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Cities and Innovation

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ABSTRACT: This paper studies the effect of the Spanish Reconquest, a military campaign that aimed to expel the Muslims from the Iberian Peninsula, on the population of its most important cities. The almost four centuries of Reconquest offer a "quasi-natural" experiment to study the persistence of population shocks at the city level. Analyzing city growth before and after the onset of the Reconquest, we find that it had a significant negative effect on the population of the main Iberian cities. However, when we control for time effects, we conclude that in most cities this effect was transitory. In order to quantify the duration of the shock driven by the Reconquest we then estimate its average effect on the urban share of these cities considering the time dimension of the entire panel of cities simultaneously and adding city-specific time trends. Our estimates suggest that these cities regained their pre-Reconquest shares on average in less than 100 years. These results are robust to controlling for a large set of country and city-specific socioeconomic indicators and spatial effects. Our findings suggest that the locational fundamentals that determined the relative size of Iberian cities before the Reconquest were more important determinants of the fate of these cities than the direct negative impact that the Reconquest had on their population.

JEL Codes: R12, N9

Keywords: Urban primacy, locational fundamentals, city growth, lock-in effects

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1. Introduction

In most models of city formation, once random events determine a particular initial condition (e.g. a settlement in a specific location), subsequent population growth becomes locked-in regardless of the advantages of different alternatives. In these theories, first-nature forces – characteristics that are intrinsic to specific location, like proximity to navigable waters, or climate– are more important than second-nature ones – man-made features like agglomeration economies- in determining a city's fate. The main implication of these models is that exogenous shocks to population should only have temporary effects as long as the fundamental elements that determined the location and size of the city a long time ago are not affected.

In this paper we use a historical event that allows us to formally test this hypothesis. Our focus is on the striking population shifts that took place in the Iberian Peninsula during the 700-1800 time interval. This period of time saw the invasion of the peninsula by the Moors[1] armies from Northern Africa around 700, and its subsequent expulsion at the end of the Reconquest, around 1500. Figure 1 shows the Caliphate of Cordoba around 1000, at the apogee of Al-Mansur, the de facto ruler of the Moors of al-Andalus[2] in the late 10th to early 11th centuries. It is apparent from the map that almost the entire territory of the peninsula was under Moorish domain in that year.

FIGURE 1 HERE

Soon after the beginning of the Moorish occupation of the Iberian Peninsula, in the year 722, a noble named Pelayo led the first phase of what it has been known as the Spanish Reconquest, a military campaign to expel the Moors and repopulate Iberian cities with

[1] The Moors were the medieval Muslim inhabitants of Morocco, Western Algeria, Western Sahara, Mauritania, Septimania, Sicily and Malta.

[2] Medieval Muslim state occupying at its peak most of today's Spain, Portugal, Andorra and part of Southern France.

Christian population.[3] The Christian army's victory over Muslim forces led to the creation of the Christian Kingdom of Asturias along the northwestern coastal mountains. The Reconquest then moved to Galicia, in the northwest of the Iberian peninsula, and, thorough a lengthy process it kept moving towards the South. Although there is no clear consensus among historians about its exact time span, the Reconquest was a long process that was particularly intense during the 1100-1300 period, as Figure 2 confirms for our sample of cities. Table A1 of the Appendix lists the 22 Iberian cities (belonging to either Spain or Portugal nowadays) included in our sample.

FIGURE 2 HERE

A remarkable consequence of the Reconquest was that, perhaps not surprisingly, the share of the Muslim and Christian populations in total population changed dramatically during this period, as Graph (a) in Figure 3 illustrates. This figure also shows that, while this tremendous change occurred, the total population of Spain grew at a rather constant rate of about 10% per year, a rate similar to that of other European countries as Graph (b) shows.[4]

FIGURE 3 HERE

This paper takes advantage of the Spanish Reconquest to estimate the effect and duration of its associated aggregate population shocks in different cities. The main results of the paper can be summarized as follows. We find that the Reconquest had a significant and sizeable negative effect on the urban population share of the main Iberian cities. However, our estimates suggest that, after controlling for the timing of the Reconquest in

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[3] Following the convention used by historians, throughout the paper we refer to the Spanish Reconquest, although Spain as such did not formally existed until the year 1516 when the crowns of kingdoms of Aragon and Castile united.

[4] Unfortunately, the lack of accurate data does not allow us to document whether this compositional change was due to the fact that a large number of Moors were killed or expelled from their city, or whether they stayed in the city after converting to Christianism.

each specific city and a large set of variables, the average effect of this shock across cities was just temporary, vanishing in less than one century on average.

The rest of the paper is organized as follows. In Section 2 we summarize the literature most closely related to our paper. The historical context of the paper is discussed in Section 3. In Section 4 we describe our empirical strategy, while the data used is presented in Section 5. The main results are displayed in Section 5. Section 6 contains the results and, finally, Section 7 concludes.

2. Literature

From a theoretical point of view, our paper is directly linked to the distinction between first and second nature forces in determining city size and city growth. The former are characteristics linked to the physical landscape of a given location, such as temperature, rainfall, access to the sea, the presence of natural resources, or the availability of arable land, while the latter refer to factors relating to human actions and economic incentives, like, for example, scale economies or knowledge spillovers.[5]

In the empirical arena, there is a recent strand of the literature that considers the importance of natural amenities to explain city creation and city growth. For instance, Bleakley and Lin (2012) show that portage sites in different U.S. regions were once fundamental in attracting commerce and manufacturing, and that, in spite of the long time elapsed since then, their effect on city growth is still present today, suggesting a strong path dependence. Another example of the importance of natural attributes is Rappaport and Sachs (2003), who find that proximity to the coast is a crucial variable in explaining current urban concentration in the U.S. These papers attempt to identify the importance of particular geographical treats to attract people to specific locations. However, they do not to take advantage of "quasi-natural experiments" i.e. fairly exogenous historical

[5] The seminal paper by Krugman (1991) offers a clear distinction between these two forces in the context of a formal economic geography model. See also González-Val and Pueyo (2010) and Picard and Zeng (2010) for more recent references.

events that help disentangling the effect of first and second nature forces. In what follows we summarize a few studies that exploit some of these historical events.

Davis and Weinstein (2002) show how the devastating bombing of Hiroshima and Nagasaki during World War II affected the population and posterior growth rates of these two cities. Their main finding is that, in spite of the huge fall in population immediately after the atomic bombs were dropped, both cities recovered very quickly, returning to their initial size.[6] Another paper that exploits an armed conflict is Miguel and Roland (2011) who analyze the long-run impact of bombing Vietnamese cities during the Vietnam war. In particular, by comparing heavily bombed districts with other districts they are able to isolate the impact of the attacks on several socioeconomic variables. One of their findings is that population density in 2002 – about five decades after the bombings - did not change much as a result of the conflict, suggesting that initial conditions were indeed very important to understand city growth in this historical episode. Finally, Brata et al. (2013) study the effect of the Indian Ocean Tsunami in 2004 and the Nias earthquake in 2005 on the population of different regions in Aceh and North Sumatera. As in the existing literature, they find that the effects of these natural disasters on population dynamics were only temporary.

Our paper is most closely related to Nitsch (2003)'s study of the dissolution of the Austro-Hungarian Empire at the end of World War I. He analyzes how the population of the empire's main city, Vienna, adjusted to this shock and finds that, although the share of Vienna's population in the new territory initially fell, it stabilized fairly rapidly, suggesting, as in the studies mentioned before, that lock-in effects and history were crucial to understand the evolution of urban primacy in this historical context. The analysis we provide differs from Nitsch (2003) in three fundamental aspects. First, in our case the size of the "country" (the Iberian Peninsula) did not change before and after the Reconquest, whereas in Nitsch's paper the territory occupied by the Austro-Hungarian

[6] Bosker et al. (2007) study the effects of World War II on German city growth from a theoretical point on view, although their emphasis is on identifying the presence of multiple equilibria.

Empire dramatically decreased after 1918. Second, our “natural experiment” consists in the systematic expulsion of a targeted population, the Moors, who represented a large fraction of the population in many Iberian cities. Finally, the Reconquest shock spans over a much longer period of time than the one associated with the dissolution of the Austro-Hungarian Empire, which was short-lived and occurred soon after the end of World War I.

3. Historical Context

As mentioned above, the Reconquest started in the Northern kingdom of Asturias and it subsequently moved towards the South of the Iberian Peninsula. There is no evidence of any other geographical pattern in the timing of the Reconquest of the Iberian cities. In particular, the Spearman correlation between cities’ urban share (the ratio between their population and the urban population of the peninsula) is just 0.12 and not significant at conventional levels, indicating that this pattern was quite uncorrelated to city size.

FIGURE 4 HERE

As the Christians advanced, the Moors retracted to the South of the peninsula. This pattern was particularly striking in the three largest cities of the peninsula: Cordoba, Granada, and Seville. Figure 4 suggests how the Moorish population relocated first from Cordoba to Seville when Cordoba fell in 1236, and from Seville to Granada when the former fell in 1248. Another salient feature of Figure 5 is that the timing of the Reconquest exhibits substantial variation across cities, as Figures 5 shows. This time variation in the onset of the Reconquest across cities is our main source of identification since it allows us to study the effect of the shock for a large number of cities.

FIGURE 5 HERE

FIGURE 6 HERE

The historical characteristics of the Reconquest impose several constraints on the type of data that we can use in our paper. While these data is discussed in detail in Section 5, we discuss such constraints here, since they shape all the analysis that follows. Ideally, given that the Reconquest was a Christian versus Muslim conflict, one would like to collect city-level data on the percentage of Christian and Muslim population before and after the Reconquest. However, this has proven impossible due to the lack of census data during most of the period of interest.[7]

An alternative strategy is to infer the percentage of Moors and Christians in each city using estimates of the number of soldiers engaged in battles and sieges of specific cities, as well as their associated casualties. Unfortunately, this approach is, in O'Callaghan (2003)'s words, "a frustrating task", due to the lack of reliable documentation. Just to cite a few examples from his book, Muslims authors claim that the number killed in the Battle of Zallaqa (1086) ranged from 10,000 to 300,000. In the Battle of Alarcos (1195), the reported Christian deaths by Muslims were 30,000, while only 500 of them seem to have been killed in reality. Or, for example, the Christian king Jaime I claimed that he had about seventy knights and 13,000 foot soldiers in the Mallorcan Crusade, although he also wrote elsewhere that he had embarked only 1000 men in his ships! (O'Callaghan, 2003, page 144).

