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Path Dependence, Institutions and the Density of Economic Activities: Evidence from Italian Cities

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Summary

In recent years a growing body of literature has begun to consider the possible presence of path dependence in the development processes of countries. This phenomenon has always been recognized in regional and urban studies because the path of development almost naturally follows a history-dependent spatial diffusion influenced by both physical geography and the quality of institutions. In this paper, I consider the case of firm concentration in Italy and its impact on local development. A large and growing literature has argued in favour of persisting effects of past institutions on current outcomes. Hence, in order to identify the impact of firm density on income, I use instruments from the history of a set of Italian cities: namely the presence of a university and status as a free-city state in the Early Middle Ages. I first show that those two variables had an important effect on the process of urban development between 1300 and 1861, together with favourable geographic conditions. Then, when I use these instruments to predict firm density, I find that the elasticity of income to firm density is close to 0.1. This result is interpreted as providing evidence of the historical roots of agglomeration economies in Italy.

Keywords: Path dependence, Urban development, Geography, Institutions, Firm density

JEL Classification: O18, R12

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Path dependence, Institutions and the Density of Economic Activities: Evidence from Italian Cities*

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Abstract

In recent years a growing body of literature has begun to consider the possible presence of path dependence in the development processes of countries. This phenomenon has always been recognized in regional and urban studies because the path of development almost naturally follows a history-dependent spatial diffusion influenced by both physical geography and the quality of institutions. In this paper, I consider the case of firm concentration in Italy and its impact on local development. A large and growing literature has argued in favour of persisting effects of past institutions on current outcomes. Hence, in order to identify the impact of firm density on income, I use instruments from the history of a set of Italian cities: namely the presence of a university and status as a free-city state in the Early Middle Ages. I first show that those two variables had an important effect on the process of urban development between 1300 and 1861, together with favourable geographic conditions. Then, when I use these instruments to predict firm density, I find that the elasticity of income to firm density is close to 0.1. This result is interpreted as providing evidence of the historical roots of agglomeration economies in Italy.

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1. Introduction

Cities were long considered as very similar to countries, so that the determinants of long-run growth and development were regarded as being human capital accumulation and the location of new firms. The New Economic Geography has instead pointed to the importance of firm density as an important determinant of wages and productivity in cities (Rosenthal and Strange, 2004). Recently, Storper (2008) has added to the existing literature by arguing that institutions and physical geography should be considered as key factors in urban growth because both forces may provide incentives to firm location and influence the rate of return on both physical and human capital..

"Institutions" form a very broad category comprising both *de jure* political institutions and *de facto* institutions, which are the "ways that public sector agencies and private sector groups and individuals interact in detailed ways to shape the rules and resources of the economy" (Storper, 2008; p. 9).The importance of history has been convincingly documented and demonstrated as regards *de jure* institutions. In particular, Acemoglu et al. (2001) provide evidence that the mortality rate of European settlers in the former colonies affected institutional quality. In colonies with high mortality rates, European colonizers established extractive rent-seeking institutions, while in countries in which the mortality rate was low, colonizers established growth-promoting institutions that protected property rights. This result can be taken as a path-breaking insight into how a historical event can have considerable effects on past institutions; effects that, through their persistence, have an influence on current income levels (Nunn, 2008). Similar arguments form the core of Putnam's well-known (1993) theory of regional development in Italy, for which he hypothesizes that past political institutions (i.e.

experiences of free cities during the Early Middle Ages) influence the current level of social capital and hence development.

An alternative theory of economic development consists in the so-called “geography view”, which has been often considered as competing with the “institutions view”. The proponents of this theory consider physical and economic geography (i.e., what Krugman (1991a) calls first and second natures) to be as important as institutions in determining economic development (Bosker and Garretsen, 2009; MacArthur and Sachs, 2000).

With very few exceptions (Acemoglu et al, 2005), the aforementioned literature has focused on cross-country development differentials, in whose analysis the role of geography is often found to be irrelevant because it is often proxied by distance from the equator, which does not prove to be salient in analyzing local development. The study of cross-city variation in development should be related to different measures of geography intended to quantify the natural advantage of cities. In other words, urban development is likely to be influenced by both geography and the quality of institutions. What is not clear *a priori* is whether the effect of geography on current economic development works through its impact on historic events or through a direct effect on current economic outcomes.

Although apparently in competition with each other, both the “institution view” and the “geography view” point to the existence of path dependence in economic development. Through the persistence of *de facto* and *de jure* institutions, as well as through economies of agglomeration in economic activity, institutional history and geography may shape paths of economic development (Martin and Sunley, 2006). Although the concept of path dependence is widely accepted by scholars in the economic geography community, there is only some local-level evidence corroborating or rejecting this hypothesis, mainly because of the lack of data and of an appropriate theoretical framework. In this paper, I propose some econometric evidence on the institutional and geographical sources of path dependence in urban development through economies of agglomeration. In other words, I argue that denser places result from good past institutions and favourable geography, and this in turn results in higher levels of income.

Figure 1 reports the positive correlation between firm density and income per capita in 2001, highlighting the competitive advantage of denser cities. Since the seminal paper by Ciccone and Hall (1996), economists have engaged in a constant quest for exogenous instruments with which to identify the elasticity of income or wages to firm density. Interestingly, figures 2a and 2b show that firm density in 2001 was strongly correlated to urban population density in 1861 and, even further in the past, in 1500. But what were the driving forces of urban development that may considered to be good instruments for firm density? In this paper, I argue that both geographical and institutional variables can be considered the driving forces of past development and might explain the current level of firm density.

I have tested this hypothesis in the context of Italian cities because of the great variability of past institutional quality within the country, its geographical characteristics, and the economic outcomes of its cities. To this end, I assembled a unique dataset containing information on the population and characteristics of 563 Italian cities over the period 1300-1861. I then tested whether and how urban development (as measured by city population) was actually influenced by both geography, as expressed by market potential and the physical-geographical characteristics of city location, and by institutions, as defined by the quality of regional governments, the communal past of the city, and the presence of a university. I found that both geography and institutions have played a significant role in shaping the urban development of Italian cities and hence in the making of modern cities, although I found that market potential has a low explanatory power, and that the presence of university institutions has been an important factor in urban development and growth.

A particular feature of the past institutions of Italian cities, as defined by the free city-states of the Early Middle Ages, is that these *de jure* institutions formalized practices into commercial laws which lasted for several centuries and which, in some cases, are still applied in modern cities. This form of "legal persistence" can be conceived as generating long-run industrial development through the enforcement of property rights, leading to higher entrepreneurship rates. I tested this hypothesis and found that the institutional past is positively correlated with the firm density, and that this in turn has a positive impact on the level of current income. These results can be interpreted as evidencing the historical and geographical origins of economies of agglomeration and of path-dependent development.

This paper adds to the existing literature by providing evidence on the importance of geography and institutions for urban development, and it proposes new instruments with which to identify the impact of firm density on development. It finds that taxable income elasticity to firm density lies in the interval [0.08-0.11], depending on the specification.

Although the econometric framework may be regarded as inadequate because it fails to account for the multiplicity of development patterns postulated in the evolutionary literature (Martin and Sunley, 2006), my econometric analysis provides some robust statistical results on the very long-run effects of historical events and adverse geography on city development.

The paper proceeds as follows. The next section reviews the main literature and highlights some aspects of the research hypothesis. Section 3 reports a quantitative analysis of urban history in Italy showing that institutions and geography have mattered for urban development. The fourth section proposes an empirical model of the impact of firm density on income. This is estimated by means of instrumental variables in which the quality of past institutions is used as an instrument. Section 5 concludes.

2. Geography and institutions in urban development

In a neoclassical growth framework, an economic system grows according to its capital accumulation rate. However, this model does not prove satisfactory in explaining intra-country variation of income where factor endowments are not the only sources of development (Acemoglu and Dell, 2009). Ciccone and Hall (1996) have proposed a framework in which the location of firms in space influences the productivity of places: that is, denser areas are more productive. From an econometric point of view, this relationship is difficult to identify because of endogeneity. Therefore required is a theory with which to identify variables that can explain the density of firms exogenously.

It is very likely that regional and urban systems grow according to their economic structure, which is influenced by, among other things, their relative position and place accessibility (i.e. geography) and the quality of their institutions. In this section, I start from this simple proposition to review the literature on both the institutions and geography views and then set out my arguments on the use of past institutional quality to explain current firm density.

The role of nature in shaping the development processes of both cities and countries has been much debated by economists in recent years since the very influential papers by Acemoglu et al. (2002), Gallup et al. (1999), MacArthur and Sachs (2000) and Sachs (2001). In general, the literature has identified different channels of transmission of geography to development.

In backward economies, specialized in agriculture, climate may have a significant impact on productivity and, in the long run, on the adoption of different technologies (Comin et al., 2006; Diamond, 1997; Sachs, 2001). Moreover, in those same poor areas, the “disease burden” in terms of malaria diffusion increases the overall mortality rate and hence reduces the economy’s growth rate. The diffusion of malaria as a proxy for the adverse effect of geography is very important because this disease is strictly related with unhealthy environmental conditions (Diamond, 1997; Percoco, 2009; Gallup and Sachs, 2001).

Over the historical period observed by the present study, i.e. 1300-1861, diseases such as plague, smallpox, cholera and malaria afflicted Italian cities and reduced their populations even significantly. The Black Death in 1347-1351 killed almost one third of the European population (Cipolla, 1974), while the plague of 1630-1631 killed a similar proportion of the Italian urban population, with a mortality rate ranging from 12% in Florence to 61% in Verona[1] (Cipolla, 1989).

[1] Interestingly, Cipolla (1989) argues that part of the variability in the mortality rates of the 1630-1631 plague was due to differences in urban health care institutions. In particular, Tuscany had an especially active system of Uffici di Sanità (“Public Health Offices”). As a consequence, the mortality rate of Florence was very low (12%).

Between the Black Death and the last epidemics in 1630-1631, several episodes of plague occurred in Italy. Cipolla (1974) reports 21 epidemics in Venice and 23 in Florence.[2] Interestingly, physical geography may help reduce the disease burden for epidemics of this kind. In particular, more isolated cities, possibly in mountain areas, were comparatively less affected by plague epidemics.[3] However, in those cases, geography also had the contrary effect of increasing transport costs and reducing the development of cities.

Besides climate and the relative disease burden, geography makes the transport of goods more costly, so that firms located in remote areas are less competitive.

As convincingly argued by Duranton (1998), the economic development of the pre-industrial city was deeply influenced by the "tyranny of distance" because physical space and transport costs introduced important frictions in economic space. The number of cities in a given system is thus a function of transport costs and agricultural surpluses (Bairoch, 1988; Braudel, 1984; Pirenne, 1925). In particular, as demonstrated by Duranton (1998), the "tyranny of distance" does not predict city size, but rather sets upper and lower bounds on the size of cities. The reason is that the maximum city size increases when all the agricultural surplus produced in the countryside is consumed during the transport process. The lower bound is set by the same reasoning. In other words, geography shapes urban development in a variety of ways, ranging from high transport costs to the morphology that may significantly influence the location of economic activities.

[2] Note that the hypothesis of a positive impact of adverse geographical conditions has been convincingly tested by Nunn and Puga (2008) in the case of the ruggedness of territory in Africa and its defensive role against the slave trade.

