than their respective lines. With a placebo distribution of 200 zones, the results in those cases have a very low probability of being entirely due to chance. For the other zones, we cannot confidently draw conclusions about the significance of the impacts with a simple graphical observation: the dark lines are not sufficiently unusual compared to the placebo effects distribution.

³⁶Along with the treatment effects, placebo effects are the gaps between values of outcome variable for each placebo-zone versus its synthetic control.

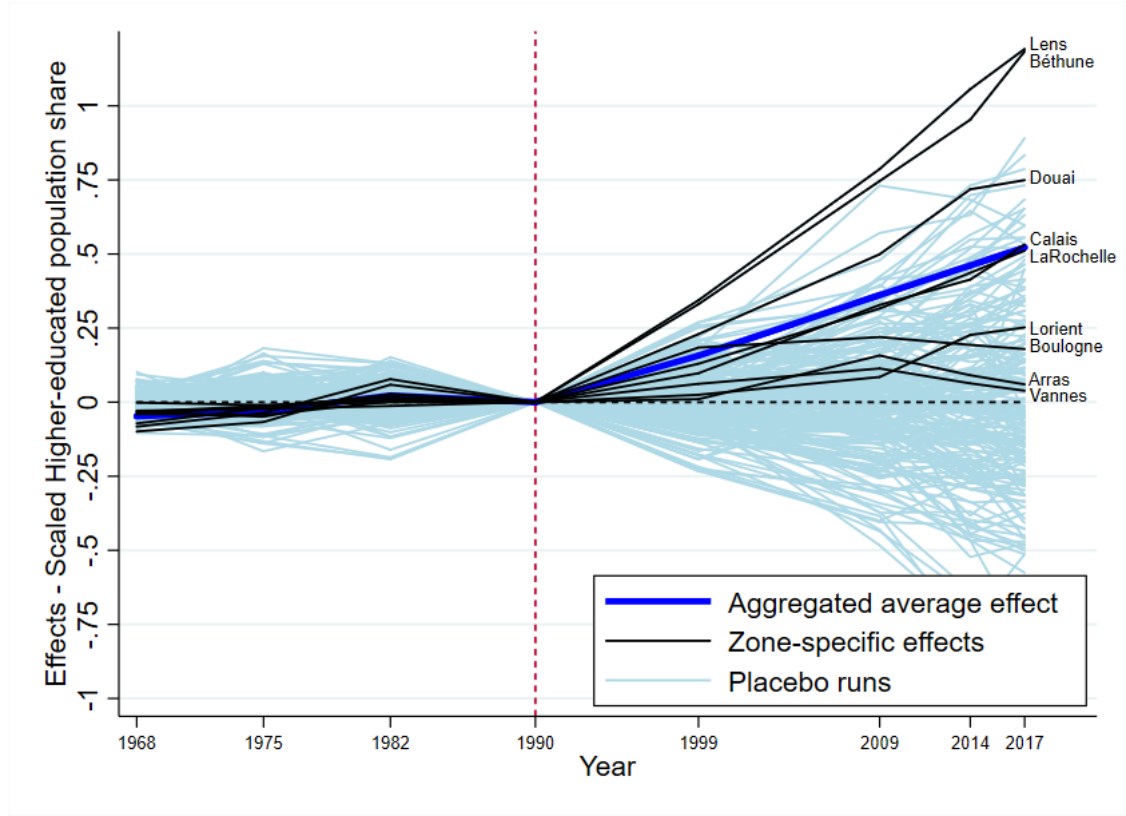


Figure 4: Local Human Capital Effects in "New Universities" Zones vs. Placebo Tests

However, Figure 4 plots all possible placebo effects, for all the donor pool, regardless of the fit quality in the pre-intervention period. As explained in part 3.2, lack of fit in placebo runs could bias the inference tests. Figure 14 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 6.

The probability that the estimation of the average aggregated impact has arisen purely by chance is nil. However, for the case-by-case analysis, 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 University,

and, to a lesser degree, the Lorient site of Bretagne-Sud University.³⁷

As explained in subsection 3.2, 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 15 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.

5 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 the potential endogenous decision of where to locate "new universities." In particular, 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.

As mentioned in Section 2.2, 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,

³⁷In 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 than 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.

and three periods of cohabitation at the national level (Mitterrand–Chirac 1986–1988, Mitterrand–Balladur 1993–1995, and Chirac–Jospin 1997–2002).³⁸ These many political changes may have encumbered the policy influence-games between local and central authorities over a medium or long-term period.

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."³⁹ This is the case in 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 5 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.

³⁸Cohabitation 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.

³⁹A 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 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.