The lack of reliable data on city-specific changes in religious affiliation implies that one cannot reject the hypothesis that the Reconquest was a relatively pacific event and that, in cities that were mostly populated by Muslims, their dwellers simply converted to Christianism once they were taken by Christian troops. This view would imply that the Reconquest was a relatively pacific process that indeed had a negligible effect on the population of Iberian cities. After all, the typical medieval warfare strategy to take a city

[7] Census data appeared for the first time in Spain in the second half of the 18th century. Chaney and Hornbeck (2013) use data from the historical tithing districts recorded by the Archbishopric of Valencia on the number of Christians and Moriscos (Muslims who decided to convert to Christianity rather than leave Spain and Portugal in the early 1500s) from 1527 to 1786. However to our knowledge, these data is only available for the region of Valencia.

was to siege a city for a long time until its population eventually surrendered.[8] Such sieges could be argued to cause relatively low number of deaths. However, sieges were often complemented, or even replaced by assaults, where the number of casualties was often much larger. "[…] *While many sieges ended with capitulation, some towns were taken by assault. This was the bloodiest outcome of a siege and in some respects the least desirable. Men, women, and children were slaughtered indiscriminately, and survivors were reduced to slavery. Although the defenders of Almeria offered Alfonso VII 100,000 maravedis if he would lift the siege, the Genovese refused to agree and took the city by assault. Some 20,000 Muslims were said to have been killed and another 30,000 taken captive; 10,000 women and children were transported to Genoa, where they were likely sold as slaves or ransomed. Following Las Navas the Muslims of Ubeda offered Alfonso VIII 1,000,000 maravedis to pass them by, but he refused and assaulted the city, enslaving the survivors. Jaime I reported that 24,000 inhabitants were massacred during the assault of Palma."* (O'Callaghan, 2003, page 140).

Equally important, once a city was reconquered, the available accounts show that there was a considerable variety of possible agreements between Christians and Moorish. In some cases, the Moors were allowed to stay – with the condition that they converted to Christianism – and in other ones they were forced to evacuate the city. O'Callaghan describes some of these pacts: *"Alfonso VI allowed the Muslims of Toledo to remain, retaining their property, worshipping freely, and living in accordance with Islamic law; those who wished to depart with their movable goods could do so, but they could return later if they wished. Alfonso I gave similar guarantees to the Muslims of Zaragoza ... [] Fernando III's general policy in Andalucia was to require the Muslims to evacuate the principal urban centers capitulating after a siege. Thus the Muslims of Capilla, Baeza, Ubeda, Cordoba, Jaen, and Seville were allowed to depart, taking their movable goods under safeconduct to Muslim territory. The Muslims similarly evacuated Palma, borriana, and Valencia, but a significant number remained in Jaime I's dominions,*

[8] It was not uncommon to combine a final assault to a city after its dwellers have been debilitated by months of siege.

assured of religious liberty and the observance of Islamic law." (O'Callaghan, 2003, pages 139-140).

A final issue to take into account is to what extent the infrastructure of the reconquered cities was affected by the military campaigns. If it is the case that most cities' infrastructure was barely affected, it is natural to expect that, even if the population loss was significant, the recovery of the city should have been relatively fast. In his book (page 134) O'Callaghan argues that in some cases the military campaigns involved considerable physical destruction: *"…the purpose of these raids was devastation: to destroy the enemies' crops; trees and vineyards were burned and cut down; livestock was seized; villages were pillaged; fortifications were wrecked; …the raiders hoped to undermine the enemy's morale and his will to resist…Once an enemy had been softened up in this way, it was possible to besiege a stronghold in the expectation that the defenders would have insufficient supplies and manpower to maintain themselves for any length of time."*

Once again, it is difficult to identify any systematic pattern across cities in relation to the extent of infrastructure damage. However, a priori, we would argue that, as in any typical war in the Medieval age, the limited destructive power of the available warfare technologies, should result in relatively unimportant losses of infrastructure. The complexity of dealing with the different ways in which cities were taken, the variety of surrender agreements, as well as the difficulties in assessing the degree of infrastructure damage leads us to follow an agnostic view in the paper. Our approach is to let the data speak for themselves and if indeed the Reconquest had a significant negative impact on the population size of a specific city, our estimates should capture such effect.

As we discuss below, our results suggest that the effect of the Reconquest was ultimately temporary. This is consistent with the geographical variation in the military strategy carried on in the Reconquest (siege vs. assault, for example), the surrender terms, and the degree of infrastructure damage. One interpretation of our finding is that the first-order effect of a siege –especially if it ended up in an assault- was the decline in the city's population. However, the likely limited amount of physical destruction, and the possibility that the Muslims could sometimes remain in the city after it was taken by Christians, made this effect just temporary, on average.

4. Empirical Strategy

Our empirical strategy consists of two steps. We first follow the methodology advanced by Nitsch (2003) that consists on analyzing how urban primacy in specific cities evolved *before* and *after* the Reconquest. The details on how we carry out this analysis are explained in detail below. Second, we estimate the effect of the Reconquest using the entire panel of cities and adding as regressors city-specific time dummies for the years at which each city experienced its Reconquest. This methodology offers two advantages: first, it allows one to estimate the average effect of the Reconquest on the Iberian cities – rather than the effect for each city individually – using information from the entire panel. This is important since our ultimate goal is to estimate the effect of this historical event on the average Iberian city. Second, the time dummies allow us to study the persistence of this shock more precisely than by just looking at city growth before and after the onset of the military campaign. In both cases we also include in our panel the urban shares of the largest European cities, in order to capture to what extent the results in the Iberian peninsula simply reflect a common trend in neighboring countries (see again Table A1 in the Appendix for the complete list of the cities used.)

4.1. City-specific growth before and after effects of the Reconquest

In this subsection we estimate the following regression:

$$p_{ijt} = \alpha + \beta' X_{it} + \lambda' Z_{jt} + \gamma \mathrm{IBERIA} + \varepsilon_{ijt} \qquad (1)$$

The dependent variable p_{ijt} denotes the urban share of city *i* in country *j* and year *t*. Urban shares are defined as the fraction of the city's population over the total urban population of the country, defined as the population living in cities greater than 5,000 inhabitants.[9] The explanatory variables included are similar to those considered by Henderson (2000) and Nitsch (2003). X is a matrix of city-specific explanatory variables with the potential to affect a country's degree of urban concentration: a dummy variable for whether a city is a transportation hub (defined as the intersection of at least two Roman roads), a dummy variable for whether a city has a port, and, in some specifications, the city's real wage for craftsmen and/or for building laborers. Finally, as in Nitsch (2003) we also include a number of relevant interactions (the density of Roman roads interacted with per capita GDP and the two measures of wages) in order to capture the differential effect of infrastructure and income.

The matrix Z includes the following country-specific variables: the total urban population, per capita Gross Domestic Product, the land area, the length of waterways and a measure of road density. Finally, IBERIA is a dummy variable which takes the value of one only for Iberian cities, and zero otherwise, and ε_i is an error term.

As in Nitsch (2003), the key coefficient in this regression is γ, which captures the extent to which a given Iberian city is larger than the target that is determined by the variables included in *X* and *Z*. The significance and sign of the coefficient of the IBERIA dummy in the regressions using the sample after the Reconquest inform us about the impact on the city urban share. In some estimations we also include an interaction between the IBERIA dummy and a time trend to analyze changes in γ over time. It is important to note that the IBERIA dummy takes the value 1 only for one city in each regression, although the remainder of the Spanish cities are also included as controls; thus, γ captures the individual effect of the Reconquest for each Iberian city. We estimate Eq. (1) before and after the date of the Reconquest of the city, splitting the sample in two periods. Table A2 in the Appendix displays an extract from our panel that helps understanding the structure of our dataset..

[9] The 5000 cutoff to define urban population is standard in historical data. See, for example, Bairoch et al. (1988). The results are qualitatively the same using the population living in cities with more than 2,000 inhabitants. For the Iberian cities we have also defined these shares as the city's population over the total urban population in Iberia (Portugal and Spain) and the results are qualitatively similar.

One possible concern with our OLS estimates is that there may exist spatial elements that affect our dependent variable, urban shares. The rationale for this is the likely existence of effects across neighbouring countries or countries located nearby others. For example, it seems plausible that the rulers of a kingdom or country reacted to an increase in their neighbours' urban primacy with policies that increased their own urban primacy. One such policy may be an improvement in infrastructure in the largest city. To deal with this, we apply the robust Lagrange multiplier and Moran's I tests to the residuals of the regression of the model in Eq. (1). The first model we use to control for these possible spatial effects is the spatial error model, which extends model (1) by considering an error variable that satisfies

$$\varepsilon_i = \lambda W \varepsilon_i + v_i, \tag{2}$$

where $|\lambda| < 1$ is a parameter that reflects the effect of the residuals of neighbouring variables on the residual of location i, W is a weighting matrix that measures the physical distances between the different locations and v_i is an iid random variable that describes the error of the regression model. There exist different possibilities for choosing W; here we consider a matrix obtained from the coordinates (longitude and latitude) of the locations in order to construct the Euclidean inverse distance between the cities. A second model we use to test for the presence of spatial effects in our data is the spatial autoregressive model:

$$p_i = \alpha + \rho W p_i + \beta X_i + \gamma \text{IBERIA} + \varepsilon_i \tag{3}$$

with $|\rho| < 1$ measuring the effect on the endogenous variable of urban share in neighbouring countries.

4.2. Average effects of the Reconquest using city-specific time dummies

In order to capture the size and duration of the Reconquest shock in the average Iberian city, we proceed to estimate the following model:

$$p_{ijt} = \eta + \theta' X_{it} + \xi' Z_{jt} + \sum_{k=1}^{13} \phi_k D_k + \pi_{ijt} + u_{ijt} \qquad (4)$$

where p_{ijt} and the matrices *X* and *Z* are the same as in Eq. (1). This model differs from the one discussed in Section 4.1. in that we introduce thirteen time dummies (one for each of the possible one-hundred time intervals between the year 800 and 2000) that are meant to capture the effect of the Reconquest on the Iberian cities in a given century. For instance, D_1 is a dummy variable that takes a value of one in the first period after the Reconquest started in a given city, and zero if the Reconquest has not yet taken place. Similarly, D_2 is the corresponding dummy 200 years after the beginning of the Reconquest, and so on. For example, for the city of Granada, whose Reconquest started in 1492, $D_1 = 1$ in the year 1500, $D_2 = 1$ in the year 1600, etc. Therefore, these dummy variables measure the number of periods (centuries) after the onset of the Reconquest for each city, capturing its dynamic effect on the city's urban share. Of course, for any city belonging to a country not located in the Iberian peninsula, we have $D_k = 0, \forall k = 1,...,13$, since there was no Reconquest in these cities. Finally, in some specifications we also include the city-specific time trends π_{ijt} in order to capture the particular behavior of each city in our panel over time. The error term is denoted by u_{ijt}.

