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City seeds: Geography and the origins of the European city system

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ABSTRACT

Cities are the focal points of the world economy. This paper sheds new empirical light on their origins. Using a new dataset covering over 250,000 randomly selected potential city locations, and all actual cities during the period 800–1800, we disentangle the different roles of geography in shaping today's European city system. We find that a location's *physical geography* characteristics are the dominant determinants of its urban chances. Preferential location for water- or land-based transportation is a particularly important city seed. In addition, a location's *position relative* to already-existing cities matters for its urban chances. Interestingly, it does so in a way corresponding to predictions from economic geography theory.

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“In a more advanced era, when better methods would permit man to conquer Nature [...], it would doubtless have been possible to build towns anywhere the spirit of enterprise and the quest of gain might suggest a site. But it was quite another matter in a period when society had not yet acquired enough vigor to rise above the physical conditions in the midst of which it developed. [...] the towns of the Middle Ages were a phenomenon determined as much by physical surroundings as the course of rivers is determined by the conformation of the mountains and the direction of the valleys.”

[Henri Pirenne, 1925, p. 138/39]

1. Introduction

Today the European landscape is dotted with cities. Historically this was quite different. In the early medieval period Europe only knew a handful of cities. Over the next millennium this changed dramatically. Cities started to appear on an unprecedented scale, and virtually everywhere on the continent. Fig. 1 shows that in 800, we only find a few scattered cities in mainly Spain, Italy,

France and Germany. One thousand years later, cities have appeared all over the continent.¹

The rise of the city in the European landscape is important for several reasons. Throughout history, cities have been the important loci for technological innovation, institutional progress, (international) trade, political power, and culture (Pirenne, 1925; Glaeser, 2011). Also, cities are generally more productive places. The concentration of many people e.g. allows for a greater degree of specialization, carries positive externalities such as knowledge spillovers, and facilitates a more efficient provision of public goods (Lampard, 1955; Marshall, 1890). It may therefore not be surprising that cities are argued to have played a very important role in Europe's economic ‘take-off’ during the late Medieval and Early Modern period. Urbanization and economic development often go hand in hand (Acemoglu et al., 2005; De Vries, 1984; Galor, 2005).

The importance of cities in the development process makes understanding their origins of great interest. Cities do not develop everywhere. The question ‘*why do cities form in some locations, and not, or only much later, in others?*’ lies at the heart of this paper. In

¹ Fig. A1 in Appendix A further illustrates the rise of the city in the European landscape. Over our sample period, Europe's urbanization rate increased from only 3% in 800 to 15% in 1800. Urban population increased 30-fold from 0.7 to 21 million, whereas total population increased 6-fold from 23 to 137 million. A full, century-by-century, visualization of the formation of the European city system is available upon request.

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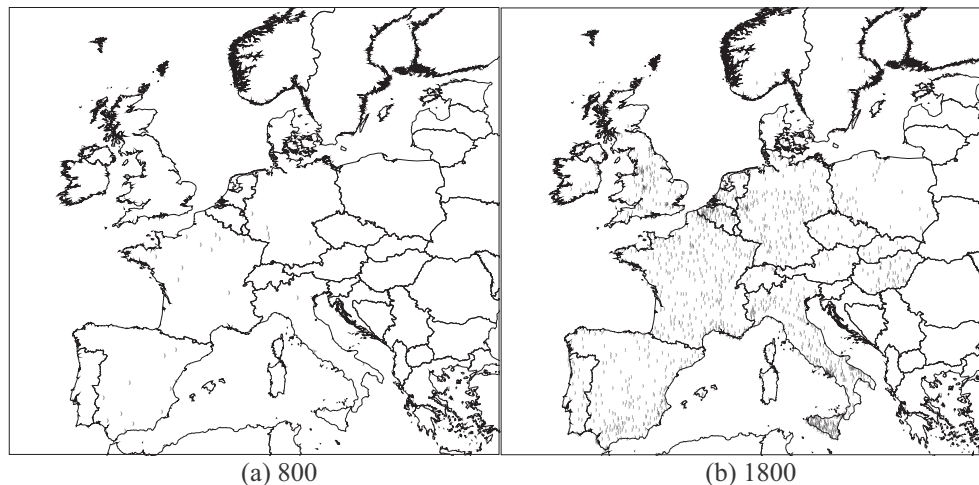


Fig. 1. The European city system in 800 and 1800. *Notes:* cities are denoted by black dots [see Section 3.2 for more detail on the city definition used]. In 800 there are 34 cities, in 1800 this number has increased to over 1450.

particular, we empirically uncover the role(s) of geography, widely viewed as the most important determinant of a location's urban chances, in 'sowing the seeds' of the European city system.

