Keeping up with the Joneses? The Rise of Modern Universities and Local Economic Development in Italy - online Appendix*

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A A brief history: origins and evolution of higher education in Italy

A1 Higher education after Italian unification: 1861-1923

Italy is the country with the longest tradition of formal university education in the world: 17 universities (out of the 78 recorded in HIU) date back to the 17^{th} century or even before. The oldest Studium Generale in Bologna, dates back to 1088. Among the most ancient universities we also find Parma, which was founded in 962 and Pavia, established in 1361. Several higher education institutions on the Italian territory were also established later on, during the Middle-Ages and Renaissance.

The university system at the onset of Italian unification was disciplined by the Law 13/11/1859, n. 3725 of the Kingdom of Sardinia (called Casati, from the name of the Minister of Education).[1] This law attributed the status of university education to four disciplines: Literary studies (which included Philosophy), Law, Medical Studies, and Natural Sciences (which included Mathematics and Physics). A disaggregated layer of governance within the university i.e. the "faculty" was held responsible of the organisation of teaching of the discipline. A fifth discipline, Theology, was organised in an autonomous faculty until 1873, when it was finally abolished. These four broader disciplines were the only ones deserving the status of academic studies. Other disciplines were considered as specific branches of the these four scientific fields. Specialised disciplines were often taught by ad-hoc schools.

For example, Pharmaceutical studies and Veterinary studies were offered by specialised schools run by the faculty of Natural Sciences in the local university.[2] Besides academic disciplines, the Casati Law also recognised the importance of applied disciplines such as Engineering and Architecture. These "applied studies" however did not deserve yet the status of university education. Degrees in these fields were granted by specialised schools, which however often operated within the University perimeter. The earliest examples of such schools are the Applied School for Engineers in Torino, (established in 1859, being transformed in the Polytechnic in 1906. See Dameri, 2006), which was later on followed by similar schools in Milano and Napoli (see Silvestri, 2006). [3]

With respect to technical education, higher education schools of Economics and Trade already existed in Venezia, Bari and Genova back from the 18^{th} century. The same holds true for schools of Agricultural Studies in Milano and Napoli. Strictly speaking, these schools offered degrees that are aimed at specific professional activities. However, these are formally outside of the perimeter of university education, as they depended on the

[1] While this Law sets the general framework of the Italian Hhigher education system, successive Laws (e.g. the Royal decrees 20/10/1860 no. 4373 (Mamiani) and 14/09/1862 no. 842 (Matteucci) describe the detailed set of rules to be implemented.

[2] The first veterinary schools date back to the 18^{th} century in Torino, Padova, Bologna, Modena and Napoli (see Cabassi and Liuzzo, 2001 for details).

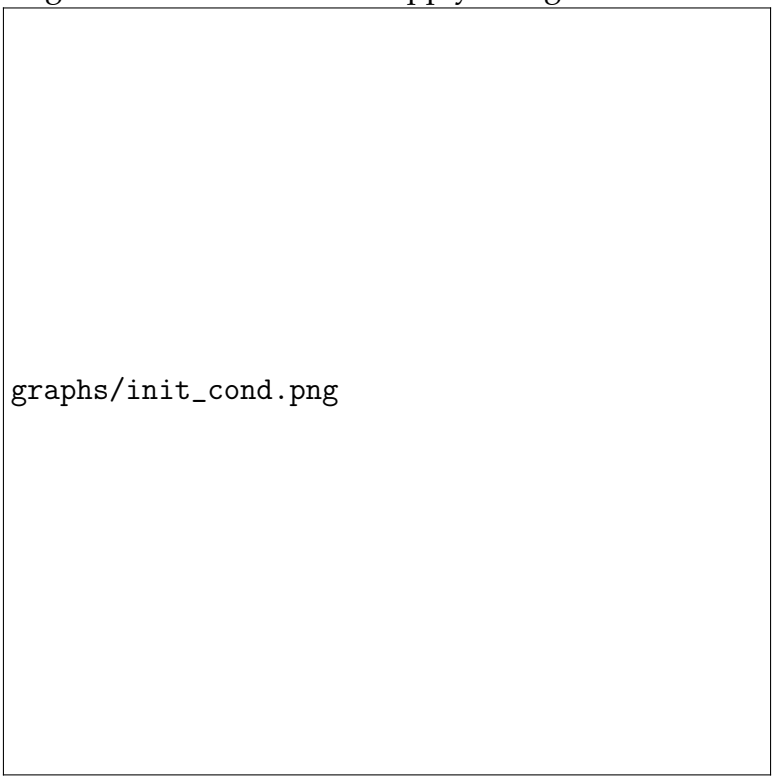
[3] To access the Engineering Schools, at least one biennium of studies at a Scientific Faculty was required. For the biennial School of Engineering in Torino the duration of the course is 5 years: two or three preparatory years of studies in math and physics plus a specialization diploma in engineering or architecture. See Brizzi and Romano (2007) for details.

Ministry of Agriculture, Trade and Industry rather than the Ministry of Education. They were often not fully funded by the state and were subject to *ad hoc* regulations. The Agricultural School of Milano, for example, became fully financed by the central state only in 1888, before it was mainly financed by the municipality and region. All in all, degrees offered by these schools did not have a university status as such, but were equivalent to a university degree to work in the public sector and access to specific professions (Bidolli and Soldani, 2001; Ritrovato, 2013). For this reason, to the purposes of mapping higher education institutions in Italy along 150 years of history, such specialised schools are to be considered by all means faculties i.e. autonomous providers of higher education.

The higher education supply the Italian Kingdom inherited by the pre-unitarian States was already relatively large and heterogeneous. There were more than 80 faculties already operating on the Italian territory, inherited by 7 pre-unitarian states (more than 10 if one considers each Papal State a political autonomous entity from the Vatican). The supply of faculties was rather disperse, being localised in the capital(s) of each pre-existing state. More importantly, faculties belonging to different states were very different in terms of internal organisation, autonomy, teaching and research standards, as they complied with the accreditation rules of their own state only.

Figure A-I describes the geographical distribution of the pre-unitarian supply of higher education (number of faculties) at the onset of Italian unification i.e. inherited from the pre-unitarian states.

Figure A-I: Pre-unitarian supply of higher education



Notes: Authors' calculation on HIU data, using map of Italian provinces in 2010.

Figure A-II: Pre-unitarian States

Source: Enciclopaedia Britannica

Figure A-II shows pre-unitarian political states that were present in the Italian territory before unification. Stars denote capitals of the pre-unitarian states i.e. Turin (Kingdom of Sardinia), Milan (Kingdom of Lombardy-Venetia), Parma (Duchy of Parma), Modena (Duchy of Modena), Lucca (Duchy of Lucca), Florence (grand Duchy of Tuscany), Rome (Papal States), Naples (Kingdom of 2 Sicilies).

One of the main tasks of the first Italian government was to deal with this highly heterogeneous system. The Casati Law sets out the rules for accrediting pre-existing institutions into the Italian university system. This law was initially applied to the new territories of the Kingdom of Sardinia. The successive Matteucci Law in 1862 extended the Casati Law to all territories that gradually entered the Italian Kingdom. The Casati-Matteucci Laws had three main objectives: (i) identifying a core set of A-level institutions. These would have outstanding teaching and research quality standards, and would be entirely financed by the State; (ii) denoting a second tier of B-Universities, that do not match such high quality standards, but are still considered useful local providers of university education. Accordingly they are partly financed by the State, while heavily relying on funding from local entities (such as banks and chambers of commerce). Both A-level and B-level institutions have the rank of *Royal Universities*. The Casati-Matteucci framework identified those public universities, which did not reach the minimum quality standards to be considered Royal universities. These C-level institutions should have been closed.

Panel A in Table A-I below, reports the classification of universities in A-B-C categories according to the Casati-Matteucci laws. Among A-level institutions, we find the

main Universities of the Centre-Northern pre-unitarian States i.e. the former Kingdom of Sardinia (e.g. the University of Torino), Lombardy-Venetia (e.g. the Scientific Academy, which will become University of Milano in 1923 and the Polytechnic of Milano, the University of Pavia), Gran Duchy of Tuscany and some Papal States. The Law also classified as A-level the universities located in the capitals and largest cities of the Vatican and Kingdom of Two Sicilies i.e. Universities in Roma, Napoli, the Academy of Bari, and Palermo. Finally, the Universities of Macerata and Sassari were evaluated as falling short of the minimum requirements set out by the Casati Law to become universities of the Italian Kingdom. So they were classified as C-level institutions, which should be abolished altogether. The Casati-Matteucci framework also defined the requirements for "free" (private) universities, i.e. institutions granting university level degrees, which were not financed by the State. At the onset of Italian unification there were four private universities only: Ferrara, Camerino, Urbino, and Perugia. These became public later on in Italian history, meanwhile new private universities were established.

The Casati Law introduced a clear ranking in the Italian university system: out of the 25 public universities inherited by pre-unitarian States, less than the 50% was considered A-level. Successive laws legislated the entry into the Casati-Matteucci framework of universities from annexed territories (e.g. Bologna, Padova). In the next three decades, small corrective laws were introduced, such as the "Coppino" Law 15/07/1877, and a successive law in 1901, which gradually dismantled the Casati framework. Several B-level and C-level universities were "promoted" to higher ranks, so that by 1902 all universities in the kingdom were ranked A-level, the only exceptions being universities in Firenze, Venezia and the Polytechnic of Torino, which were still ranked B-level. Out of three institutions, categorised as C-level by Casati-Matteucci, only the University of Foggia was effectively closed.

No major changes in the Italian university system were introduced until the R.D. 2102/1923 (the "Gentile" Law, by the name of the Ministry of education at that time)[4]. The Gentile Law partly restored the Casati framework, re-introducing a distinction between A-level and B-level universities. A-level institutions needed to have all four major faculties in place, and were entirely financed by the State. [5] The picture emerging from the Gentile Law is shown in Table A-I, Panel B. The group of A-level universities included those identified by the Casati Law. As an exception the Polytechnic of Milano was downgraded to B-level. The A-group was however expanded to include the Polytechnic of Torino, the Architecture Institute in Venezia (which had just acquired academic ranking), the Universities of Cagliari and Genova (B-level under the Casati Law), and the new

[4]The Royal Decrees 09/08/1910 no. 795, 796, 808 simply acknowledge the legislative framework created by the Casati-Matteucci Laws and the successive modifications, and make a precise list of active higher education institutions (royal universities and royal schools) active in the Italian Kingdom. Moreover in 1913 the Schools of Economics acquire the status of higher education institutions, under the governance of the Ministry of Agriculture.