The estimates of the time dummies in Eq. (4) allow us to determine the effect of the shock on cities' urban shares and whether this effect declines or grows over time. One advantage of this strategy versus the before-and-after analysis of Section 4.1 is that it makes use of all the available years for each city, significantly increasing sample size. Furthermore, we can estimate the average effect of the Reconquest in our sample of cities, instead of estimating the effect city by city considering cities one by one.

5. Data

We include twenty cities from the Iberian península that are nowadays located in Spain: Almeria, Badajoz, Barcelona, Cadiz, Cordoba, Gerona, Granada, Huesca, Jaen, Leon, Madrid, Malaga, Murcia, Palma, Seville, Toledo, Tortosa, Valencia, Zamora, and Zaragoza. In some regressions we also include the (currently) Portuguese cities of Lisbon and Coimbra.[10] We choose these cities based on two criteria: first, these were the largest ones during the period considered in the paper. This is a necessary choice since data for smaller cities is much more incomplete.[11] Second, this selection of cities covers the vast majority of the peninsula, as it is apparent in Figure 5. For the rest of the countries (the current Austria, Belgium, France, Germany, Italy, Netherlands, Portugal, Switzerland, and the UK)[12] we choose the cities that were the largest ones in their country for at least one period (one century in our data) during the 800-2000 period.[13] Figure 6 shows the evolution of the urban share for all the European cities in our panel. Although all of them were the largest city in at least one period, these plots display a high variance in the evolution of urban population shares across cities and over time; some cities were thriving, while the share of others clearly declined over time.

FIGURE 6 HERE

To construct the urban shares we use data on city population and country urban population taken from Bairoch et al. (1988).[14] Total urban population and per capita Gross Domestic Product taken from Maddison (2003). Land area - according to the 1870

[10] We can only consider the Portuguese cities in the regressions that use per capita GDP as a measure of wealth, since Allen (2001) does not provide data on wages for any Portuguese city.

[11] We exclude two relatively large Northern cities (Vigo, Coruña) because there is ample historical evidence that Muslim influence was very limited there. Moreover, data for these cities is only available for the last periods of our sample.

[12] To be clear, the country denomination is a bit ad hoc since, with the exception of France, none of these countries existed as such in the entire time period studied here. However, this is the convention typically used in the literature. See, for instance, Bairoch et al. (1988).

[13] This sample selection criteria implies that, apart from Spain, some countries have several cities in the sample (five cities in the case of Germany) while others have only one (for instance, the United Kingdom, where only London is selected.)

[14] Since Bairoch et al. (1988) do not provide population estimates for 1100, for this century we use the interpolated values provided by Eltjo Buringh and Jan Luiten van Zanden on their webpage (http://socialhistory.org/en/projects/global-historical-bibliometrics).

political borders[15] - is collected from Malanina (2009). We also use information from the CIA *World Factbook* on the length of waterways, which are assumed to be constant over time. Measuring road density is problematic due to the scarcity of data in early periods. In order to deal with this, we proxy this variable with the number of cities that were crossed by a Roman road, following Bosker et al. (2012). The source of information on the presence of a Roman road is Talbert (2000).[16]

As in Bosker et al. (2012), we identify locations where two (or more) Roman roads crossed as hub locations. The building craftsmen and building labourers real wages are from Allen (2001) and are measured in grams of silver per day. Allen provides annual data since the thirteenth to the twentieth century for several European cities; when data for a particular city is not available we use data from the nearest city within the same country. Missing data for a given city-year are filled with linear interpolations.

6. Results

6.1. City-specific before and after effects of the Reconquest

The estimation of Eq. (1) gives us the impact of the Reconquest on the urban share of every Iberian city in our sample. However, for the sake of brevity, we have chosen to present the results for only six representative cities: Cordoba, Seville, Granada, Toledo, Valencia and Palma.[17] These cities were the largest Iberian cities for most of the centuries covered in the paper and they offer substantial geographical variation as well as differential Reconquest years. There exists strong historical evidence that, around the year 800, and before the onset of the Reconquest, around the eleventh century, Cordoba, Granada, and Seville were the dominant urban centers in the Iberian Peninsula. Indeed,

[15] Following Bairoch et al (1988), we consider constant boundaries over time, because some of our variables (road density, GDP, waterways, etc.) are defined according to these boundaries. Furthermore, if we allow country boundaries to change over time there could be spurious changes in our endogenous variable.
[16] There are two independent projects that provide geocoded data based on Talbert (2000): DARMC (Harvard, http://darmc.harvard.edu) and OmnesViae (http://omnesviae.org/). We acknowledge René Voorburg from the OmnesViae project for kindly providing data.
[17] Results for the rest of the cities are available from the authors on request.

Cordoba was often considered the most populated city in the world in 1000 (Chandler and Fox, 1974; Chandler, 1987). Taking their average population between the years 800 and 1300, the ranking of the rest of cities was, in descending order: Toledo, Barbastro, Valencia, Leon, Merida, Malaga, and Palma. Seville experienced a re-growth period in the 1400-1600 period, in large part due to the fact that it was the main port in the trade with the New World, confirming the hypothesis of Acemoglu et al (2005).

FIGURE 7 HERE

Figure 7 displays the evolution of the population for these cities, showing a clear change around the onset of the Reconquest. Table 1 presents the main results for these six representative cities using OLS to estimate Eq. (1) and measuring income using national GDP per capita. For each city we split the sample in two periods, which are city-specific (see Figure 5): before and after Reconquest. As we discussed above, there is considerable agreement among historians that the first period corresponds to a “mild” process of Christian re-occupation of Muslim cities, while the second one is a much more intensive one.

TABLE 1 HERE

We include two different set of results: with and without the interaction term between the IBERIA dummy and a time trend. Focusing on the estimates not including the temporal term, the most important result for our interests is the fact that the sign of the dummy IBERIA is significantly negative after the Reconquest, with the exception of Granada. Before the Reconquest, the sign associated with these dummies is insignificant or positive in all cases, with the exception of Toledo, which has a significant negative coefficient. The interpretation of these coefficients is clear and it leads to the main result of this section: the Reconquest had a remarkable negative effect on the urban share of our sample of cities. To give an interpretation of the key variable IBERIA, consider, for example, the case of Cordoba. Its estimated coefficient 0.254 for the before-Reconquest period indicates that Cordoba's share in total urban population was around 25 percentage points larger than is explained by the economic size of Spain. Similarly, the coefficient of -0.037 in the after-Reconquest period for Cordoba suggests that after 1300 Cordoba's share in total urban population is around 4 percentage points smaller than is explained by the economic size of the country, indicating a strong negative effect of the Reconquista on Cordoba's urban share.

However, these results change substantially when we incorporate the interaction term between the IBERIA dummy and a time trend, along with the interaction between IBERIA and the square of the time trend (to allow for possible nonlinear patterns over time). Note that since the IBERIA dummy only takes the value of one for one city (Cordoba, Seville, Granada, Toledo, Valencia or Palma) in each regression, this term can be interpreted as a city-specific trend. Focusing on the after-Reconquest period, the estimate of the time trend is negative for all cities, although, with the exception of Cordoba, it is never statistically significant. Nevertheless, the most interesting result is that, after the inclusion of this time trend component in the model, the IBERIA coefficient in the after-Reconquest period turns insignificant in all cities but Cordoba.[18] This is our second main result: the effect of the Reconquest on urban shares vanishes once we control for a time trend. Taken together, these two findings suggest that, although the Reconquest seemed to have had an initial negative impact on the urban shares of these cities, this effect was just temporary.

Regarding the rest of the variables and controls, most of them show the expected sign, and the estimates are consistent across the different cities. The coefficients of the hub city and port city dummies are positive (and most of the times significant). Urban population has a strong and negative significant impact on urban share, which is obviously expected since our endogenous variable is constructed as the city's population divided by the urban population. Road density doesn't have a significant effect in half of the specifications, and when it does it enters with a puzzling negative sign. The same pattern occurs with the

[18] The squared time term is significant in most cities only before the Reconquest indicating falling growth in urban shares in cities that were thriving before the Reconquest.

control for waterways. One possible explanation for this is that these two variables are likely to be highly correlated with the hub and port dummies. Land area, when significant, enters with a positive sign. Interestingly, the income controls –per capita GDP and its square- are never significant, whereas their interactions with road density are significant only after the Reconquest, exhibiting a positive and concave effect

As a robustness check, we re-estimate Eq. (1) using other city-specific measures of income, namely building craftsmen and building labourers wages from Allen (2001). Results using the two wages are qualitatively similar, so we only show here the estimates using the building craftsmen wages (Table 2).[19] This reduces our sample size because Allen does not provide information for Portuguese and Swiss cities. The main conclusions hold, although the significant negative coefficient of the IBERIA dummy in the after-Reconquest period is less common even in the regressions excluding the time trend interaction, although it is still negative and significant for Seville and Palma. As in Table 1, the effects found in the after-Reconquest period disappear when we introduce the time trend interaction in the specifications, although this time the negative effect on Palma's urban share remains negative and significant.

TABLE 2 HERE

These results provide strong evidence that the Reconquest had transitory effects on the population of the main Iberian cities. This means that, in the context studied here, history matters for city growth in the sense that the locational fundamentals that made these cities some of the most populated ones in the Peninsula for about 500 years since 800 seem to continue to be crucial growth determinants once Christians took control of them. However, given that the effect of the shock was transitory, can we quantify how long did it take these cities to recover from the shock? To address this question, the next

[19] Results using the building labourers wages are available upon request.

subsection estimates the average dynamic effect of the Reconquest using the entire panel of cities simultaneously and city-specific time dummies.