[3] Note that the decision to locate cities was made in the past according to two competing objectives: the minimization of transport costs or the minimization of health and military risks. Hence, mountain areas, because they were almost isolated, were particularly attractive for the second reason.

However, as noted earlier, the "tyranny of distance" does not fully explain actual city size. In fact, the quality of institutions has been identified as a crucial source of development at country, regional and urban level. From an institutional-economic viewpoint, North (1981, p.3) defined institutions as "the rules of the game in a society or, more formally, the humanly devised constraints that shape human interaction". In the pre-industrial period, guilds were the pro-market institutions in the sense that they sought to increase inter-city trade in order to increase demand and production. However, the guilds system was only one part of the much more complex institutional structure of pre-industrial cities.

Particularly interesting for the purposes of the present paper is DeLong and Shleifer's (1993) seminal work in which they presented results on the relevance of regional institutions in explanation of urban development. In the case of Europe in the period between 1000 and 1800, they found that cities under absolutist regimes grew less than cities under non-absolutist governments, possibly because of higher taxation under revenue-maximizing monarchs.[4]

On analyzing the contemporary development geography of Italy, Putnam (1993) argued that trust and the quality of local government affect the level of development by reducing transaction and coordination costs. Putnam (1993) also argues that social capital is greater in areas in the North where, in the Early Middle Ages, independent city states were widespread.[5]

[4] A similar result is reported in a recent paper by Henderson and Wang (2006) on contemporary worldwide cities. Interestingly, they find that technological innovations have large impacts on bigger cities, while the process of democratization affects smaller cities. Henderson and Wang conclude that those opposing effects may have been the reason why the worldwide relative size distribution of cities remained unchanged from 1960 to 2000.

[5] In a recent and interesting paper, Guiso et al. (2007) have provided empirical support for the view that the current levels of social capital in Central-Northern Italian municipalities depend on the communal past of those cities. Similarly, Tabellini (2007) finds that past political institutions explain current culture in European regions, which, in turn, is positively related to income level.

On this view, the existence of independent communal republics (*Repubbliche Comunali*) in several areas of the North gave rise to a long-lasting *civicness* which in its turn produced higher levels of trust and in general of social capital. Interestingly, the rise of *Repubbliche comunali* in northern Italy can be viewed as an historical accident. In particular, in the Early Middle Ages the main concern of governments was the defense of cities against enemy attacks. In order to minimize defense costs, citizens in the North self-organized into oligarchic democracies. In the South, Frederick II maintained a centralized defense policy together with a slight decentralization of fiscal policy. There is no evidence on the differences in the effectiveness of the defense policy between the two parts of the country, although the economic consequences of the choice were large and persistent. In fact, in the aftermath of the death of Frederick II, rent-seeking local lords condemned Southern cities to underdevelopment because of higher tax rates and poor rules on property rights (Ascheri, 1994).

Putnam's hypothesis (1993) therefore postulates that a relatively minor difference in *de jure* institutions resulted, in the long run, in considerable differences in *de facto* institutions and social capital. But why do past political institutions influence the current level of development? One possible reason is the existence of multiple equilibria in the intergenerational transmission of beliefs, so that agents with a low-quality culture transmit good values only in the case of shocks, while agents with good culture always transmit good culture (Guiso et al., 2007).

Although appealing, this process could be viewed as only one of the possible channels of transmission of the institutional history of Italian cities.

A very important feature of the *Repubbliche Comunali* has been neglected by most of the aforementioned literature, namely the fact that urban governments enacted the so-called *Statuti Comunali*, which were similar to local constitutions. The interesting feature of these statutes was the prevalence of commercial law (which is indicative of the market orientation of communal institutions) which was applied until the 1950s and in some cases is still adopted in some cities (Cattini and Romani, 2001).[6] In fact, after the unification of Italy, the rules formalized in the *Statuti Comunali* evolved into formal commercial local rules maintained by the local Chambers of Commerce.

Obviously, such norms evolved over the centuries, but what I wish to stress here is the importance of the *Statuti Comunali* in enhancing an early rule of law which persisted across the centuries as a formal economic institution (Cattini and Romani, 2001).

The economic literature has reached broad agreement on the importance of the rule of law in enhancing entrepreneurship and hence economic development (Audretsch, 2007). Cities in which norms were stable and written, and which were governed by market-oriented institutions, were more likely to become important commercial or proto-industrial centers. Interestingly, the persistence of the rule of law across the centuries guaranteed, along with favorable economic geography conditions, the persistence of entrepreneurial behavior. It is consequently unsurprising to find that industrial districts arose in cities and towns with a communal past (Cattini and Romani, 2001; Putnam, 1993).

The hypothesis of the importance of *Statuti Comunali* as a source of long-run development is also borne out by recent studies in economic geography. As convincingly pointed out by Martin and Sunley (2006), one source of path dependence consists in region-specific institutions which enable specific economic and regulatory

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[6] The strength over time of economic norms autonomously set by cities is confirmed by the fact that after the Papal State was established in Central Italy, also by annexing cities which had previously been city-states, Pope Innocent III gave wide autonomy to those city parliaments as in terms of economic and fiscal

institutions to emerge. In particular, habits and conventions are among the most important factors driving the location of new firms and hence economic growth (Boschma and Lambooy, 1999; Storper, 1997).

It should be mentioned in this regard that also Southern cities developed forms of autonomy from the central State. During the tenth century, Southern Italy was sufficiently developed to attract merchants from throughout the Mediterranean basin. Normans arrived in 999 and founded a kingdom by conquering or annexing southern Italian cities. The most important of those cities had the status of *universitas*, i.e. cities endowed with an institutional structure very similar to that of the German and French independent cities (Ascheri, 1994). There are several reasons for the long-run failure of the *universitas*: here I shall point out only the most important ones as identified by Ascheri in his seminal work of 1994. Firstly, although *universitas* had a formalized *corpus iuris* which regulated relationships both between the city and the central government and among private agents within the city, those norms were often violated by the Norman kings and local lords in order to satisfy vested interests. Secondly, whilst the *Repubbliche Comunali* were democratic states with market-oriented institutions, the *universitas* were ruled by local lords, mainly landowners, interested in maximizing fiscal revenues and profits from agriculture. As a consequence, Southern cities were for centuries uncongenial to the birth of firms.

To sum up, both geography and institutions can be conceived as key factors in urban development. However, institutional history may exert persistent effects on the economic environment, not only through culture, as the previous literature has argued, but also through formal norms which persist and evolve over the centuries. In particular,

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matters. Also indicative of the importance of such norms is the fact that they persisted after the process of legal convergence begun in the aftermath of the Unification of Italy in 1861.

the hypothesis put forward in this paper can be summarized as in figure 3. It will be assumed that past institutions provided fertile soil for market development which in its turn stimulated entrepreneurship. On the other hand, geographical conditions are important *per se* because transport costs, although they decrease over time, are still relevant to explanation of firm productivity differentials. Hence, in what follows I do not assume that geography impacts on development only through a particular channel. Rather, I assume that geography has a persistent and direct effect on current development, firm location, and past development.

[Figure 3]

In econometric terms, this means that I shall make use of past institutions as instruments with which to identify the relationship between firm density and income. Despite their statistical properties, good instruments need a theory to justify their use. In this section I have argued that the experience of free city-states and of *Statuti comunali* were important factors in enhancing property rights and hence entrepreneurship. In the next section I shall verify whether this argument is supported by empirical evidence by reporting estimates of the impact of geography and institutions on the process of urban development in Italy in the period 1300-1861.

3. Geography and institutions in the making of the modern Italian cities

3.1 Description of the variables

As regards my dependent variable, I use data from Malanima (1998), who provides population estimates for cities with more than 5,000 inhabitants on a centennial basis over the period 1300-1861 (i.e. 1300, 1400, 1500, 1600, 1700, 1800, 1861). Appendix 1 contains the list of cities in the sample.

Some details on the characteristics of Malanima's (1998) dataset on Italian cities (1998) may prove useful. A 5,000-inhabitant threshold was used to maximize the number of cities in the sample and to minimize errors in population size. In other words, the dataset includes centers when they exceed a population of 5,000 and excludes them when the population falls below the threshold. Data were collected only once in a century owing to a lack of reliable information on small centers and for most Southern cities.

Malanima (2005) proposes three stages in the urbanization of Italy. The first occurred between the tenth century and 1350, during which period relatively new centers increased in population (Amalfi, Cuneo, Ferrara, Udine, Venice and many other cities). At the same time, the urbanization rate became higher in the Center-North than in the South. The second phase was during the period 1350-1861, while the third one started with the Unification of Italy in 1861 and has continued until the present day.

From the fourth century onwards, urbanization declined and several cities disappeared. However, in 1200 other cities underwent very large population growths: Alessandria, Amalfi, Catanzaro, Cuneo, Fabriano, Ferrara, Foggia, l'Aquila, Lecce, Macerata, Molfetta, Udine, Venice and Viterbo (Malanima, 2005). In the same period, towns in the North and in the Center began to grow faster than Southern ones. In 1300 the urbanization rate was higher in the Center-North (21.4%) than in the South (18.6%). In the same period, the triangle formed by Florence, Milan and Venice became the core of Italian development, with 97 cities exceeding 5,000 inhabitants, while 26 had 10,000 inhabitants and 13 had 15,000 (Malanima, 2005). It should be mentioned that this was the period with the largest number of *Repubbliche comunali*, and was hence a period of important institutional innovation.

The second period of Italian urban history covers a very long time-span and largely coincides with the period of observation for the present section, i.e. 1350-1870. Malanima (2005) found that the Italian urbanization rate declined over this period from 21.4% to 16.2%. Interestingly, the pattern of the urbanization rate reflected the declining importance of the Italian economy between the sixteenth and nineteenth centuries (Braudel, 1984). In 1500, the urbanization rate in Central-Northern Italy was 16.4%, which was almost three times the Western Europe average and five times the English rate. This figure changed dramatically at the end of the period, when the Italian urbanization rate was 3.4 points lower than the European average and only one third of the English rate.

The decline of Italy's importance in Europe was also reflected by the decline of the Italian population as a fraction of the European population as a whole. In fact during the period 1300-1800 the percentage of the Italian population over the total population of Europe fell from 30.5% to 15.9% (Bairoch, 1988).

As table 1 shows, in 1300 the largest Italian city was Milan, while Palermo was the biggest city in the South, as well as the only Southern city in the ranking. The hierarchy in 1300 was deeply influenced by the legacy of *Repubbliche Comunali* such as Bologna, Brescia, Cremona, Florence, Padua, and Siena, and also by the presence of two of the four *Repubbliche Marinare*, namely Genoa and Venice (the other two were Amalfi and Pisa).

Interestingly, it seems that, with only few exceptions, the core of the urban hierarchy in Italy as in 1861 was set up in 1500 and stabilized over the centuries until Unification in 1861, and thereafter in 2001 with the sole exception of Naples.

[Insert tables 1 and 2 about here]

Table 2 shows the average population by macro-region and city size. In this case, too, Italy's well known dualism is evident, given that average city size in the Center-North was almost double that in the South, although slight convergence occurred over the centuries as the average size of Northern cities decreased and that of Southern ones increased.