[5]Besides, the Gentile Law entices a substantive reorganisation of the university system: Napoli Parthenope is established as a new university. The University of Trieste is also added, upon annexion to Italian territory. Universities of Bari and Milano are built upon pre-existing academies. Moreover, specialised institutes in the fields of architecture, economics and trade, pedagogical studies are finally granted university status. In 1924 the first school of political sciences is established in Roma, which becomes a university faculty in 1925 (See Brizzi and Romano, 2007 for details).

universities Napoli Parthenope and Trieste. Universities of Parma, Modena and Reggio Emilia, Macerata, Sassari, Messina, Catania that were upgraded to A-level during the two parification waves in 1887 and 1901 were downgraded again to B-level.

Table A-I: Quality assessment of public universities in the Kingdom of Italy:

	Panel A: Quality assessment by Casati Law (1859)
A-level Univ.	Torino, Milano Ac.; Milano Poly.; Pavia; Padova; Bologna; Pisa; Roma; Napoli; Napoli Eastern St.; Napoli II; Bari Ac.; Palermo;
B-level Univ.	Torino Poly; Genova*; Venezia; Parma*; Modena and Reggio*; Firenze; Siena*; Messia*; Catania*; Cagliari^{+}.
C-level Univ.	Macerata**, Sassari**, Foggia$^{\#}$
	Panel B: Quality assessment by Gentile Law (1923)
A-level Univ.	Torino; Torino Poly; Genova, Pavia, Venezia-Arch., Padova, Trieste, Bologna; Pisa, Roma, Napoli, Napoli Eastern St.; Napoli II; Napoli Parth., Bari, Palermo, Cagliari
B-level Univ.	Milano; Milano Poly.; Venezia; Parma; Modena and Reggio; Macerata; Firenze; Siena; Perugia; Messina; Catania; Sassari.

Notes:. $*$: upgrade at A-level in 1886;$+$: upgrade at A-level in 1901; $**$: double upgrade at B-level in 1886, and A-level in 1901. All universities upgraded at A-level in 1935. #: closed.

Figure A-III shows the evolution of the number of faculties for each region, this is useful to grasp the variation in the data by region over time.

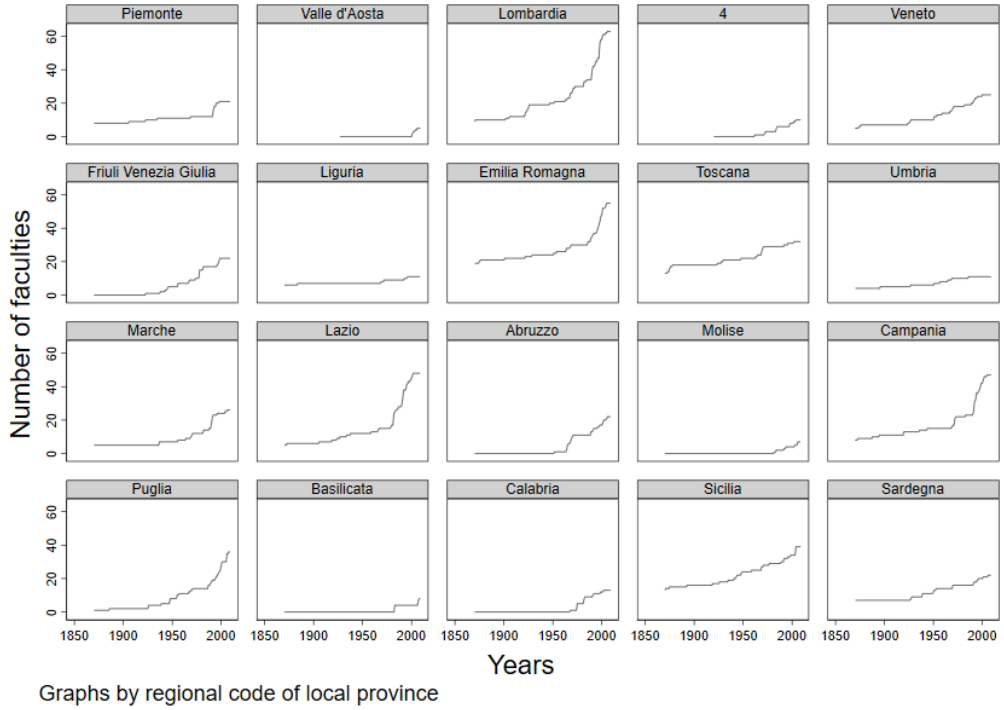
A2 Higher education reforms during 1923-2010

The legislative framework set out by the Gentile Law remained roughly unchanged until the Royal Decree 1592/1933 (known as the De Vecchi-Bottai reform) and subsequent ancillary laws which span over the next five years. This imposed a highly centralised system, without any residual substantial autonomy of universities in their decisions about their internal organisation and curricula. For the first time, by the end of 1938 all the technical disciplines in that 'grey' zone (part of the tertiary education system but not organically included in the university system) gained university status.

Accordingly, the number of academic faculties increases from 4 to 11. The new 7 are existing schools that gained the status of faculty (Political Science, Economics, Veterinary Medicine, Pharmacy, Engineering, Architecture, Agrarian). The "fascist" law De Vecchi of 1935 provided that all institutes were aggregated to the university districts, that is, they could no longer be institutes or royal schools. The schools or the institutes offering these diplomas lost their autonomy, being aggregated as additional faculties to existing universities.

The core of most recent reforms is very well described by Braga et al. (2013), who collect detailed information from the Eurydice database (See Appendix A of Braga et al., 2013 for a comprehensive description of sources). Except for some major interventions, the core of the 1933 reform survived until the mid '90s. In particular, until the end of the '60s, the university system remained substantially unchanged, except from an increase in the number of students due to changes in enrollment requirements. In that period there

Figure A-III: Evolution in the supply of higher education by region over time



Source: Author's calculations on HIU data

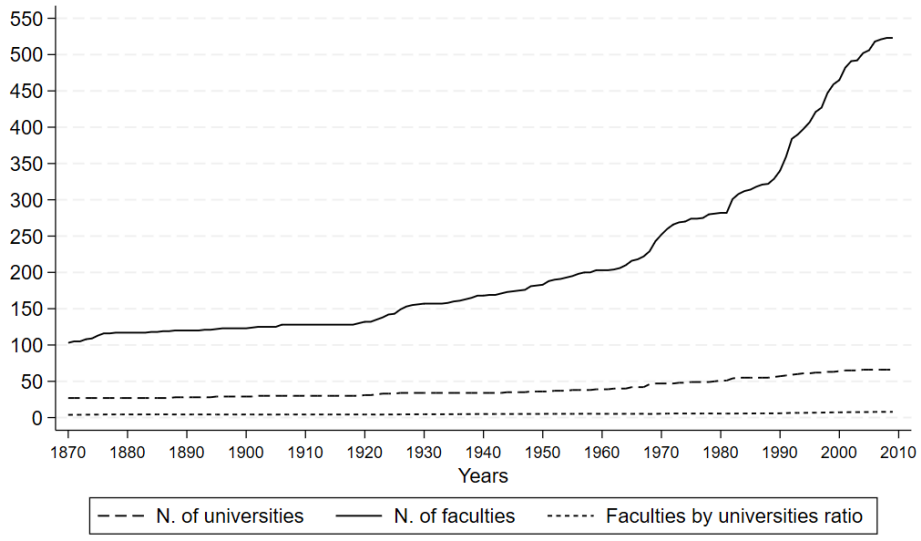
has been two attempts of major reforms to actuate the constitutional principle of university autonomy. However, these projects of reorganisation were ineffective due to the lack of political support in the Parliament. Instead, there were a multiplication of *ad hoc* or 'urgent' normative interventions to adapt to the exponential increase in the population of students, without any organic reform in the university governance, curricula etc.

Instead, a key turning point was the Law 910/1969, which liberalised the university access to all students with a 5 year diploma of secondary education, including those from technical schools that before 1969 did not allow university enrolment. This led to a significant surge in the university student population. Consequently, it exerted substantial pressure on universities, as well as on social, economic, and political authorities. They were compelled to reconfigure the provision of tertiary education in response to the overwhelming surge in demand for university placements. In essence, it was the point in which the Italian university system, still internally organised to serve the 'elite', was asked to provide tertiary education for the 'mass'. How the system responded to this shock is detailed in Figure A-IV, which shows a tremendous increase of university faculties after 1969.

This figure shows the supply reaction to the initially moderate and then more pronounced demand shift from an "elite" to a "mass" university system occurred in those years.

Another important feature of higher education systems is that the (rise in the) number of universities did not fully account for the (expansion in the) supply. As shown by Figure

Figure A-IV: Evolution in the supply of higher education 1870-2010 in Italy: n. faculties, universities and faculties by university ratio



A-IV an appropriate metric to analyse supply dynamics is the number of faculties, which increased much more than that of universities, especially in the case of Italy. Unsurprisingly, this reflects into higher average number of faculties per university over time (which passes from 3.6 in 1870 to 7.3 in 2009). In this respect, the number of faculties accounts for both the intensive margin (new faculties in existing universities) and the extensive one (new universities consisting of new faculties), and provides a more effective way of measuring changes in the provision of higher education.

For these reasons, in the 70s and in the '80 more substantial interventions were implemented. First, the Law no. 766/1973 introduced, among other things, the possibility of opening new faculties and locations to harmonise the geographical diffusion of universities. Second, the Presidential Decree No. 382/1980 authorised, on an experimental basis, a departmental structure with financial and administrative autonomy to coordinate research activities, and created a range of new collegiate bodies such as the degree course councils to oversee teaching activities and coordinate coursework and students' study plans. Third, the law 168/1989 established the Ministry of Universities, Scientific and Technological Research to coordinate university activities and allocate funding.

It also increased the institutional, administrative and cultural autonomy of universities by allowing areas which were previously subject to national regulations to be covered by the university statutes. Fourth, two law interventions in 1990 obliged universities to set up triennial development plans and allowed them to promote a mild reorganisation of teaching and curricula.

