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Cultural environment, entrepreneurship and innovation in Europe. The importance of history*

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Abstract

This paper proposes a conceptual framework in which the cultural environment is shaped by historical factors and, in turn, affects entrepreneurship and innovation in the long-term. To support this idea, we have described the scientific revolution that took place in Europe at the end of the Renaissance period, when social and religious tolerance, the power of the church and the attitude of elite groups towards scientific discovery spawned different cultural environments across European regions. In addition, using historical data

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at NUTS-3 geographical level in Europe, we estimated an econometric model to explore the long-term impact of regional knowledge base and creativity, two important aspects of the cultural environment, on actual economic drivers. The estimates suggest that the presence of universities in the past, our measure for historical knowledge base, and the number of scientists and inventors in the past, our measure for historical creativity, have a positive effect on current levels of regional entrepreneurship and innovation. The effects of creativity depend on the scientific field of the scientists and inventors.

Il presente lavoro propone un quadro concettuale in cui l'ambiente culturale è modellato da fattori storici e, a sua volta, influisce sull'imprenditorialità e sull'innovazione a lungo termine. Per supportare questa tesi, abbiamo descritto la rivoluzione scientifica che ha avuto luogo in Europa alla fine del Rinascimento, quando la tolleranza sociale e religiosa, il potere della chiesa e l'atteggiamento delle élite verso le scoperte scientifiche hanno creato diversi ambienti culturali tra le regioni europee. Inoltre, utilizzando dati storici con un livello geografico NUTS-3 in Europa, abbiamo stimato un modello econometrico per esplorare l'impatto di lungo periodo della base di conoscenze e della creatività regionale, due aspetti rilevanti dell'ambiente culturale, su aspetti economici contemporanei. Le stime suggeriscono che la presenza di università nel passato, la nostra misura per la base di conoscenza storica, e il numero di scienziati e inventori nel passato, la nostra misura per la creatività storica, hanno un effetto positivo sull'imprenditorialità e sull'innovazione delle regioni. Inoltre, gli effetti della creatività dipendono dall'area scientifica di appartenenza degli scienziati e degli inventori.

1. *Introduction*

Many studies have examined the role of history in economic development, showing that historical cultural differences across countries and regions persist over long periods of time and can explain different paths of regional growth[1]. A first approach maintains that the institutions of a society can be an important determinant of the evolution and long-term persistence of economic growth. These studies suggest that the differences in domestic institutions explain the different paths of growth today. Some important papers within this literature examined European expansion and colonization of the globe, which began in the sixteenth century[2]. These papers share the view that the characteristics of the region being colonized were crucial in determining the effects of colonial rule on long-term development. Many empirical studies have confirmed this hypothesis, although the papers differ in their view of which aspects of colonial rule were more important for shaping institutions, and in the proposed causal mechanisms.

1 Nunn 2009.

2 Acemoglu *et al.* 2001; Engerman, Sokoloff 1994; Sokoloff, Engerman 2000; La Porta *et al.* 1997, 1998.

Another approach considers that historical events permanently affected culture and the norms of behavior. The most well-known use of this approach is by Max Weber, who studied the importance of the Protestant religion and its effects on norms and behavior and, therefore, on the development of capitalism. Evolutionary anthropologists have recognized that there are clear micro-foundations that explain the existence of a phenomenon like culture[3]. The geneticist Cavalli-Sforza[4] observed that potential geniuses can be born anywhere but a suitable cultural environment is crucial for them to achieve success. Individual behavior is influenced by both genes and the external environment. Genetic factors can partially affect the geographical distribution of scientists and inventors, but a sociocultural environment inclined towards science is the key aspect that determines if a potential genius will become a great scientist or inventor. Cavalli-Sforza[5] noted, for example, that most Italian scientists before 1600 were born near the city of Florence. This was not because of a concentration of genetic factors, but because Florence had a very open and stimulating cultural environment. From the twelfth to the sixteenth century, Florence was in fact the most stimulating city in the Western world for arts and culture.

Putnam[6] advanced the hypothesis that during the period 1000-1300, the city states in Northern Italy developed a level of social capital higher than the towns in the Kingdom of Naples. These large differences in behavioral norms between Northern and Southern Italy may explain the current differences in economic development across Italian regions.

The psychologists Cohen *et al.*[7] suggested that there was a culture of "honor" in the South of the USA but not the North because the two areas were settled by different groups. The North was mostly settled by groups with a farming background, whereas the South was settled by Scottish and Irish people, who were mostly herders. Herders leave the protection of property rights to the individual and not to the community. Their culture of honor was less important in a more organized society.

The hypothesis that culture also affects norms of behavior in homogeneous environments was tested by Fisman and Miguel[8]. They found a link between corruption and culture across countries. There was a close link between parking violations by United Nations diplomats in New York City and the cultural tolerance of corruption back home. Another approach hypothesized that knowledge, education, and technology, through historical events, have

[3] Boyd, Richerson 1985; Cavalli-Sforza, Feldman 1981.
[4] Cavalli-Sforza 2016.
[5] *Ibidem*.
[6] Putnam *et al.* 1993.
[7] Cohen *et al.* 1996.
[8] Fisman, Miguel 2007.

a long-term impact on economic development. Glaesler *et al.*[9], for example, argued that part of the positive relationship between European settlements and economic growth documented by Acemoglu *et al.*[10] may reflect the knowledge and know-how brought by settlers to the colony.

Recent literature has emphasized the relationship between cultural environment and attitude towards science. Attitude towards science is affected by socio-cultural factors and shapes regional entrepreneurship. An environment that supported new ideas could also have a crucial role in fostering innovation and economic activity. This stream of literature identified creativity as a driver of innovation, competitiveness and, ultimately, economic development[11]. Audretsch and Belitski[12] proposed a theoretical framework supporting the creativity theory of knowledge spillover entrepreneurship. They distinguished ordinary and intellectual human capital from creativity, embodied in people. The former is attributable to educational attainment, and the latter «is an excluded knowledge element, primarily personalized (tacit) knowledge of individuals»[13]. Both human capital and creativity in well-educated or skilled people can foster entrepreneurship at national and local level[14]. Regions with large numbers of ideas and talented people are centers of global competitiveness. Creative people are attracted to an environment characterized by diversity and availability of cultural amenities[15]. Cities with a creative environment show higher levels of innovation and new firm formation in technology-intensive industries[16]. However, this literature on creativity has not tried to explain the historical roots of actual creativity.

Only a few papers have explored the importance of history for actual creativity and knowledge base. Some have emphasized the path-dependency of regional entrepreneurship, which is a long-term phenomenon[17]. Fritsch and Wyrwich[18] documented the persistent effect of the establishment of universities and historical self-employment rates on new business formation in German regions over the period 1907-2014. They found that, despite the political, social and economic changes that influence society over time, the structure of new business formation at local level was broadly constant over a long period, and only changed slowly[19]. Del Monte and Pennacchio[20] proposed a measure

9 Glaesler *et al.* 2004.
10 Acemoglu *et al.* 2001.
11 UNCTAD 2008.
12 Audretsch, Belitski 2013.
13 Audretsch, Belitski 2013, p. 820.
14 Boschma, Fritsch 2009; Lee *et al.* 2004.
15 Florida 2004.
16 *Ibidem*.
17 Fotopoulos 2013; Fritsch, Wyrwich 2014.
18 Fritsch, Wyrwich 2018.
19 Anderson, Koster 2011; Fritsch, Storey 2014.
20 Del Monte, Pennacchio 2020.

of cultural attitude towards science based on historical data about scientists and inventors (SIs) and investigated whether the actual rate of high-tech firm formation in Italy was affected by this index. Their paper also highlighted the positive relationship between the establishment of universities in the past and the current levels of new business formation in Italy.