Let us now turn to the explanatory variables of urban development. As stated in the previous sections, there are good reasons to maintain that urban development has been historically influenced by both geography and institutions. In the model sketched by Duranton (1998), the higher the transport costs, the lower is the bound limiting city size. In other words, transport costs are decisive for city size. In my analysis, I proxied transport costs with several variables: altitude, road and waterway accessibility, and the existence of a port.[7]

I expected altitude to correlate negatively with urban development as expressed by city size because transport costs are higher when goods are shipped to or from mountain areas. As a consequence and *ceteris paribus*, mountain cities are less attractive to people because of lower productivity, lower wages and higher prices of goods.

The second measure of geography was roads and waterway accessibility. Italy's road infrastructure network was mainly built by Romans and it expanded slowly over time.

The index of accessibility took value 1 if the city was on the Roman road network and 0 otherwise. For inland waterways accessibility, the index was a dummy variable taking value 1 if the city was on a navigable river and 0 otherwise.[8]

Finally, the presence of a port in the city as a major facility was regarded as likely to influence the development process profoundly (Fujita and Mori, 1996). In fact, the dramatic increase of international trade during the late Middle Ages was mainly driven by two factors (du Jourdin, 1993): innovation in shipping technology and the rise of capitalist institutions. As first argued by Braudel (1984) and empirically demonstrated by Acemoglu et al. (2005), the focal point of international trade until the end of the seventeenth century was the Mediterranean Basin. And in that geographical context, Italian cities played a crucial role as both shippers and traders (du Jourdin, 1993). However, with the rise of Atlantic trade, the baricenter of international trade shifted to Northern Europe, exacerbating the poor economic circumstances of cities in the South whose economies, highly specialized in agriculture, suffered substantially from the competition of cheaper goods coming from overseas (De Rosa, 2003). However, as pointed out by Cipolla (1965) and Munro (1999), geography, in terms of distance from the Northern range, was not the only reason for the decline of some Italian cities in the eighteenth century: also different sailing technologies and the increased risks due to local conflicts in the Mediterranean basin were also key factors.[9]

The analysis reported here also considered the economic geography that characterizes city locations. In fact, the New Economic Geography literature has convincingly

[7] Appendix 2 provides a detailed description on the sources and construction of all variables.

[8] Both accessibility variables are time-invarying. In a previous version of the paper I used road accessibility indicators as varying across the time because of network expansion. However, because the econometric results were qualitatively similar, I decided to rely on the time-invarying variable in order to reduce measurement error.

[9] Pozzolo (2007) reports an increase of 250% circa between the end of the fifteenth and the seventeenth centuries in insurance rates for goods shipped in the Mediterranean Sea.

demonstrated the importance of market potential as a determinant of trade flows. With regard to cities, de Vries (1984) proposed an index, also used by Bosker et al. (2008), which defines the urban potential as:

(1) $$Urban\ potential_i = \sum_{j=1}^{n} \frac{Pop_j}{w_{ij} \cdot Dist_{ij}}$$

where Pop_j is population of city j, $Dist_{ij}$ is the great circle distance between city i and city j, and w_{ij} is a distance weight function. In particular, we consider the following values of w_{ij}:

$$w_{ij} = \begin{cases} 0.25 & \text{if } i \text{ and } j \text{ are both seaports} \\ 0.50 & \text{if } i \text{ and } j \text{ are both on inland waterways} \\ 0.75 & \text{if } i \text{ and } j \text{ are both on the main roads network and } \mathrm{Dist}_{ij} \leq 50km \\ 1 & \text{otherwise or } i = j \end{cases}$$

It should be noted that the urban potential indicator as defined by de Vries (1984) and Bosker et al. (2008) has been simplified in order to make computation easier, without losing any generality. Also to be noted is the value w_{ij} = 0.75, which has been attributed on the basis of the qualitative accessibility indicator discussed above. Associated with this value is a threshold of 50 kilometers because it is assumed that no interregional trade takes place over distances exceeding one day's travel by horse.[10]

At this point caution is required in correctly interpreting urban potential. In fact, market potential is commonly associated with the potential profitability of interregional trade. In the Middle Ages and the early Modern Age, trade volume was extremely low because of high tariffs (the *gabella*) and high transport costs. In fact, a given good produced in city A to be sold in city D crossing the borders of B and C was taxed three times, even if those cities belonged to the same state. This fiscal system had two implications:

a) the important role of inland waterways, which reduced the tax burden (Munro, 1999);
b) the incidence of interregional trade was very small.

As regards point b), it should be noted that the largest portion of trade was between the countryside and the core city. In fact, larger cities were often the result of large arable fields. For these reasons, I imposed a cut-off point at 50 kilometers for urban potential.

As concerns institutions, I used the data in Tabellini (2007), where past regional institutions are coded following the variable "Constraints on the Executive" as in the POLITY IV database. This variable (*institutions*) varies from 1 (unlimited authority) to 7 (accountable executive, constrained by checks and balances). I extended Tabellini's (2007) dataset to cover 1300 and 1400. The main sources of information for this purpose were Ascheri (1994) and DeLong and Shleifer (1993). It should be pointed out that my measure of institutional quality was at regional level, while some cities in the same political system could differ because of their culture and institutional history.[11] In particular, this concerns the fact that a number of Center-Northern cities in the Early Middle Ages were independent republics where capitalistic institutions were crucial in shaping economic development. The relevance of *Comuni* has also been recognized by Putnam (1993) who argued that North/South differences in *civicness* may be explained in terms of a civic *ethos* with respect to property rights protection, inequality aversion

[10] Personal communication ~~of~~from Marco Cattini, professor of Economic History at Bocconi University.
[11] In line with Tabellini (2007), I assume borders to be the current ones.

and rule of law. All these features, which largely affect economic development, are direct consequences of the institutional pasts of cities and regions, and in particular of the existence of independent and democratic forms of urban government (Ascheri, 2006; Guiso et al., 2007; Milani, 2005). In my analysis I hypothesised that cities under regional capitalistic regimes with a *Comune* past were more developed and grew to a greater extent than cities under absolutist regimes. In my dataset, the time-invariantvariable *comune* took value 1 if the city was a *Repubblica Comunale* and 0 otherwise.

Bosker et al. (2008) use a dummy variable on capital cities meant to be a politico-institutional variable. However, I could not find reliable information on this aspect because, according to Alfani (2005), during the period 1300-1861 too many cities lost or acquired the “capital city attribute”. In particular, in a descriptive analysis of some of the North Italian capitals, Alfani defines the rationalization of capital cities during the sixteenth and seventeenth centuries as a “capitals holocaust”. In addition, several so-called “capitals” were actually *Comuni*. For my purposes, I preferred to rely on the variable *comune* indicating a city’s communal past because it has a clear interpretation in terms of the impact of institutions.

According to Ascheri (1994), medieval universities should be regarded as liberal institutions because teaching was relatively free, and so was the internal organization of both students’ and professors’ cultural activities. This implies that the presence of a university in a pre-modern city should not be considered a proxy for human capital, but rather as an institution improving urban governance. In order to estimate the impact of university location, I introduced the variable $university_{it}$, which took value 1 if city *i* had a university in century *t* and 0 otherwise.

3.2 Empirical evidence

I began the empirical analysis by considering urban development differences. The first specification tested was as follows:

$$(2) \quad pop_{it} = d_t + \delta_j + \beta_1 altitude_i + \beta_2 accessibility_i + \beta_3 port_i + \beta urban \quad potential_{it} \varepsilon_{it}$$

where pop_{it} indicates log-population of city i at time t, $altitude_i$ is a dummy variable taking value 1 if the city's altitude is above 500 meters, and $accessibility_{it}$ indicates the road and inland waterway accessibility indices described in the previous sub-section. Variable $port_i$ is a dummy variable for the presence of a major port. Urban potential is expressed in log and defined from equation (1). Equation (2) was estimated by means of a GLS random effect estimate with a complete set of time and regional dummies (d_t and δ_j respectively).

Model 1 in table 3 reports the results for equation (2). All the estimated coefficients have the expected signs. In particular, mountain cities have smaller populations than cities, although this is not found to be significant. The presence of a port is of particular importance for urban development because it increases the city population by about 5,200 inhabitants. As regards accessibility, both roads and waterways have very similar effects on urban development, increasing population by? 1,300 inhabitants if a city was located on a major road or a navigable river. The elasticity of log-population is found to be very large (0.59) and significant.

[Table 3]

Let us now consider the role of institutions in influencing urban development. Table 3 (models 2, 3) reports the empirical estimates of a slightly modified version of (2), that is:

$$(3) \qquad \ln(pop_{it}) = d_t + \delta_j + \alpha university_{it-1} + \beta X_{it} + \gamma institutions_{jt} + \delta comune_i + \varepsilon_{it}$$

where $university_{it-1}$ stands for the presence of a university institution in the city in century *t-1*. It might be objected that this variable is probably affected by endogeneity. However, as convincingly argued by Ascheri (1994), throughout the Middle and Modern Ages, universities were founded, not as specific results of government planning, but because of unpredictable choices made by one or a group of experts on given matters. Hence, my analysis did not consider the university variable as an endogenous regressor, although, as a precaution, it considered the lagged value of the variable.[12]

The variable $institutions_{jt}$ is the quality of regional government at time *t*, while *comune* is the above-described variable denoting prior history as a free city state. Matrix $\mathbf{X}_{it}$ is the set of variables considered in regression (2).

Interestingly, the coefficients of all the additional variables in models 2 and 3 have the expected signs and are highly significant. Also evidenced is the positive effect of regional institutions, implying that high-quality institutions in the region provided fertile soil for urban development. Also to be noted is that when *institutions* are considered, *urban potential* becomes not significant. Having been a free city state in the Early

Middle Ages (*commune*) increases city population by 1,480 inhabitants, while the presence of a university does so by 2,460.

In models 4 and 5, I divided the sample between cities with populations larger than or equal to 10,000 inhabitants and smaller cities. The burden of physical geography is significant only for larger cities, implying a sort of nonlinear effect of geography between large and small cities. The presence of a university turns out to be very large and highly significant for larger cities, while the communal past is important in explaining urban population only in the case of smaller cities. It seems from the results for models 4 and 5 that, from an institutional viewpoint, *university* is more important than a city's institutional past only for large cities. Finally, I used model 6 to look at development differentials within the North and test the robustness of the coefficient associated with *comune*, which, in this case, slightly increases, while its significance is maintained.

Although I considered regional dummy variables and several time-invariant variables in the specification of (3), I could not exclude the existence of further heterogeneity. In order to address this issue, I estimated fixed effects regressions where all time-invariant variables (*port*, *comune*, *altitude*, *accessibility*) were interacted with a full set of time dummy variables. Panel B reports the coefficient estimates of time-varying variables as well as p-values of tests for joint significance of interacted time-invariant variables. Physical geography is found to be significant, while the elasticity of urban development to urban potential is still not significant. As for institutions, *university* is positive and marginally significant only in models 7 and 8, while there is no evidence of the

[12] To this end, I extended the dataset to consider also the year 1200 only for the university variable. However, it should be mentioned that very few universities had been established at that time.

particular importance of regional institutions. Interestingly, *comune* maintains its significance across all models as from the p-values of the significance tests.