It is only in the '90s (about 30 years later the failed attempts of the '60s) that the process of reform of the national university system produced a new institutional setting, which passed through many intermediate steps and contradictions. The main features of the reformed system were introduced, first, by the Law 59/1997 (the so-called 'Bassanini liberalisations'), which granted universities financial and teaching autonomy in an attempt

Table A-II: Dates of Creation and Disruption of Theology Faculties

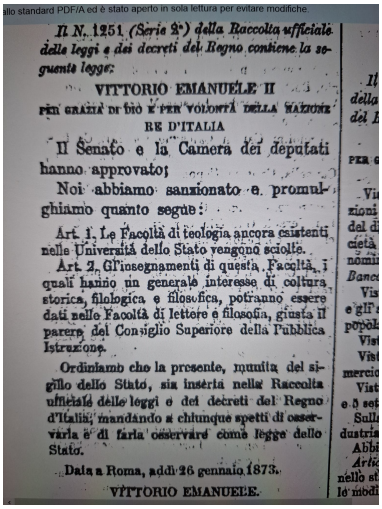
[1] Province	[2] Code	[3] Year of Foundation	[4] Year of Closure
Bologna	BO	1364	1859
Napoli	NA	1224	1861
Parma	PR	1412	1859
Modena	MO	1682	1859
Macerata	MC	1540	1859
Torino	TO	1404	1873
Genova	GE	1471	1873
Cagliari	CA	1620	1873
Pavia	PV	1361	1797
Pisa	PI	1343	1873
Siena	SI	1408	1873
Palermo	PA	1550	1873
Catania	CT	1434	1873
Sassari	SS	1632	1873
Messina	ME	1838	1873
Padova	PD	1363	1873
Perugia	PE	1371	1811
Ferrara	FE	1391	1859

to simplify and deregulate public administration [6], and fully implemented with a major reform in 1999, followed by a tuning intervention in 2004. Indeed, the Ministry Decree 509/1999 gave substantial content to the Constitutional principle of university autonomy, establishing only rather general principles and requirements, but leaving the universities free to decide about their organisation in faculties and curricula, being subject only to budget constraints, plus additional requirements (e.g. equilibrium between the number of Faculty members and the number of curricula, the formal development of medium term strategic plans, etc.).

A3 History of Faculties of Theology

At the time of Italian unification (1860–1870), many universities in Italy had a faculty of theology. This was true not only for universities located in the former Papal States but also for those in the Kingdom of Sardinia and other pre-unification states. During the Napoleonic era, all state universities within the empire's territories comprised five faculties: theology, law, medicine, sciences, and literature. Looking further back in Italian history, nearly all universities founded during the Holy Roman Empire in the 14th and 15th centuries included a theology faculty, often from their inception. This was also the

[6]The development of curricula, previously defined by rigid tables established by the Ministry, was now the responsibility of individual universities which were guided by very general national regulations. The laws provided norms for the development, planning and assessment of the university system and its activities and reorganised the university councils to make their representation more balanced.



Il N. 1251 (Serie 2ª) della Raccolta ufficiale delle leggi e dei decreti del Regno contiene la seguente legge:

VITTORIO EMANUELE II
PER GRAZIA DI DIO E PER VOLONTÀ DELLA NAZIONE
RE D'ITALIA

Il Senato e la Camera dei deputati hanno approvato;

Noi abbiamo sanzionato e promulghiamo quanto segue:

Art. 1. Le Facoltà di teologia ancora esistenti nelle Università dello Stato vengono sciolte.

Art. 2. Gl'insegnamenti di questa Facoltà, i quali hanno un generale interesse di coltura storica, filologica e filosofica, potranno essere dati nelle Facoltà di lettere e filosofia, giusta il parere del Consiglio Superiore della Pubblica Istruzione.

Ordiniamo che la presente, munita del sigillo dello Stato, sia inserta nella Raccolta ufficiale delle leggi e dei decreti del Regno d'Italia, mandando a chiunque spetti di osservarla e di farla osservare come legge dello Stato.

Data a Roma, addì 26 gennaio 1873.

VITTORIO EMANUELE.

Figure A-V: Law No. 1251, January 26, 1873, stating the suppression of Faculties of Theology

case for many of the earliest *Studium* institutions established between the 11th and 13th centuries.

In the period immediately preceding unification, universities with a theology faculty included Bologna, Cagliari, Catania, Genoa, Ferrara, Macerata, Messina, Modena, Naples, Padua, Palermo, Parma, Pavia, Pisa, Sassari, Siena, and Turin. (Notably, the Faculty of Theology in Perugia had already been closed in 1811 — see Table A-II.)

Initially, the Casati Law of 1859 — legislation from the Kingdom of Sardinia that defined the structure of its university system — recognized theology as one of the five standard faculties within each university. These faculties were: theology; law; medicine; mathematical, physical, natural sciences; and humanities. However, theology faculties quickly declined. As the Casati Law was extended to new territories incorporated into the Kingdom of Italy, several theology faculties were closed when existing universities were absorbed into the new state system. This was the case for Bologna, Ferrara, Naples, Parma, Modena, and Macerata.

Additionally, several legislative measures further contributed to the decline of theology faculties. In 1862, university professors' salaries were significantly increased by law, with the exception of theology professors. Moreover, retiring theology professors were not replaced due to a hiring freeze, which meant that some faculties lacked the necessary teaching staff to offer degrees.

The decline was also reflected in enrollment figures. By 1870, only ten students were enrolled in theology programs across all universities that still offered the degree. As a result, some theology faculties lost government funding due to a lack of students.

Ultimately, theology as a university faculty or degree program was abolished in 1873 (Law No. 1251, January 26, 1873; see Figure A-V) as part of broader reforms under the newly unified Kingdom of Italy. Beyond the negligible student enrollment figures, this decision was driven by a deliberate effort to secularize education and reduce the Catholic Church's influence in public institutions.

B Data Appendix

B1 The History of Italian Universities (HIU) Register data

The register dataset on the History of Italian Universities (HIU) contains detailed and complete information on institutions providing higher education in Italy, disaggregated at the faculty level over the period 1000-2010. The register includes the following information:

- University name.
- Faculty name.
- 15 faculty field identifiers (Agricultural studies, Architecture, Chemical and Pharmaceutical studies, Economics and Statistics, Physical Education, Geo-Biological studies, Law, Engineering, Educational studies, Literary studies and Philosophy, Foreign Languages, Medicine, Political Sciences, Psychology, and Mathematical Sciences), which we aggregated into 7 teaching areas (Socio-Economic area, Physical Education, Law, Engineering and Architecture, Medicine, Sciences, and Humanities.) and 2 macro-areas of science (STEM - Agricultural Studies, Architecture, Chemistry, Pharmacy and Medical Studies, Geology and Biology, Engineering and Scientific Studies - and NO STEM - Social Sciences and Humanities -), according to the classification used by the Italian National Statistical Office.
- Year of establishment of the faculty. This is recorded as the year when the faculty is formally established as a provider of a higher education degree. Alongside with this basic information, we recorded other potentially important ancillary dates i.e. whether the faculty was built upon a pre-existing major of studies (e.g. belonging to an existing faculty), the year the faculty was formally recognised as a provider of University education, the date(s) when the faculty became part of a different university.
- Address of the university.
- Address of the faculty.

The final registry includes 554 faculties and (in) 72 universities providers of education equivalent to a standard bachelor registered on the Italian territory at some point between 1000 and 2010. We exclude universities or schools offering only post-graduate education programs (e.g., Scuola IMT Alti Studi Lucca, Scuola Normale di Pisa), enrolling foreign students only (e.g., Università per Stranieri di Pisa, di Perugia, di Reggio Calabria), or offering only degrees in very narrow and specialized disciplines (e.g., Università di Scienze Gastronomiche di Pollenzo). We also exclude the eleven so-called *università telematiche*, i.e. institutions established in 2003 and offering only online teaching and degrees (e.g., Università Telematica e-Campus, Università Telematica Pegaso, Università Telematica Mercatorum).

While they track very precisely the creation of new higher education institutions during Italian history, as well as their change in status and governance, our data record only

seven cases of effective faculty closures. Four engineering faculties were closed due the re-organisation of the Polytechnic of Milano, which in 2000 closed down campuses in Como and Lecco and opened brand new faculties in the Milano area. The faculties of Environmental Sciences and Mathematical Sciences in Urbino were suppressed in 2006. This may underestimate the actual closure higher education institutions. As a matter of fact, our sources do not allow to map closures as precisely as start-ups. However, none of our original sources mentions significant waves of closure of HE institutions during Italian history (see Brizzi and Romano, 2007 Volume 3 for details.).

Our data do not record changes in the exact address of each university and each faculty at each point in time i.e. do not record changes of address over time. The university address is identified by the address of the university dean, and the faculty address is the address of the faculty dean. Both are collected as for 2010.

B2 Neighbourhood and distance matrices

We constructed two alternative local interaction matrices. The first one (1) is a simple contiguity matrix available from ISTAT. The second one (2) is a distance matrix, which contains information on (a) linear distance, (b) travel distance, and (c) travel time. We computed distances using the Google Maps API Geometry Library, and Google Maps Distance Matrix API, respectively.

- Contiguity matrix. Each province i is matched to (the HIU indicators of) its neighbours, which we define as provinces j that share a border with province i. Notice that due to the process of provinces creation discussed above, the neighbours of each province i in most cases change over time. In practice, consider the example of province k, which is a neighbour of province i at time t. Imagine that at time $t+1$ a new province z is established, which covers the geographical territory of k that shares a border with i. Our data register these changes overtime so that until time t province k is recorded as being neighbour of province i, while starting from time $t+1$, k is no longer adjacent to i, while province z appears in the data, which shares a border with i. In the process, we always follow provinces overtime and register changes in the names. Accordingly we do not lose prior history of a province as this one changes name (e.g. Aosta to Valle d'Aosta).

- Linear distance matrix. Each province i is matched to (the HIU indicators of) all other provinces $j \neq i$, and for each ij couple, the linear distance is recorded between i and j. This is the distance in Km calculated "on-air", by drawing, and measuring the length of a straight line between the capitals of province i and province j (*capoluoghi di provincia*). Notice that, as long as the capitals of provinces do not change over time, the distance between provinces remains constant over our sample. In the case of provinces with multiple "*capoluoghi*", the largest one is considered as capital. However there are only two cases in Italy (Barletta-Andria-Trani, and Pesaro-Urbino).

- Travel distance matrix. Each province i is matched to (the HIU indicators of) all other provinces $j \neq i$, and for each ij couple, the travel distance is recorded be-

tween i and j. This is the lowest distance in Km that one needs to travel from/to i to/from province j, with whatever transport available (plane, car, train). Notice that these distances are recorded in 2016, so they take a cross-sectional picture of travel connections between Italian provinces in that specific year i.e. they do not take into account the process of infrastructures building that has occurred during Italian history. The same convention as in the case of linear distances applies to Barletta-Andria-Trani, and Pesaro-Urbino.

- Travel time matrix. Each province i is matched to (the HIU indicators of) all other provinces $j \neq i$, and for each ij couple, the travel time is recorded between i and j. This is the lowest time in minutes, that one needs to travel from/to i to/from province j, with whatever transport available (plane, car, train). Also travel time is recorded in 2016, so it does not take into account the process of infrastructures building and innovation that has occurred during Italian history. The usual convention as in the case of distances applies to Barletta-Andria-Trani, and Pesaro-Urbino.