Figure 5: Local Human-Capital Effects in Treated Zones: Group 1 vs. Group 2

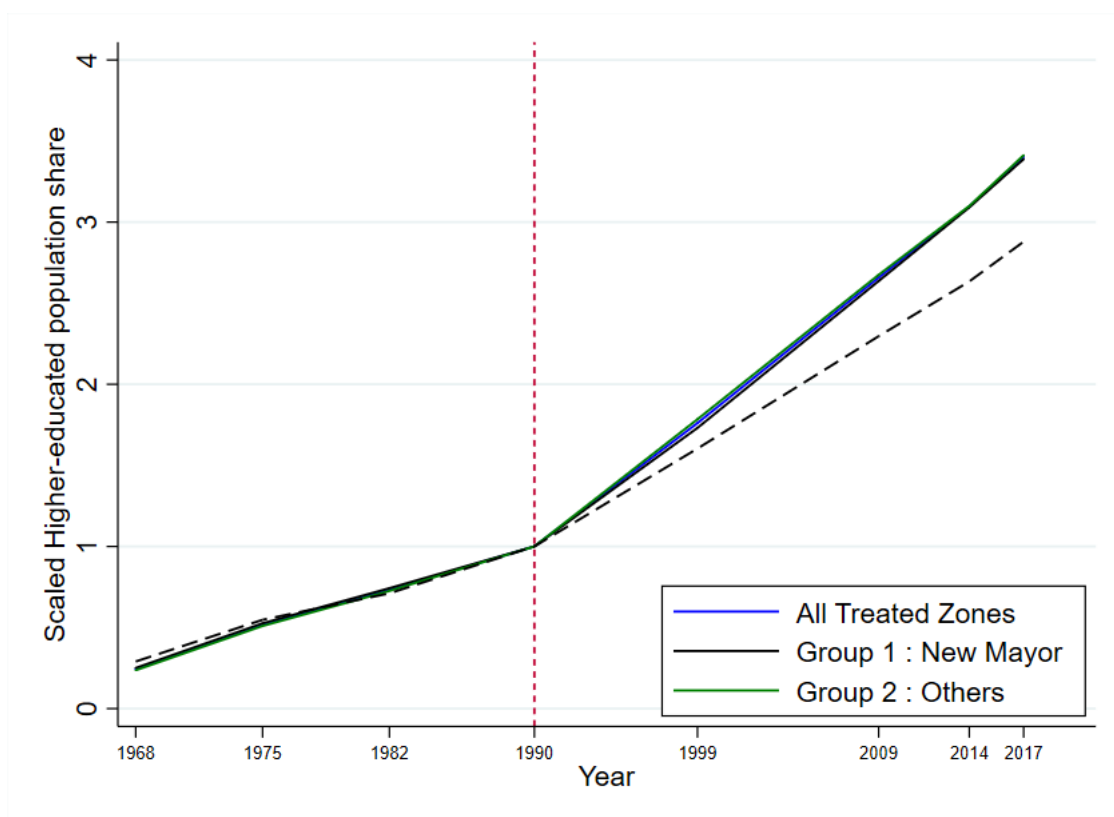


Table 3: Average Human Capital Gains (percentage points) - Donor Pool Comparisons

	1999	2009	2014	2017
Donor Pool 1 (Benchmark)	1.1 (0.000)	2.6 (0.000)	3.3 (0.000)	3.7 (0.000)
Donor Pool 2	1.1 (0.000)	2.5 (0.000)	3.2 (0.000)	3.6 (0.000)
Donor Pool 3	1.1 (0.000)	2.2 (0.000)	3.1 (0.000)	3.6 (0.000)
Donor Pool 4	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 2. 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).

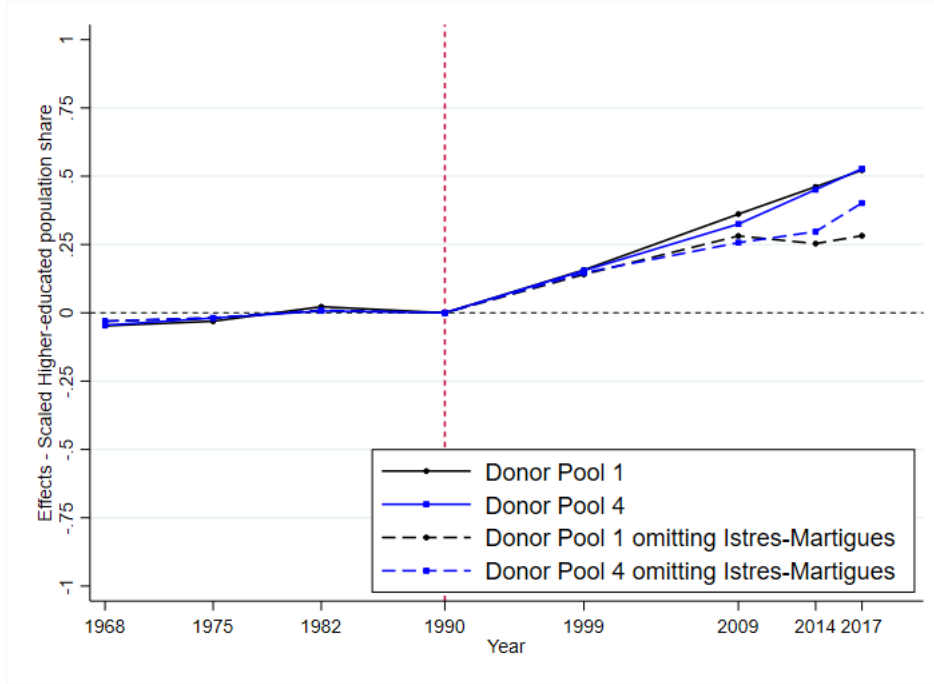
Spatial spillovers bias As explained in Section 3.2, to further gauge the sensitivity of our results, we conduct additional analyses with alternative donor pools.

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,⁴⁰ 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.

⁴⁰Recall 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.

Figure 6: Sensitivity of Local Human-Capital Effects: omitting Istres - Martigues



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 3 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.

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 tables of Appendix F 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 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 6 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.

Alternative Diff-in-Diff method - Control for other contemporaneous shocks 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 present in Table 4 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 program⁴¹), easier access to the area (through rail development⁴²), new taste for local amenities such as the proximity of the sea⁴³ 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 potential⁴⁴).

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:

$$Y_{zt} = \alpha + \gamma Post_{zt} \times NewUni_z + \theta X_{z,t} + \eta_z + \delta_t + \epsilon_{zt} \quad (10)$$

⁴¹The *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).

⁴²Due 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.

⁴³Most of the treated zones are located near the sea (see map 1).

⁴⁴Following 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 4: DiD estimations of new university impact on scaled higher-educated population share

Scaled Higher-educated population share						
	(1)	(2)	(3)	(4)	(5)	(6)
Impact of the university creation	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)
In 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 ²	0.97	0.97	0.98	0.98	0.98	0.98

Notes. This Table presents Diff-in-Diff estimation results based on equation 10. 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.

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. η_z and δ_t

are zone fixed effects and year fixed effects. ϵ_{zt} are the errors terms.

Results reported in columns (1) to (6) of Table 4 show that DD method similarly concludes on a strongly significant positive effect of new universities creation on the local accumulation of higher-educated people.