6.2. Average effects of the Reconquest using city-specific time dummies

The results of estimating our complete panel of cities using city-specific time dummies are displayed in Table 3. In this estimation, the results using per capita GDP or the two different measures of wages from Allen (2001) are very similar. The reason is that, since when doing the latter we include several cities for which the Allen's data are not available, we end up using the same wages for a large percentage of cities within each country. Therefore, we present only the results using per capita GDP here.[20]

The first thing to notice from this table is that all the significant coefficients have a negative sign, confirming the finding from the last section that the Reconquest indeed had a negative impact on the population of the average Iberian city. The first column of Table 3 displays the estimates of Eq. (4) without including any fixed or time effects. In this case, all the coefficients turn out to be highly significant, suggesting that the effect was very persistent. Moreover, the size of these coefficients does not change much over time. In the second column however, the persistence of the shock practically disappears once we add all the time and fixed effects in the estimation. This can be interpreted as strong evidence that, for the average Iberian city, the effect of the Reconquest was temporary, vanishing within the first hundred years (before $D_1 = 1$). These results confirm the analysis carried out in the previous section.

TABLE 3 HERE

6.3. Spatial effects

[20] The results using Allen's wages are available from the authors.

In this section we check the robustness of our results to the spatial dimension discussed in Section 4.1. We first run the robust Lagrange multiplier and Moran's I tests to the residuals of the regression of the model in Eq. (1), using two different spatial structures: a spatial error model and a spatial lag model, see Eq. (2) and (3).

Table 4 reports the p-values of these tests for the city-specific regressions. The six cities considered, the two subperiods and the two measures of income (GDP per capita and the building craftsmen wages)[21] are the same as in Tables 1 and 2. The models tested include all the controls and time interactions; the results not including the time trends are almost identical. The six cities show results that are very similar: the null hypothesis of zero spatial autocorrelation cannot be rejected in almost all cases for the spatial error model, as indicated by the high p-values. However, the zero spatial autocorrelation hypothesis is rejected in most of the cases for the spatial autoregressive model. To check whether our results survive after controlling for these spatial effects, we proceed to estimate the corresponding spatial autoregressive model (Eq. 3). Tables 5 and 6 show the results using GDP per capita and the building craftsmen wages, respectively. To save space, we only show the results for the after-Reconquest period. In these regressions the spatial term (ρ) is always significant, confirming the presence of important spatial effects as the tests of Table 4 indicated. The main difference from previous results in Section 6.1 (Tables 1 and 2) is that the city-specific negative effect of the Reconquest on urban share is harder to find when we take into account the spatial structure of the data (the effect remains significant only in the case of Palma).

TABLE 4 HERE

TABLE 5 HERE

TABLE 6 HERE

[21] Results using the building labourers wages are available upon request.

Finally, we run the same tests for our complete panel of cities using city-specific time dummies to estimate the average effect of the Reconquest. Using specification (3) from Table 3 –the one that includes all the time and fixed effects, we find p-values very close to one in both the spatial error and the spatial lag models. The clear conclusion is that the null hypothesis of zero spatial autocorrelation cannot be rejected in all cases, indicating that our panel estimates of the average effects are robust to spatial effects. One interpretation of this finding is that the inclusion of country and city fixed effects in the model are sufficient to control for the spatial dimension of the data. Therefore, the main conclusion from this section is that spatial effects are not crucial in our exercise and so our results are robust to including such effects in our estimation.

TABLE 7 HERE

7. Conclusions

In this paper we analyse a quite unique "quasi-natural" experiment, the effect of the Spanish Reconquest on the population of the main Muslim cities of the Iberian Peninsula. The Reconquest was a military campaign that lasted about 700 years and which main aim was to expel the Muslim population from the Iberian peninsula. Naturally, this process involved dramatic changes in the composition of the population, both in the peninsula, but also across different cities. Our estimates indicate that the negative impact of the Reconquest was significant in the largest cities, although the effect of the shock was temporary in most cases and it vanishes when we control for time and spatial interactions. Then we estimate the average effect on the urban shares of our sample of Iberian cities by using city-specific time dummies, finding that cities regained its pre-Reconquest urban share in less than one hundred years.

From a theoretical point of view, these findings are supportive of models where locational fundamentals, or time invariant city characteristics, are the most important variable to explain a city's location and subsequent growth. These findings are not just of esoteric historical interest. There are plenty of events that recurrently affect the size of today's cities in an exogenous way, including wars or natural disasters. The results of this paper may shed light on the future evolution of these cities and so may offer a guide for policymakers that seek to design policies to help cities recovering after such shocks.

References

Acemoglu, D., S. Johnson, and J. Robinson (2005), “The Rise of Europe: Atlantic Trade, Institutional Change, and Economic Growth.” *American Economic Review*, 95(3): 546-579.

Allen, R. C. (2001), “The Great Divergence in European Wages and Prices from the Middle Ages to the First World War.” *Explorations in Economic History*, 38: 411–447.

Álvarez-Nogal, and L. Prados de la Escosura (2013), “The Rise and Fall of Spain (1270–1850).” *Economic History Review,* 66(1): 1-37.

Bairoch, P., J. Batou, and P. Chevre (1988), “*La population des villes européennes de 800 a 1850: Banque de donnees et analyse sommaire des resultats.*”(The population of European cities, 800–1850: Data bank and short summary of results.) Centre of International Economic History Series, No. 2. Geneva: Librarie Droz, 1988.

Bleakley, H., and J. Lin (2012), “Portage and Path Dependence.” *Quarterly Journal of Economics*, 127(2): 587-644.

Bosker, M., E. Buring, and J. L. Van Zanden (2012), “From Baghdad to London: unraveling urban development in Europe, the Middle East and North Africa, 800-1800.” *Review of Economics and Statistics*, forthcoming.

Bosker, E. M., S. Brakman, H. Garretsen, and M. Schramm (2007), “Looking for multiple equilibria when geography matters: German city growth and the WWII shock.” *Journal of Urban Economics*, 61: 152–169.

Brata, A.G, H.L.F. de Groot, and P. Rietveld (2013), “Dynamics in Aceh and North Sumatera after the Twin Disasters.” Tinbergen Institute Discussion Paper.

Chandler, T. (1987), “*Four Thousand Years of Urban Growth: An Historical Census*.” Lewiston, NY: The Edwin Mellen Press.

Chandler, T., and G. Fox (1974), “*3000 Years of Urban Growth*.” New York, NY: Academic Press.

Chaney, E., and R. Hornbeck, (2013), “Economic Growth in the Malthusian Era: Evidence from the 1609 Spanish Expulsion of the Moriscos.” Working paper, Harvard University.

Davis D. R., and D. E. Weinstein (2002), “Bones, Bombs, and Break Points: The Geography of Economic Activity.” *American Economic Review*, 92(5): 1269-1289.

González-Val, R., and F. Pueyo (2010), “First nature vs. second nature causes: industry location and growth in the presence of an open-access renewable resource.” Working Papers 2010/39, Institut d'Economia de Barcelona (IEB).

Henderson, J.V. (2000), “The Effects of Urban Concentration on Economic Growth.” NBER Working Paper 7503, National Bureau of Economic Research, Cambridge, MA.

Krugman, P. (1991), “Increasing Returns and Economic Geography.” *Journal of Political Economy*, 99(3): 483–499.

Maddison (2003), “*The World Economy: Historical Statistics*.” Paris: OECD.

Malanina, P. (2009), “*Pre-modern European economy: one thousand years (10th-19th centuries)*.” Leiden: Brill.

McEvedy, C., and R. Jones (1978), “*Atlas of world population history*.” Harmondsworth: Penguin.

Miguel, E., and G. Roland (2011), “The Long-Run Impact of Bombing Vietnam.” *Journal of Development Economics*, 96:1: 1-15.

Nitsch, V. (2003), “Does History Matter for Urban Primacy? The Case of Vienna.” *Regional Science and Urban Economics*, 33: 401-418.

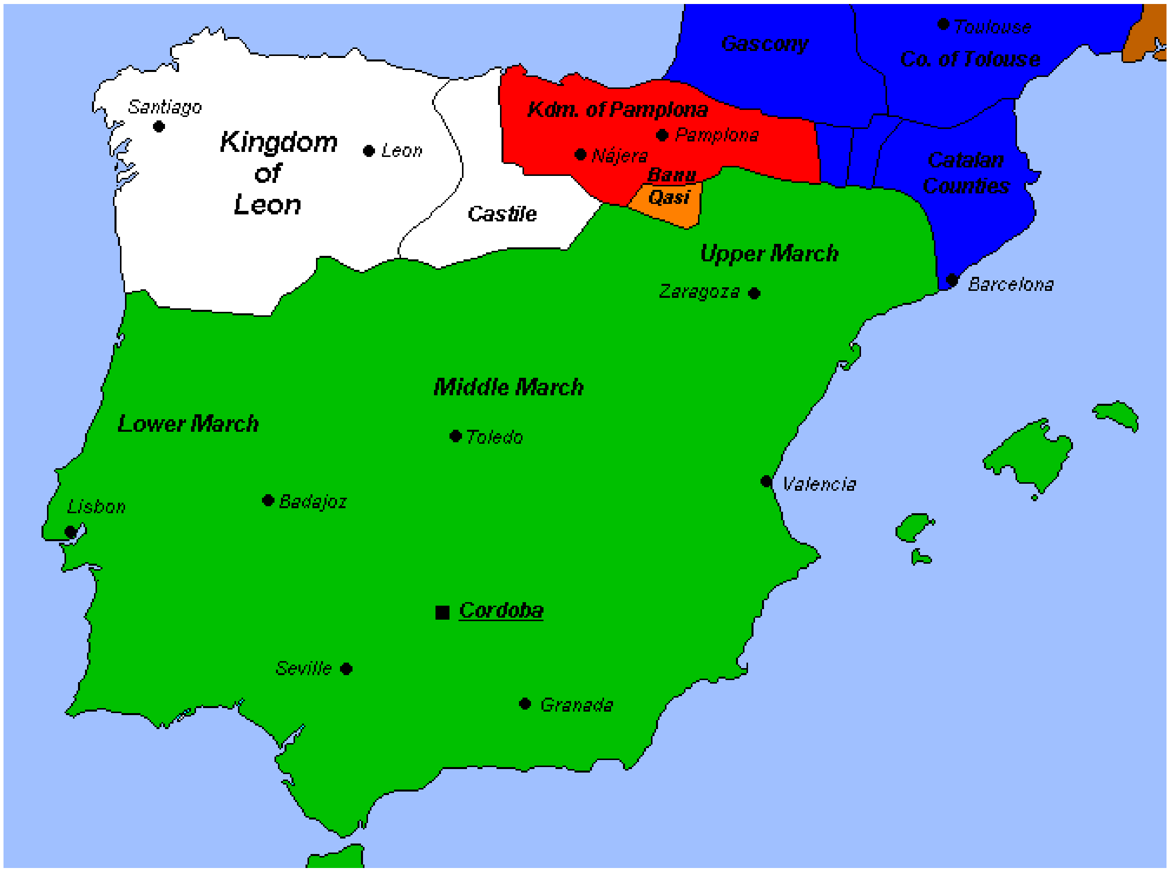
O'Callaghan, J. F. (2003), “*Reconquest and Crusade in Medieval Spain*.” Philadelphia: University of Pennsylvania Press.