B3 Historical political color of the province

We web-scraped data from the historical portal of the House of Representatives of the Italian Parliament $https://storia.camera.it/$ the individual information on all Italian Deputies of the first 16 legislatures of the Italian Kingdom (i.e. from legislature 8^{th} (1861-65) to 13^{th} (1876-1880)). We have complemented these data with additional information (e.g. taken from Wikipedia) on the political party (or more in general his ideological affiliation) of each deputy. We assigned each deputy to the province of birth as in the overwhelming majority of instances, this was the province where candidates for deputies would run and get elected. We have then assigned each deputy to four main political groups or ideological affiliations: "historical left", "historical right", "liberals and centrists", "republicans and radicals". We classified as "independents" those deputies that would not have any specific party affiliation or a clear ideological inclination that would correspond to the four political groups mentioned above. For each province we have computed the total number of deputies belonging to one of the five groups. Finally, we have classified each province as being historically left-wing or right-wing, depending on whether the majority of locally elected deputies ($50\% + 1$) would belong to one of these two parties. Shares of left-wing and right-wing deputies are reported in Columns [1] and [2] of Table A-III below. Values of a dummy equal to one for left-wing and right-wing provinces respectively are reported in Columns [3] and [4] of the same Table. Notice that some provinces are not classified either as left-wing or right-wing. This is due to relatively high shares of deputies in the other three groups, which do not allow left-wing or right-wing parties to have majorities according to our rule of thumb (50%+1 of elected deputies).

Based on the information summarised in Table A-III below we distinguish neighbouring provinces j that have the same political color as province i (i.e. i and j both right-wing or both left-wing) from neighbouring provinces that have different political color (i.e. j right-wing if i left-wing and vice-versa). The exact definition of the variable is summarised in the next section.

Table A-III: Historical political color of Italian provinces – Elected Deputies 1861-80

[1] Province	[2] Share left	[3] Share right	[4] Leftwing province	[5] Right-wing province
Agrigento	0.86	0.00	1.00	0.00
Alessandria	0.68	0.21	1.00	0.00
Ancona	0.22	0.50	0.00	0.00
Ascoli Piceno	0.58	0.42	1.00	0.00
Aquila	0.43	0.43	0.00	0.00
Arezzo	0.00	1.00	0.00	1.00
Avellino	0.25	0.50	0.00	0.00
Bari	0.00	0.50	0.00	0.00
Bergamo	0.63	0.38	1.00	0.00
Belluno	1.00	0.00	1.00	0.00
Benevento	1.00	0.00	1.00	0.00
Bologna	0.29	0.41	0.00	0.00
Brescia	0.48	0.48	0.00	0.00
Cagliari	0.50	0.50	0.00	0.00
Campobasso	0.86	0.14	1.00	0.00
Cesena	0.33	0.42	0.00	0.00
Chieti	0.52	0.26	1.00	0.00
Caltanisetta	0.43	0.57	0.00	1.00
Cuneo	0.59	0.35	1.00	0.00
Como	0.17	0.42	0.00	0.00
Cremona	0.33	0.67	0.00	1.00
Cosenza	0.33	0.67	0.00	1.00
Catania	1.00	0.00	1.00	0.00
Catanzaro	0.36	0.64	0.00	1.00
Forlì-Cesena	0.00	1.00	0.00	1.00
Ferrara	0.00	1.00	0.00	1.00
Foggia	0.00	1.00	0.00	1.00
Firenze	0.11	0.89	0.00	1.00
Genova	0.57	0.39	1.00	0.00
Grosseto	0.00	0.57	0.00	1.00
Lecce	0.50	0.50	0.00	0.00
Livorno	0.56	0.44	1.00	0.00
Lucca	0.33	0.11	0.00	0.00
Macerata	0.00	0.50	0.00	0.00
Messina	0.53	0.47	1.00	0.00
Milano	0.18	0.68	0.00	1.00
Mantova	0.67	0.25	1.00	0.00
Modena	0.00	1.00	0.00	1.00
Napoli	0.43	0.43	0.00	0.00
Novara	0.43	0.43	0.00	0.00
Palerno	0.59	0.36	1.00	0.00
Piacenza	0.00	0.75	0.00	1.00
Padova	0.00	1.00	0.00	1.00
Perugia	0.22	0.57	0.00	1.00
Pisa	0.00	0.60	0.00	1.00
Parma	0.64	0.36	1.00	0.00
Pesaro-Urbino	0.00	0.75	0.00	1.00
Pavia	0.71	0.29	1.00	0.00
Potenza	0.93	0.00	1.00	0.00
Ravenna	0.43	0.57	0.00	1.00
Reggio Calabria	1.00	0.00	1.00	0.00
Reggio Emilia	1.00	0.00	1.00	0.00
Roma	0.31	0.69	0.00	1.00
Rovigo	0.25	0.75	0.00	1.00
Salerno	0.80	0.20	1.00	0.00
Siena	0.44	0.33	0.00	0.00
Siracusa	1.00	0.00	1.00	0.00
Sassari	0.88	0.13	1.00	0.00
Teramo	0.50	0.50	0.00	0.00
Torino	0.47	0.34	0.00	0.00
Trieste	0.00	1.00	0.00	1.00
Udine	0.08	0.75	0.00	1.00
Venezia	0.00	1.00	0.00	1.00
Vicenza	0.50	0.00	0.00	0.00
Verona	1.00	0.00	1.00	0.00
Total	0.43	0.46	0.37	0.35

Note: Authors' calculations based on data from Camera dei Deputati and Wikipedia. In Columns [1] and [2], by province of birth, we have the share of deputies elected in the Lower House of Italian Parliament between 1861 and 1880 belonging to the left or the right. In Columns [3] and [4] we have a dummy equal to 1 if the province is classified as historically left-wing, or right-wing, depending on the 50%+1 of its candidates.

B4 Socio-economic province level variables

We collected the following historical indicators on province level economic and social characteristics. Some information were available from Unioncamere (2011). Other information was retrieved from Census data, covering the period 1861-2010 (unbalanced at the province level). The collection years are 1861, 1871, 1891, 1901, 1911, 1921, 1931, 1936, 1951, 1961, 1971, 1981, 1991, 2001, 2011. Census data are not available for 1881, so we retrieved them by linear interpolation; as well, we attribute the 2011 census values to 2010 information on higher education (number of faculties and so on), at the province level. Other information was collected from historical sources. Below you may find the detail of the variables used in the analysis with source.

- No. of A-B-private universities in the province. This indicator is constructed based upon the Casati ranking (1859) and its successive updates in 1877 (Coppino), 1900 (Galli), 1923 (Gentile), and 1933 (De Vecchi-Bottai) (Source: Unioncamere, 2011).

- Total population: Population of residents in the province, all ages (Source: Unioncamere, 2011).

- Population in the 0-14 cohort. Population of residents aged 0-14 in the province (Source: Italian Census data, 1951-2010).

- Population 800-2010. Historical population based on estimated gridded data (Source: History Database of the Global Environment -HYDE 3.2).

- Population density. Population density is defined as inhabitants per km^2 and it is calculated as the ratio between population and province area in Km^2. (Source: Italian Census data, 1861-2010).

- Urbanisation rate. Percentage of the provincial population resident in an urban area with more than 6000 inhabitants (Source: Italian Census data, 1861).

- Higher education. Population with tertiary education as a percentage of total population in the province (Source: Italian Census data, 1951-2010).

- Provincial VA per capita (worker). i.e. total provincial VA divided the total population (active population) of the province (Source: Unioncamere, 2011). Original historical series expressed in nominal terms (in lira, current values). Real figures were obtained by applying the VA deflator at constant 1911 prices, available from ISTAT.

- Provincial participation rates. Active population, as a percentage of total population (Source: Unioncamere, 2011).

- Share of active population in agriculture industry services. Number of workers in agriculture industry services as a share of total workers (Source: Unioncamere, 2011).

- Index of relative industrialisation. The index is calculated as an ersatz index of specialisation obtained as the ratio of the province's share of the national industrial value added to the share of the male population over age of 15 using Italian Census data from 1881, 1901 and 1911. We then use the average over the three censuses (Source: Ciccarelli and Fenoltea (2013)).

- Distance from Bologna. Linear distance between the capital of each province and the city of Bologna (Source: GoogleMaps).

- Distance from the Capital of the Pre-Unitarian State. Linear distance between the capital of each province and capital of Pre-Unitarian States (Source: GoogleMaps).

- Distance from Roma. Linear distance between the capital of each province and the city of Roma (Source: GoogleMaps).

- Academic Notability Index. Indicators of academic notability of the local university developed by De la Croix et al. (2024). We attribute the university level index to the local province, and assign zero to provinces without a university, or with an "obscure" university in the sense of De la Croix et al. (2024).

- Urban Population Growth. Indicator taken from the Italian Urban Population Database 1300-1861, developed by Malanima (1998). The indicator we use measures population changes for urban areas i.e. cities characterized by more than 5000 inhabitants between 1800 and 1861.

- Urban Wages' Growth. Growth rate of wages of bricklayers/masons in former broad areas of "Piemonte" (covering current regions of Piemonte and Val d'Aosta) "Lombardia" (covering the current Lombardia region), "Sud" (covering current regions Lazio, Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sicilia, Sardegna) "Toscana" (covering Toscana, Umbria Marche), "Genova" (covering current Liguria) "Venezia" (covering current Veneto, Emilia Romagna, Trentino, Friuli-Venezia Giulia). Data on Piemonte, Lombardia, and Sud are taken from Malanima (2006). Data from Toscana, Genova, Venezia are taken from Malanima (2003).

- Political color of the province. The political color of a province is defined based upon the party (historical left or historical right) of the 50%+1 of the deputies from this province elected in the parliament of the Italian Kingdom between legislatures VIII (1861-65) and XIII (1876-80). (Source: Senato (Upper House) and Camera dei Deputati (Lower House) Historical Archives and Wikipedia).

- Out-migration rate. Emigration rates at the province level are defined as migrants over total population. The data are available for the 69 pre-unitarian provinces (Source: Gray et al. (2019)).

- Railway Endowment. Railway extension in Italian provinces at 1913 borders for the years 1839-1913. (Source: Ciccarelli and Groote (2017)).

- Average altitude of province. Indicator constructed as the average altitude of municipalities by province derived from the 2011 census. Istat derives altitude measures for each municipality in Italy using GIS-ArCGIS 10.1 methodology (Source: Italian Census data).

C Conditional convergence model

In this section we estimate a conditional convergence regression model as Barro (1991, 2012). This approach has the advantage of improving comparability of our results to closely related studies such as Gennaioli et al. (2013) and Valero and Van Reenen (2019). The model underlying a conditional convergence regression is equivalent to ours in the sense that it estimates levels-on-levels relationships that operate in the long run.

In Table A-V, we present results from our Barro growth regression estimates. We use as a dependent variable the change in GVA per capita (in logarithmic terms), and we include the lagged levels of GVA per capita at the province and regional level as controls. While in Columns [1] - [8] we use the number of faculties as a measure of higher education supply, in Columns [9] and [10] we adopt the number of universities as a regressor (see in Valero and Van Reenen, 2019). Moreover, while in Columns [1] - [5] we consider the entire time period, in Columns [6] - [10] we focus on the post-WWII period only. Throughout the analysis, we add progressively controls for population, population density, and a vector of distances (see Gennaioli et al., 2013), both at the local province and neighbourhood level. Besides, all specifications also include region and year fixed effects.