The next step in the econometric analysis was estimation of a growth regression in the form:

$$(4)\ \ln(pop_{it}) - \ln(pop_{it-100}) = d_t + \delta_j + \alpha \ln(pop_{t-1}) + \beta X_{it} + \gamma institutions_{jt} + \delta \mathrm{comune}_{\mathrm{i}} + \varepsilon_{it}$$

The results in table 4 show that a city located in a mountainous area had, on average, a population growth rate almost ten percentage points lower than that of a city in the lowlands, and as from models 3 and 6, the presence of a port increased the growth rate by 31.6%-32.6%, depending on city size. As regards institutions, it is interesting to note that *university* has a very large and significant impact on urban growth. It should be stated that the specification of (4) considered the centennial growth rate as a dependent variable. This does not pose particular problems in the estimation and interpretation of the coefficient estimates, with the sole exception of the period 1800-1861, which is unequally spaced with respect to the others. Although the results are not reported for the sake of brevity, I estimated equation (4) excluding that period and found that the results did not change significantly.

[Tables 4 and 5]

Owing to the structure of the database, the analysis may have suffered from a selection bias imposed by logarithmic specification for cities with populations smaller than 5,000. In order to overcome this problem, table 5 reports estimates for balanced panels for both level and growth regressions. Interestingly, *comune* and *university* maintain their sign and significance, while *institutions* loses its significance. This result casts some doubt on the relevance of regional institutions in explaining urban development, once heterogeneity has been fully considered. A similar consideration applies to the urban potential.

Accessibility is found to be significant, while altitude is not significant (with the exception of model 5) and in one case changes the sign of the coefficient.

The econometric evidence presented thus far shows a plausible link among institutions, geography and urban development, and it seemingly confirms my argument for the use of past institutional variables as instruments for the density of firms. In the next section I propose some evidence that the effects of past institutions persist through the density of economic activities.

4. The historical roots of agglomeration economies

A large body of literature has provided evidence on the positive effect of firm density on productivity, as a measure of agglomeration economies. Since the seminal work by Ciccone and Hall (1996), the major challenge faced by analysts has been to devise the right set of instruments with which to identify the parameter associated with the density of economic activities. As recognized and discussed in Krugman (1991b), industrial location follows a path-dependent process mainly imposed by increasing returns. Combes et al. (2009) estimate agglomeration economies in France by using population density in 1831 and a set of indicators measuring land characteristics as instruments for the density of firms. They find that the elasticity of wage and productivity to firm density lies between 0.03 and 0.05.

As discussed in Section 2, in the case of Italy, the legacy of *Repubbliche Comunali* consisted in a sound and stable body of local commercial laws, the so-called *Statuti Comunali*, which fostered firm birth and, in the long run, industrial development. In my model, prior history as a free city state should be correlated with current firm density owing to the persistence of rules and laws protecting property rights.

Combes et al. (2009) estimate the impact of firm density on wages and total factor productivity. Neither variable is available in the case of Italian cities; hence I used taxable per capita income from work as a measure of wage or development.[13]

From a formal point of view, I estimated the following model:

(5) $$firm\ \ density_{ij} = \alpha + \beta X_i + \gamma university_i + \delta comune_i + \varpi institutions_j + \xi_i$$

(6) $$income_i = a + bX_i + cfirm\ \ density_i + \varepsilon_i$$

where *firm density* for city *i* in region *j* is the (log) of the ratio between the number of firms and total city surface in 2001, *university* is a dummy variable taking value 1 if the city had a university in 1861 and 0 otherwise, *institutions* is the average across time of the variable measuring the quality of regional institutions, *income* is (log) taxable income per capita in 2001. Vector *X* comprises a set of variables including *altitude* and *port*, road and waterway accessibility as defined in the previous section.

Before the results are described, some comments on the hypotheses underlying the estimation of model (5)-(6) are required.

[13] Note that the Italian fiscal system is homogeneous across space and that my variable of interest excludes capital income.

Combes et al. (2009) use population density in 1831 as a history-related instrument to explain exogenously the current level of firm density in France. In the previous section I showed that the urban populations of Italian cities are clearly related to past institutions and some of the geographical variables. With these results in mind, in model (5)-(6), I chose, not the population in 1861 (or in any other century) as an instrument for firm density, but rather its determinants, so that in the first stage regression in (5) institutional and geographical variables took the place of past population.

The exclusionary restrictions imposed that *university, comune* and *institutions* influence *income* only through the density of firms. This hypothesis was justified by the discussion in previous sections, so that it was assumed that good institutions enforced property rights protection through a set of norms and commercial habits which enhanced private initiative. The environment proved to be congenial for firm birth and the consolidation of entrepreneurship behavior. However, in what follows, I report a number of sensitivity checks conducted to verify the robustness of the hypothesis under investigation.

To be noted is that the geographical variables in the basic model were only those found to be relevant in explaining past urban development. Furthermore, I assumed that they affected per capita income not only through firm density (hence through firm location), but also directly, possibly because of transport cost differentials.

A final point concerns the choice of the dependent variable in (6), which is *income* and not, as is common in the literature, productivity or wage rate. However, the aforementioned literature assumes that denser places produce higher productivity and wages, which are reasonably associated with higher per capita income. Hence, in the case of equation (6) I considered a sort of reduced form estimation linking firm density to income, without providing the intermediate effect on productivity or wage.

[Tables 6, 7]

Table 6 reports the results of the estimation of equations (5)-(6). Models 1 and 2 in Panel A, in particular, show the coefficient estimates of first-stage regressions for the entire sample. The coefficient for *port* is significant and large, while there is no evidence that *altitude* has an impact on the density of economic activities. The coefficient for *university* is significant and larger than the coefficient for *comune*, while *institutions* is found to be significant at 5% level. Panel B reports estimates of second-stage regressions. It is found that the elasticity of *income* to *firm density* is very close to the value 0.1. The other variables *altitude* and *port* are not or marginally significant in explaining income in the cities of the sample. In both models, the Hansen J test for over-identifying restrictions had very large p-values, although it seems that the quality of the instruments is lower when also the variable *institutions* is considered. This is reasonable, because this variable is measured at regional level. Also the F statistic for weak instruments has comfortably? large values.

In model 3, I introduced a different variable in place of *comune,* namely *statuto*. This variable was very likely to be measured with error because it took the value of 1 if the city had a *Statuto Comunale* in the Middle Ages and 0 otherwise. The reason why this was measured with error is that the source was the *Statuti Comunali* collection maintained by the Senate of the Italian Republic. This collection cannot be considered complete because some cities may have had a *Statuto* which was not collected by the

Senate for some reason. Hence, the variable *statuto* may have under-measured the phenomenon of interest. Also to be noted is that the correlation between *comune* and *statuto* is approximately 0.30. This variable is nevertheless interesting because it provides a clearer rationale for the long-run regressions in (5) and (6) and because it provides a robustness check for *comune*. As with Panel A, I found that the coefficient for *statuto* was larger than that for *comune*, while the elasticity to *firm density* was very close to the one in model 2. In addition, no substantial changes occurred in the tests for the quality of the instruments.

Models (4) and (5) present the results when differences internally to the Center-North were considered. They show that the coefficient associated with *university* decreases, while the one for *comune* is higher. The variable *statuto* is found to be only weakly significant, although in the specification of model (5) the p-value of the test for over-identifying restrictions was particularly high. Also in this case, however, the elasticity of *income* to *firm density* is very close to 0.1.

The tests on the instruments did not reject the hypothesis that past institutions do not have an impact on *income* only through *firm density*. As a further check, in table 9, I add the institutional variables one at a time. If the instruments are valid, the coefficient associated with these additional regressors must not be significantly different from zero and the elasticity to the density of firms should remain significant and stable across the specifications. The results in table 7 confirm my hypotheses, although in the case of *institutions* the p-value for the Hansen J test is low.

The results presented thus far confirm my argument concerning the historical roots of the geographical concentration of firms. However, they may still be biased by the structure of the economy and by social capital, because both variables were not included in the second-stage regressions and could be among the long-run outputs of past institutions.

Models (1) and (4) in table 8 report estimates including the share of agriculture in 1971 (as measured by the share of firms located in the city included in the agriculture sector by the 1971 Census) in order to take account of the possibility that past institutions may have provided incentives for a particular specialization of the economy. Furthermore, I exclude the instrument *institutions* because it does not seem to pass the test proposed previously.

Interestingly, it emerges that agriculture is negatively correlated to firm density, which is to be expected because of competition for land. Moreover, agriculture proves significant in explaining income per capita only for cities in the Center-North. Note also that in both model (1) and (4), the sign and significance of the instruments is preserved, as well as the magnitude of the coefficient for firm density.

[Table 8]

In the spirit of Putnam (1993) and Tabellini (2007), Guiso et al. (2007) assume that *comune* influences culture in Italian cities and hence their development. In orderdeal with this literature,? in models (2) and (5) in table 8, I have added the number of not-for-profit organizations per capita in 2001 as an exogenous variable in model (5)-(6). The rationale for including this variable is that the aforementioned literature uses it as a proxy for social capital and trust because it is closely related to volunteering and hence to generalized trust. The results in table 8 show that the coefficient associated with the variable under scrutiny is significant, with negative sign, in explaining firm density and, with positive sign, for income.

However, these results may be biased by potential endogeneity, as also shown by the very low p-value of the Hansen J-statistics. Hence, in models (3) and (6) I treated the number of not-for-profit organizations as an endogenous variable with the same instruments as firm density. It turns out that firm density maintains its sign and significance, while not-for-profit organizations per capita are not found to be significant. Hence, according to my analysis and contrary to the previous literature, I do not find a long-run impact of past institutions when firm density is taken into account. In general, the results of the econometric analysis presented in this section seem to confirm the path dependence characterizing development because cities with good past institutions have higher densities of economic activities and income. Those cities are also the ones which were larger and grew faster in the years between 1300 and 1861.

5. Conclusion

The geography of economic activities and its importance in local development is one of the main issues in economic geography. In this paper I have tried to link this theme with the concept of path dependence by showing that the process of firm agglomeration is deeply influenced by both geography and the quality of institutions.

The recent economic literature has proposed two conflicting views of economic development: the "institutions" view and the "geography" one. In light of a model of the pre-industrial city, I have espoused a third way that may be called the "institutions and geography" view. This holds that the development process, at least at local level, is deeply influenced by both the quality of institutions and the geography burden. In particular, I have argued that good geographical conditions and good institutions (which enacted enduring pro-market laws) can be conceived as fundamental forces behind the growth and development of cities.

Using a new dataset on a large panel of Italian cities, I have provided some econometric evidence in support of this research hypothesis. In particular, I have found that accessibility and the presence of a seaport have been as important as good formal institutions for urban development. Interestingly, also the presence of a university has been found to be a key factor in the making of modern cities, although this variable should be not considered as a measure of the presence of human capital, but rather as a liberal institution.

To sum up, my historical evidence shows that past institutions and first-nature geography have an evident role in explaining cross-city variations of development across the centuries. I have consequently used the quality of past institutions as an instrument with which to identify the impact of firm density on income, while I have not restricted the role of geography in shaping development only through firm density. In particular, by means of instrumental variable regressions, I have found that the density of economic activities is positively influenced by good past institutions and by the presence of a port. The elasticity of per capita income to firm density has been found to be 0.08-0.1 depending on the specification. Although these results should be treated with caution, they nevertheless point out the long-run determinant role? of institutions and, only in part, of geography.

In general, my analysis suggests that the origin of agglomeration economies in Italy, especially in the Center-Northern part of the country, is rooted in history.