This paper has two main areas of focus. Firstly, we analyzed the role of historical institutions in shaping the cultural environment and attitude towards science. We focused on the scientific revolution that took place in Europe at the end of the Renaissance period, and continued to the late 18th century, and used this as a case study. We developed a descriptive analysis suggesting that the level of social and religious tolerance, the power of the church and the attitude of elite groups towards scientific discoveries gave rise to different cultural environments across European regions. These different environments affected the attitude towards science. Secondly, we estimated an econometric model showing that regional knowledge base and creativity, two proxies for the attitude towards science and cultural environment, had long-term and positive effects on actual economic drivers such as entrepreneurship and innovation. We found that having a higher concentration of SIs in the "soft" (social) sciences than "hard" (natural) sciences had a stronger impact on entrepreneurship, while the reverse was true for innovation. This empirical analysis was based on current and historical data going back as far as 1100 on some items. It considered the four European countries with the largest GDPs (Italy, France, Germany, and the UK) at the NUTS-3 geographical level. Our results suggest that the presence of universities in the past, our proxy for historical knowledge base, and the number of scientists and inventors in the past, our proxy for historical creativity, have a positive effect on current rates of regional entrepreneurship and innovation.

The paper contributes to the literature in several ways. First, we suggest that historical factors, such as the scientific revolution in Europe, have an important role in shaping the cultural environment. Previous studies have not emphasized the importance of history in this way. Second, we proposed a new and original database for scientists and inventors, our proxy for creativity, which is based on data from Wikidata. This database extends and complements the data used in Del Monte and Pennacchio's paper[21], by distinguishing the scientific specialisms of scientists and inventors and their different impact on entrepreneurship and innovation. Lastly, previous analyses were based on individual countries[22], but we investigated the historical determinants of entrepreneurship and innovation across European regions.

The remainder of this paper is organized as follows. Section 2 discusses our theoretical framework and derives the two research hypotheses about the

21 *Ibidem*.
22 Fritsch, Wyrwich 2014, 2018, among others.

importance of history in shaping cultural environment and attitude towards science in the past, and their impact on current levels of entrepreneurship and innovation. Section 3 discusses the case study of the scientific revolution in Europe, and sets out a descriptive analysis supporting the idea that historical factors have shaped the cultural environment and the attitude towards science in the past. Section 4 describes our data and the econometric model used to empirically test the hypothesis that historical attitude towards science has a long-lasting impact on two important drivers of economic growth today: entrepreneurship and innovation. Section 5 concludes the paper.

2. *Historical cultural environment, attitude toward science and current economic drivers*

The scientific revolution replaced the Aristotelian scientific tradition, which was based on deduction, with an inductive approach that aimed to obtain knowledge, and observe events with an open mind. The value of evidence, experimental or observed, led to a scientific methodology in which empiricism played an important role. The scientific revolution had no immediate economic effect but it strongly affected the intellectual environment. Until the nineteenth century, technology was developed by individuals who were not necessarily scientists. The scientific method affected the way of thinking and operating of artisans, who were the main technological innovators. The use of observation, experimentation and rationality became a crucial aspect of the innovation process, which was part of the way that artisans commonly operated.

The positive attitude towards science inspired the creation of scientific societies and organizations across Europe that tried to explain natural phenomenon with a common method based on observation, experimentation and reasoning[23]. The relationship between science and technology was not immediate, but the influence of the new scientific method based on experimentation and reasoning spread into many aspects of society, fostering technology and, ultimately, growth. The long development of scientific knowledge would not have determined continued economic growth if Western society had not developed a social consensus on the use of new products and inventions. The importance of innovating, starting new firms and modifying the management of existing firms spread widely. However, the scientific revolution and its positive consequences were not accepted everywhere with the same intensity. In Western regions, science and technology developed more easily where there was an environment

[23] The Royal Academy of Science was created in the UK in 1662. Academies of Science were also created in France in 1666, in Prussia in 1700, in Russia in 1724, in the United States in 1743, and in Turin (the Kingdom of Sardinia) at the end of the eighteenth century.

with a high degree of autonomy from political and religious authorities. The environment was therefore not equally favorable in all countries to the rise of a positive attitude towards science and technology.

A different strand of literature identified historical tolerance as an important determinant of the cultural environment, especially with respect to creativity and innovation. Social tolerance of cultural diversity and cultural differences can drive unconventional approaches to the development of new ideas and encourage experimentation, innovation and entrepreneurial behaviors. Florida[24], for example, analyzed the case of San Francisco, emphasizing that its long history of tolerance fostered the creation of a creative environment. Florida[25] also found a significant and positive relationship between creativity and concentration of high-technology industry. Religious tolerance is also important to build a creative environment. McCann[26] found that the success of the Dutch Republic during the seventeenth century was because religious tolerance allowed inflows of Jews, Huguenots and Catholics. This led to a creative environment. Similarly, the growth of some of the US coast cities in the nineteenth century was supported by high levels of religious tolerance.

Serafinelli and Tabellini[27] showed that city institutions promoting economic and political freedoms, as well as local autonomy, were crucial in developing a creative environment. They considered a sample of large cities in Europe between the eleventh and nineteenth centuries and found that local culture played an important role in encouraging individuals towards creative endeavors. They also suggested that elite creative groups were attracted by social and cultural environments open to external ideas and where authority and tradition had a lesser role. These articles therefore emphasized that historical heritage and the characteristics and history of a society are crucial factors in determining the cultural environment of a region, especially knowledge base and creativity[28].

Culture shapes institutions and environment, and environment affects the birth of new inventors and scientists. Scientists spending their life in their region of birth could positively affect local scientific culture. This creates a very strong self-sustaining mechanism that improves local scientific and cultural environment. The openness of regional culture toward scientific discoveries and attitude toward science determine beliefs, social connections, perspectives, mental models, and behaviors of the population, and these aspects affect the birth of scientists and inventors. In turn, a cultural environment characterized by strong levels of creativity and knowledge base is conducive to a positive

24 Florida 2002.
25 *Ibidem*; Florida 2014.
26 McCann 2013.
27 Serafinelli, Tabellini 2019.
28 Santagata 2002.

attitude towards entrepreneurship and innovation, which are important drivers of regional growth[29].

Figure 1 shows the theoretical background used to derive our research hypotheses. Historical factors such as the degree of autonomy from religion and politics, and social and religious tolerance, created a culture and norms of behavior that determined a favorable attitude toward science. This environment was an important factor in past centuries that favored the birth of important scientists and inventors. Institutions like academies of science and other informal organizations of scientists that adopted methods based on an inductive approach helped to spread a mentality supporting the development of knowledge over parts of the population, such as artisans and the intellectual elite. This process had a positive effect on culture and norms of behavior that were open to science, and supported self-sustaining development. From this theoretical background, we derived two hypotheses. The first one was investigated through the descriptive analysis set out in Section 3, and the second was empirically tested using econometrics, described in Section 4:

Hypothesis 1. The cultural environment and attitude towards science have historical roots that depend on factors that affect culture and behavioral norms.

Hypothesis 2. Historical attitude towards science has an important role in fostering innovation and entrepreneurship in the long-term.

3. *Scientific revolution, culture and the birth of new scientists and inventors in Europe*

This section provides a descriptive analysis of the historical evolution of institutions and how they affected the attitude towards science in Europe. We also calculated an index linked to history and based on the number of scientists and inventors at regional level. The index is both a measure of attitude towards science in a location and a factor with a positive effect on the attitude of culture towards science.

Table 1 shows the spatial and time-related distribution of scientists and inventors and GDP per capita in five European countries: France, Germany, UK, Italy, and Spain. The last two columns of the table show the ratio between the number of SIs born in Italy and Spain, and the total number born in the five countries, and the variance of their spatial distribution.