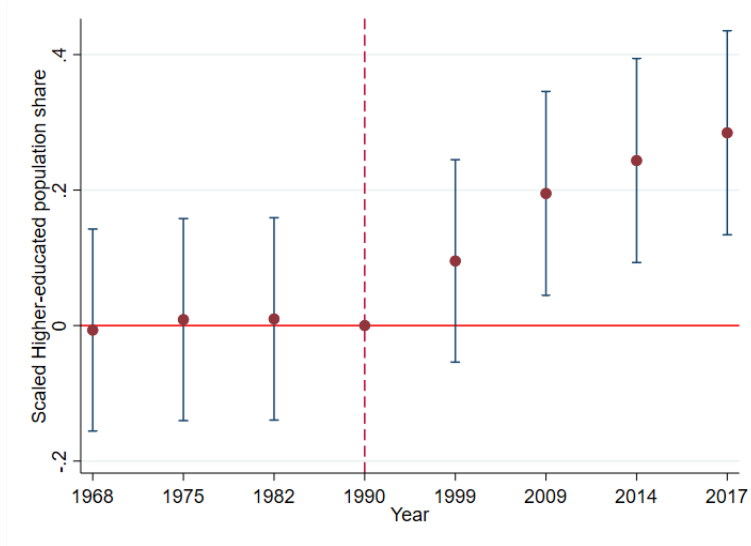
For comparison and robustness purposes, we first present in column (1) of Table 4 a DD model where $X_{z,t}$ contains all the matching variables used in the SCM model: share of managers and professionals in the employed population (aged 25-54); employment rate (in population aged 25-54); employment and population density; unemployment rate; participation rate (25-54); sectoral shares; age group shares; and distance from the nearest pre-existing university. 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 6). 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)).

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 4. 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 DD specification.

We finally run a difference-in-differences event-study design to evaluate treatment effects of the different pre- and post- treatment periods. We include the same controls as in column (5) of Table 4. Estimation results are reported in Annex. Compared to SCM, event study results plot on Figure 7 show very similar progressive increase of the outcome variable after the 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.

Figure 7: 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.

6 Exploring the Employment 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 univer-

sities and the associated human-capital accumulation in the local labor pool have led to more employment, less unemployment, and more skilled jobs at the local level. Using precisely the same synthetic control method, we also explore the U2000 program's impact on employment density, unemployment, and the share of white-collar occupations in the local labor markets.

Figures 8 to 10 depict the estimated results for the average of the treated zones. While the synthetic control method shows a good match in the pre-treatment period with the actual trends, when averaging over all the treated zones, it actually smooths out some of the heterogeneity in the match for each individual treated zone. In contrast with the synthetic controls in the principal case of higher-educated population share, which showed a reasonably good match for all the treated zones, for these new outcomes, case-by-case results should be interpreted with some caution, keeping an eye on the pre-RMSPE value. For this reason, we choose to comment on only the average effects – case-by-case results and robustness tests are presented in the Annex.

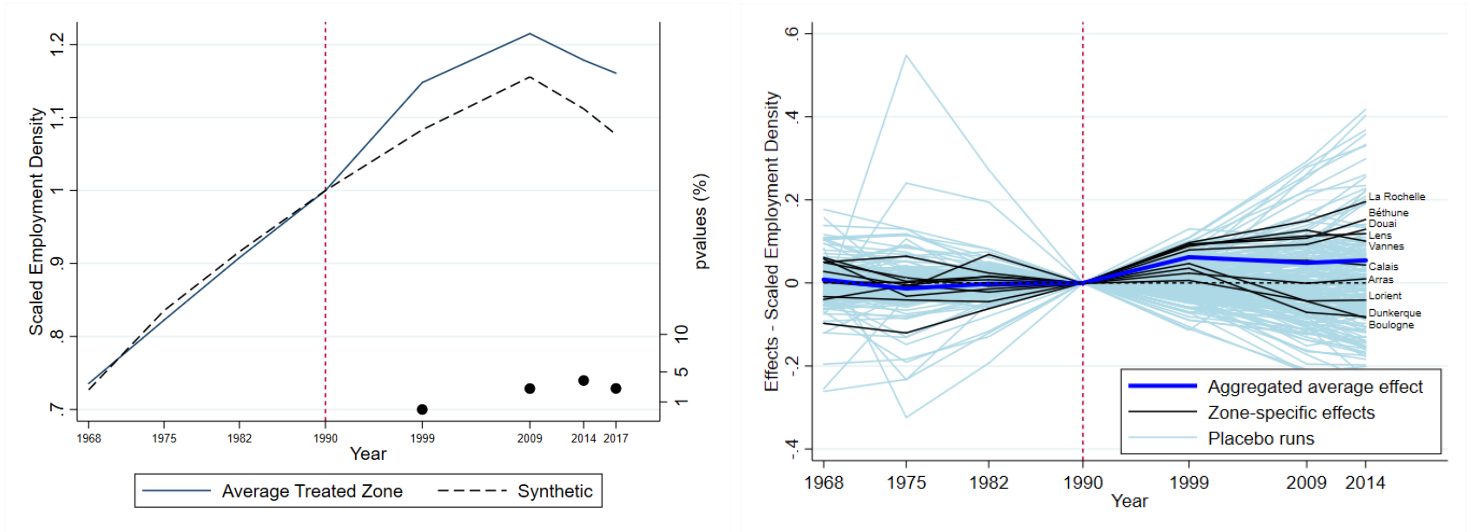


Figure 8: Effects of "New Universities" Creation on Local Employment Density

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. For a mean of 85 jobs per km² in 1990, these estimates indicate that the employment density is on average 6 jobs greater in those zones in 1999, 5 jobs greater in 2009, 6 jobs greater in 2014, and 7 jobs greater

in 2017 as a result of "new universities" creation,⁴⁵ which represents an increase of 8% compared to the counterfactual in 2017. Testing statistical inference, we see that the probability that the estimation of the average aggregated impact has arisen purely by chance is nil for the first period, but that the *p-values* are around 3% for the last periods.

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, and new demand from students and university workers. 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.