Picard, P. M., and D.-Z. Zeng (2010), “A Harmonization of First and Second Natures.” *Journal of Regional Science*, 50:5: 973-994.

Rappaport, J., and J. D. Sachs (2001), “The U.S. as a Coastal Nation.” Mimeo, Harvard University.

Talbert, R. J. A., (2000), "*Barrington atlas of the Greek and Roman world*." Princeton: Princeton University Press.

Figure 1: The Caliphate of Cordoba c. 1000



Source: Wikipedia

Figure 2: Distribution of Reconquest years in the main cities of the Iberian Peninsula

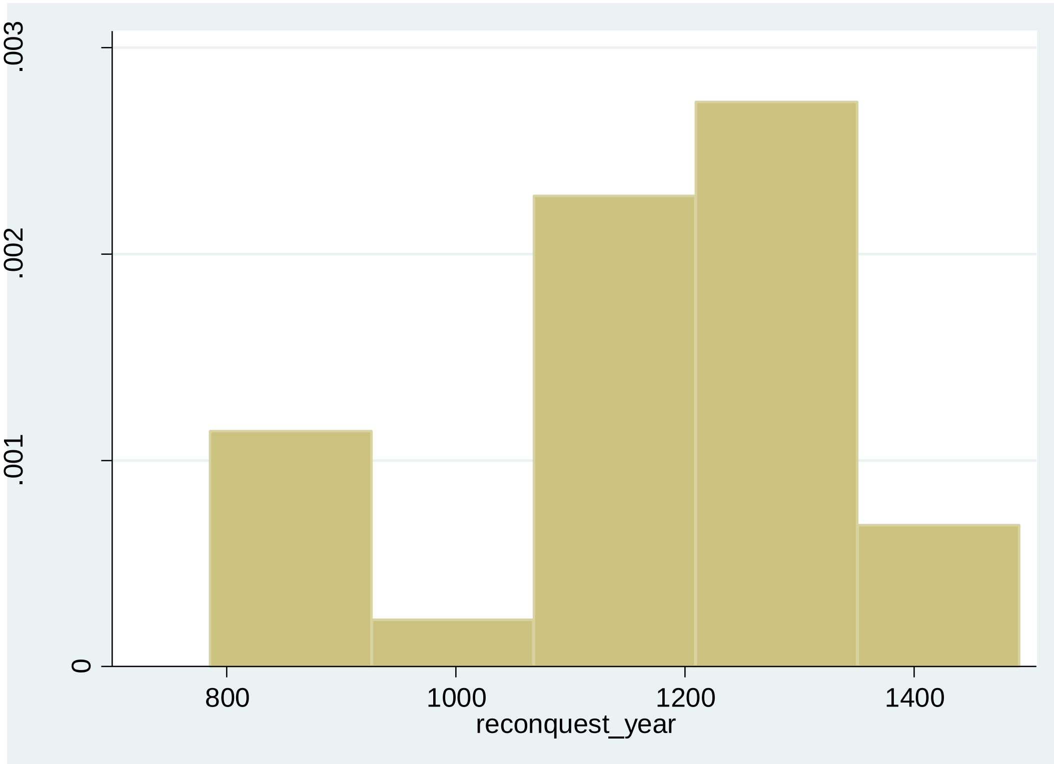
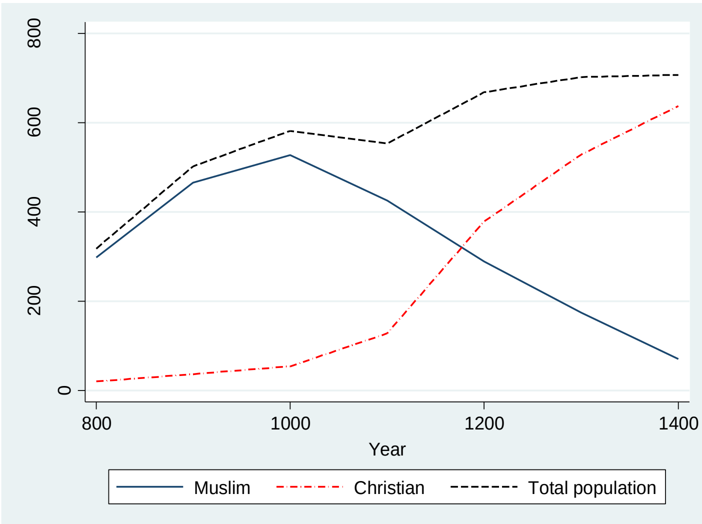
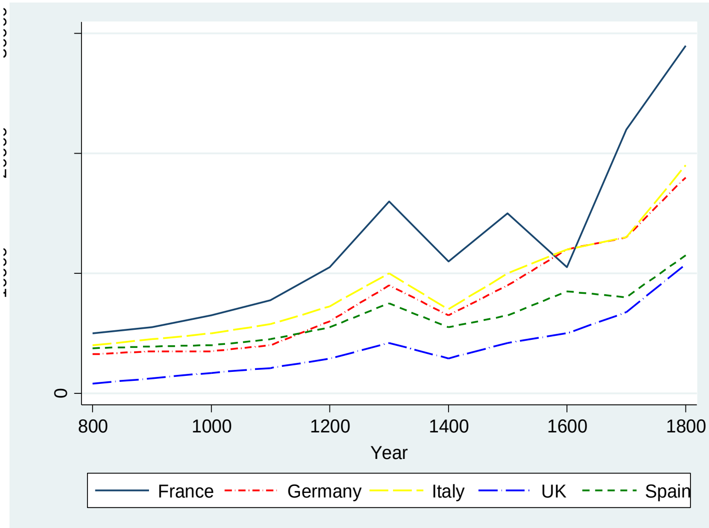


Figure 3: Evolution of the population



(a) Spain, 800-1400



(b) European countries, 800-1800

Sources: (a) Data estimated by Eltjo Buringh and Jan Luiten van Zanden based on Bairoch et al. (1988). Available at: http://socialhistory.org/en/projects/global-historical-bibliometrics. (b) McEvedy and Jones (1978).

Figure 4: The evolution of the Caliphate of Cordoba

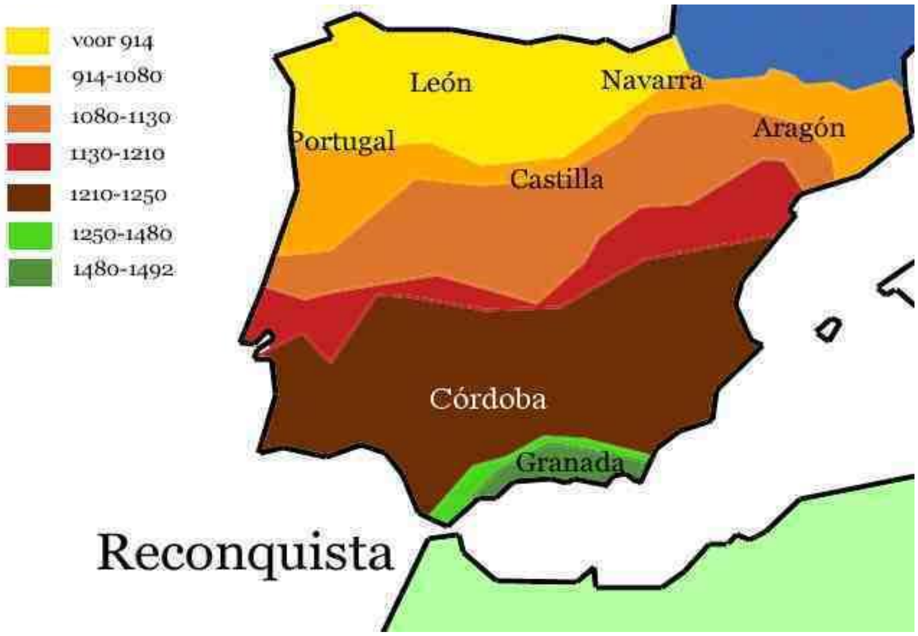


Figure 5: Reconquest data in the most important Iberian cities

Figure 6: Evolution of the urban share of the largest cities by country, 800-2000