It could be argued that the distribution of SIs has been affected by GDP per capita. This relationship is quite complex to investigate. From the fifteenth to eighteenth centuries, Italy had the highest GDP per capita of the five countries.

29 Del Monte *et al.* 2020.

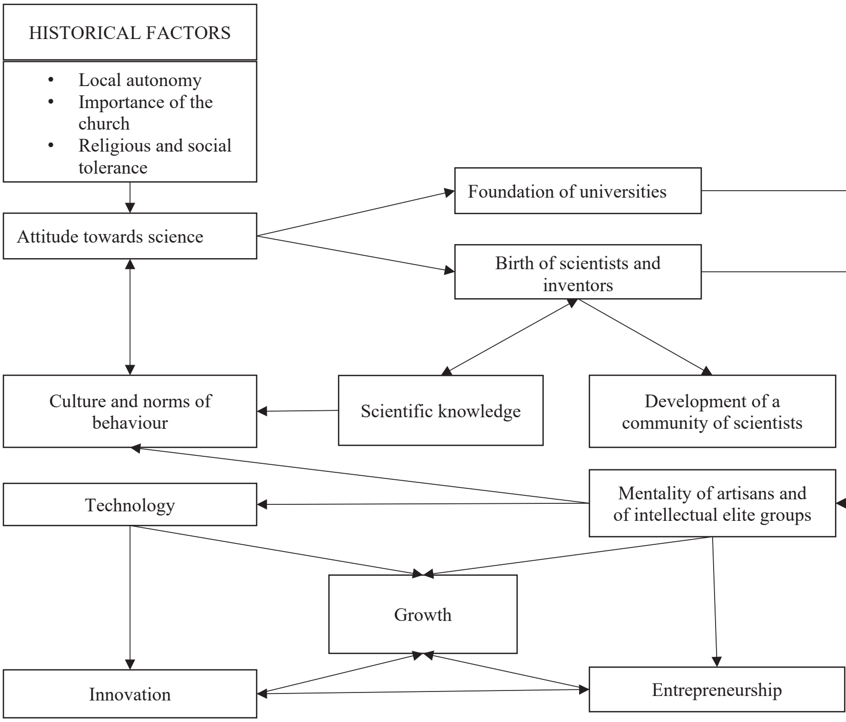

Fig. 1. The theoretical framework of this paper (Source: own elaboration)

It was exceeded in Europe only by the Netherlands. However, it had fewer scientists and inventors than Germany and France. In the seventeenth century, with the start of the industrial revolution, Italy was surpassed by the UK. Spain, with a GDP per capita similar to Germany and France, had very low numbers of SIs. A relationship between SIs and GDP per capita therefore cannot be ruled out, but the evidence is mixed[30].

It is more likely that the changing pattern of the presence of SIs was shaped by the emergence of the scientific revolution. It is interesting to note not only that there are differences across countries, but that these differences increased steadily over time. The variance in the SIs index increased from 2.8 before the fifteenth century to 382.8 in the nineteenth century. Before the fifteenth century, the number of scientists and inventors was quite low in all countries and the differences between the five countries were also low. The change started with the scientific revolution that marked the emergence of modern science during the early modern period. The scientific revolution took place in Europe towards

30 In the same vein, Serafinell and Tabellini (2019) provided evidence that the agglomeration of creative individuals in European cities cannot be predicted by the levels of wages.

the end of the Renaissance period and continued to the late eighteenth century, influencing the intellectual and social movement known as *the Enlightenment*. The publication in 1543 by Nicolas Copernicus of *De revolutionibus orbium coelestium* is often cited as marking the beginning of the scientific revolution. From the sixteenth century, the proportion of SIs in Italy and Spain relative to the other countries decreased steadily, probably because the Catholic Church was stronger in those countries than the other three. We suggest that the different intensity of scientific revolution in the five countries was caused by the differences in the social, economic, and political institutions. Religious institutions were very important. The Catholic religion in Southern Europe played a different role in supporting science and development than the Protestant religion in Northern European countries. Max Weber described Catholics and Protestants having a different attitude towards innovation. After the sixteenth century, the Protestant world was characterized by a higher freedom of expression than Catholic countries. The intolerance of the Catholic world caused the different effects of Reform and Counter-Reform[31]. The British historian Hugh Trevor-Roper suggested that the reactionary attitude against Protestantism, more than Protestantism itself, characterized the destiny of Southern Europe for more than three hundred years. The Iberian Peninsula and Southern Italy therefore lost their opportunity to lead the scientific revolution. Intolerance also existed in the Protestant world, but religion's control on intellectual life was much weaker[32]. The reaction of the Inquisition was tougher, and this explains the attitude of suspicion of new ideas seen in many Catholic countries.

In addition, in the Protestant world, power was seen as emanating directly from God. Political power was seen as sacred. Even after the theological origins of this belief were forgotten, a sense of respect for the political institutions remained. During some periods, absolute institutions prevailed in Protestant countries, but during other periods, constitutional theories were accepted. Sometimes the rejection of a cruel prince was instituted through democratically-elected representatives. This led to a higher tolerance of new ideas than in Catholic countries. Catholics believe that God has no role in institutions that are created by humankind and people could therefore build whatever they desired[33].

31 Landes 2000, p. 196.
32 Jostock 2007; Luzzi 2011, p. 84.
33 Levi 2011.

	Spain	Italy	Germany	France	Great Britain	SIs in Spain and Italy as a proportion of total SIs	Variance of SIs between countries
11th–15th centuries							
SIs	3	4	0	2	4	0.53	2.8
15th century							
SIs	0	3	6	1	0	0.30	6.5
GDP p.c.	661	1,100	688	727	714		
16th century							
SIs	0	6	6	5	2	0.31	7.2
GDP p.c.	853	1,100	791	841	974		
17th century							
SIs	0	7	7	13	15	0.17	34.8
GDP p.c.	853	1,100	910	910	1,250		
18th century							
SIs	0	7	16	31	36	0.08	235.5
GDP p.c.	1,008	1,117	1,077	1,135	1,706		
19th century							
SIs	1	5	44	11	37	0.06	382.8
GDP p.c.	1,207	1,499	1,839	1,876	3,190		

Tab. 1. Number of scientists and inventors (SIs) and GDP per capita (p.c.) from the eleventh to nineteenth centuries (Notes: GDP per capita is in 1959 international dollars. Sources of data were Singer (1959) for SIs and Maddison Contours of the World Economy 1-2018 for GDP per capita)

Humans are sinners and tend to produce imperfect institutions, so the Church was required to correct their action and lead them to salvation. Under the Counter-Reformation, two forms of authority – the Church and the State – were constantly fighting for supremacy, with no clear separations of tasks or hierarchies. In many Catholic countries, the strength of the Church meant that citizens' relationship with government was marked by weak institutions and a culture of clemency, absolutism and legal uncertainty. The Church was able to sustain the old ideas in line with the Bible. The trial against Galileo is probably the best-known action of the Church against new scientific ideas but there were many other cases before the Counter-Reformation. Belloc *et al.*[34] noted that in Italy between 1100 and 1300, the occurrence of an earthquake retarded institutional transition from autocratic regimes to self-government (the commune) in cities where the political and religious leaders were the same person (episcopal cities) but not in cities where the political and religious power were distinct (non-episcopal cities). In the Middle Ages, earthquakes were considered to be manifestation of the will and outrage of God, and represented a shock to people's religious beliefs. The earthquake in Italy therefore enhanced

34 Belloc *et al.* 2016.

the ability of political religious leaders to restore social order after the crisis because of the emerging of communal institutions' leaders.