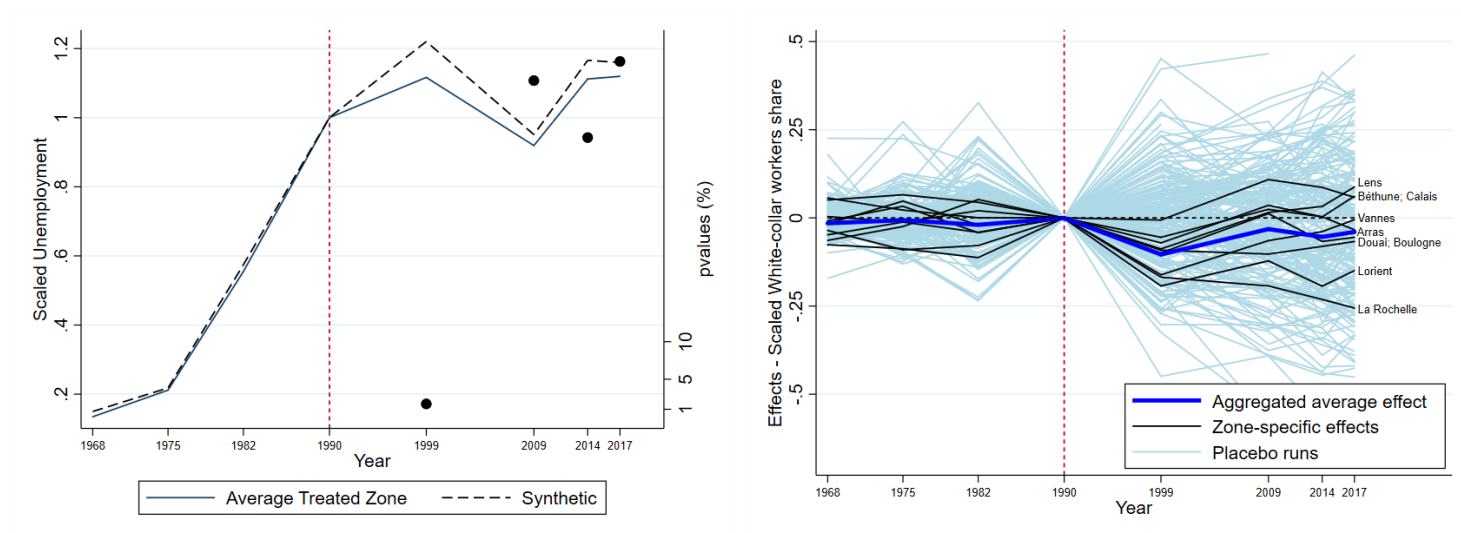


Figure 9: Effects of "New Universities" Creation on Local Unemployment

Unemployment On average, the creation of "new universities" reduced the growth of local unemployment by 10 p.p. by 1999. This effect is no longer statistically credible, however, after 15, 20 and 25 years (based on a threshold of 10%). At a mean of 12.6% in 1990, the first period estimate indicates that the unemployment rate in those zones is on average lower by 1.3 p.p. by 1999, as a result of the "new universities" creation,⁴⁶ which represents a decrease of 10% compared to the counterfactual.

⁴⁵Employment density levels in 1990 times the estimated growth difference between treated-zones and synthetic control zones.

⁴⁶The unemployment level in 1990 times the estimated growth difference between treated-zones and synthetic control.

Those results indicate that university creation seems to have had no 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 subsequently subsides in the next period, to return to the counterfactual trend.