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Appendix 1

Cities in the sample

Abbiategrasso, Acerra, Acireale, Acquaviva, Acqui, Adernò, Adria, Afragola, Agira, Agnone, Agrigento, Aidone, Airola, Alatri, Alba, Alcamo, Alessandria, Alghero, Alia, Altamura, Amalfi, Amelia, Anagni, Ancona, Andria, Angri, Aosta, Apricena, Aragona, Arezzo, Ariano, Arpino, Arzano, Ascoli Piceno, Ascoli Satriano, Assisi, Asti, Atri, Augusta, Avellino, Aversa, Avigliano, Avola, Bagnara Calabra, Bagnocavallo, Bari, Barletta, Barra, Barrafranca, Bassano, Belcastro, Bella, Belluno, Belpasso, Benevento, Bergamo, Bernalda, Biancavilla, Biella, Bisaccia, Bisacquino, Bisceglie, Bisignano, Bitonto, Bivona, Bologna, Bolzano, Borgetto, Borgo (Stradella), Borgo di Gaeta, Bovino, Bra, Brescia, Brindisi, Bronte, Buccino, Burgio, Busto Arsizio, Caccamo, Cagliari, Caivano, Calascibetta, Calatafimi, Calitri, Caltabellotta, Caltagirone, Caltanissetta, Caltavuturo, Calvello, Camerino, Cammarata, Campagna, Campanaro, Campobasso, Campobello , Campobello di Licata, Candela, Canicattì, Canicattini, Canosa, Canosa, Capua, Caravaggio, Carignano, Carini, Carpi, Carpino, Carrara, Casacalenda, Casale Monferrato, Casalpusterlengo, Casamassima, Cascia, Caserta, Casoria, Cassano allo Jonio, Cassino, Castelbuono, Castellammare del Golfo, Castellammare di Stabia, Castellana, Castellaneta, Castellazzo Bormida, Castelnuovo Scrivia, Castelvetrano, Casterltermini, Castronovo di Sicilia, Castroreale, Castrovillari, Catania, Catanzaro, Cattolica Eraclea, Cefalù, Ceglie Messapico, Cento, Cerignola, Cerreto Sannita, Cesena, Chiaromonte Gulfi, Chiavari, Chieri, Chieti, Chioggia, Chiusa Sclafani, Chivasso, Ciminna, Cingoli, Cinisi, Cinquefondi, Città di Castello, Cittanova, Civitanova, Civitavecchia, Codogno, Colle Sannita, Colle Valdelsa, Comacchio, Comiso, Como, Conegliano, Conversano, Corato, Corigliano, Corleone, Corneto, Corridonia, Cortona, Cosenza, Crema, Cremona, Crotone, Cuneo, Eboli, Empoli, Enna, Erice, Fabriano, Faenza, Fano, Fasano, Favara, Feltre, Ferentino, Fermo, Ferrandina, Ferrara, Firenze, Florida, Foggia, Foligno, Fondi, Forenza, Forlì, Fossano, Fossombrone, Francavilla, Frattamaggiore, Gaeta, Galatina, Galatone, Galliate, Gallipoli, Gangi, Garlasco, Genova, Gerace, Giarre, Gibellina, Gioia del Colle, Giovinazzo, Giuliano in Campania, Gorizia, Gragnano, Grammichele, Grassano, Gravina, Grosseto, Grottaglie, Grotte, Grupo Appula, Gubbio, Iglesias, Imola, Irsina, Isernia, Itri, Ivrea, Jesi, Lacedonia, Lanciano, L'Aquila, Largo di Mercato, Larino, Laterza, Latiano, Laurenzana, Lauria, Lavello, Lavello, Lecce, Lentini, Leonessa, Leonforte, Lercara, Licata, Licodia Eubea, Linguaglossa, Lipari, Livorno, Lodi, Longobucco, Lucca, Lucera, Lugo, Lungro, Macerata, Maddaloni, Magenta, Maglie, Mammola, Manduria, Manfredonia, Mantova, Maratea, Marcianise, Marineo, Marsala, Marsico Nuovo, Martina Franca, Massa, Massa Marittima, Massafra, Matera, Mazara, Mazzarino, Melfi, Menfi, Mesagne, Messina, Meta, Mezzoiuso, Milano, Milazzo, Militello Val Catania, Mineo, Minervino Murge, Misilmeri, Misterbianco, Mistretta, Modena, Modica, Modugno, Mola (Formia), Mola di Bari, Molfetta, Moliterno, Moncalieri, Mondovì, Monopoli, Monreale, Monselice, Montalcino, Monte Sant'Angelo, Montefiascone, Montella, Montemaggiore, Montepulciano, Monterosso Almo, Montesarchio, Montescaglioso, Monza, Morano Calabro, Mormanno, Muro Lucano, Mussomeli, Napoli, Nardò, Narni, Naro, Nicastro, Nicosia, Niscemi, Nizza, Nocera, Noci, Noicataro, Nola, Norcia, Noto, Novara, Novi, Nuoro, Oneglia, Oria, Oristano, Orsara Danno Irpina, Orte, Ortona, Orvieto, Osimo, Ostuni, Ozieri, Padova, Padula, Pagani, Palagonia, Palazzo Adriano, Palazzo San Gervasio, Palazzolo Acreide, Palermo, Palma Campania, Palma di Montechiaro, Palmi, Paola, Palo del Colle, Parma, Partinico, Paternò, Patti, Pavia, Penne, Pertanna, Perugia, Pesaro, Pescia, Piacenza, Piana, Piazza, Piazza Armerina, Piedimonte, Pietragalla, Pietraperzia, Pinerolo, Pisa, Pisticci, Pistoia, Pizzo, Polistena, Polizzi, Pomigliano d'Arco, Pontecorvo, Pontedera, Popoli, Portici, Porto Maurizio, Potenza, Pozzuoli, Prato, Pratola, Peligna, Prizzi, Putignano, Quarto Sant'Elena, Racalmuto, Raffadali, Ragusa, Randazzo, Ravanusa, Ravello, Ravenna, Recalbuto, Recanati, Reggio Calabria, Reggio Emilia, Resina, Ribeira, Riccia, Riesi, Rieti, Rimini, Rionero in Vulture, Riposto, Roma, Roseto Valfortore, Rossano, Rovereto, Rovigno, Rovigo, Ruvo, Sala Consilina, Salemi, Salerno, Saluzzo, Sambuca di Sicilia, San Bartolomeo, San Cataldo, San Colombano al Lambro, Sant'Elpidio, San Fele, San Fratello, San Gimignano, San Giovanni a Tedduccio, San Giovanni in Fiore, San Giovanni Rotondo, San Gregorio , agno, San Marco in Lamis, San Miniato, San Nicandro, San Remo, San Severino Marche, San Severo, San Vito dei Normanni, Sanbiase, Santa Caterina, Santa Eufemia, Santa Margherita di Belice, Santa Maria a Vico, Santa Maria Capua Vetere, Santa Ninfa, Sant'Agata di Puglia, Sant'Angelo Lodigiano, Sant'Antimo, Santeramo in Colle, Santo Stefano, Quisquina, Sarno, Saronno, Sassano, Sassari, Savigliano, Savona, Scafati, Sciacca, Scicli, Scordia, Secondigliano, Senigallia, Seregno, Serradifalco, Sessa Aurunca, Sestri Ponente, Sezze, Siculiana, Siena, Siracusa, Sora, Sora, Soresina, Sortino, Spaccafurno, Spezia, Spinazzola, Spoleto, Stigliano, Strongoli, Subiaco, Sulmona, Taormina, Taranto, Teano, Teggiano, Tempio Pausania, Teramo, Terlizzi, Termini, Terni, Terranova di Sicilia, Terrasini, Tivoli, Todi, Tolentino, Torino, Toritto, Torre Annunziata, Torre del Greco, Torre Maggiore, Tortona, Trani, Trapani, Treia, Trento, Treviglio, Treviso, Tricarico, Trieste, Triggiano, Trinitapoli, Trino, Troia, Troina, Tropea, Tuscania, Udine, Urbino, Valenza, Valguarnera, Valle d'Olmo, Varese, Vasto, Velletri, Venezia, Venosa, Vercelli, Veroli, Verona, Viadana, Viareggio, Vibo Valentia, Vicenza, Vico del Gargano, Vieste, Vigevano, Viggianello, Viggiano, Villarosa, Viterbo, Vittoria, Vizzini, Voghera, Volterra.

Appendix 2

Description of variables

Population
This variable is in ‘000 and comes from Malanima (1998), where one observation per century is available. The dataset reports information only for cities with populations larger than 5,000.

Altitude
The source for this variable is the *Atlante Statistico dei Comuni*.

Institutions
This is a seven point scale with the following classification

Index	Form of government
1	Absolutism
2	Non-bureaucratic absolutism
3	Strong-prince proto-absolutism
4	Feudal anarchy
5	Princes controlled extra-constitutionally by powerful magnates
6	Independent city-republics
7	Weak prince standestaats

The sources for this variable are De Long and Shleifer (1993) and Tabellini (2007).

Comune
This variable is intended to capture the long-run effect of a period of democracy. It is a dummy variable taking value 1 if the city was an autonomous municipality from the tenth to the thirteenth centuries. The sources for this variable are: Ascheri (2006), Guiso et al. (2007), Milani (2005), and the atlas *Atlante Storico De Agostini* and *Nuovissimo Atlante Storico Mondiale*.

Port and accessibility
The dummy variable for the presence of a port is taken from du Jourdin (1993) and from *Atlante Storico De Agostini* and *Nuovissimo Atlante Storico Mondiale*. My index of road accessibility takes value 1 if the city was on the Roman road network and 0 otherwise. For inland waterway accessibility, the index is a dummy variable taking value 1 if the city was on a navigable river and 0 otherwise. Data are from *Atlante Storico De Agostini* and *Nuovissimo Atlante Storico Mondiale* and books in the series *Le città nella storia d'Italia*, Laterza.

University
The sources for the university variable are *Atlante Storico De Agostini* and *Nuovissimo Atlante Storico Mondiale*.

Income
The source for taxable income per capita is ANCITEL.

Statuto
This variable takes value 1 if the city had a *Statuto Comunale* and 0 otherwise. The source for this variable is the Collezione degli Statuti Comunali maintained by the Senate. The databank is accessible through the website: http://notes9.senato.it/w3/Biblioteca/catalogoDegliStatutiMedievali.nsf/home?OpenPage

Firm density and *Not-for-profit organizations*
The source of these variables is the 2001 Census, as reported in the *Atlante statistico dei Comuni*.

Agriculture
This variable, which measures the percentage of agricultural firms in the total of firms, is from the 1971 Census, as reported in the *Atlante statistico dei Comuni*.

Appendix 3
The evolution of city size distribution, 1300-1861

NOT FOR PUBLICATION

The evolution of urban systems has been one of the most debated topics in the history of economics and is currently setting the scene in economic geography (Storper, 2008). Recently, works by Eaton and Eckstein (1997) on France and Japan and by Dobkins and Ioannides (2001) on the USA, with later works by Black and Henderson (2003) and Ioannides and Overman (2003), have established or confirmed certain basic facts about urban systems and their development. In particular, city size has been found to be distributed according to a Pareto distribution highly stable over time. However, the apparent persistence of the Pareto distribution has been in fact characterized by two trends:

- a very stable ranking of city size at the top of the hierarchy;
- substantial changes at the bottom of the distribution reflecting the entry of new cities and the rapid growth and decline of the old ones.