In Spain, where the Catholic religion was the core of national identity, the scientific revolution had very weak roots. During the years of political decline in Spain, while the hegemony in Europe was disappearing, there was a burgeoning of the arts (e.g. Cervantes, Lopes De Vega, Calderon El Greco) but few scientists and inventors. Theology was still considered the master science, and all other sciences its servants. The University of Salamanca held that the study of Newton would not improve logic or metaphysics and that Descartes was much further from revealed truth than Aristotle[35]. There were fanatic religious massacres across the whole of Europe during the period, but Spain is unique in how long religious intolerance lasted. The Inquisition was not abolished until 1820.

The situation was different in other Catholic countries like France. This was a centralized state and the political power was able to resist the power of the Church. After a period of religious war in the second half of the sixteenth century, the Edict of Nantes in 1598 granted a degree of religious tolerance towards Protestants. The strength of the central State relative to the Church, and the religious tolerance, allowed France to give a strong push to the scientific revolution.

The Italian situation was different again. Italy was not characterized by religious wars, but was greatly influenced by foreign powers. In Southern Italy, where the influence of Spain was very strong, religious intolerance and closure to the ideas of the scientific revolution resulted in an attitude that was not favorable to science. The number of great scientists and inventors born in Southern Italy was low[36]. Lazio, dominated for centuries by the pope, also had few scientists and inventors. A different situation emerged in the center and Northern Italy. This area was more influenced by Austria and France, both of which were inclined towards the scientific revolution, and the weight of the Renaissance was strong.

Germany was characterized by a large number of states with different religions (Lutheran, Calvinist, and Catholic). The citizens of each state were forced to adopt the religion of their rulers (the principle of *cuius regio, eius religio*, set out under the Peace of Augsburg in 1555). Germany was devastated by religious wars until the second half of the seventeenth century, when the Peace of Westfalia in 1648 institutionalized the Catholic, Lutheran, and Calvinist religious divide with the population either converting, or moving to areas controlled by rulers of their own faith. However, in the last few years of the seventeenth century, religious tolerance and openness towards new ideas increased. In the kingdom of Prussia, constituted in 1701, and under Federico II (the Great), the law of religious tolerance was approved. Federico II also

[35] Crow 2005.
[36] Del Monte 2019.

adopted policies favoring science and culture. Consequently, in the eighteenth century, the scientific revolution received a big push in Germany.

In Great Britain, before the Protestant reformation, the power of the Church was largely opposed by the kings, and there were fights against the privileges of the Church. After the Reformation, freedom of speech and religious tolerance, despite the distrust of Catholics, were regarded as important. The role of Parliament was also important, dating from the *Magna Carta*. From the seventeenth century, Parliamentary government was viewed as a key characteristic of Britishness, and the ideas of limited government, representative politics, an accountable monarchy, the rule of law and an absence of religious persecution (even if Catholics could not take public office until the nineteenth century) were established.

Summing up, religious tolerance, free speech, and weak power of the church were therefore all elements that favored the spread of the scientific revolution, the creation of a cultural environment open to science and the growth of important scientists and inventors. This descriptive analysis is consistent with our Hypothesis 1.

4. *The impact of historical attitudes towards science on current entrepreneurship and innovation in Europe*

This section describes the empirical test of our second hypothesis about the positive and long-lasting effect of a cultural environment inclined towards science on current levels of entrepreneurship and innovation. To this aim, we built an econometric model to assess the impact of historical creativity, in terms of SIs, and knowledge base, in terms of universities, on regional entrepreneurship and innovation.

The information used in this empirical analysis drew on different sources of data. We built an original dataset that includes data at the NUTS-3 geographical level for the most important countries in Europe in terms of GDP (Germany, United Kingdom, Italy and France) collected over a long period starting from the eleventh century for some items. The NUTS-3 administrative unit corresponds to small regions, which are about the size of a main city and its neighbouring municipalities. Overall, our dataset includes cross-sectional data for 737 small regions.

4.1 *Data and variables*

4.1.1 *Dependent variables*

To fit the theoretical background outlined in Section 2, we used current entrepreneurship and innovation as dependent variables in our econometric analysis. Entrepreneurship and innovation are important drivers of growth and are closely linked[37].

We used two proxies for entrepreneurship. These considered firms in innovative sectors in the period 2013-2018. The variable *Innovative SMEs* measured the number of innovative small and medium-sized enterprises (SMEs) that were less than five years old and held at least one patent in the period under scrutiny. This variable captures the intensity of start-ups in a region. The second proxy for entrepreneurship is *Innovative Firms*, which gives the number of all firms (SMEs and larger firms) with at least one patent. The source of data for these two variables was Orbis, the cross-country longitudinal firm-level database provided by Bureau van Dijk.

We used two proxies to operationalize innovation. *Patents* measures the number of patents registered with the European Patent Office (EPO) and *Inventions* measures the number of inventions by firms. The first can be considered as a measure of radical innovation, and the second can be used to measure incremental innovation, because it includes different types of innovations (process, product, and organizational). Data were from Eurostat for *Patents*, and Orbis for *Inventions*. Both variables were calculated as the sum of patents and innovation in the period 2007-2012.

4.1.2 *Main explanatory variables*

The main explanatory variables concerned historical creativity and knowledge base, two important characteristics of a cultural environment. Data for both variables were collected from the eleventh to the twentieth century at NUTS-3 level.

[37] We embraced the view of Schumpeter, whose first entrepreneurship theory coined the figure of "entrepreneur as innovator". He argued that the implementation of new ideas requires entrepreneurs. Innovation and technological change therefore stem directly from the effort of entrepreneurs (Schumpeter 1912, 1947).

Creativity

Creativity is a multidimensional concept that embraces different contexts. Artistic creativity, for example, is associated with imagination and the ability to generate new ideas and interpret things differently, in the form of text, sound, or image. Scientific creativity implies curiosity and propensity to experiment and make new connections among existing pieces of information. Economic creativity is a dynamic process that applies innovative solutions in technology and business domains to obtain a competitive advantage.

Previous studies have used data on creative industries[38], creative people such as "bohemians and other artistically creative people" (authors, musicians, composers, actors, directors, painters, sculptors, or dancers)[39] or notable individuals in different creative endeavors (art, humanities, science and business)[40] to measure creative activity of regions and countries. However, we felt these proxies of creativity were not suitable to investigate the relationships with entrepreneurship and innovation. Data on creative industries are more useful to identify the impact of creativity on economic development, and data on bohemians and individuals in creative endeavors are mainly related to artistic creativity rather than scientific or economic creativity. We suggest that economic and scientific creativity matter more than artistic creativity in studying entrepreneurship. Following Del Monte and Pennacchio[41], we therefore used the number of scientists and inventors in a region as a more suitable proxy for the type of creativity that matters in the economic and business domain, that is, economic and scientific creativity. As we explained, the presence of scientists and inventors in a region has a close link to the socio-economic conditions and the characteristics of the cultural environment.

Information on SIs came from two sources of data. First, in line with Del Monte and Pennacchio[42], we used the book *Short History of Scientific Ideas to 1900* by Charles Singer[43], which provides a list of scientists and inventors between the eleventh and twentieth centuries, with information on their place and date of birth. The variable *SI_Singer* measured the number of scientists and inventors who were born in a given region in the period under scrutiny.