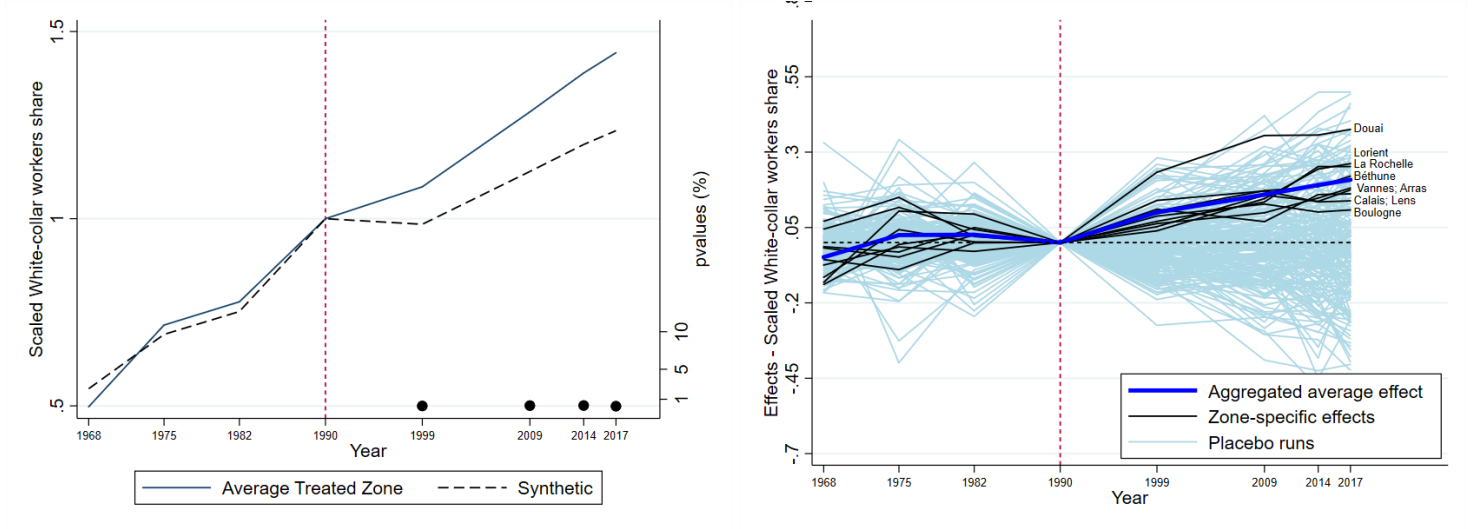


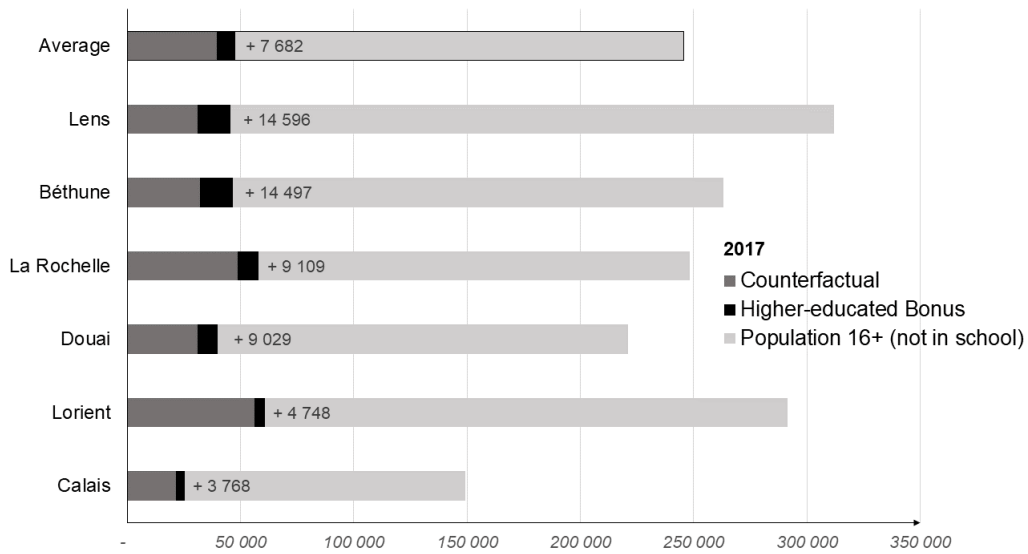
Figure 10: Effects of "New Universities" Creation on Local White-Collar Workers Share

White-collar workers share On average, "new universities" creation increased the growth of the local white-collar employment share 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. At a mean level of 8.4% in 1990, these estimates indicate that the share of white-collar workers in those zones is progressively larger on average, rising to a difference of 1.7 p.p. in 2017, as a result of the "new universities" creation,⁴⁷ which represents an increase of 17% compared to the counterfactual.

Those results indicate that the impact of the creation of "new universities" on the share of local white-collar workers 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 skilled employment at the local level.

⁴⁷White-collar workers' share in 1990 times the estimated growth difference between treated-zones and synthetic control.

Figure 11: Higher-educated Population Share in Total Population in 2017 (not in school 16+)



7 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 1968-2014 period.

Our estimates provide the first causal evidence regarding the positive effects of French "new university" creation on local human-capital accumulation. Taking into account the upward trends in higher-education in the late 20th century, the results show that, on average, the creation of "new universities" increased the higher-educated population share by 3 points within 25 years. This represents a 17% increase from the counterfactual level: the average share of higher-educated population reached 21,6% in "new university" zones in 2014, though it would have been 18,5% without the U2000 Plan. This represents around 6,000 higher-educated individuals on average (see Figure 11 for effects in terms of population level).

We measure notable heterogeneity across zones. In six cases,⁴⁸ 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 45% of the respective counterfactuals). This represents around 7,700 more higher-educated individuals on average, in comparison to the counterfactual. In the three other cases, we cannot confidently conclude that there exists a significant "new university" effect on local human-capital accumulation.

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 middle-sized areas has a positive impact on local development by increasing human-capital accumulation. Moreover, exploring the employment implications of "new universities" creation, we found credible evidence that, on average, human-capital gains co-occurred with gains in skilled employment, providing some arguments against the idea that there is a mismatch between higher-education demand and supply in medium-sized cities containing universities. In terms of general employment, using the same synthetic control method, we show that average employment density in the treated zones was 6% higher in 2014 compared to the counterfactual (although we found no convincing impact on local unemployment on average). More specifically, we show that, on average, "new university" creation increased the white-collar workers population share by 1.6 points within 25 years. This represents a 16% increase from the counterfactual level.

The synthetic control method helps us to identify the causal effects of a university's creation, but it does not provide information about the mechanisms underlying local human-capital accumulation – nor about the implications for skilled employment. In particular, we cannot distinguish between direct and indirect causal effect. We do not know if the "new universities" create and/or attract and/or maintain higher-educated population in their zones. The underlying demographic causes could include the fact that newly higher-educated individuals decide to work and stay in the zone where they went to university, but also the fact that the existence of a university could be a positive signal that attracts new companies and higher-educated workers.

⁴⁸The 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.