Results from Table A-V offer additional insight into the long-run productivity returns of higher education supply. Higher education supply in the local province and the neighbourhood take the expected positive sign. Coefficients are statistically significant at conventional levels, even in the more demanding specification in Column [7], where we include the shares of tertiary educated individuals in the province and the neighbourhood as additional controls.[7]

The specification more closely comparable to our baseline is the one reported in Column [4]. As it is standard in Barro conditional regression models, we obtain the long-run elasticity of GVA per capita to local and neighbours' supply by dividing the respective coefficients of the higher education supply variables by the coefficient of the lagged dependent variable at the province level. Using these coefficients from Column [4] of Table A-V, we obtain $0.046 (= 0.019/0.415)$ and $0.031 (= 0.013/0.415)$. This implies an approximate long-run elasticity of GVA per capita to higher education supply equal to $0.77 (= 0.046 + 0.031)$. This is larger than elasticities $0.20 - 0.27$ estimated by our model.

Column [9] of Table A-V presents results from a specification equivalent to Column [3] of Table A-7 of Valero and Van Reenen (2019), which refers to the 1951-2010 period only. This is the closer we can get to their analysis. Taken at face values, our estimated coefficients suggest that long-run GDP per capita increases by 1.5% in response to a 10%

[7] This is inspired by Column (4) of Table A-7 in Valero and Van Reenen (2019)'s study, where a comparative analysis, resembling a horse-race, is conducted between the inputs (higher education supply) and outputs (average years of education) of the human capital formation process.

Table A-IV: Correlations of IC_j and IC_i with characteristics of province i for $t_0 = 1860$ and pre-trend periods from 1600-1861.

	Initial Levels								**Pre-trends**	
	[1] Dis. of i, Bologna	[2] Dis. of i, Roma	[3] Dis. of i Capital	[4] Per capita GVA of i	[5] Share of agric. in i	[6] Share of industry in i	[7] urbanization in i ($>$ 6000 inh.)	[8] Total pop. density	[9] $\Delta_{800-1500}$ pop. in i	[10] $\Delta_{1500-1861}$ pop. in i
					Panel A: North					
IC_{j0}, $t_0 = 1861$	–0.0022	–0.0054	0.0004	–1.2031	–0.0002	–0.0479	3.2185	–0.0021	–6.6805	–1.6622
	(0.0040)	(0.0026)	(0.0014)	(0.2686)	(0.0095)	(0.0545)	(1.8776)	(0.0006)	(46.4478)	(0.8431)
Observations	138	138	138	138	138	138	96	138	138	138
IC_{j0}, $t_0 = 1861$ (no top decile)	–0.0005	–0.0042	–0.0007	–0.7515	–0.0012	–0.0412	6.3225**	–0.0070	–3.8099	–1.4811
	(0.0059)	(0.0048)	(0.0002)	(0.2611)	(0.0112)	(0.0572)	(0.4787)	(0.0016)	(46.7096)	(0.7487)
Observations	125	125	125	125	125	125	83	125	125	125
IC_{j0}, $t_0 = 1700$	–0.0034	–0.0055**	0.0012	–0.6601**	–0.0035	–0.0154	3.6819	–0.0011	–6.4381	51.7797
	(0.0017)	(0.0004)	(0.0015)	(0.0336)	(0.0038)	(0.0428)	(1.3832)	(0.0005)	(33.9536)	(58.7443)
Observations	138	138	138	138	138	138	96	138	138	138
IC_{i0}, $t_0 = 1861$	–0.0033	–0.0037	–0.0026	2.4183*	–0.0272	0.0365	18.2619**	0.0019*	–42.4931	1.8828
	(0.0089)	(0.0053)	(0.0006)	(0.2371)	(0.0238)	(0.0083)	(0.7956)	(0.0003)	(8.2349)	(1.4744)
Observations	30	30	30	30	30	30	21	30	30	30
IC_{i0}, $t_0 = 1861$ (no top decile)	–0.0100	–0.0104**	0.0000	–0.7070	–0.0210	0.0534	18.2455***	0.0084	–45.6633*	1.0566
	(0.0063)	(0.0006)	(0.0032)	(4.4886)	(0.0260)	(0.0100)	(0.0510)	(0.0096)	(4.1288)	(2.8665)
Observations	27	27	27	27	27	27	18	27	27	27
IC_{j0}, $t_0 = 1700$	–0.0050	–0.0056*	0.0009	–0.4616	–0.0134	0.0198	9.4017	–0.0002	–30.1914**	80.2187
	(0.0041)	(0.0007)	(0.0014)	(1.2687)	(0.0142)	(0.0093)	(1.8538)	(0.0005)	(1.2562)	(29.6441)
Observations	30	30	30	30	30	30	21	30	30	30
					Panel B: South					
IC_{j0}, $t_0 = 1861$	–0.0013	–0.0001	–0.0004	1.6948	–0.0093	–0.0055	–0.7410	–0.0008	4.2576	–2.2091*
	(0.0015)	(0.0014)	(0.0023)	(0.7569)	(0.0046)	(0.0122)	(0.6560)	(0.0004)	(5.4457)	(0.7163)
Observations	148	148	148	148	148	148	143	148	148	148
IC_{j0}, $t_0 = 1861$ (no top decile)	–0.0012	0.0002	–0.0004	2.3378*	–0.0257	0.0046	–0.1409	0.0081	5.2361	–1.5574
	(0.0014)	(0.0013)	(0.0026)	(0.7731)	(0.0114)	(0.0170)	(0.3141)	(0.0060)	(5.8064)	(1.1584)
Observations	129	129	129	129	129	129	129	129	129	129
IC_{j0}, $t_0 = 1700$	–0.0010	–0.0004	0.0002	0.9843	–0.0021	–0.0061	–0.7034	–0.0006	–0.2192	–0.9009
	(0.0009)	(0.0010)	(0.0012)	(0.3388)	(0.0055)	(0.0114)	(0.4731)	(0.0003)	(3.7126)	(16.4570)
Observations	148	148	148	148	148	148	143	148	148	148
IC_{i0}, $t_0 = 1861$	–0.0006	–0.0010	0.0004	2.1283	–0.0514	0.0479*	0.6104	0.0041***	–6.9215	4.1154
	(0.0010)	(0.0021)	(0.0029)	(1.7197)	(0.0319)	(0.0162)	(1.4305)	(0.0003)	(5.3389)	(2.1004)
Observations	39	39	39	39	39	39	38	39	39	39
IC_{i0}, $t_0 = 1861$ (no top decile)	–0.0003	0.0017	0.0028	0.6034	–0.0305	0.0297	0.1039	0.0058	–9.2696	2.1494
	(0.0013)	(0.0013)	(0.0023)	(1.1862)	(0.0212)	(0.0188)	(0.8667)	(0.0045)	(6.3612)	(2.9499)
Observations	34	34	34	34	34	34	34	34	34	34
IC_{j0}, $t_0 = 1700$	–0.0005	–0.0006	0.0009	0.9406	–0.0130	–0.0021	0.0840	0.0011*	–3.0221	–12.7970
	(0.0006)	(0.0017)	(0.0019)	(1.1418)	(0.0143)	(0.0170)	(0.6358)	(0.0003)	(3.6715)	(16.3376)
Observations	39	39	39	39	39	39	38	39	39	39

Notes: In Columns [1]-[8], we report correlations of initial conditions with time invariant characteristics of province i. The urbanization rate is measured in 1861 for provinces that already belonged to the Italian Kingdom by then. All other variables are measured for 1870 for provinces except Belluno, Mantova, Padova, Roma, Rovigo, Treviso, Udine, Vicenza, and Verona and for 1861 for all other provinces. In Columns [9] and [10], we report correlations of initial conditions with growth rates of province i's population as reported in each column. In Column [12], we report correlations with a dummy equal to 1 if a university was established in province i between 1500 and 1861. Standard errors are clustered at the NUTS1 regional level. Significance levels: $*$: 10% $**$: 5% $***$: 1%.

increase in the supply of universities, in the local province and its neighbourhood,[8] which is very close the 1.6% increase in long-run GDP per capita they find. This is also larger than baseline estimates provided by Valero and Van Reenen (2019) (cfr. their equation (1)), which suggest an elasticity equal to 0.4.

D Neighbourhood and productivity effects: additional results

In this section we present a battery of additional robustness and placebo exercises that provide further validations of our identifying assumptions in the estimation of either the neighbourhood or the productivity effects.

In Table A-IV we present correlations between the initial distribution of the number of faculties and observable characteristics of province *i* before the start of our sample period by geographic area (North vs Center-South). In general, pre-trends becomes less evident when we split the sample by geographic area.

In Table A-VI, we check the sensitivity of our results to the adoption of alternative empirical strategies. In Column [1], we replace the Bartik instrument with the interaction of initial conditions with a dummy equal to 1 after the introduction of the Laws 2102/1923 (Gentile Law), and the Laws 910/1969, which are the two most important reforms of the university system. In Column [2] we report LIML/Fuller estimations, which are a medium unbiased estimator with (many) weak instruments and suggested as an alternative method to confront main results by Goldsmith-Pinkham et al. (2020). In Column [3] we report results using a version of the Bartik instrument computed on province-level shares of faculties in the three broad fields of STEM, Humanities and Social Sciences (instead of using the province-level share of total faculties). In this way, we allow for heterogeneous and more dis-aggregated shift factors in the Bartik shift-share instrument.

In Column [4] we include region-by-year dummies for the neighbouring province. In Column [5] we drop provinces of Lecce, Palermo, Milano, Napoli, Roma, and Torino, as these belong to the top decile of the population in 1861 to check the sensitivity of results to the inclusion/exclusion of upper tails in the population distribution. In Column [6] we drop province level observations that relate to year 1936, which is an unusual year for census data, which, except for 1936, have always been collected with a decennial timing until now (i.e. 1861, 1871, 1881, and so on). Finally, In Column [7], we drop province observations starting from the year they host a multi-campus university. Also in this case, the results remain qualitatively unchanged in terms of both significance and direction.

In the main analysis we define as pre-unitarian provinces that existed as administrative units at the onset of Italian history. However, we allow their territory and borders to change overtime, alongside the creation of new provinces during Italian history. We take this choice to be as precise as possible in the measurement of the local neighbourhood effects.

[8] Using coefficients in Column [9] we obtain $0.10 = 0.069/0.692$, and $0.057 = 0.040/0.692$. This implies that long-run GDP per capita increases by 1% in response to a 10% increase in local universities, and by 0.5%, in response to a 10% increase in universities in the neighbouring provinces.