Second, as a new source of data, we used Wikidata, the free and open knowledge base associated with Wikipedia[44]. Wikidata has two major

[38] Lazzeretti *et al.* 2015.
[39] Lee *et al.* 2004.
[40] Serafinelli, Tabellini 2019.
[41] Del Monte, Pennacchio 2020.
[42] *Ibidem*.
[43] Singer 1959.
[44] Launched in 2012, Wikidata is designed to host structured, multilingual (so there is only one edition) and plural (can support many competing facts) data. It is a free and open knowledge base with 82,149,960 data items that people can edit. Wikidata acts as central storage for the structured data of its Wikimedia sister projects, which include Wikipedia, Wikivoyage, Wiktionary,

advantages over Singer: *i)* it contains data about more scientists and inventors; and *ii)* it provides information not only on the place and date of birth, but also on the field or specialism of scientists or inventors, distinguishing between "hard" (natural) and "soft" (social) sciences. This distinction is useful to compare scientific fields on the basis of their perceived methodological rigor, exactitude, and objectivity. Natural sciences (e.g. biology, chemistry, physics, mathematics, and astronomy) are considered hard, whereas social sciences (e.g. economics, political science, psychology, and sociology) are usually described as soft[45]. Singer's book only gives information about scientists and inventors in hard sciences.

To extract information on scientists and inventors from Wikidata, we selected the labels "scientists and inventors" and "occupation of a person". For each individual, therefore, we obtained information on the place and date of birth, place and date of death, and occupation. Using information on the place of birth, we calculated a variable measuring the total number of SIs (*SI_Wikidata*) who were born in a given region between the eleventh and twentieth centuries. This variable was used in the first set of estimates as an alternative measure of creativity instead of *SI_Singer*. We then considered data on occupation of SIs. We allocated them to provinces by their place of birth, and created two further variables distinguishing the number of SIs in hard sciences (*SI_Wikidata_HS*) and the number of SIs in soft sciences (*SI_Wikidata_SS*). These two variables were used as explanatory variables in the second step of the analysis to verify whether the impact of creativity on entrepreneurship and innovation depends on the field of the SIs.

Knowledge base

To measure the stock of regional knowledge base, we used historical data on universities. The presence of a university in a given area is widely used in the literature on innovation as a proxy for the stock of knowledge available in an area. This is because universities foster the creation of local research networks[46], the transfer of knowledge to industry[47] and increase the probability of knowledge spillovers[48], stimulating local entrepreneurship and innovation. Historical information about universities was taken from Wikidata, which provides the city and the year of establishment for each university from the eleventh century. Using these data, we computed two variables at the NUTS-3

and Wikisource. This "data commons" provides structured data for Wikipedia articles and other applications. Every article on Wikipedia has a hyperlink to an editable item in this database.

[45] Fanelli 2010; Hedges 1987; Smith *et al*. 2000.

[46] Ardovino, Pennacchio 2012.

[47] Bellucci, Pennacchio 2016.

[48] Bellini *et al*. 2019.

level to measure: *i)* the number of public and private universities, and *ii)* the sum of years since the establishment of all the universities in the region. The results shown are those obtained with the latter variable (*University*), which can be considered a measure of the stock of knowledge available in each region. This variable accounts for both the presence of universities and also their reputation in terms of years of activity. The first variable gave similar results in terms of statistical significance, and these were therefore omitted for the sake of space.

4.1.3 *Controls*

We included several control variables. *Population* controlled for the size of different regions, and was the number of individuals (million). The variable *Density* measured the number of people per square kilometer. This control is important because the literature has emphasized that agglomeration economies could generate more productive environments that foster the birth of new firms and, therefore, entrepreneurship and innovation[49]. Both variables were calculated in 2012 to be consistent with the reference period of the dependent variables. The source of data was Eurostat.

Finally, we used GDP per capita at constant price as a control for the economic development of the regions, calculated in 2012 (variable *GDP p.c.*). The source of data for the GDP per capita was the Organization for Economic Co-operation and Development (OECD).

Table 2 shows the main descriptive statistics and correlations of the variables used in the empirical analysis. The final sample included 737 small regions in Italy, France, UK and Germany. The proxies for entrepreneurship included 4,990 innovative small and medium-sized enterprises and 6,766 innovative large firms. We therefore included 4,990 firms in the variable *Innovative SMEs* and 11,756 firms in the variable *Innovative Firms*. For the proxies of innovation, the variable *Patents* included 247,265 patents registered with the EPO, and the variable *Inventions* considered 38,825 inventions made by firms in the time span.

The number of scientists and inventors varied with the source of data. Singer gave a total of 256 SIs (variable *SI_Singer*), but Wikidata gave much higher numbers: 1,548 scientists and inventors in total (*SI_Wikidata*): 1,320 in hard sciences (*SI_Wikidata_HS*) and 228 in soft sciences (*SI_Wikidata_SS*). The total number of universities is all regions was 538.

[49] e.g. Reynolds *et al.* 1994.

	Mean	Std. Dev.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Innovative_SMEs	6.77	14.8											
(2) Innovative_firms	15.95	27.4	0.75*										
(3) Patents	335.5	529.2	0.60*	0.57*									
(4) Inventions	52.68	417.9	0.09*	0.12*	0.14*								
(5) SI_Singer	0.34	1.13	0.23*	0.40*	0.36*	0.05							
(6) SI_Wikidata	2.10	5.29	0.40*	0.55*	0.51*	0.06	0.80*						
(7) SI_Wikidata_HS	1.79	4.44	0.38*	0.53*	0.50*	0.06	0.79*	0.99*					
(8) SI_Wikidata_SS	0.34	0.98	0.42*	0.56*	0.45*	0.07	0.71*	0.88*	0.83*				
(9) University	0.73	2.37	0.48*	0.65*	0.40*	0.08	0.61*	0.72*	0.72*	0.63*			
(10) Population	361,507	392,650	0.63*	0.64*	0.58*	0.05	0.30*	0.42*	0.41*	0.39*	0.57*		
(11) Density	815.7	1,757	0.11*	0.38*	0.39*	0.05	0.34*	0.38*	0.38*	0.30*	0.32*	0.20*	
(12) GDP p.c.	37,241	24,706	0.19*	0.47	0.41*	0.10*	0.42*	0.45*	0.44*	0.41*	0.41	0.03	0.46

Tab. 2. Descriptive statistics and correlations (Notes: N = 737. * Statistically significant at the 5% level)

4.2 *The model*

The baseline estimated equation is:

$$Y_i = \beta_0 + \beta_1 SIs_i + \beta_2 University_i + \beta_3 Population_i + \beta_4 Density_i + \beta_5 GDP\ pc_i + \alpha_i + \varepsilon_i$$

where *Y* is the dependent variable and *SIs* our different measures for scientists and inventors; indicates small regions (NUTS-3 geographical level) in Germany, United Kingdom, Italy and France; α_i are regional fixed effects at NUTS-2 geographical level that capture any unobserved heterogeneity that may affect regional entrepreneurship and innovation; ε_i is the error term and β_1 and β_2 are the main coefficient of interest. The object of this empirical analysis was to estimate the impact of historical creativity and knowledge base on current levels of regional entrepreneurship and innovation. The dependent variables covered the current period (between 2007 and 2018), and the explanatory variables measured the stock of creativity and university using historical data from the eleventh century onward. This therefore provided a cross-sectional dataset including both current and historical data.

The model was estimated using ordinary least squares and all variables were log-transformed so that coefficients are elasticities. The variables on the presence of universities and inventors have the advantage of being fairly exogenous to the dependent variable, because of the ample time lag.

4.3 *Empirical results*

In first step of the analysis, we estimated the econometric model by considering SIs from Singer. The results are shown in Table 3. In columns 1 and 2, the dependent variables measure entrepreneurship, and in columns 3 and 4, they measure innovation. Looking at the specifications of the model with *Innovative SMEs* and *Innovative firms* as dependent variables, *SI_Singer* and *University*, our main variables of interest, had positive coefficients and were statistically significant at the 1% level. This indicates that regions with a strong historical presence of both scientists and inventors and universities have higher rates of entrepreneurship today. The coefficients were 0.17 and 0.15 for SIs and 0.13 and 0.17 for universities, suggesting that the positive effects of creativity and knowledge base on entrepreneurship are quite similar.