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Appendices

A Trends in Higher-educated Population Share 1968-2014

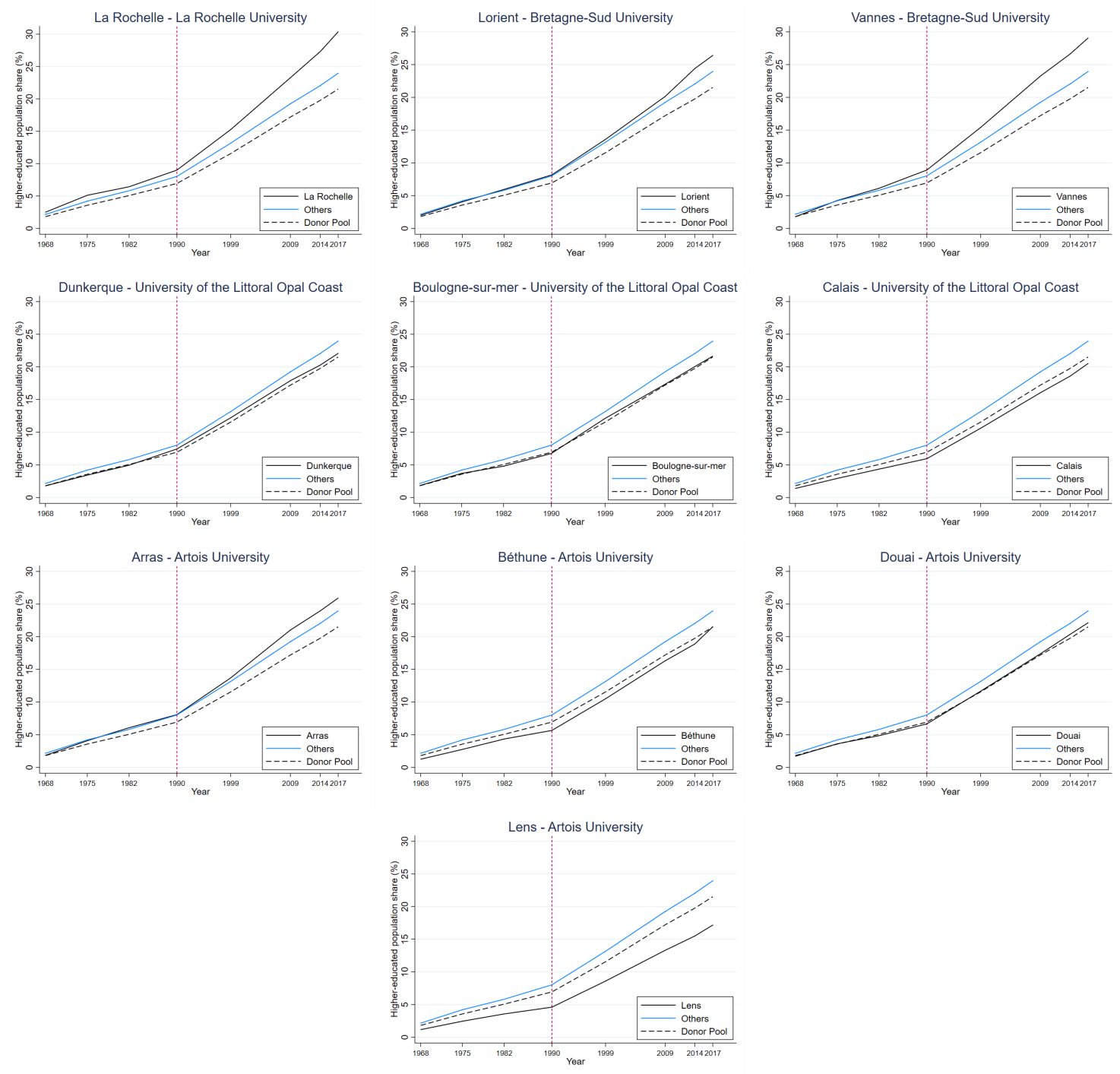


Figure 12: Trends in Higher-educated population share 1968-2014

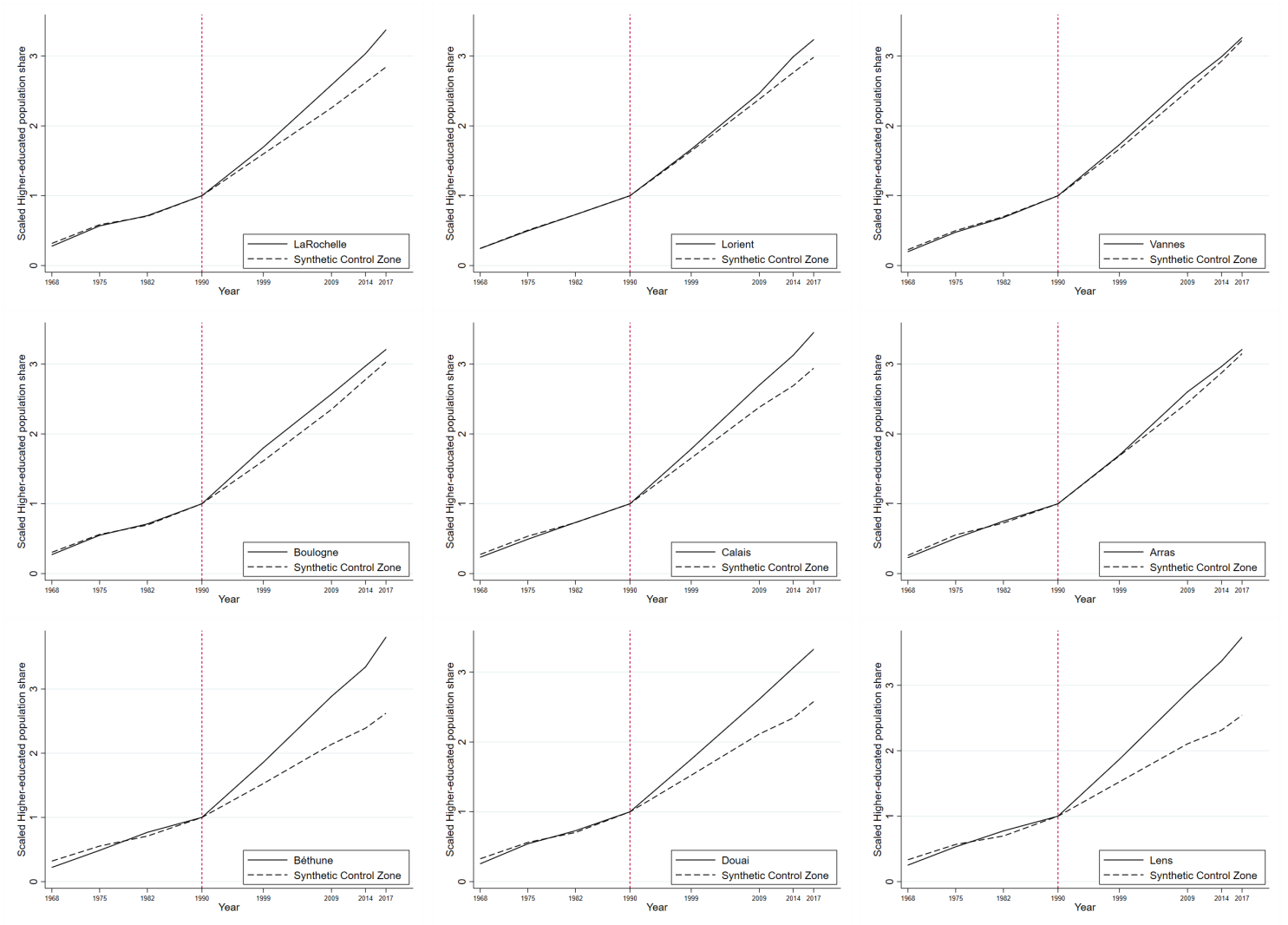


Figure 13: Trends in Higher-educated population share 1968-2014 (Scaled in 1990) - Synthetic Control Comparisons (Scaled in 1990)

B Fit & Balance

Table 5: Fit & 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)		0,033		0,067		0,019		0,029		0,041	
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)		0,065		0,022		0,059		0,005		0,020	
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.