This implies that, although the urban hierarchy is in general very stable over the time, intra-distribution dynamics are present and reflect the life cycle of cities. Hence the shape as well as the evolution of city size distribution are likely to be driven by the fundamental determinants of urban development (Krugman, 1996).
Within that relative size distribution, individual cities generally grow in population size over time; while what is considered a big versus small city in absolute size changes over time. While there is entry by new cities and both rapid growth and decline of cities nearer the bottom of the urban hierarchy, at the top city size rankings are substantially stable over time. Size distributions of cities within countries, at least at the upper tail are well approximated by a Pareto distribution.
Building on the paper by Eaton and Eckstein (1997), Black and Henderson (1999) propose a model of endogenous growth in a system of different types of cities. The authors consider a typical trade-off faced by a firm in its location decision: that is, the trade-off between localized economies of scale and congestion costs. They find that, given steady national population growth and human capital accumulation, the size and number of cities grow, although a constant relative size distribution persists.[14] This constant rank-size rule is also known as the Zipf's law for cities.
Following Gabaix and Ioannides (2005), let S_i denote the normalized size of city *i*The Zipf's law is satisfied if, for large *S*, we have:

(A1) $$\Pr(Size > S) = \frac{c}{S^{\alpha}}$$

where *c* is a positive constant and $\alpha = 1$. Equation (A1) implies that the size of a city times the percentage of cities of larger size equals a constant. As an approximation of the Zipf's law, the rank-size rule states that if we rank cities from largest to smallest, and denote their sizes $S_{(1)} \geq ... \geq S_{(n)}$, respectively, the rank *i* for a city of size $S_{(i)}$ is proportional to the proportion of cities greater than *i*. Hence, from equation (A1) we

[14] See also Rossi-Hansberg and Wright (2007) for a general equilibrium model leading to similar results.

have $S_{(i)} \cong \frac{k}{i}$ where k is a constant. The theoretical properties of the Zipf's law have been extensively studied by Gabaix (1999), who shows that if city growth rates obey Gibrat's Law where growth rates are random draws from the same distribution (i.e. growth rates are independent of current size), Zipf's Law emerges as the limiting size distribution (as long as a lower bound on how far cities can deteriorate in size is imposed). As growth is scale invariant, so too is the final distribution. We thus have a power law with unitary exponent. By highlighting the role of uncertainty, Gabaix (1999) sketches an illustrative model based on on-going natural amenity shocks facing cities of any size, which leads to Zipf's Law for the size distribution of cities.

In recent years, an increasing number of papers have empirically estimated the evolution of the Zipf's law, with particular reference to US cities.[15] Black and Henderson (2003) studied the evolution of the size distribution of US cities in the twentieth century, finding a stable wide relative size distribution of cities which was supported by different types of cities with different industrial compositions (specializations). The size distribution exhibited some increasing relative concentration which Black and Henderson associated with the recent relative growth of services in the US economy. Along the same lines, Dobkins and Ioannides (2001) found evidence of parallel growth in US cities, implying a α constant over time.

The classical regression approach to testing the Zipf's Law consists in estimating:

$$\text{(A2)} \qquad log(rank) = constant + \alpha * log(population) + \varepsilon$$

where ε in an iid error term. If $\alpha = 1$, then the rank-size rule holds. One of the main concerns is the consistent definition over time of the threshold population size that the Zipf's Law is supposed to mainatin. Some authors use an absolute cut-off point (e.g., urban population of 50,000 or more); some use a relative cutoff point (e.g., the minimum-size city included in the sample should be 0.30 mean city size); and others look at a set number (e.g., 50 or 100) of the largest cities.

[Insert table A1 about here]

Table A1 Panel A reports estimates of the Zipf's exponent for both the full sample and the upper tail of the distribution, i.e. cities in the top one-third of the size distribution. In both cases, there is a slight decline in the concentration of city population, although the Pareto distribution, as expected, is very likely to hold only for larger cities. Interestingly enough, since 1600, the distribution of cities in the upper tail has been substantially stable, confirming the preliminary evidence offered in table 1 in the main text. This result partly holds also for the full sample, although the decline in the Pareto exponent seems to be more marked.

Panels B and C in table A1 present empirical results for the Zipf's Law estimation for the Center-North and the South. Although in some cases the number of observations is low and does not allow estimation of the exponent of the power law, it nevertheless emerges that the urban hierarchy was more pronounced in the Center-North than in the South, although in both cases, the Pareto distribution seemed to hold for the top 1/3 of the distribution. In addition, it is interesting to note that the concentration of population

[15] See e.g. the survey in Gabaix and Iannides (2005).

among cities was stronger in the South than in the North during the fourteenth century, but convergence towards a 0.946-0.992 value of the exponent took place over the centuries, leading to a substantially equal distribution of city population between Center-Northern and Southern cities.

Table 1: The ten largest cities in Italy, 1300-2001

1300		1500		1700		1861		1901		1951		2001	
Milano	150	Napoli	150	Napoli	220	Napoli	419	Napoli	564	Roma	1702	Roma	2460
Venezia	110	Venezia	102	Roma	140	Milano	196	Milano	492	Milano	1277	Milano	1183
Firenze	110	Milano	100	Venezia	138	Roma	188	Roma	463	Napoli	1025	Napoli	993
Genova	60	Genova	70	Palermo	110	Torino	181	Torino	336	Torino	722	Torino	857
Bologna	50	Bologna	55	Milano	109	Palermo	168	Palermo	310	Genova	688	Palermo	653
Siena	50	Roma	55	Firenze	72	Genova	128	Genova	235	Palermo	503	Genova	604
Palermo	50	Firenze	50	Genova	64	Venezia	114	Firenze	206	Firenze	391	Bologna	370
Brescia	45	Palermo	50	Bologna	63	Firenze	114	Bologna	152	Bologna	351	Firenze	352
Cremona	45	Brescia	48	Messina	50	Bologna	90	Venezia	152	Venezia	323	Bari	313
Padova	40	Cremona	40	Torino	44	Livorno	84	Messina	150	Catania	302	Catania	307

Table 2: Average city size by population

	Italy	*North*	*Center*	*South*
Whole Sample	13.500	20,564	13,250	10.095
Population> 10,000	25,710	34,152	25,100	17,611
Population< 10,000	6,449	6,437	6,303	6,527
Average in 1300	13,197	21,416	13,096	8,984
Average in 1861	13,436	21,340	13,537	10,444
Average centennial growth rate	0.36%	-0.07%	0.66%	3.01%

Table 3: Geography, Institutions and Urban development (Dependent variable is log city population, in '000)

	Panel A: Random effect estimates						*Panel B: Fixed effect estimates*				
	1 Whole sample	2 Whole sample	3 Whole sample	4 Population > 10,000	5 Population < 10,000	6 Only Center-North	7 Whole sample	8 Whole sample	9 Population >10,000	10 Population <10,000	11 Only Center-North
Altitude	-0.09	-0.03	-0.03	-0.14	0.01	0.07	[0.02]	[0.32]	[0.03]	[0.44]	[0.64]
	(-1.95)**	(-0.84)	(-0.75)	(-2.05)**	(0.17)	(1.25)					
Road Accessibility	0.33	0.29	0.29	0.29	0.28	0.31	[0.09]	[0.08]	[0.08]	[0.08]	[0.06]
	(2.27)**	(2.16)**	(2.21)**	(2.23)**	(2.19)**	(2.07)**					
Waterways accesibility	0.27	0.21	0.21	0.21	0.21	0.28	[0.04]	[0.04]	[0.03]	[0.07]	[0.02]
	(1.98)**	(1.99)**	(2.01)**	(2.07)**	(2.09)**	(1.99)**					
Port	1.65	1.41	1.37	1.03	-0.07	1.68	[0.03]	[0.03]	[0.05]	[0.08]	[0.12]
	(6.61)***	(6.76)***	(6.62)***	(6.68)***	(-0.40)	(5.27)***					
Urban potential	0.59	0.30	0.17	0.40	-0.01	0.12	0.09	0.24	0.31	0.16	0.48
	(4.60)***	(12.73)***	(1.79)*	(1.54)	(-0.17)	(1.03)	(0.45)	(1.03)	(0.60)	(0.75)	(1.09)
University		1.10	0.94	0.63	0.09	0.91	0.66	0.53	0.09	0.02	0.53
		(12.73)***	(9.95)***	(7.38)***	(2.30)**	(7.66)***	(2.78)***	(1.74)*	(0.21)	(0.29)	(0.80)
Institutions			0.02	0.02	0.01	0.02		0.01	0.07	0.00	0.03
			(2.13)**	(1.00)	(0.06)	(1.74)*		(1.44)	(2.07)**	(0.08)	(2.03)**
Comune			0.39	0.01	0.11	0.45			[0.01]	[0.01]	[0.01]
			(5.92)***	(0.21)	(4.27)***	(6.10)***					
R^2	0.27	0.36	0.39	0.38	0.25	0.46	0.41	0.44	0.46	0.23	0.39
Number of observation	1699	1699	1699	512	1077	907	1699	1699	512	1077	907

Note: GLS random effect estimation with robust standard errors, with *z*-statistics in parentheses, are reported in Panel A. Panel B reports fixed effects estimates with *t*-statistics in parentheses. P-values of the test for joint significance of the variable interacted with a full set of dummy variables are in brackets. A constant and a full set of time and regional dummies are always included though not reported. *** indicates significance at 99% confidence level; ** indicates significance at 95% confidence level; * indicates significance at 90% confidence level.

Table 4: Geography, Institutions and Urban growth (Dependent variable is centennial population growth)

	Panel A: Random effect estimates						*Panel B: Fixed effect estimates*				
	1 Whole sample	2 Whole sample	3 Whole sample	4 Population > 10,000	5 Population < 10,000	6 Only Center-North	7 Whole sample	8 Whole sample	9 Population >10,000	11 Population <10,000	11 Only Center-North
Population t-1	-0.12	-0.18	-0.18	-0.31	-0.77	-0.18	-0.64	-0.66	-0.62	-0.94	-0.62
	(-6.06)***	(-7.79)***	(-7.62)***	(-8.33)***	(-25.87)***	(-5.54)***	(-16.86)***	(-17.65)***	(-12.24)***	(-22.93)***	(-12.84)***
Altitude	-0.09	-0.06	-0.06	-0.10	-0.02	-0.04	[0.08]	[0.15]	[0.22]	[0.17]	[0.18]
	(-3.08)***	(-2.57)***	(-2.37)**	(-1.67)*	(-0.74)	(-1.20)					
Road accessibility	0.29	0.29	0.29	0.29	0.29	0.32	[0.08]	[0.07]	[0.08]	[0.06]	[0.06]
	(2.19)**	(2.31)**	(2.13)**	(2.22)**	(2.21)**	(1.98)**					
Waterways accessibility	0.22	0.22	0.21	0.22	0.21	0.24	[0.09]	[0.06]	[0.09]	[0.09]	[0.08]
	(1.99)**	(2.01)**	(2.17)**	(2.19)**	(2.05)**	(2.05)**					
Port	0.29	0.32	0.32	0.34	0.08	0.45	[0.01]	[0.01]	[0.01]	[0.02]	[0.01]
	(3.33)***	(3.71)***	(3.73)***	(3.07)***	(0.97)	(3.33)***					
Urban potential t-1	-0.155	-0.20	-0.20	-0.17	0.04	-0.21	0.39	0.19	0.09	0.15	-0.18
	(-1.50)	(-2.03)**	(-2.04)**	(-1.02)	(1.05)	(-2.06)**	(1.45)	(1.34)	(0.20)	(0.53)	(-0.22)
University		0.24	0.23	0.18	0.04	0.22	0.36	0.34	0.04	0.06	0.09
		(5.99)***	(5.64)***	(3.54)***	(1.06)	(4.61)***	(2.15)**	(2.08)**	(0.24)	(2.05)**	(0.67)
Institutions t-1			0.01	0.01	0.03	0.02		0.02	0.09	-0.01	0.03
			(0.93)	(0.87)	(0.35)	(1.77)*		(1.87)*	(2.62)***	(-0.79)	(2.32)**
Comune			0.03	0.04	0.07	0.07		[0.04]	[0.22]	[0.03]	[0.08]
			(2.22)**	(0.84)	(2.67)***	(1.95)*					
R^2	0.39	0.40	0.42	0.46	0.74	0.46	0.64	0.65	0.68	0.82	0.68
Number of observation	1040	1040	1040	433	607	581	1040	1040	433	607	581

Note: GLS random effect estimation with robust standard errors, with *z*-statistics in parentheses, are reported in Panel A. Panel B reports fixed effects estimates with *t*-statistics in parentheses. P-values of the test for joint significance of the variable interacted with a full set of dummy variables are in brackets. A constant and a full set of time and regional dummies are always included though not reported. *** indicates significance at 99% confidence level; ** indicates significance at 95% confidence level; * indicates significance at 90% confidence level.