There were similar results for the specifications with *Patents* and *Inventions* as dependent variables. Both *SI_Singer* and *University* were statistically significant and had a positive coefficient. The significance was lower and the coefficients were smaller than for entrepreneurship, but the result was basically the same: historical knowledge base and creativity have positive and long-lasting effects on current levels of innovation.

In all model specifications, the control variables were statistically significant and had a positive coefficient, as expected. The R-squared was high in all specifications, suggesting that the model had good overall explanatory power. It was higher in the equation with *Patents* as dependent variable (0.88) and lower when the dependent variable was *Inventions*. This is probably because the variable *Inventions* was drawn from Orbis and was based on a sample of firms, while the other dependent variables considered innovation across the whole population of firms. The measurement of firms' innovation is also more difficult than the measurement of patents or innovative firms. These considerations may explain the weaker explanatory power of the equation for firms' innovation.

	Innovative SMEs	Innovative firms	Patents	Inventions
SI_Singer	0.173*** (0.062)	0.152*** (0.047)	0.129** (0.064)	0.124* (0.054)
University	0.131*** (0.047)	0.177*** (0.036)	0.093* (0.054)	0.351*** (0.076)
Population	0.785*** (0.050)	0.905*** (0.041)	1.292*** (0.047)	1.070*** (0.080)
Density	0.048* (0.025)	0.047** (0.022)	0.054** (0.027)	0.090* (0.048)
GDP p.c.	0.623*** (0.110)	0.632*** (0.097)	0.338*** (0.107)	1.120*** (0.212)
Regional fixed effects	YES			
Observations	737	737	683	737
R2	0.81	0.85	0.88	0.64

Tab. 3. The historical determinants of current entrepreneurship and innovation. Data from Singer (1959) (Notes: ***, **, and * show statistical significance at the 1, 5 and 10% levels. Robust standard errors in parenthesis)

The next step was to estimate the model using SI numbers from Wikidata. In this set of estimates (see Tab. 4), we used the variable *SI_Wikidata*, which includes all scientists and inventors in a region, across both hard and soft sciences.

The variable *University* was still significant in all specifications and the coefficients were similar to Table 3. For the new proxy for creativity, however, there were some differences. The variable *SI_Wikidata* was still significant at the 1% level for entrepreneurship, but not for innovation. In addition, the coefficients attached to *SI_Wikidata* in the equations for entrepreneurship were also lower than those obtained with *SI_Singer*. These differences between the two sources of data for SIs may be because Singer only included information on scientists and inventors in hard science areas, but the variable *SI_Wikidata* includes those working in soft sciences.

	Innovative SMEs	Innovative firms	Patents	Inventions
SI_Singer	0.016*** (0.003)	0.010*** (0.002)	0.003 (0.004)	0.006 (0.006)
University	0.091** (0.046)	0.163*** (0.037)	0.124** (0.055)	0.346*** (0.082)
Population	0.794*** (0.047)	0.913*** (0.040)	1.307*** (0.046)	1.077*** (0.080)
Density	0.049** (0.024)	0.049** (0.022)	0.058** (0.028)	0.091* (0.048)
GDP p.c.	0.602*** (0.107)	0.620*** (0.097)	0.330*** (0.108)	1.115*** (0.221)
Regional fixed effects		YES		
Observations	737	737	683	737
R2	0.81	0.84	0.87	0.63

Tab. 4. The historical determinants of current entrepreneurship and innovation. Data from Wikidata (Notes: ***, **, and * show statistical significance at the 1, 5 and 10% levels. Robust standard errors in parenthesis)

In the next step of the analysis, we therefore distinguished between SIs in hard (*SI_Wikidata_HS*) and soft sciences (*SI_Wikidata_SS*). Table 5 provides the estimates for hard sciences, and Table 6 shows those for soft sciences.

Looking at the variable *SI_Wikidata_HS*, there was a positive and statistically significant effect for both entrepreneurship and innovation. These results are consistent with those in Table 3, where we used data from Singer. This therefore means that when we included only scientists and inventors in hard science fields, there was a positive impact on both entrepreneurship and innovation, irrespective of the source of data.

	Innovative SMEs	Innovative firms	Patents	Inventions
SI_Singer	0.021*** (0.004)	0.013*** (0.003)	0.010** (0.005)	0.007* (0.004)
University	0.084* (0.046)	0.156*** (0.037)	0.117** (0.055)	0.349*** (0.081)
Population	0.793*** (0.048)	0.913*** (0.040)	1.306*** (0.046)	1.077*** (0.080)
Density	0.048** (0.024)	0.048** (0.022)	0.057** (0.028)	0.091* (0.048)
GDP p.c.	0.615*** (0.105)	0.635*** (0.096)	0.365*** (0.107)	1.116*** (0.220)
Regional fixed effects		YES		
Observations	737	737	683	737
R2	0.81	0.84	0.88	0.64

Tab. 5. The historical determinants of current entrepreneurship and innovation considering SIs in hard science fields (Notes: ***, **, and * show statistical significance at the 1, 5 and 10% levels. Robust standard errors in parenthesis)

It is interesting to observe that the results were slightly different when we included only SIs in soft sciences (Tab. 6). The coefficient of *SI_Wikidata_SS* was positive and significant for both *Innovative SMEs* and *Innovative firms* as dependent variables, but was not significant for *Patents* or *Inventions*. This suggests that those working in soft sciences had a positive effect on entrepreneurship but not innovation. This could be because we measured innovation using patents and innovations. Both items are more likely to capture radical innovation, which requires specific and technical skills that are mainly acquired in the hard sciences.

In addition, the coefficients of *SI_Wikidata_SS* in Table 6 were higher than those of *SI_Wikidata_HS* in Table 5. This suggests that scientists and inventors in soft sciences have a stronger effect on entrepreneurship than those in hard sciences. However, the effect of creativity on entrepreneurship was less dependent on the fields of SIs.

	Innovative SMEs	Innovative firms	Patents	Inventions
SI_Singer	0.086*** (0.022)	0.060*** (0.016)	0.33 (0.029)	0.035 (0.036)
University	0.103** (0.045)	0.164*** (0.036)	0.130** (0.053)	0.352*** (0.078)
Population	0.797*** (0.048)	0.916*** (0.040)	1.309*** (0.046)	1.079*** (0.080)
Density	0.054** (0.024)	0.052** (0.022)	0.056** (0.027)	0.093* (0.048)
GDP p.c.	0.605*** (0.104)	0.628*** (0.096)	0.365*** (0.107)	1.112*** (0.221)
Regional fixed effects	YES			
Observations	737	737	683	737
R2	0.81	0.84	0.86	0.60

Tab. 6. The historical determinants of current entrepreneurship and innovation considering SIs in soft sciences (Notes: ***, **, and * show statistical significance at the 1, 5 and 10% levels. Robust standard errors in parenthesis)

Until now, the dependent variables have been expressed in logarithmic form. For robustness purposes, we also estimated the main regressions in Tables 3 and 4 using alternative measures of the dependent variables. Tables A1 and A2 in the Appendix show the results obtained by estimating a negative binomial model in which the dependent variables give the number of SMEs and large innovative firms. In Tables A3 and A4, we applied ordinary least squares regression to the dependent variables scaled per thousand inhabitants. The estimates are consistent with those provided in the main analysis.

Overall, our findings show that historical creativity and knowledge base, and therefore the cultural environment in the past, have an important role in fostering entrepreneurship and innovation today. This evidence supports our Hypothesis 2. Using data from Wikidata, however, we found that the effect on creativity depends in part on the field of the scientists and inventors included in the analysis.