C Estimated Effects by Zone with *p-values*

Table 6: Estimated gains (percentage points) with corresponding *p-values*

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

D In-Space Placebo Tests by Zone

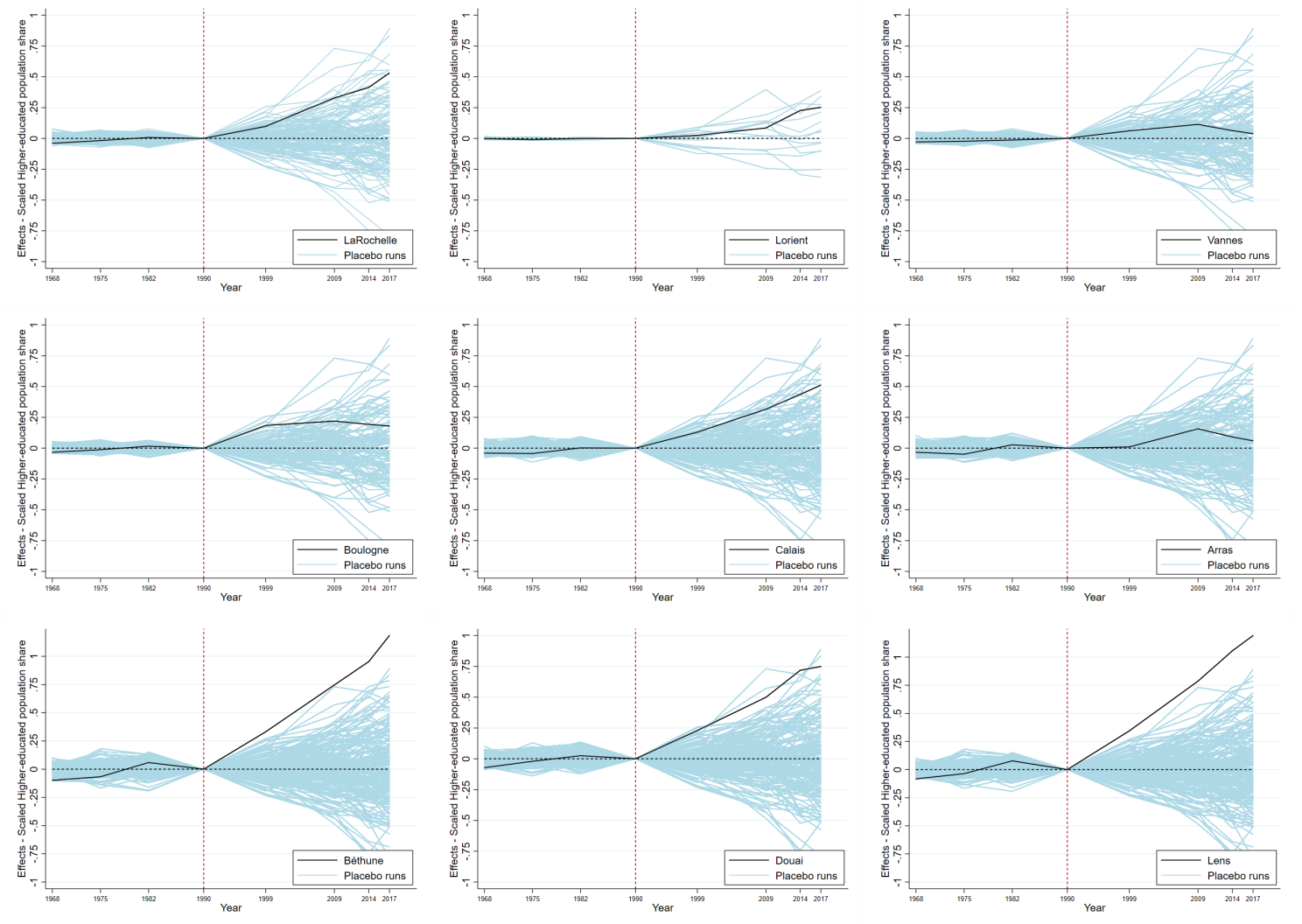


Figure 14: Gaps in scaled higher-educated population share - treated-zone vs. placebo tests ($<2 \times \text{RMSPE}$)