Table 5: Geography, institutions, urban development and growth – Balanced panel

	Panel A: Random effect estimates (Dep. Var.: log population)		Panel B: Fixed effect estimates (Dep. Var.: log population)		Panel C: Random effect estimates (Dep. Var.: Centennial growth)		Panel D: Fixed effect estimates (Dep. Var.: Centennial growth)	
	1	2	3	4	5	6	7	8
	Whole sample	Only Center-North	Whole sample	Only Center-North	Whole sample	Only Center-North	Whole sample	Only Center-North
Population t-1					-0.18	-0.18	-0.64	-0.60
					(-7.62)***	(-5.54)***	(-16.86)***	(-11.93)***
Altitude	-0.03	0.07	[0.09]	[0.08]	-0.06	-0.04	[0.09]	[0.11]
	(-0.75)	(1.25)			(-2.47)***	(-1.20)		
Road Accessibility	0.271	0.279	[0.01]	[0.01]	0.288	0.276	[0.02]	[0.01]
	(2.11)**	(2.14)**			(2.11)**	(2.13)**		
Waterways accessibility	0.201	0.212	[0.02]	[0.02]	0.213	0.209	[0.03]	[0.03]
	(2.33)**	(2.17)**			(1.97)**	(2.02)**		
Port	1.37	1.68	[0.01]	[0.01]	0.32	0.45	[0.01]	[0.01]
	(6.62)***	(5.27)***			(3.73)***	(3.33)***		
Urban potential t-1	0.17	0.12	0.09	0.34	-0.20	-0.21	0.39	-0.38
	(1.69)*	(1.03)	(0.45)	(0.85)	(-2.04)**	(-2.06)**	(1.45)	(-0.49)
University	0.94	0.91	0.66	0.63	0.23	0.22	0.36	-0.05
	(9.95)***	(7.66)***	(2.78)***	(1.22)	(5.64)***	(4.61)***	(1.99)**	(-1.11)
Institutions t-1	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.02
	(2.13)**	(1.74)*	(1.73)*	(1.48)	(0.93)	(1.77)*	(1.72)*	(1.73)*
Comune	0.39	0.45	[0.01]	[0.01]	0.03	0.07	[0.01]	[0.02]
	(5.92)***	(6.10)***			(1.22)	(1.98)**		
R^2	0.38	0.46	0.42	0.36	0.42	0.46	0.64	0.65
Number of observations	1699	907	1699	907	1040	581	1040	581

Note: GLS random effect estimation with robust standard errors. *z*-statistics are in parentheses. A constant and a full set of time and regional dummies (North, Centre, South, Sardinia and Sicily) are always included though not reported. *** indicates significance at 99% confidence level; ** indicates significance at 95% confidence level; * indicates significance at 90% confidence level. In models 3, 4, 7, 8 altitude, road accessibility, waterways accessibility, port and comune are interacted with a full set of time dummy variables. The corresponding values in brackets report p-values for a test of joint significance of the interacted variables.

Table 6: Long run regressions

	Panel A: First stage regressions. Dependent variable is *Firm Density* in 2001 (in logs)				
	1	2	3	4	5
	Whole sample	Whole sample	Whole sample	Only cities in the Center-North	Only cities in the Center-North
Altitude	-0.10	-0.16	-0.20	-0.01	-0.10
	(-0.62)	(-0.94)	(-1.18)	(-0.06)	(-0.39)
Road accessibility	0.54	0.52	0.49	0.52	0.52
	(2.03)**	(2.01)**	(2.07)**	(2.13)**	(2.12)**
Waterwayss accessibility	0.23	0.23	0.19	0.23	0.23
	(1.78)*	(1.79)*	(1.78)*	(2.01)**	(1.99)**
Port	1.11	1.16	1.02	0.62	0.60
	(3.93)***	(4.01)***	(3.18)***	(1.38)	(1.20)
University	1.27	1.28	1.23	0.90	1.08
	(5.12)***	(5.03)***	(4.78)***	(3.16)***	(3.79)***
Comune	0.41	0.37		0.53	
	(2.58)***	(2.28)**		(3.11)***	
Institutions		0.53	0.52	0.26	0.19
		(2.38)**	(2.32)**	(0.57)	(0.40)
Statuto			0.57		0.32
			(2.84)***		(1.83)*
	Panel B: Second stage regressions. Dependent variable is *Income per capita* in 2001 (in logs)				
Firm density	0.11	0.09	0.09	0.09	0.10
	(6.18)***	(4.96)***	(5.57)***	(4.74)***	(4.82)***
Road accessibility	0.12	0.13	0.12	0.09	0.09
	(1.76)*	(1.42)	(1.55)	(0.98)	(0.99)
Waterways accessibility	0.03	0.02	0.03	0.02	0.02
	(0.89)	(0.91)	(0.99)	(1.01)	(1.07)
Altitude	-0.03	-0.03	-0.03	-0.04	-0.04
	(-1.81)*	(-1.82)*	(-1.84)*	(1.62)	(1.52)
Port	-0.30	-0.002	-0.003	-0.02	-0.03
	(-0.61)	(-0.04)	(-0.06)	(-0.39)	(0.42)
R^2	0.62	0.67	0.67	0.56	0.49
Number of observations	563	563	563	269	269
p- value of Hansen J statistic	0.85	0.33	0.33	0.20	0.81
Kleibergen-Paap rk Wald F statistic	20.88	14.79	16.39	8.916	8.26

Note: *t* statistics are in parentheses. A constant is always included though not reported. *** indicates significance at 99% confidence level; ** indicates significance at 95% confidence level; * indicates significance at 90% confidence level.

Table 7: Robustness checks on the validity of the instruments: Second stage regressions
(Dependent variable is log *income per capita*)

	1 Whole sample	2 Whole sample	3 Whole sample	4 Whole sample	5 Only cities in the Center-North	6 Only cities in the Center-North	7 Only cities in the Center-North	8 Only cities in the Center-North
Firm density	0.08 (2.89)***	0.08 (3.73)***	0.11 (6.04)***	0.08 (3.66)***	0.08 (3.18)***	0.13 (3.70)***	0.09 (4.81)***	0.11 (4.10)***
Altitude	-0.03 (-1.80)*	-0.03 (-1.81)*	-0.04 (-2.01)**	-0.03 (-1.71)*	-0.04 (-2.22)**	-0.04 (-1.28)	-0.04 (-1.55)	-0.05 (-1.52)
Road accessibility	0.11 (1.45)	0.12 (1.41)	0.11 (1.23)	0.06 (1.08)	0.09 (0.99)	0.10 (1.09)	0.11 (1.13)	0.10 (0.99)
Waterways accessibility	0.03 (0.89)	0.02 (0.91)	0.03 (0.99)	0.02 (1.01)	0.02 (1.07)	0.04 (0.97)	0.05 (1.08)	0.04 (0.84)
Port	0.05 (0.87)	0.005 (0.10)	-0.03 (-0.72)	0.001 (-0.03)	0.009 (0.13)	-0.04 (-0.56)	-0.02 (-0.38)	-0.03 (-0.49)
University	0.10 (1.27)				0.08 (1.50)			
Comune		0.01 (0.65)				-0.05 (-1.51)		
Institutions			-0.05 (-1.45)				0.005 (0.10)	
Statuto				0.01 (0.03)				-0.01 (-0.62)
R^2	0.75	0.68	0.62	0.68	0.68	0.34	0.56	0.44
Number of observations	563	563	563	563	269	269	269	269
p- value of Hansen J statistic	0.26	0.32	0.98	0.32	0.54	0.89	0.07	0.99
Kleibergen-Paap rk Wald F statistic	13.78	15.33	18.92	14.34	14.88	15.80	12.69	7.82

Note: *t* statistics are in parentheses. A constant is always included though not reported. *** indicates significance at 99% confidence level; ** indicates significance at 95% confidence level; * indicates significance at 90% confidence level.

Table 8: Sensitivity analysis

	Panel A: First stage regressions. Dependent variable is *Firm Density* in 2001 (in logs)					
	1 Whole sample	2 Whole sample	3 Whole sample IV on NP	4 Only cities in the Center-North	5 Only cities in the Center-North	6 Only cities in the Center-North IV on NP
Altitude	-0.01 (-0.01)	-0.07 (-0.47)	-0.01 (-0.01)	-0.08 (-0.38)	0.17 (0.79)	-0.08 (-0.38)
Road accessibility	0.53 (2.38)**	0.52 (2.32)**	0.36 (0.57)	0.59 (3.40)***	0.58 (3.12)***	0.61 (3.29)***
Waterways accessibility	0.26 (0.57)	0.19 (0.40)	0.23 (0.87)	0.32 (0.77)	0.33 (0.67)	0.41 (0.77)
Port	0.97 (3.46)***	0.91 (3.13)***	0.97 (3.46)***	0.25 (0.73)	0.19 (0.46)	0.25 (0.73)
Agriculture	-31.51 (4.78)***	-30.56 (-4.80)***	-31.58 (-4.71)***	-40.72 (-4.52)***	-37.32 (-4.78)***	-40.72 (-4.52)***
Not for profit organizations per capita		-94.00 (-2.33)**			-106.75 (-2.54)**	
University	1.10 (4.44)***	1.14 (4.57)***	1.10 (4.44)***	0.62 (2.47)**	0.66 (2.69)**	0.62 (2.47)**
Comune	0.36 (2.26)**	0.45 (2.63)***	0.36 (2.26)**	0.47 (2.69)***	0.58 (3.12)***	0.47 (2.69)***
	Panel B: Second stage regressions. Dependent variable is *Income per capita* in 2001 (in logs)					
Firm density	0.12 (6.67)***	0.08 (5.61)***	0.13 (3.77)***	0.12 (4.68)***	0.08 (4.60)***	0.12 (2.83)***
Not for profit organizations per capita		41.15 (9.11)***	-15.20 (-0.42)		28.04 (9.62)***	-14.29 (0.78)
Agriculture	2.21 (1.58)	0.60 (0.64)	2.78 (2.43)**	4.30 (2.73)***	1.73 (1.85)*	1.89 (2.22)**
Road accessibility	0.11 (1.09)	0.13 (1.12)	0.11 (1.09)	0.08 (0.99)	0.08 (1.01)	0.09 (1.08)
Waterways accessibility	0.03 (1.11)	0.03 (0.97)	0.02 (1.13)	0.04 (1.02)	0.05 (0.87)	0.03 (1.01)
Altitude	-0.04 (-1.86)*	-0.07 (0.39)		-0.03 (-1.22)	-0.01 (0.72)	-0.01 (-0.99)
Port	-0.03 (-0.65)	0.02 (0.73)		-0.06 (-0.09)	0.01 (0.83)	-0.01 (-0.77)
R^2	0.67	0.79	0.59	0.52	0.73	0.68
Number of observations	366	366	366	152	152	152
p- value of Hansen J statistic	0.62	0.02	Just identified	0.02	0.02	Just identified
Kleibergen-Paap rk Wald F statistic	17.31	19.92		9.76	12.42	

Note: *t* statistics are in parentheses. A constant and a full set of regional dummies are always included though not reported. *** indicates significance at 99% confidence level; ** indicates significance at 95% confidence level; * indicates significance at 90% confidence level.