The narrative urban history, the economic geography, as well as the more recent urban economic and new economic geography literatures, stress two important, but very different, roles for geography in the origins of an urban system.²

First, geography determines a location's physical, or *1st nature geography*, characteristics. A location's agricultural potential, access to natural resources, its transportation possibilities and its defensive advantages, have all been noted as important city seeds. The second role for geography, although already stressed by e.g. von Thünen (1826), Christaller (1935) and Lösch (1938, 1940), has received renewed attention in the economics literature following Krugman (1991, 1993b). While not denying the importance of 1st nature geography, this line of literature stresses the importance of a location's position relative to the already existing urban system, its *2nd nature geography*, for its urban prospects. Locations far away from already existing cities, although maybe well suited for urban development based on their own characteristics, do not benefit from the ease of access to the existing cities' markets, and as a result "remained sterile, like seed fallen upon stony ground" (Pirenne, 1925, p. 145). On the other hand, already existing cities may also pose strong limits on urban development in their (immediate) backyard, reducing the urban chances of nearby locations.

The debate on the relevance of the two different roles of geography in determining cities' origins has up to now largely taken place without using rigorous empirical evidence. Instead, it relies on historical narratives, largely descriptive accounts of European urbanization, or detailed case studies looking at one particular city or region only. Some empirical papers do look at the relative importance of 1st and 2nd nature geography, but these papers typically focus on the evolution of a city after its initial establishment. They e.g. look for path-dependence in urban development, or identify the important determinants of a city's size (see Bleakley and Lin, 2010; Davis and Weinstein, 2002; Bosker et al., 2013; or Redding and Sturm, 2008). By looking at city size conditional on a city's existence, although very interesting in itself, these papers effectively take cities' location as given and refrain from shedding empirical light on the question why these cities formed at their

particular locations in the first place. They do not answer the question why other, often a priori equally viable, locations never became a city or only did so at a much later stage.

The aim of our paper is to identify the important determinants of city location. It allows us to shed light on predictions from (economic) theory that are specific to city emergence.

We focus on the emergence of the European city system in particular.³ The European case provides an ideal testing ground. First, historical data availability on the size and characteristics of individual cities in Europe is better than that of other continents in terms of both spatial and temporal coverage. This is largely due to the work of Bairoch et al. (1988) and De Vries (1984). They have constructed comprehensive data sets providing population estimates for many cities in Europe starting as early as the year 800. We build on this data in two ways. First, we extend its coverage by also considering over 250,000 randomly selected potential city locations: locations that in principle could have become a city but never did. Second, we complement the existing datasets with detailed information on each location's 1st and 2nd nature geography characteristics.

All this data is available for the period, 800–1800, during which one can forcefully argue that the seeds for the eventual European city system were sown.⁴ Following the eclipse of the Roman empire, cities in Europe withered (Pirenne, 1925; Greif, 1992). In 800, only about 30 cities can be found. Over the next millennium Europe witnessed an unprecedented revival of urban activity and the establishment of cities on a scale not seen before (Davis, 1955, p. 432). In 1800 their number had increased to over 1450 (see Fig. 1), effectively laying out the foundations of today's European city system.

³ We define Europe as roughly everything west of the line Trieste – St. Petersburg (with the exception of the Baltic States). This line is based on the European Marriage Pattern (see Hajnal, 1965), and coincides with the border of the Catholic Church during the Middle Ages. See also De Vries (1984) or Findlay and O'Rourke (2007). Europe thus defined comprises current-day Norway, Sweden, Finland, Poland, Germany, Czech Republic, Slovakia, Austria, Hungary, Belgium, Luxembourg, Netherlands, France, Great Britain, Ireland, Switzerland, Italy, Spain and Portugal.

⁴ We focus on the 800–1800 period for the following reasons. We start in 800 as it is the first year for which comprehensive data on city population exists for Europe, i.e. Bairoch et al. (1988). We stop in 1800 because not doing so would add the Industrial Revolution to our sample (see e.g. Ashton, 1948). The substantial changes during that period in terms of transportation (railroads, steamships), production (both industrial and agricultural), and the importance of different natural resources (coal), turned many locations that previously had little chance of becoming a city into viable city sites (e.g. many locations in the coal-rich areas of Germany, Sweden, north-east England, and the Limburg provinces of both Belgium and The Netherlands). Including the Industrial Revolution in our view requires a detailed account of its effects, which lies beyond the scope of this paper.

² Influential contributions in these literatures are e.g. Pirenne (1925), De Vries (1984) or Bairoch (1988) [urban history], Christaller (1935), Lösch (1940), Ullman (1941) or Lampard (1955) [economic geography], and Krugman (1993a), Fujita and Mori (1997) or Behrens (2007) [urban economics/new economic geography].

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