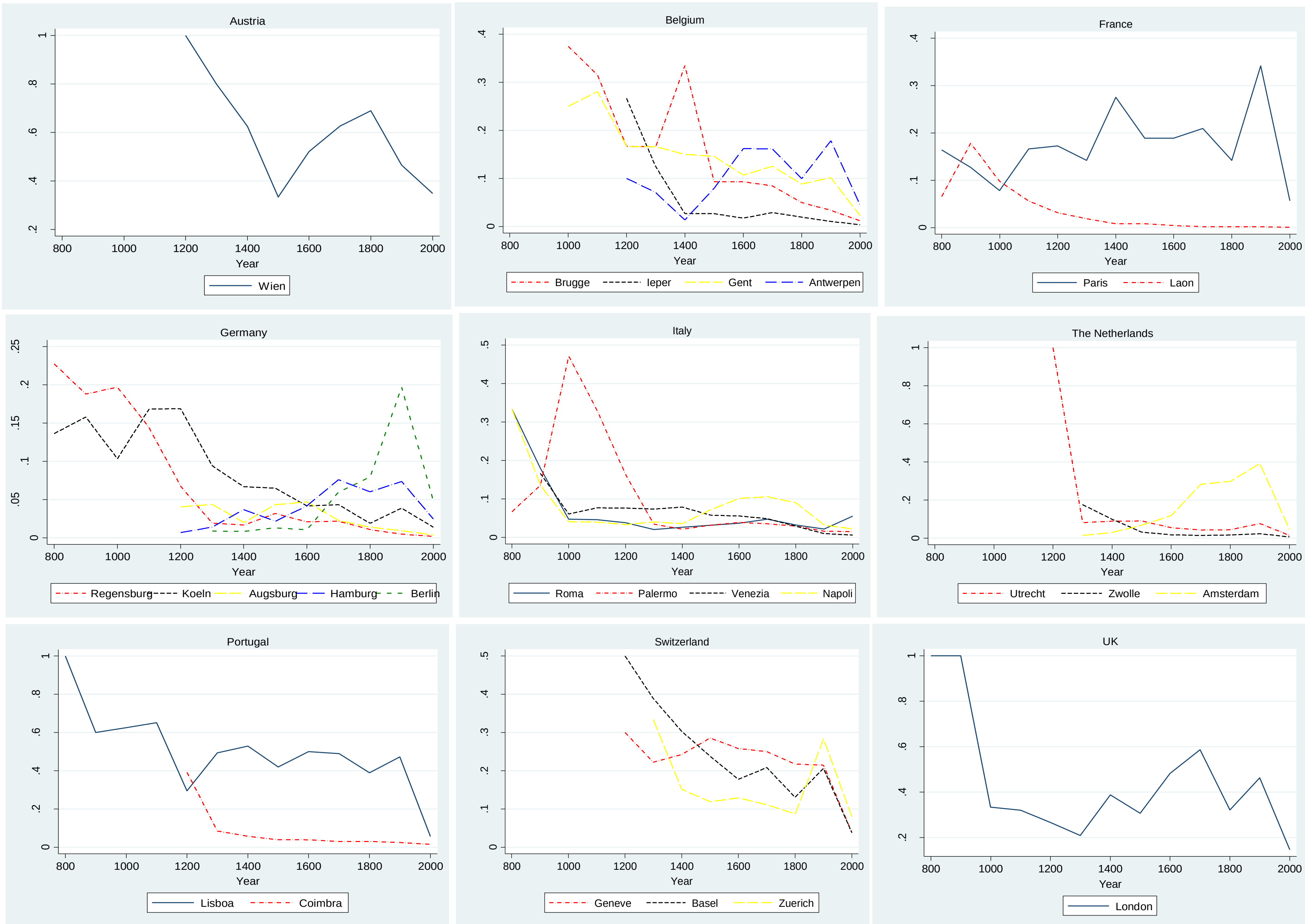
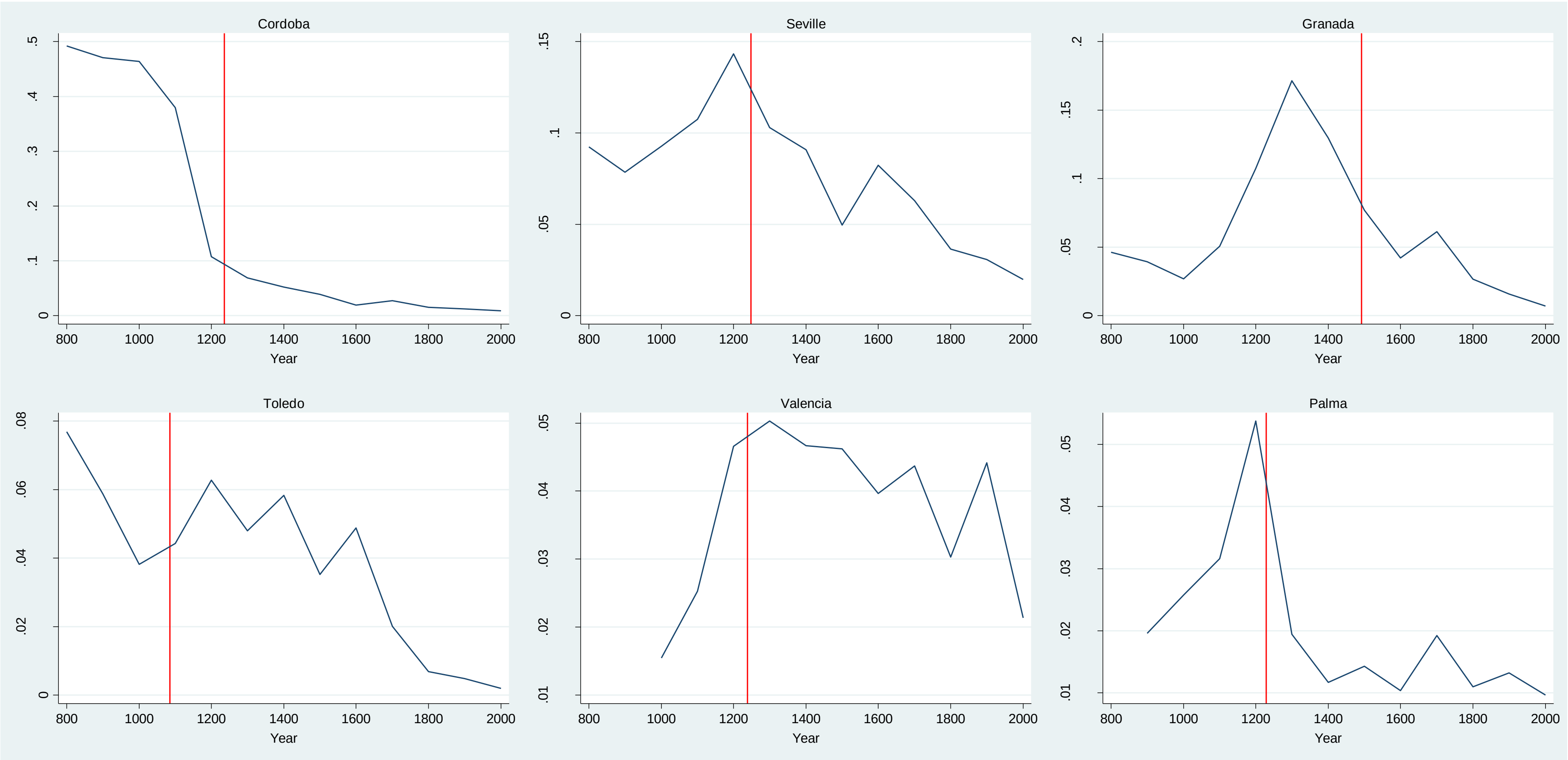


Figure 7: The evolution of the urban share in some selected Iberian cities, 800-2000



Note: The vertical line indicates the date of the city's Reconquest.

Table 1. The impact of the Spanish Reconquest on some selected cities (income measure: national per capita GDP)

	Cordoba				Seville				Granada			
	Before		After		Before		After		Before		After	
IBERIA dummy	0.254***	0.188**	-0.037**	0.353**	-0.028	-0.268***	-0.074***	0.182	0.043	-0.191***	0.033*	0.527
	(0.076)	(0.088)	(0.018)	(0.171)	(0.038)	(0.041)	(0.024)	(0.174)	(0.029)	(0.040)	(0.018)	(0.721)
IBERIA*time		0.175**		-0.067*		0.134***		-0.035		0.096***		-0.073
		(0.075)		(0.035)		(0.031)		(0.037)		(0.023)		(0.133)
IBERIA*time^2		-0.036***		0.003		-0.015***		0.001		-0.008***		0.003
		(0.011)		(0.002)		(0.005)		(0.002)		(0.002)		(0.006)
Hub city	0.028*	0.029*	0.061***	0.061***	0.060***	0.059**	0.064***	0.064***	0.063***	0.062***	0.056***	0.056***
	(0.017)	(0.017)	(0.016)	(0.016)	(0.023)	(0.023)	(0.016)	(0.016)	(0.016)	(0.016)	(0.019)	(0.019)
Port city	0.024	0.024	0.059***	0.059***	0.007	0.007	0.064***	0.064***	0.025*	0.025*	0.068***	0.067***
	(0.016)	(0.016)	(0.010)	(0.010)	(0.019)	(0.019)	(0.010)	(0.011)	(0.013)	(0.014)	(0.013)	(0.013)
Log (Total urban population,t)	-0.176***	-0.177***	-0.112***	-0.112***	-0.173***	-0.174***	-0.112***	-0.112***	-0.155***	-0.156***	-0.112***	-0.112***
	(0.022)	(0.023)	(0.014)	(0.014)	(0.023)	(0.023)	(0.014)	(0.014)	(0.019)	(0.019)	(0.018)	(0.018)
Log (Road density)	-6.117	-8.954	-0.652**	-0.676**	-4.403	-3.925	-0.646**	-0.675**	-4.838	-4.353	-0.850**	-0.873**
	(11.317)	(11.315)	(0.288)	(0.291)	(11.211)	(11.341)	(0.285)	(0.288)	(4.842)	(4.878)	(0.401)	(0.404)
Log (Per capita GDP, t)	-18.293	-21.908	0.114	0.096	-15.550	-15.083	0.123	0.102	-11.896	-11.404	-0.023	-0.039
	(19.536)	(19.628)	(0.352)	(0.353)	(19.132)	(19.289)	(0.349)	(0.350)	(8.061)	(8.094)	(0.454)	(0.456)
Log (Per capita GDP, t)^2	1.473	1.758	-0.001	0.000	1.258	1.222	-0.001	0.000	0.943	0.905	0.008	0.009
	(1.542)	(1.550)	(0.021)	(0.021)	(1.511)	(1.523)	(0.021)	(0.021)	(0.623)	(0.626)	(0.027)	(0.027)
Log (Land area)	0.048	0.050	0.062***	0.062***	0.046	0.047	0.063***	0.063***	0.044*	0.044*	0.063***	0.063***
	(0.034)	(0.034)	(0.017)	(0.017)	(0.035)	(0.035)	(0.017)	(0.017)	(0.024)	(0.024)	(0.022)	(0.022)
Log (Waterways)	-0.010***	-0.010***	0.001	0.001	-0.012***	-0.012***	0.001	0.001	-0.007**	-0.007**	0.004**	0.004**
	(0.004)	(0.004)	(0.002)	(0.002)	(0.004)	(0.004)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
Log(Road density)*Log(Per capita GDP)	1.956	2.846	0.158**	0.164**	1.421	1.273	0.157**	0.164**	1.518	1.370	0.209**	0.215**
	(3.568)	(3.567)	(0.070)	(0.071)	(3.534)	(3.575)	(0.070)	(0.070)	(1.496)	(1.507)	(0.098)	(0.098)
Log(Road density)*Log(Per capita GDP)^2	-0.156	-0.226	-0.009**	-0.010**	-0.114	-0.103	-0.009**	-0.010**	-0.119	-0.108	-0.013**	-0.013**
	(0.281)	(0.281)	(0.004)	(0.004)	(0.278)	(0.282)	(0.004)	(0.004)	(0.115)	(0.116)	(0.006)	(0.006)
Observations	169	169	315	315	169	169	315	315	259	259	225	225
R^2	0.713	0.733	0.485	0.486	0.670	0.673	0.491	0.492	0.649	0.653	0.451	0.451