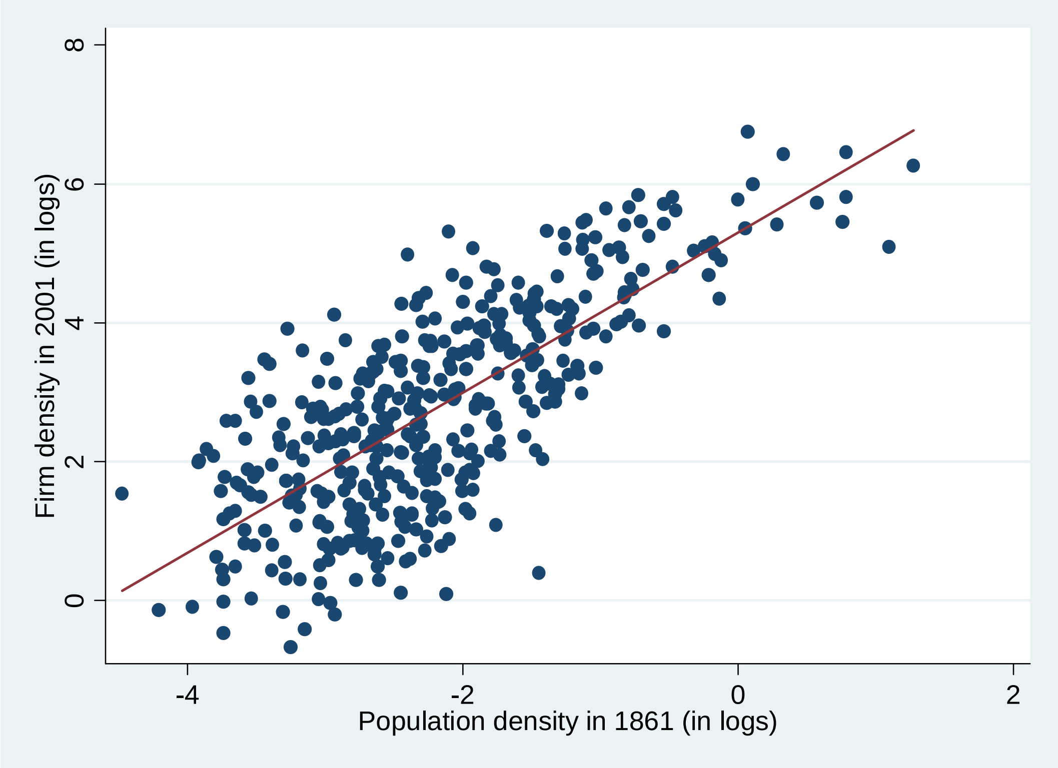
Table A1: Parametric estimation of city size distribution

	Panel A: Whole sample					
	Full sample			Cities in top 1/3 of size distribution		
	a_t	R^2	*Obs.*	a_t	R^2	*Obs.*
1300	0.786	0.898	192	1.168	0.973	64
	(0.016)			(0.020)		
1400	0.792	0.912	94	1.248	0.914	33
	(0.022)			(0.019)		
1500	0.723	0.865	146	1.115	0.981	50
	(0.018)			(0.017)		
1600	0.677	0.871	208	0.981	0.945	70
	(0.017)			(0.012)		
1700	0.693	0.846	212	1.038	0.932	74
	(0.028)			(0.025)		
1800	0.656	0.844	337	0.984	0.954	107
	(0.021)			(0.022)		
1861	0.559	0.783	510	0.902	0.926	170
	(0.022)			(0.021)		
	Panel B: Cities in the Centre-North					
	Full sample			Cities in top 1/3 of size distribution		
	a_t	R^2	*Obs.*	a_t	R^2	*Obs.*
1300	0.786	0.937	109	1.054	0.985	35
	(0.019)			(0.022)		
1400	0.742	0.948	65	0.926	0.940	22
	(0.021)			(0.051)		
1500	0.745	0.893	79	1.120	0.939	26
	(0.029)			(0.058)		
1600	0.734	0.907	93	1.033	0.956	34
	(0.024)			(0.039)		
1700	0.719	0.891	93	1.056	0.948	32
	(0.026)			(0.044)		
1800	0.745	0.874	88	1.254	0.958	26
	(0.030)			(0.053)		
1861	0.670	0.878	157	0.992	0.957	52
	(0.020)			(0.029)		
	Panel C: Cities in the South					
	Full sample			Cities in top 1/3 of size distribution		
	a_t	R^2	*Obs.*	a_t	R^2	*Obs.*
1300	0.937	0.924	83	1.246	0.972	32
	(0.029)			(0.038)		
1400	1.105	0.972	29	[a]	[a]	[a]
	(0.036)					
1500	0.955	0.966	67	0.977	0.877	23
	(0.033)			(0.031)		
1600	0.822	0.971	115	0.921	0.955	39
	(0.079)			(0.029)		
1700	0.756	0.951	119	0.832	0.957	55
	(0.015			(0.024)		
1800	0.722	0.934	219	0.876	0.956	72
	(0.012)			(0.022)		
1861	0.628	0.842	353	0.946	0.953	126
	(0.014)			(0.019)		

Note: Biased standard errors in parentheses. ([a]): The paucity of the number of observations does not allow correct estimation.

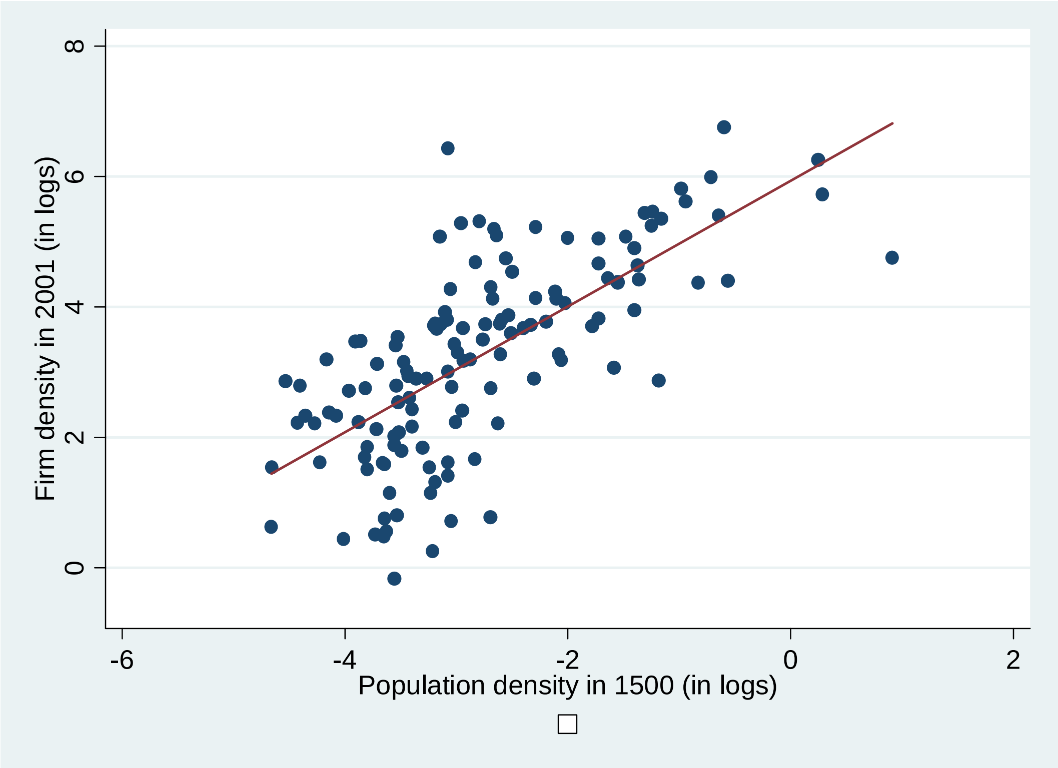
Figure 1: Firm density and per capita income in Italian cities (2001)

Figure 2a: Firm density in 2001 and Population density in 1861



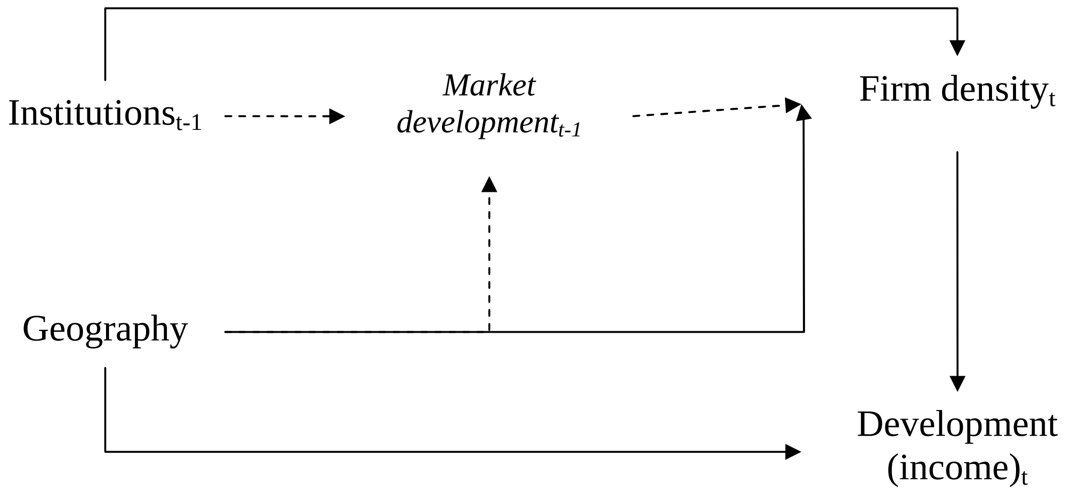
Note: The surface area used to calculate population density in 1861 is that reported in the 2001 Census.

Figure 2b: Firm density in 2001 and Population density in 1500



Note: The surface area used to calculate population density in 1861 is that reported in the 2001 Census.

Figure 3: The structure of the empirical model



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