Table A-V: Long-term returns of higher education supply: Barro conditional convergence model

	Dependent variable Δ (ln) GVA per capita in i									
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
lagged HE supply in i	0.021***	0.021***	0.015***	0.019***	0.020***	0.036***	0.039***	0.009*	0.069***	0.071***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.009)	(0.009)	(0.004)	(0.019)	(0.020)
lagged HE supply in $-i$				0.013*	0.013*	0.027***	0.031***	0.013**	0.040**	0.045**
				(0.007)	(0.008)	(0.010)	(0.011)	(0.006)	(0.017)	(0.018)
lagged (ln) GVA per capita in i	-0.397***	-0.397***	-0.411***	-0.415***	-0.415***	-0.704***	-0.705***	-0.481***	-0.692***	-0.693***
	(0.053)	(0.053)	(0.050)	(0.049)	(0.049)	(0.131)	(0.128)	(0.026)	(0.137)	(0.133)
lagged (ln) GVA per capita in region		0.657***	0.591***	0.783***	0.758***	1.358***	1.321***	0.797***	1.227***	1.246***
		(0.100)	(0.080)	(0.130)	(0.134)	(0.307)	(0.309)	(0.093)	(0.298)	(0.313)
Observations	1227	1227	1227	1227	1227	663	663	571	663	663
Measure of HE supply	#Faculties	#Faculties	#Faculties	#Faculties	#Faculties	#Faculties	#Faculties	#Faculties	#Universities	#Universities
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	No	No	No	No	No	No	No	No	No	No
Population density controls	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distances controls	No	No	No	No	Yes	No	Yes	No	No	Yes
Share tertiary educated population controls	No	No	No	No	No	No	No	Yes	No	No
Time span	1861-2010	1861-2010	1861-2010	1861-2010	1861-2010	1950-2010	1950-2010	1950-2010	1950-2010	1950-2010

Notes: The dependent variable is change in GVA per capita (in logarithmic terms), lagged levels of GVA per capita at the province and regional level are included as controls. In Columns [1]-[8] we use the number of faculties as a measure of higher education supply, in Columns [9] and [10] we adopt the number of universities as a regressor (see Valero and Van Reenen (2019)). In Columns [1]-[5] we consider the entire time period, in Columns [6]-[10] we focus on the post-WWII period only. The vector of population density controls include population density of the local province and the neighbourhood. The vector of distance controls is the same as Valero and Van Reenen (2019) (Table A-7), and includes the distance of the local province from the Capital, the administrative capital of the region, and the corresponding average measures for the neighbourhood. Similarly, population % with tertiary education are for both local and neighbours' population. We include region and year fixed effects. Standard errors are clustered at the province level. Significance levels: $*$: 10% $**$: 5% $***$:1%.

Table A-VI: Additional robustness checks

	[1] Reforms 1923 & 1969	[2] LIML/Fuller	[3] B(K=3)	[4] Region-by-year FE neighbourhood	[5] Drop Top Decile Pop 1861	[6] Drop 1936	[7] Drop multi-campus
				Panel A: Neighbourhood effects			
Total no. faculties in j	-0.162**	-0.204**	-0.144**	-0.208**	-0.221**	-0.208**	-0.194**
	(0.067)	(0.093)	(0.062)	(0.102)	(0.096)	(0.094)	(0.095)
Observations	3868	3868	3868	3868	3293	3366	3695
K-P rk Wald F-stat	32.069	29.773	60.737	54.636	156.986	28.716	41.343
				Panel B: Productivity			
Total no. faculties in i	0.369***	0.310**	0.298**		0.291**	0.345**	0.250*
	(0.130)	(0.149)	(0.138)	–	(0.141)	(0.152)	(0.145)
Total no. faculties in $-i$	0.141**	0.130**	0.102**	–	0.164***	0.117**	0.174***
	(0.064)	(0.052)	(0.052)	–	(0.059)	(0.054)	(0.054)
Observations	1025	1025	1025	–	887	936	980
K-P rk Wald F-stat	14.887	34.063	26.940	–	31.174	38.288	20.890

Notes:. We take as preferred specifications IV FE one used to produce results reported in Table 4, Column [8] (Panel A for Neighbourhood effects; Panel B for productivity effects). In Column [1], we replace the Bartik instrument with the interaction of initial conditions with a dummy equal to 1 after the introduction of the Laws 2102/1923 (Gentile Law), and the Laws 910/1969. In Column [2] we report LIML/Fuller estimations. In Column [3] we report results as we use a version of the Bartik instrument, computed on province-level shares of faculties in the three broad fields of STEM, Humanities and Social Sciences. In Column [4] we include region-by-year dummies for the neighbouring province. In Column [5] we drop provinces of Lecce, Palermo, Milano, Napoli, Roma, and Torino, as these belong to the top decile of the population in 1861. In Column [6] we we drop province level observations that relate to year 1936. Finally, In Column [7], we drop province observations starting from the year they host a multi-campus university. Standard errors clustered at the level of the local province are reported in parentheses. Significance levels: $*$: 10% $**$: 5% $***$: 1%.

Table A-VII: Alternative definitions of pre-unitarian provinces, IV neighbourhood estimates

	[1] Existing in 1870, borders at 1870	[2] Existing in 1870, borders in 2010	[3] Existing in 2010 borders in 2010
Total no. faculties in j	-0.120*	-0.162**	-0.172*
	(0.068)	(0.077)	(0.092)
K-P rk Wald F-stat	29.492	21.484	42.683
K-P rk LM-stat	21.614	17.753	25.010
p-value KP	0.000	0.000	0.000

Notes:. Baseline pairwise estimates. Borders and territory of pre-unitarian provinces are maintained constant over the entire period $1870 - 2011$. In Column [1] pre-unitarian provinces are defined by borders and territory at 1870 i.e. the HE supply of the territory of provinces created during Italian history is reassigned to the pre-unitarian province from which the new provinces have been created. In Column [2] pre-unitarian provinces are defined by borders and territory in 2010. In Column [3] pre-unitarian provinces are defined as administrative units in 2010 at their 2010 borders and territories. Standard errors clustered by province are reported in parentheses. Significance levels: $*$: 10% $**$: 5% $***$: 1%.

In Table A-VII, we check the robustness of our results to alternative definitions of pre-unitarian provinces. In Column [1] we adopt a definition that encompasses not only their existence as administrative units, but also their territory and borders in 1870. In order to do so, we assign all faculties set up in a province created during Italian history to the territory of the corresponding pre-unitarian province. We define neighbourhood relationship accordingly, on the basis of these pre-unitarian borders, which we maintain constant during Italian history.[9] Our main results are preserved.

Next, we build upon the consideration that the 41 provinces created during Italian history are the same provinces of pre-unitarian states that were downgraded to districts of the 69 we use in the baseline analysis (Palombelli, 2012). If this is the case, the process of provinces' creation during Italian history actually features these 41 districts gaining autonomy again i.e. restores the true pre-unitarian distribution. Thus, in Column [2] we define pre-unitarian provinces the administrative units that existed in 1870, but at their 2010 borders. In Column [3], we define pre-unitarian provinces all administrative units that existed in 2010 at their 2010 borders. In both cases, we maintain these definitions constant over the 150 years of Italian history. Our results are again confirmed alongside size and significance of the estimated coefficients.

In Table A-VIII we present results as we drop specific decades and regions. Results

[9]To make some examples, the faculties of the province of Pescara belong to the pre-unitarian province of Chieti (as the corresponding territory was then assigned to the new-born province of Pescara in 1927), which we assume always shares borders with the pre-unitarian territories of L'Aquila, Teramo and Campobasso during Italian history. Similarly we assign higher education supply set up in the province of Taranto to the pre-unitarian territory of Lecce (to which the province of Taranto belongs), in the neighbourhood of the pre-unitarian provinces of Bari and Potenza (which shared borders with Lecce in 1870, but never with Taranto).

are qualitatively unchanged in terms of significance and sign.

In Table A-IX, we apply the Adão et al. (2020) (AKM) correction to neighbourhood estimates presented in Column [2] of Table 4 to account for arbitrary correlation in the error term across provinces with similar initial conditions. The correction is compared with homoskedastic and heteroskedastic consistent (EHW) standard errors, clustered at the province level. Results show that standard errors of out main set of estimates are larger than the AKM, resulting in more conservative estimates.

Next, we address a peculiar feature of our data, where only 20 out of 69 pre-unitarian provinces initially have faculties. Thus, for many of them the initial value IC_{j0} is 0, and hence the predicted number of faculties is also 0. This dis-proportionate number of zeroes may have some consequences for the estimates, and perhaps a more 'proportionate' share of provinces between zero and positive initial conditions would reduce concerns and potential biases in the estimation of neighbourhood effects induced by the correlation between the instrument and the endogenous variable (IC_{j0}, IC_{jt}) falling more than the correlation between the instrument and the dependent variable (IC_{j0}, F_{it}).

Hence, in Figure A-VI we randomly re-proportionate the sample of pre-unitarian 69 provinces (which are used in our preferred specification), including the 20 provinces with $IC > 0$ and a random draw of 30 with $IC = 0$ out of the remaining 49 ones. We repeat the exercise 100 times. In Figure A-VI we show an histogram with coefficients and confidence intervals of neighbourhood effects estimates. The visual inspection shows that effects with these placebo samples are sometimes less precisely estimated (due to the reduced sample for the analysis), but overall in line with those presented in the main text (Table 4, Column [8]) and obtained from the whole sample.

In Table A-X we present results of another placebo exercise that provide further validations of our identifying assumptions to estimate either the neighbourhood or the productivity effects. First, we define as far away enough potential neighbours those distanced by at least $>$ 500 km; Second, we randomly select among them 5 units for each province (5 is approximately the average number of true neighbours for each province in the data); Third, we replicate 100 times the random draw. We would expect that, given the random allocation of neighbours, in any of the 100 repetitions (each made by 100 draws) coefficients are overall insignificant, i.e. that the number of negative and statistically significant coefficients is below standard thresholds. Results in Table A-X show that, on average, about 5.7% of times coefficients are not insignificant (5.7 this is the average of the distribution reported in the table), which is only marginally above the canonical 5% level of statistical acceptance. Hence, we can reject statistical significance almost at the 5% level.

In Table A-XI we check the sensitivity of productivity effects reported in Table 4, Column [6] of the main text to an alternative definition of initial shares. In each column, the placebo Bartik instrument is constructed using the initial (i.e., in 1860, we do not have information for 1700) share of the corresponding variable (e.g. the share of provincial average Value Added - VA - per capita in the neighbourhood) multiplied by the total number of faculties in any given year in province i (or in provinces $-i$).