E In-Time Placebo Tests

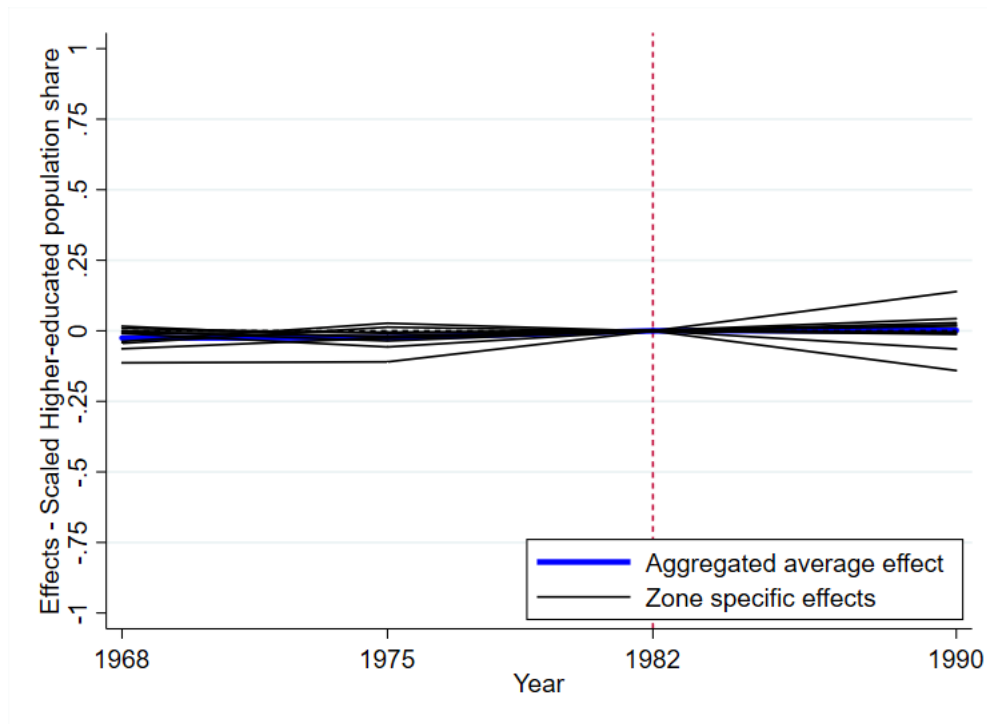


Figure 15: Local Human Capital Effects in "New Universities" Zones: Placebo 1982

F Synthetic Weights by Zone

Table 7: La Rochelle University

Employment-Zones	Donor Pool 1	Donor Pool 2	Donor Pool 3
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 8: Arras - Artois University

Employment-Zones	Donor Pool 1	Donor Pool 2	Donor Pool 3
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 9: Lorient - Bretagne Sud University

Employment-Zones	Donor Pool 1	Donor Pool 2	Donor Pool 3
Ternier	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 10: Vannes - Bretagne Sud University

Employment-Zones	Donor Pool 1	Donor Pool 2	Donor Pool 3
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 11: Lens - Artois University

Employment-Zones	Donor Pool 1	Donor Pool 2	Donor Pool 3
Alès	0	0	0,05
Istres - Martigues	1	1	0,95

Table 12: Boulogne - Littoral University

Employment-Zones	Donor Pool 1	Donor Pool 2	Donor Pool 3
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 13: Calais - Littoral University

Employment-Zones	Donor Pool 1	Donor Pool 2	Donor Pool 3
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 14: Béthune - Artois University

Employment-Zones	Donor Pool 1	Donor Pool 2	Donor Pool 3
Le Creusot - Montcea	0,100	-	-
Alès	0,068	0,339	0,409
Istres - Martigues	0,832	0,661	0,591

Table 15: Douai - Artois University

Employment-Zones	Donor Pool 1	Donor Pool 2	Donor Pool 3
Le Creusot - Montceau	0,075	-	-
Alès	0	0,084	0,158
Istres - Martigues	0,925	0,916	0,842

G Diff-in-Diff Event Study Design

Table 16: 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 ²	0.97

Notes. This Table presents Diff-in-Diff Event Study estimation results based on equation described in Section 5. 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.

H Employment Outcomes Effects by Zone

Table 17: Employment Outcomes Average Effects - Donor Pools comparisons

	Employment Density				White-collar workers share				Unemployment			
	RMSPE	1999	2009	2014	RMSPE	1999	2009	2014	RMSPE	1999	2009	2014
Donor Pool 1 (benchmark)	6,5 (0,000)	5,9 (0,028)	6,7 (0,039)	8,4 (0,028)	10,0 (0,001)	15,9 (0,002)	19,1 (0,002)	20,8 (0,001)	-10,4 (0,017)	-3,2 (0,448)	-5,4 (0,372)	-4,0 (0,473)
Donor Pool 2	7,2 (0,000)	6,9 (0,011)	8,0 (0,015)	9,8 (0,011)	9,9 (0,002)	15,1 (0,003)	18,2 (0,003)	19,8 (0,001)	-10,3 (0,019)	-2,6 (0,47)	-6,5 (0,302)	-4,8 (0,417)
Donor Pool 3	5,9 (0,000)	4,0 (0,000)	4,4 (0,000)	5,9 (0,000)	10,8 (0,002)	13,8 (0,011)	17,2 (0,011)	17,9 (0,006)	-4,3 (0,206)	5,6 (0,113)	4,6 (0,198)	7,4 (0,107)
Donor Pool 4	5,1 (0,004)	3,1 (0,164)	3,6 (0,165)	5,1 (0,119)	10,9 (0,001)	14,2 (0,006)	17,1 (0,007)	18,0 (0,004)	-3,9 (0,216)	5,4 (0,124)	4,9 (0,2)	7,3 (0,113)

Notes. We present the synthetic control results for our three different donor pools for the different census. Results are computed the same way as Table???. The magnitude of the 'new university' impact is measured as the outcome's trend deviation in the 'new university' zone compared to the counterfactual's trend. 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).

I Employment Outcomes In-Time Placebo Tests

Figure 16: In-Time Placebo Employment Density Outcome

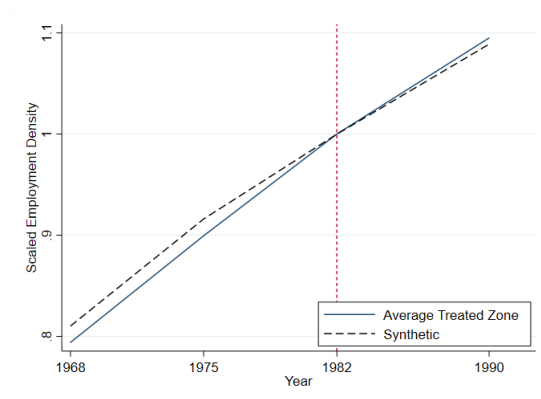


Figure 17: In-Time Placebo Unemployment Outcome

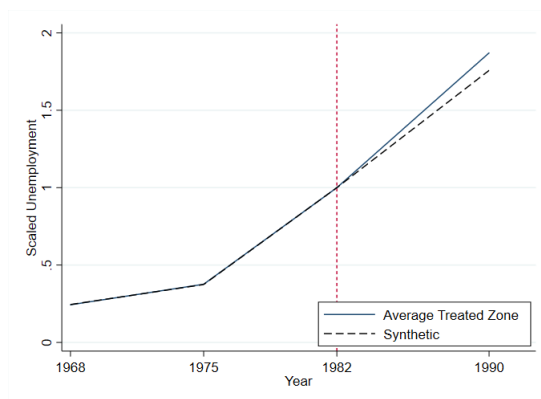


Figure 18: In-Time Placebo White-collar Workers Share Outcome