5. *Conclusions*

In this study, we analyzed the impact of historical factors on the cultural environment and attitude towards science, as well as the role of the cultural environment in shaping regional entrepreneurship and innovation in the long-term. Analyzing the scientific revolution that took place in Europe at the end of the Renaissance period, we showed that historical factors such as social and religious tolerance, the power of the church and the attitude of elite groups towards scientific discovery spawned different cultural environments across European regions. Where the cultural environment was characterized by tolerance and a positive attitude towards culture and scientific knowledge, important values such as creativity and knowledge emerged. These factors, in the long-term, stimulated regional entrepreneurship and innovation. However, the scientific field of scientists and investors matters when assessing the effect of creativity: soft sciences have a stronger impact on entrepreneurship than hard sciences, but the reverse is true for innovation.

Overall, our results suggest that history matters in shaping long-term economic patterns. This is consistent with the recent strand of literature that recognizes a culture of entrepreneurship as an informal institution[50]. This culture is persistent over time despite relevant changes in regional socio-economic conditions. It is highly heterogeneous across different regional contexts and helps to explain why regions have different rates of growth.

An important implication of this analysis is that public policies that are designed to foster entrepreneurship and innovation may be effective in the short-term. In the long-term, however, it is necessary to build a culture of entrepreneurship and innovation through the creation of an environment characterized by tolerance and a positive attitude towards scientific knowledge and culture in general.

In this paper, in line with previous studies, we considered regional creativity and knowledge base as two important but independent aspects of the cultural environment. Future research could investigate their relationship to understand if they are really independent, or if there are some causal links between them. Future studies could also try to provide empirical support for our first hypothesis. We used the scientific revolution to provide a descriptive analysis of the impact of historical factors on the features that characterize the cultural environment of different European regions. This idea should be extended to other historical

[50] Fritsch, Wyrwich 2019.

contexts and supported by an econometric analysis. Previous studies have suggested the presence of spatial dependence in the regional distribution of SIs[51]. An in-depth investigation of spatial spillovers of regional creativity would therefore be an interesting avenue for further research. Similarly, the migration flows of SIs could also be analyzed. The geographical distribution of SIs considered in this analysis was based only on the place of birth. However, some studies on artists have emphasized that it is important to consider where they moved to study or work[52].

References / Riferimenti bibliografici

Acemoglu D., Johnson S., Robinson J.A. (2001), *The colonial origins of comparative development: An empirical investigation*, «American Economic Review», 91, n. 5, pp. 1369-1401.

Anderson M., Koster S. (2011), *Sources of persistence in regional start-up rates – evidence from Sweden*, «Journal of Economic Geography», 11, n. 1, pp. 179-201.

Ardovino O., Pennacchio L. (2012), *Le determinanti della cooperazione nei distretti tecnologici italiani finanziati dal governo*, «Studi Economici», n. 108, pp. 121-149.

Audretsch D.B., Belitski M. (2013), *The missing pillar: the creativity theory of knowledge spillover entrepreneurship*, «Small Business Economics», 41, n. 4, pp. 819-836.

Bellini E., Piroli G., Pennacchio L. (2019), *Collaborative know-how and trust in university-industry collaborations: empirical evidence from ICT firms*, «Journal of Technology Transfer», 44, n. 6, pp. 1939-1963.

Belloc M., Drago F., Galbiati R. (2016), *Earthquakes, religion, and transition to self-government in Italian cities*, «The Quarterly Journal of Economics», 131, n. 4, pp. 1875-1926.

Bellucci A., Pennacchio L. (2016), *University knowledge and firm innovation: evidence from European countries*, «Journal of Technology Transfer», 41, n. 4, pp. 730-752.

Boschma R.A., Fritsch M. (2009), *Creative class and regional growth: Empirical evidence from seven European countries*, «Economic Geography», 85, n. 4, pp. 391-423.

Boyd R., Richerson P.J. (1985), *Culture and Evolutionary Process*, Chicago: University of Chicago Press Books.

[51] e.g. Del Monte, Pennacchio 2020.

[52] O'Hagan, Hellmanzik 2008; O'Hagan, Borowiecki 2010.

Cavalli-Sforza L.L., Feldman M.W. (1981), *Cultural transmission and evolution: A quantitative approach*, Princeton, NJ: Princeton University Press.

Cavalli-Sforza L.L. (2016), *L'evoluzione della cultura*, Torino: Codice Edizioni.

Cohen D., Nisbett R.E., Bowdle B.F., Schwarz N. (1996), *Insult, aggression, and the southern culture of honor: An "experimental ethnography"*, «Journal of Personality and Social Psychology», 70, n. 5, p. 945.

Crow J.A. (2005), *Spain: the Root & the Flower*, Berkeley: University of California Press.

Del Monte A. (2019), *Il Mezzogiorno d'Italia e il Sud degli Stati Unit: due casi di sviluppo a confronto*, Soveria Mannelli: Rubbettino Editore.

Del Monte A., Moccia S., Pennacchio L. (2020), *Regional entrepreneurship and innovation: historical roots and the impact on the growth of regions*, «Small Business Economics», <https://doi.org/10.1007/s11187-020-00425-w>.

Del Monte A., Pennacchio L. (2020), *Historical roots of regional entrepreneurship: the role of knowledge and creativity*, «Small Business Economics», 55, n. 1, pp. 1-22.

Engerman S.L., Sokoloff K.L. (1994), *Factor endowments: institutions, and differential paths of growth among new world economies: a view from economic historians of the United States*, NBER Historical Working Paper No. 0066, Cambridge, MA: NBER.

Fanelli D. (2010), *"Positive" results increase down the hierarchy of the science*, «PLoS One», 5, n. 4, e10068.

Fisman R., Miguel E. (2007), *Corruption, norms, and legal enforcement: Evidence from diplomatic parking tickets*, «Journal of Political economy», 115, n. 6, pp. 1020-1048.

Florida R. (2002), *The rise of the creative class*, New York: Basic Books.

Florida R.L. (2004), *Cities and the creative class*, New York: Routledge.

Florida R.L. (2014), *The Creative Class and Economic Development*, «Economic Development Quarterly», 28, n. 3, pp. 196-205.

Fotopoulos G. (2013), *On the spatial stickiness of UK new firm formation rates*, «Journal of Economic Geography», 14, n. 3, pp. 651-679.

Fritsch M., Storey D.J. (2014), *Entrepreneurship in a regional context: historical roots, recent developments and future challenges*, «Regional Studies», 48, n. 6, pp. 939-954.

Fritsch M., Wyrwich M. (2014), *The long persistence of regional levels of entrepreneurship: Germany, 1925–2005*, «Regional Studies», 48, n. 6, pp. 955-973.

Fritsch M., Wyrwich M. (2018), *Regional knowledge, entrepreneurial culture, and innovative start-ups over time and space – an empirical investigation*, «Small Business Economics», 51, n. 2, pp. 337-353.

Fritsch M., Wyrwich M. (2019), *Regional Trajectories of Entrepreneurship, Knowledge, and Growth: The Role of History and Culture*, Springer Nature: Switzerland.