Differently to the 'true' Bartik instruments used in the main analysis, the number of Italian faculties in any given year (say, 1980) it is not redistributed across the provinces or the province's neighbours based on the share of initial faculties (i.e., the total number

Table A-VIII: Dropping decades and set of regions

	Panel A: Dropping decades						
	[1] 1870-1890	[2] 1890-1910	[3] 1910-1930	[4] 1930-1950	[5] 1950-1970	[6] 1970-1990	[7] 1990-2010
total no faculties in *j*	–0.23**	–0.19**	–0.19**	–0.20**	–0.21**	–0.20*	–0.20**
	(0.11)	(0.09)	(0.09)	(0.10)	(0.10)	(0.10)	(0.10)
Observations	3061	3001	3041	3113	3115	3125	3141
K-P rk Wald F-stat	27.813	33.511	32.488	31.234	31.663	27.508	45.663
	Panel B - Dropping regions						
	[1]VD-PIE-LI	[2]LOM-EMRO	[3]FRI-TRE-VE	[4]MAR-TOS-UM	[5]LAZ-ABR-MOL	[6]BAS-CAM-PUG-CAL	[7]SAR-SIC
total no. faculties in *j*	–0.19**	–0.19*	–0.18*	–0.19	–0.24**	–0.24**	–0.20**
	(0.09)	(0.10)	(0.10)	(0.13)	(0.11)	(0.11)	(0.10)
Observations	3582	2712	3393	3021	3630	3267	3549
K-P rk Wald F-stat	48.148	24.680	22.062	19.261	38.406	27.327	25.129

Notes:. IV FE Specification as in Table 4 Column [8] with pre-unitarian provinces during the entire period and 10 years lags of regressor and controls. All specifications include provincial pair fixed effects, region-by-year fixed effects, and the usual set of provincial controls. Standard errors clustered by province are reported in parentheses. Significance levels: $*$: 10% $**$: 5% $***$: 1%

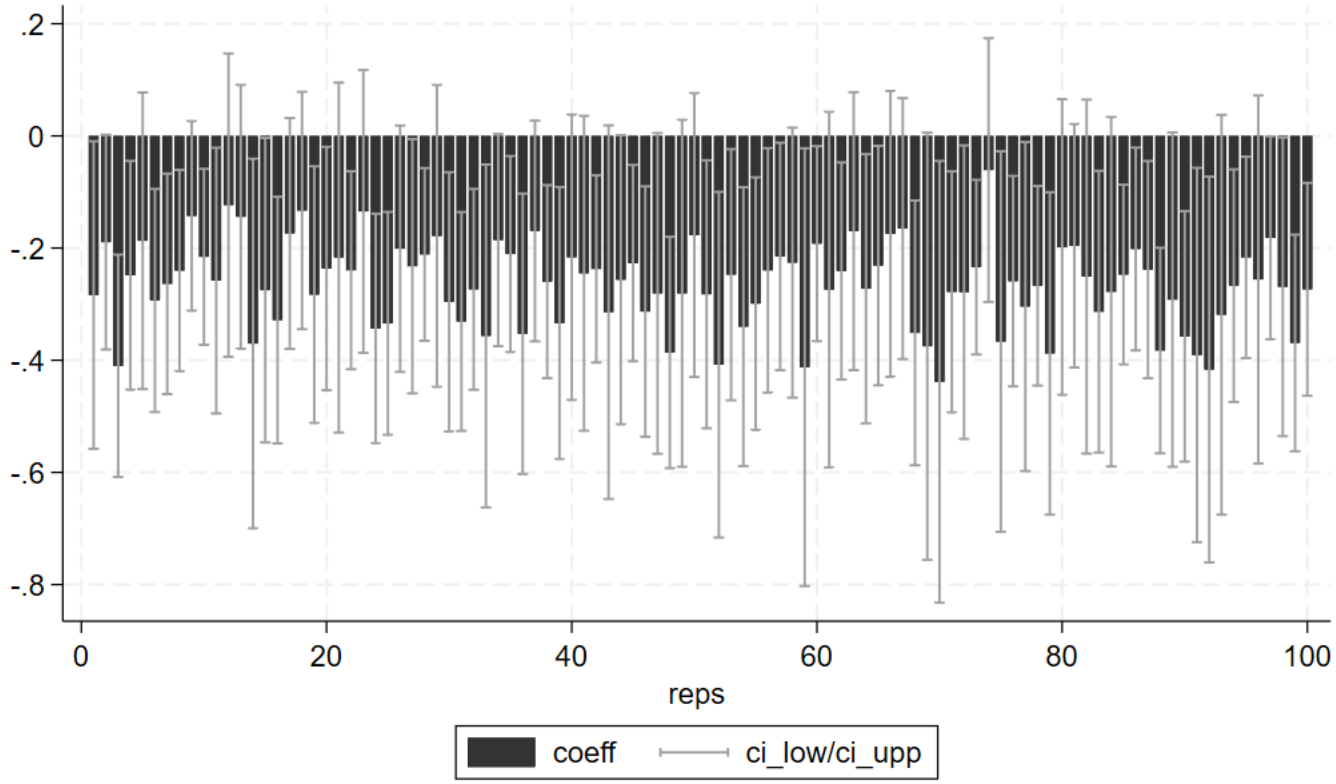


Figure A-VI: Randomization of provinces with initial conditions (initial endowment of faculties) equal to zero

Notes:. The figure reports estimated coefficients for $F_{j,t-10}$ (coeff) and its lower and upper confidence intervals (ci_low/ci_upp) from 100 replications of a randomization where we draw only 30 out of the 49 pre-unitarian provinces with zero faculties and then estimate equation (1) of the main text.

Table A-IX: Adao Correction for cross-province correlation in the initial conditions

	Estimated coefficient (B_{jt}): -0.205			
	Std. Error	p-value	Lower CI	Upper CI
Homoskedastic	0.032	0.000	-0.190	-0.063
EHW	0.045	0.002	-0.214	-0.039
AKM	0.000	0.000	-0.126	-0.126

Notes:.All specifications include the usual set of controls region-by-year and pair fixed effects. All specifications consider 10 years lags of the regressor and controls. We apply the Adão et al. (2020) (AKM) correction to estimates presented in Column [8] of Table 4. The correction is compared with Homoscedastic and heteroskedasticity consistent (EHW) standard errors, clustered at the province level. Results are the same for AKM(0) and AKM(1) corrections.

of faculties in the province or in the neighbourhood over the total national initial number of faculties), but, instead on the share of the placebo initial conditions: e.g., (share of average valued added per capita in the neighbourhood) = (average initial value added per capita in the neighbourhood)/(initial average national value added). In this way, the provinces or groups of provinces receiving more faculties every year are those with higher quotes of placebo initial economic outcomes, instead of higher shares of initial faculties. Using these alternative shares of the initial conditions, instruments in the first stage are in general jointly insignificant in the equations for the two endogenous variables (see the Kleibergen-Paap - KP - F statistic for the first stage), and coefficients in the main estimates are in general not significant. This suggests that, indeed, only the interaction with shares of initial faculties is what matters for our results.

In Table A-XII, we complement the mechanisms' analysis for neighbourhood effects of Section 6.1 and report results for matrices based on travel distance and travel time. In Panels A-B we define neighbours on the basis of the travel distances, and travel time between the provinces' capitals. Using these alternative measures we find that competition effect is concentrated among a travel distance of 120 kilometres and a travel time of 80 minutes. The spatial reach of strategic interactions can thus be estimated to be somewhat within these ranges. The effect disappears for travel distances beyond 360 kilometers and travel time exceeding 3 hours.

In Table A-XIII we check the robustness of our results dealing with spatial restrictions imposed by the geography of Italian territory. In Column [1], we present IV results dropping internal Italian provinces i.e. perform the analysis using bordering regions only. The estimates are similar to that is found with the full set of provinces, and suggest that results are not driven by internal provinces (which have on average more neighbours). In Columns [2] and [3] we account for the possibility that bordering regions may be affected by the supply of higher education of neighbouring foreign provinces by adding one dummy = 1 if there is HE supply in neighbouring foreign NUTS3 regions (provinces) and a count variable for the number of foreign universities, respectively. In this case

Table A-X: Number of negative and statistically significant coefficients in 100 replications: evidence from 100 random repetitions of the procedure

N	Freq.	Percent	Cum.
1	1	2.00	2.00
2	2	2.00	4.00
3	10	10.00	14.00
4	15	15.00	29.00
5	23	23.00	52.00
6	21	21.00	73.00
7	7	7.00	80.00
8	9	9.00	89.00
9	4	4.00	93.00
10	4	4.00	97.00
11	1	1.00	98.00
12	1	1.00	100.00
Total	100	100.00	

Notes:. The Table reports the number of negative and statistically significant coefficients from 100 replications of a placebo exercise where for each province and year, we estimated equation (1) 100 times, each time using randomly selected five neighbours at a distance above 500 km.

we include also NUTS3 regions in Slovenia and France which are neighbours of NUTS3 regions in Italy even if the language spoken is different. Interestingly, we find that these variables are indeed significant, but the results are similar to the main estimates presented in the paper.

In Table A-XIII we also report results from a gravity model. In Column [4] we consider a broader definition of neighbourhood where each province i has all the other Italian provinces $j \neq i$ as neighbours. As expected, the coefficient is much smaller, aligning with the idea that somehow artificial neighbours have a zero effect. This does not exclude the possibility that distant provinces may compete against each other too, but rather suggests that this does not happen on average, indicating that competition is predominantly local. In Column [5] we weight the number of faculties of each neighbour j ($F_{i,j}$) in equation (2) by the inverse of the squared linear distance $d_{i,j}$ (i.e. $d_{i,j}^{-2}$). In Column [6], for each province i, we consider only provinces within the spatial reach of 90Km. These three alternative weighting schemes deliver the usual results.

In Table A-XIV, we use the pre-1500 index of historical potential crop yield by Galor and Özak (2016) to examine the developmental trajectory of provinces at varying stages of development. Results suggest a more pronounced impact of higher education supply on productivity measures (GVA per capita and per worker) when considering provinces in the top quartile of the caloric suitability index distribution. Conversely, higher education's impact on population and density is more significant and accurately estimated in provinces within the bottom quartile of the index distribution, suggesting a higher probability of being in a Malthusian stage.