Notes: The dependent variable is the share of each city on its country's urban population. The before- and after-Reconquest periods are defined according to the historical dates, see Figure 5. Every regression includes a constant. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 1 (continued). The impact of the Spanish Reconquest on some selected cities (income measure: national per capita GDP)

	Toledo				Valencia				Palma			
	Before		After		Before		After		Before		After	
IBERIA dummy	-0.121**	-0.289***	-0.030*	0.121	-0.000	0.134**	-0.023*	0.115	-0.020	-0.136**	-0.052***	0.095
	(0.055)	(0.080)	(0.017)	(0.100)	(0.023)	(0.062)	(0.012)	(0.101)	(0.026)	(0.058)	(0.012)	(0.139)
IBERIA*time		0.098		-0.021		-0.122**		-0.026		0.090**		-0.028
		(0.062)		(0.024)		(0.050)		(0.027)		(0.041)		(0.032)
IBERIA*time^2		-0.010		0.000		0.023**		0.001		-0.014**		0.001
		(0.012)		(0.001)		(0.009)		(0.002)		(0.007)		(0.002)
Hub city	0.090**	0.089**	0.054***	0.054***	0.057***	0.057***	0.057***	0.057***	0.056***	0.056**	0.056***	0.056***
	(0.036)	(0.037)	(0.013)	(0.013)	(0.021)	(0.021)	(0.015)	(0.015)	(0.021)	(0.021)	(0.015)	(0.015)
Port city	-0.022	-0.022	0.050***	0.050***	0.005	0.005	0.062***	0.062***	0.007	0.007	0.064***	0.064***
	(0.029)	(0.029)	(0.009)	(0.009)	(0.019)	(0.019)	(0.010)	(0.010)	(0.019)	(0.019)	(0.010)	(0.010)
Log (Total urban population,t)	-0.157***	-0.159***	-0.132***	-0.133***	-0.173***	-0.173***	-0.112***	-0.112***	-0.173***	-0.173***	-0.112***	-0.112***
	(0.027)	(0.028)	(0.015)	(0.015)	(0.023)	(0.023)	(0.014)	(0.014)	(0.023)	(0.023)	(0.014)	(0.014)
Log (Road density)	114.630	120.935	-0.747***	-0.773***	-4.762	-4.937	-0.653**	-0.670**	-4.651	-4.580	-0.650**	-0.662**
	(97.438)	(98.836)	(0.258)	(0.260)	(11.283)	(11.390)	(0.288)	(0.292)	(11.270)	(11.395)	(0.287)	(0.291)
Log (Per capita GDP, t)	170.582	181.932	-0.029	-0.047	-16.187	-16.397	0.112	0.100	-15.989	-15.939	0.116	0.107
	(175.311)	(177.461)	(0.316)	(0.317)	(19.280)	(19.436)	(0.352)	(0.353)	(19.269)	(19.437)	(0.351)	(0.353)
Log (Per capita GDP, t)^2	-13.863	-14.784	0.009	0.010	1.308	1.325	-0.000	0.000	1.292	1.289	-0.001	-0.000
	(14.268)	(14.442)	(0.019)	(0.019)	(1.522)	(1.534)	(0.021)	(0.021)	(1.521)	(1.534)	(0.021)	(0.021)
Log (Land area)	-0.049	-0.047	0.070***	0.070***	0.046	0.046	0.063***	0.063***	0.046	0.047	0.063***	0.063***
	(0.050)	(0.051)	(0.017)	(0.017)	(0.034)	(0.035)	(0.017)	(0.017)	(0.034)	(0.035)	(0.017)	(0.017)
Log (Waterways)	-0.019***	-0.019***	0.000	0.000	-0.012***	-0.012***	0.001	0.001	-0.012***	-0.012***	0.001	0.001
	(0.006)	(0.006)	(0.002)	(0.002)	(0.004)	(0.004)	(0.002)	(0.002)	(0.004)	(0.004)	(0.002)	(0.002)
Log(Road density)*Log(Per capita GDP)	-37.193	-39.238	0.184***	0.190***	1.533	1.589	0.159**	0.163**	1.498	1.476	0.158**	0.161**
	(31.706)	(32.158)	(0.065)	(0.065)	(3.557)	(3.590)	(0.070)	(0.071)	(3.552)	(3.592)	(0.070)	(0.071)
Log(Road density)*Log(Per capita GDP)^2	3.017	3.183	-0.011***	-0.011***	-0.123	-0.128	-0.010**	-0.010**	-0.121	-0.119	-0.009**	-0.010**
	(2.579)	(2.615)	(0.004)	(0.004)	(0.280)	(0.283)	(0.004)	(0.004)	(0.280)	(0.283)	(0.004)	(0.004)
Observations	87	87	397	397	169	169	315	315	169	169	315	315
R^2	0.720	0.722	0.546	0.547	0.670	0.670	0.484	0.485	0.670	0.670	0.487	0.487

Notes: The dependent variable is the share of each city on its country's urban population. The before- and after-Reconquest periods are defined according to the historical dates, see Figure 5. Every regression includes a constant. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 2. The impact of the Spanish Reconquest on some selected cities (income measure: city building craftsmen wage)

	Cordoba				Seville				Granada			
	Before		After		Before		After		Before		After	
IBERIA dummy	0.263***	0.204**	-0.019	0.034	0.000	-0.231***	-0.036*	-0.177	0.023	-0.210***	0.021	-0.091
	(0.072)	(0.089)	(0.014)	(0.126)	(0.039)	(0.044)	(0.020)	(0.144)	(0.031)	(0.040)	(0.015)	(0.713)
IBERIA*time		0.158**		-0.019		0.123***		0.026		0.092***		0.012
		(0.074)		(0.027)		(0.030)		(0.032)		(0.023)		(0.147)
IBERIA*time^2		-0.033***		0.001		-0.013***		-0.001		-0.007***		-0.000
		(0.011)		(0.002)		(0.004)		(0.002)		(0.002)		(0.007)
Hub city	-0.000	0.000	0.028*	0.028*	0.035	0.035	0.030*	0.030*	0.037**	0.037**	0.015	0.015
	(0.016)	(0.017)	(0.017)	(0.017)	(0.025)	(0.025)	(0.017)	(0.017)	(0.017)	(0.017)	(0.022)	(0.023)
Port city	0.005	0.005	0.045***	0.045***	-0.013	-0.013	0.048***	0.048***	0.002	0.002	0.057***	0.057***
	(0.016)	(0.016)	(0.011)	(0.011)	(0.018)	(0.018)	(0.012)	(0.012)	(0.013)	(0.013)	(0.015)	(0.015)
Log (Total urban population,t)	-0.171***	-0.170***	-0.039**	-0.039**	-0.170***	-0.171***	-0.039**	-0.039**	-0.151***	-0.153***	-0.050*	-0.051*
	(0.025)	(0.026)	(0.016)	(0.016)	(0.025)	(0.025)	(0.016)	(0.016)	(0.019)	(0.019)	(0.030)	(0.030)
Log (Road density)	1.929	1.935	0.056	0.056	1.403	1.375	0.055	0.055	1.577	1.460	-0.233	-0.234
	(2.582)	(2.599)	(0.425)	(0.427)	(2.616)	(2.630)	(0.425)	(0.427)	(1.068)	(1.083)	(0.554)	(0.558)
Log (Craftsmen wage, t)	4.703	4.809	-0.242	-0.250	3.837	3.699	-0.233	-0.237	4.241	3.813	-1.661	-1.668
	(7.958)	(8.000)	(2.138)	(2.149)	(8.019)	(8.082)	(2.140)	(2.151)	(3.786)	(3.841)	(2.985)	(3.011)
Log (Crafstmen wage, t)^2	-0.980	-1.002	0.013	0.015	-0.766	-0.733	0.011	0.012	-0.816	-0.722	0.265	0.267
	(1.709)	(1.718)	(0.463)	(0.466)	(1.723)	(1.736)	(0.464)	(0.466)	(0.832)	(0.844)	(0.642)	(0.648)
Log (Land area)	0.011	0.010	0.016	0.016	0.012	0.012	0.016	0.016	0.026	0.025	-0.015	-0.015
	(0.056)	(0.056)	(0.025)	(0.025)	(0.056)	(0.056)	(0.025)	(0.025)	(0.023)	(0.023)	(0.041)	(0.041)
Log (Waterways)	-0.009	-0.009	0.001	0.001	-0.012*	-0.012*	0.001	0.001	-0.002	-0.002	0.000	0.000
	(0.006)	(0.006)	(0.003)	(0.003)	(0.006)	(0.006)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Log(Road density)*Log(Craftsmen wage)	-1.648	-1.650	-0.131	-0.130	-1.144	-1.116	-0.131	-0.131	-1.301	-1.194	0.089	0.090
	(2.320)	(2.335)	(0.379)	(0.380)	(2.350)	(2.363)	(0.379)	(0.380)	(0.954)	(0.967)	(0.498)	(0.502)
Log(Road density)*Log(Craftsmen wage)^2	0.356	0.355	0.044	0.044	0.234	0.227	0.044	0.044	0.272	0.248	0.009	0.009
	(0.522)	(0.525)	(0.083)	(0.083)	(0.529)	(0.531)	(0.083)	(0.083)	(0.213)	(0.215)	(0.107)	(0.107)
Observations	156	156	240	240	156	156	240	240	236	236	160	160
R^2	0.679	0.702	0.267	0.268	0.616	0.620	0.269	0.269	0.607	0.613	0.301	0.301

Notes: The dependent variable is the share of each city on its country's urban population. The before- and after-Reconquest periods are defined according to the historical dates, see Figure 5. Every regression includes a constant. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 2 (continued). The impact of the Spanish Reconquest on some selected cities (income measure: city building craftsmen wage)