Glaeser E.L., La Porta R., Lopez-de-Silanes F., Shleifer A. (2004), *Do institutions cause growth?,* «Journal of Economic Growth», 9, n. 3, pp. 271-303.
Hedges L.V. (1987), *How hard is hard science, how soft is soft science? The empirical cumulativeness of research*, «American Psychologist», 42, n. 5, pp. 443-455.
Jostock I. (2007), *La Censure négociée: le contrôle du livre à Genève, 1560–1625*, Geneva: Droz.
La Porta R., Lopez de Silanes F., Shleifer A., Vishny R. (1997), *Legal determinants and external finance*, «Journal of Finance», n. 52, pp. 1131-1150.
La Porta R., Lopez de Silanes F., Shleifer A., Vishny R. (1998), *Law and Finance*, «Journal of Political Economy», 106, n. 6, pp. 1113-1155.
Landes R. (2000), *Encyclopedia of Millennialism and Millennial Movements*, New York: Routledge.
Lazzeretti L., Innocenti N., Capone F. (2015), *Does Related variety matter for Creative Industries?,* Papers in Evolutionary Economic Geography (PEEG) 1510, Utrecht: Utrecht University, Department of Human Geography and Spatial Planning, Group Economic Geography.
Lee S.Y., Florida R., Acs Z. (2004), *Creativity and entrepreneurship: a regional analysis of new firm formation*, «Regional Studies», 38, n. 8, pp. 879-891.
Levi G. (2011), *Catholicism, power, democracy and the failure of the past*, in *History of Nations*, edited by P. Furtado, London: Thames & Hudson, pp. 264-271.
Luzzi S. (2011), *L'Italia della riforma, l'Italia senza riforma. Seconda parte. Cultura protestante in Italia e protestanti esuli fuori d'Italia nel Settecento*, in *Cristiani d'Italia. Chiese, società, stato, 1861-2011*, edited by A. Melloni, Roma: Istituto della Enciclopedia Italiana Treccani.
McCann P. (2013), *Modern Urban and Regional Economics*, Oxford, UK: Oxford University Press.
Nunn N. (2009), *The importance of history for economic development*, «Annual Review of Economics», 1, n. 1, pp. 65-92.
O'Hagan J., Borowiecki K.J. (2010), *Birth location, migration, and clustering of important composers: historical patterns*, «Historical Methods», 43, n. 2, pp. 81-90.
O'Hagan J., Hellmanzik C. (2008), *Clustering and Migration of Important Visual Artists: Broad Historical Evidence*, «Historical Methods», 41, n. 3, pp. 121-136.
Putnam R.D., Leonardi R., Nanetti R.Y. (1993), *Making democracy work: Civic traditions in modern Italy*, Princeton, NJ: Princeton University Press.
Reynolds P.D., Storey D.J., Westhead P. (1994), *Cross-national comparisons of the variation in new firm formation rates*, «Regional Studies», 28, n. 4, pp. 443-456.
Santagata W. (2002), *Creativity, fashion, and market behavior*, Working Paper 05/2002, Torino: University of Torino.

Schumpeter J.A. (1912), *The Theory of Economic Development*, New Brunswick, NJ: Transaction Publishers.

Schumpeter J.A. (1947), *Theoretical problems of economic growth*, «Journal of Economic History Supplement», 7, S1, pp. 1-9.

Serafinelli M., Tabellini G. (2019), *Creativity Over Time and Space*, IZA Discussion Paper No. 12644.

Singer C.J. (1959), *Short history of scientific ideas to 1900*, New York: Oxford University Press.

Smith L.D., Best L.A., Stubbs D.A., Johnston J., Archibald A.B. (2000), *Scientific graphs and the hierarchy of the sciences: A Latourian survey of inscription practices*, «Social Studies of Science», 30, n. 1, pp. 73-94.

Sokoloff K.L., Engerman S.L. (2000), *Institutions, factor endowments, and paths of development in the new world*, «Journal of Economic Perspectives», 14, n. 3, pp. 217-232.

UNCTAD (2008), *Creative economy*, Report 2008, Geneva-New York: UNDP(UNCTAD).

Appendix

	Innovative SMEs	Innovative firms	Patents	Inventions
SI_Singer	0.213***	0.137***	0.134**	0.188*
	(0.062)	(0.042)	(0.061)	(0.112)
University	0.118***	0.157***	0.095*	0.312***
	(0.047)	(0.032)	(0.052)	(0.081)
Population	1.070***	1.046***	1.286***	1.176***
	(0.044)	(0.032)	(0.045)	(0.092)
Density	0.043	0.050**	0.066***	0.144***
	(0.029)	(0.019)	(0.026)	(0.051)
GDP p.c.	0.728***	0.764***	0.314***	1.548***
	(0.113)	(0.086)	(0.097)	(0.215)
Regional fixed effects		YES		
Observations	737	737	683	737
Pseudo R^2	0.31	0.38	0.39	0.15

Tab. A1. Negative binomial regressions on the historical determinants of current entrepreneurship and innovation. Data from Singer (1959). (Notes: ***, **, and * show statistical significance at the 1, 5 and 10% levels. Robust standard errors in parenthesis)

	Innovative SMEs	Innovative firms	Patents	Inventions
SI_Wikidata	0.016***	0.011***	0.003	0.001
	(0.002)	(0.002)	(0.003)	(0.008)
University	0.058	0.122***	0.128**	0.343***
	(0.046)	(0.031)	(0.051)	(0.083)
Population	1.089***	1.058***	1.301***	1.190***
	(0.043)	(0.031)	(0.045)	(0.091)
Density	0.042	0.050***	0.072***	0.146***
	(0.029)	(0.019)	(0.026)	(0.051)
GDP p.c.	0.743***	0.760***	0.345***	1.562***
	(0.110)	(0.085)	(0.099)	(0.217)
Regional fixed effects		YES		
Observations	737	737	683	737
Pseudo R^2	0.31	0.36	0.38	0.15

Tab. A2. Negative binomial regressions on the historical determinants of current entrepreneurship and innovation. Data from Wikidata (Notes: ***, **, and * show statistical significance at the 1, 5 and 10% levels. Robust standard errors in parenthesis)

	Innovative SMEs	Innovative firms	Patents	Inventions
SI_Singer	0.592***	2.154*	16.82*	10.36*
	(0.218)	(1.220)	(10.01)	(0.611)
University	0.247**	0.177*	0.488*	0.660**
	(0.115)	(0.968)	(0.052)	(0.312)
Population	0.006	0.798	2.106***	1.737
	(0.177)	(0.647)	(0.730)	(1.533)
Density	0.223**	0.027	1.214***	1.165
	(0.097)	(0.261)	(0.437)	(1.145)
GDP p.c.	1.827***	6.434***	6.003**	4.984*
	(0.486)	(1.996)	(2.291)	(3.063)
Regional fixed effects		YES		
Observations	737	737	683	737
R^2	0.58	0.65	0.65	0.29

Tab. A3. Historical determinants of current entrepreneurship and innovation. Data from Singer (1959) (Notes: The dependent variables are scaled by population (100,000 inhabitants). ***, **, and * show statistical significance at the 1, 5 and 10% levels. Robust standard errors in parenthesis)

	Innovative SMEs	Innovative firms	Patents	Inventions
SI_Wikidata	0.051**	0.378*	0.650*	0.413*
	(0.025)	(0.216)	(0.350)	(0.224)
University	0.140	0.476*	0.430	0.230
	(0.139)	(0.257)	(0.743)	(1.283)
Population	0.038	0.729	2.220***	2.606*
	(0.169)	(0.492)	(0.707)	(1.526)
Density	0.228**	0.052	1.232***	1.234
	(0.096)	(0.206)	(0.446)	(1.156)
GDP p.c.	1.836***	5.85***	6.205***	4.465
	(0.474)	(1.764)	(0.302)	(3.015)
Regional fixed effects		YES		
Observations	737	737	683	737
R^2	0.57	0.69	0.65	0.29

Tab. A4. The historical determinants of current entrepreneurship and innovation. Data from Wikidata (Notes: The dependent variables are scaled by population (100,000 inhabitants). ***, **, and * show statistical significance at the 1, 5 and 10% levels. Robust standard errors in parenthesis)

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