Table A-XI: Productivity effects, Instruments based on placebo initial conditions

	Initial shares constructed using the initial conditions of:								
	[1] GVA tot	[2] GVA per cap.	[3] GVA per work.	[4] Particip.	[5] Population	[6] Popul. dens.	[7] Sh. Agri	[8] Sh. Serv	[9] Sh. Ind
Tot. n. faculties in i	0.497**	-0.544	16.760	-0.165	0.244	0.191	0.208	1.009	0.272
	(0.219)	(0.691)	(586.921)	(0.341)	(0.189)	(0.623)	(0.202)	(1.694)	(0.257)
Tot. n. faculties in $-i$	0.402	-0.121	14.063	0.175	0.391*	1.398	0.129	0.305	0.068
	(1.371)	(0.252)	(478.248)	(0.173)	(0.237)	(1.932)	(0.224)	(0.368)	(0.143)
K-P rk Wald F-st.	0.043	1.719	0.000	4.809	6.307	0.169	0.557	0.090	1.357
Observations	1025	1025	1025	1025	1025	1025	1025	1025	1025

Notes: In all specifications the dependent variable is Y_{it}, gross domestic value added. In each column, the placebo Bartik instrument is constructed using the initial share (i.e., in 1860) of the corresponding variable (e.g. the share of provincial average Value Added - VA - per capita in the neighbourhood) multiplied by the total number of faculties in any given year. Differently to the 'true' Bartik instruments used in the main analysis, the number of Italian faculties in any given year (say, 1980) it is redistributed across the provinces or the province's neighbours based on the share of the placebo initial conditions: e.g., the share of average valued added per capita in the neighbourhood = (average initial value added per capita in the neighbourhood)/(initial average national value added). In this way, the provinces or groups of provinces receiving more faculties every year are those with higher quotes of placebo initial economic outcomes. All first stage estimates are available to the authors upon request. The total number of faculties in the province and in the neighbourhood are lagged 10 years. All specifications include province FE and region by year dummies. Standard errors clustered at the province level are always reported in parentheses. Significance levels: $*$: 10% $**$: 5%

Table A-XII: Neighbourhood effects, travel distance and time matrices

	Panel A: Travel distance (km)			
	[1] within 120Km	[2] btw 120 and 240 km	[3] btw 240 and 360 km	[4] btw 360 and 480 km
no. of faculties in j	-0.269***	0.020	-0.040	-0.048*
	(0.096)	(0.027)	(0.033)	(0.026)
Observations	4434	9762	10747	8476
K-P rk Wald F-stat	24.032	70.187	152.624	54.586
	Panel B: Travel time (minutes)			
	[5] within 80 min.	[6] btw 80 and 160 min.	[7] btw 160 and 240 min.	[8] btw 240 and 320 min.
no. of faculties in j	-0.287***	-0.017	-0.030	-0.011
	(0.103)	(0.027)	(0.028)	(0.017)
Observations	3267	11013	12449	9151
K-P rk Wald F-stat	18.538	76.343	98.310	56.142

Notes:. Baseline IV FE specification from Table 3, Column [2], which include provincial pair fixed effects, region-by-year fixed effects, and the usual set of provincial controls. Standard errors clustered by province are reported in parentheses. Significance levels: $*$: 10% $**$: 5% $***$: 1%.

Table A-XIII: Neighbourhood effects, alternative structures of Spatial Interactions

	[1] Drop internal prov.	[2] Foreign univ. as a neigh	[3] Foreign prov. in the neigh.	[4] All provinces	[5] All prov. weight. by $1/\text{dist}^2$	[6] All neigh. prov. within 90km
no. of faculties in j	-0.230*	-0.210**	-0.216**	-0.020***	-0.173**	-0.206*
	(0.115)	(0.098)	(0.099)	(0.003)	(0.076)	(0.119)
Observations	2102	3859	3859	69110	69110	2788
K-P rk Wald F-stat	77.794	31.829	31.202	29407.333	81.198	23.065

Notes: In Column [1] we run the regressions dropping internal pre-unitarian provinces (i.e. we keep only provinces with border with foreign countries and/or the sea). In Column [2] we include in the set of controls a dummy equal to one if there is at least one foreign university in the neighbourhood. In Column [3] we include a count variable for the number of foreign universities in the neighbourhood. In Column [4] we allow for pairwise interactions between all provinces in the sample. In Column [5] we estimate Weighted neighbourhood effects by the inverse of squared linear distance ($1/d_{ij}^2$). In Column [6] we consider as neighbours only provinces that share a border within a spatial reach of 90Km. All specifications include the usual set of controls, region-by-year and pair fixed effects. Standard errors clustered by province are reported in parentheses. Significance levels: $*$: 10% $**$: 5% $***$: 1%

Table A-XIV: Heterogeneity exercise: caloric suitability index

	[1] GVA per capita	[2] Population	[3] Pop. density	[4] GVA per worker
	Panel A: top three quartiles provinces			
Total no. faculties in i	0.364**	0.052**	0.474*	0.676**
	(0.179)	(0.026)	(0.266)	(0.344)
Total no. faculties in $-i$	0.146**	-0.008*	-0.012	0.341***
	(0.062)	(0.005)	(0.045)	(0.104)
Observations	771	771	771	771
K-P rk Wald F-stat	15.718	15.718	15.718	15.718
	Panel B: bottom three quartile provinces			
Total no. faculties in i	0.186	0.114***	0.558**	0.166
	(0.150)	(0.035)	(0.253)	(0.313)
Total no. faculties in $-i$	0.093	-0.028***	-0.086*	0.204**
	(0.060)	(0.011)	(0.050)	(0.098)
Observations	787	787	787	787
K-P rk Wald F-stat	16.846	16.846	16.846	16.846

Notes: The 69 preunitarian provinces are categorized into four quartiles of the distribution of the province level average index of historical potential crop yield as captured by calories (per hectare per year) before 1500 Galor and Özak (2016). In the subsample of Panel A we drop provinces in the bottom quartile of the distribution. In the subsample of Panel B we drop provinces in the top quartile of the distribution. Standard errors clustered at the level of the local province i are reported in parentheses. Significance levels: $*$: 10% $**$: 5% $***$: 1%.

E Alternative first stage specifications of IV FE neighbourhood effects: Accounting for multiple entries

In the first stage of neighbourhood equation (1) there are somehow 'imperfect repetitions' of each province j - year t combination. These repetitions would be perfect if in the first stage we used information only on province j and not on province i, which is the unit of observation of the main equation. In our case, these replications are 'imperfect' because there are also elements of province i entering the estimation of the first stage: not only the fixed effect of the ij pair, but also the time-by-region of province i fixed effects, as well as variables in the X vector (e.g., the number of universities in province i) and the clustering (based on province i). If these province i-related variables had enough predictive power to make observations for each province j-time combination sufficiently different across i provinces, and, more importantly, if they affected the way the Bartik instrument predicts the number of faculties in province j, the issue of repetitions of observations in the first stage (and its impact on the statistical significance of neighbouring estimates) should not be of particular concern.

However, the issue deserves further investigation. We estimate the first stage of our preferred specification (69 initial provinces) of the neighbouring analysis using only one observation for each province j - year t combination. Since many provinces j have more than one province i of which they are neighbours, we use a conservative approach and draw at random one observation within these province j - year t cells. If the cells contains just one observation, we select that observation. If it contains, say, 3 observations, we randomly pick up 1 of them. We end up with about 1,080 (instead of 3,868) observations, and all the 69 provinces i are still represented (although, in terms of province i, the panel is no longer balanced). Given that we use lagged variables for province j number of faculties and Bartik instrument ($F_{j,t-10}$ and $B_{j,t-10}$, respectively) the number of observations for the first stage is lower. Also note that different draws of the observation relative to province j - year t produce different samples (in terms of province i characteristics associated to each province j), producing different first stages. We experimented with that, and found that first stage results are consistent and similar across different draws. For the sake of brevity, here we present evidence obtained with one specific 'representative' draw.

We present two pieces of evidence. First, we run a set of first-stage regressions on the restricted sample with only one observation for each combination of province j - year t, with different sets of fixed effects and controls. Second, for comparison and as a sensitivity analysis, we replicate the first stage based on the full sample (the sample used to produce results of Table 4, Column [8]) with different sets of fixed effects and controls.

Results are in Table A-XV, for the full sample (Columns [1] - [4]) and for the restricted sample (Columns [5] - [8]). We start with a simple specification (Column [1], [5], respectively) that includes only the Bartik instrument. Then, we progressively add fixed effects for region i-by-year t (Columns [2], [6]), for the pair ij (for the full sample, in Column [3]) or province j (for the restricted sample, in Column [7]), and controls $X_{ij,t-10}$ (the number of universities in province i and that in j, Columns [4], [8]). In this respect, Column [4] is the reference first stage that appears in the main text, in Table 4 Column [2].

We notice that, moving through the different columns, the patterns observed across

Table A-XV: Alternative first stage specifications of IV FE neighbourhood effects

	Panel A: Full sample				*Panel B: One obs. for each prov. j-year t combin.*			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
B_{jt}	0.495***	0.491***	0.203***	0.203***	0.517***	0.525***	0.261***	0.257***
	(0.028)	(0.035)	(0.037)	(0.037)	(0.050)	(0.057)	(0.065)	(0.065)
K-P rk Wald F-stat	323.856	194.688	30.304	29.773	108.392	86.394	16.326	15.658
K-P rk LM-stat	41.334	36.512	20.722	20.717	25.454	26.088	14.645	14.331
p-value KP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Region i-by-year t FE		✓	✓	✓		✓	✓	✓
Pair ij FE			✓	✓				
Prov j FE							✓	✓
Controls				✓				✓
Observations	3868	3868	3868	3868	1010	1010	1010	1010

Notes:. The dependent variable is the total no. of faculties in province j (neighbouring province) $F_{j,t-10}$. Regressions in Columns [1] to [4] use the full sample of 69 pre-unitarian provinces, which is our preferred specification from Table 4 Column [2]. For convenience and comparability purposes, Column [4] here replicates the IV FE first stage results and diagnostics of Table 4 Column [2]. Columns [5] to [8] reports first stages by a restricted sample, where we keep only one (randomly selected) observation for each province j - year t combination, to avoid issues of multiple replications of the same first stage link between the total no. of faculties in province j (neighbouring province) $F_{j,t-10}$ and the value of its Bartik instrument $B_{j,t-10}$ across all the i provinces that have j as a neighbour. The set of controls $X_{ij,t-10}$ includes the total no. of universities in i and that in j. Standard errors clustered at the level of the local province i are reported in parentheses. Significance levels: $*$: 10% $**$: 5% $***$: 1%.

the two samples are similar (with the caveat that comparing results obtained from different samples and specifications is always difficult): the inclusion of province i - by - year t fixed effects and of the controls has negligible impact on the ways the Bartik instrument predictsthe number of faculties in province j (and hence on the F-stat). In both samples, what matters more is the fixed effect related with the unit of observation (the pair ij in the full sample, province j in the restricted one). We also note that the coefficients are of comparable magnitude in the full vs the restricted sample. In particular, the comparability of first stage coefficients in Columns [3] and [7] seems consistent with the idea that much of the first stage heterogeneity is related to the characteristics of province j than that of province i, such that controlling for province j FE or pair ij FE produces similar first stage results (i.e. the heterogeneity of province i has little relevance when predicting $F_{j,t}$ by $B_{j,t}$). We also find evidence of some F-stat inflation: for example the first stage F-stat in the restricted sample is half (15) than in the full sample (30), indeed much closer to the F-stat that corresponds to the regressions focusing on productivity and still well above the classical level of 10.

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