	Toledo				Valencia				Palma			
	Before		After		Before		After		Before		After	
IBERIA dummy	-0.109*	-0.311***	-0.017	0.009	0.003	0.131***	-0.024	-0.084	-0.017	-0.123**	-0.055***	-0.212*
	(0.055)	(0.091)	(0.015)	(0.069)	(0.023)	(0.047)	(0.015)	(0.100)	(0.024)	(0.056)	(0.016)	(0.110)
IBERIA*time		0.147***		-0.018		-0.130***		0.002		0.073*		0.022
		(0.053)		(0.019)		(0.047)		(0.027)		(0.041)		(0.026)
IBERIA*time^2		-0.022***		0.002		0.026***		0.001		-0.010		-0.000
		(0.008)		(0.001)		(0.009)		(0.002)		(0.007)		(0.002)
Hub city	0.084**	0.083**	0.022	0.022	0.035	0.035	0.025	0.025	0.034	0.034	0.024	0.024
	(0.038)	(0.039)	(0.015)	(0.015)	(0.023)	(0.023)	(0.016)	(0.016)	(0.023)	(0.023)	(0.016)	(0.016)
Port city	-0.026	-0.025	0.028**	0.028**	-0.013	-0.013	0.047***	0.047***	-0.012	-0.012	0.049***	0.049***
	(0.027)	(0.028)	(0.011)	(0.011)	(0.018)	(0.018)	(0.011)	(0.011)	(0.018)	(0.018)	(0.011)	(0.011)
Log (Total urban population,t)	-0.148***	-0.153***	-0.066***	-0.067***	-0.170***	-0.170***	-0.039**	-0.040**	-0.170***	-0.170***	-0.039**	-0.040**
	(0.038)	(0.040)	(0.018)	(0.019)	(0.025)	(0.025)	(0.016)	(0.016)	(0.025)	(0.025)	(0.016)	(0.016)
Log (Road density)	24.153**	24.530**	0.249	0.248	1.402	1.397	0.054	0.054	1.410	1.413	0.052	0.051
	(10.843)	(10.990)	(0.417)	(0.418)	(2.619)	(2.636)	(0.424)	(0.426)	(2.617)	(2.636)	(0.423)	(0.425)
Log (Craftsmen wage, t)	107.721**	108.946**	0.299	0.285	3.830	3.811	-0.249	-0.262	3.874	3.862	-0.251	-0.265
	(42.280)	(42.769)	(2.042)	(2.048)	(8.024)	(8.081)	(2.133)	(2.144)	(8.017)	(8.077)	(2.129)	(2.140)
Log (Crafstmen wage, t)^2	-24.347**	-24.593**	-0.103	-0.099	-0.765	-0.760	0.014	0.018	-0.775	-0.773	0.014	0.018
	(9.357)	(9.459)	(0.440)	(0.441)	(1.723)	(1.736)	(0.462)	(0.465)	(1.722)	(1.735)	(0.461)	(0.464)
Log (Land area)	-0.192**	-0.186*	0.017	0.017	0.012	0.012	0.016	0.016	0.012	0.013	0.017	0.017
	(0.094)	(0.097)	(0.027)	(0.027)	(0.055)	(0.056)	(0.025)	(0.025)	(0.055)	(0.056)	(0.025)	(0.025)
Log (Waterways)	-0.031*	-0.033*	0.002	0.002	-0.011*	-0.012*	0.001	0.001	-0.012*	-0.012*	0.000	0.000
	(0.017)	(0.018)	(0.003)	(0.003)	(0.006)	(0.006)	(0.003)	(0.003)	(0.006)	(0.006)	(0.003)	(0.003)
Log(Road density)*Log(Craftsmen wage)	-21.855**	-22.163**	-0.298	-0.297	-1.142	-1.137	-0.130	-0.129	-1.151	-1.155	-0.129	-0.127
	(9.623)	(9.747)	(0.370)	(0.371)	(2.352)	(2.368)	(0.378)	(0.380)	(2.350)	(2.368)	(0.377)	(0.379)
Log(Road density)*Log(Craftsmen wage)^2	4.898**	4.960**	0.083	0.082	0.234	0.232	0.044	0.044	0.236	0.237	0.044	0.044
	(2.118)	(2.143)	(0.081)	(0.081)	(0.529)	(0.532)	(0.083)	(0.083)	(0.528)	(0.532)	(0.082)	(0.083)
Observations	83	83	313	313	156	156	240	240	156	156	240	240
R^2	0.661	0.664	0.321	0.321	0.616	0.617	0.268	0.269	0.616	0.617	0.272	0.273

Notes: The dependent variable is the share of each city on its country's urban population. The before- and after-Reconquest periods are defined according to the historical dates, see Figure 5. Every regression includes a constant. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3. Average effect of the Reconquest in Iberian cities (income measure: national per capita GDP)

	(1)	(2)
d1	-0.068***	-0.031
	(0.017)	(0.030)
d2	-0.068***	-0.025
	(0.023)	(0.028)
d3	-0.089***	-0.021
	(0.025)	(0.039)
d4	-0.090***	-0.005
	(0.023)	(0.051)
d5	-0.107***	0.018
	(0.028)	(0.062)
d6	-0.086***	0.059
	(0.027)	(0.074)
d7	-0.107***	0.090
	(0.030)	(0.089)
d8	-0.092***	0.152
	(0.033)	(0.106)
d9	-0.129***	0.186
	(0.028)	(0.131)
d10	-0.100***	0.290*
	(0.028)	(0.170)
d11	-0.117***	0.400*
	(0.036)	(0.225)
d12	-0.132***	0.487
	(0.031)	(0.301)
d13	-0.091***	0.612
	(0.026)	(0.404)
Time fixed effects	No	Yes
Country fixed effects	No	Yes
City fixed effects	No	Yes
City * time	No	Yes
City * time^2	No	Yes
Observations	484	484
R-squared	0.580	0.886

Notes: The dependent variable is the share of each city on its country's urban population. Every regression includes a constant and the following set of controls: a dummy for whether the city is a hub, a dummy for whether the city has a port, log of urban population, log of roman cities, log of per capita GDP and its square, log of the country's land area, log of length of waterways, and log of Roman roads interacted with per capita GDP and its square. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4. Diagnostics for spatial dependence in city-specific regressions

	Cordoba				Granada				Seville			
	Per capita GDP		Craftsmen wage		Per capita GDP		Craftsmen wage		Per capita GDP		Craftsmen wage	
Test	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Spatial error:												
Moran's I	0.222	0.243	0.143	0.189	0.217	0.221	0.150	0.177	0.245	0.249	0.178	0.193
Robust Lagrange multiplier	0.499	0.065	0.183	0.027	0.666	0.001	0.432	0.003	0.973	0.114	0.696	0.037
Spatial lag:												
Lagrange multiplier	0.034	0.000	0.003	0.001	0.020	0.000	0.001	0.001	0.048	0.000	0.002	0.001
Robust Lagrange multiplier	0.029	0.000	0.001	0.000	0.026	0.000	0.002	0.000	0.096	0.000	0.007	0.000
	Toledo				Valencia				Palma			
	Per capita GDP		Craftsmen wage		Per capita GDP		Craftsmen wage		Per capita GDP		Craftsmen wage	
Test	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Spatial error:												
Moran's I	0.391	0.211	0.344	0.170	0.246	0.243	0.177	0.192	0.242	0.240	0.174	0.187
Robust Lagrange multiplier	0.312	0.002	0.042	0.017	0.880	0.045	0.666	0.024	0.836	0.060	0.694	0.019
Spatial lag:												
Lagrange multiplier	0.038	0.000	0.080	0.002	0.037	0.000	0.003	0.001	0.029	0.000	0.002	0.001
Robust Lagrange multiplier	0.244	0.000	0.591	0.000	0.097	0.000	0.007	0.000	0.087	0.000	0.007	0.000

Note: p-values. The null hypothesis in all tests is that there is zero spatial autocorrelation.

Table 5. Effect on urban share after the Spanish Reconquest, spatial lag models (income measure: national per capita GDP)

	Cordoba		Seville		Granada		Toledo		Valencia		Palma	
IBERIA dummy	-0.019	0.332	-0.049	0.170	0.031	0.486	-0.020	0.115	-0.018	0.091	-0.056*	0.057
	(0.033)	(0.880)	(0.033)	(0.877)	(0.039)	-2671	(0.033)	(0.413)	(0.033)	(0.557)	(0.033)	(0.707)
IBERIA*time		-0.062		-0.030		-0.068		-0.019		-0.022		-0.023
		(0.181)		(0.180)		(0.492)		(0.097)		(0.145)		(0.163)
IBERIA*time^2		0.003		0.001		0.002		0.000		0.001		0.001
		(0.009)		(0.009)		(0.022)		(0.005)		(0.009)		(0.009)
Hub city	0.056***	0.056***	0.058***	0.058***	0.053***	0.053***	0.051***	0.051***	0.054***	0.054***	0.052***	0.052***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.013)	(0.013)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Port city	0.045***	0.045***	0.048***	0.048***	0.048***	0.048***	0.045***	0.045***	0.047***	0.047***	0.049***	0.049***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.012)	(0.012)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Log (Total urban population,t)	-0.091***	-0.091***	-0.091***	-0.092***	-0.094***	-0.094***	-0.118***	-0.118***	-0.091***	-0.091***	-0.091***	-0.091***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.011)	(0.011)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)
Log (Road density)	-0.248	-0.269	-0.250	-0.276	-0.333	-0.353	-0.545**	-0.569**	-0.246	-0.259	-0.239	-0.247
	(0.278)	(0.280)	(0.278)	(0.279)	(0.390)	(0.391)	(0.252)	(0.253)	(0.279)	(0.280)	(0.277)	(0.279)
Log (Per capita GDP, t)	0.462	0.447	0.463	0.444	0.498	0.483	0.125	0.108	0.463	0.454	0.470	0.465
	(0.311)	(0.311)	(0.310)	(0.310)	(0.420)	(0.421)	(0.292)	(0.292)	(0.311)	(0.311)	(0.309)	(0.310)
Log (Per capita GDP, t)^2	-0.023	-0.022	-0.023	-0.022	-0.024	-0.023	-0.001	-0.000	-0.023	-0.023	-0.024	-0.023
	(0.019)	(0.019)	(0.019)	(0.019)	(0.025)	(0.025)	(0.018)	(0.018)	(0.019)	(0.019)	(0.019)	(0.019)
Log (Land area)	0.030***	0.030***	0.031***	0.032***	0.029**	0.029**	0.048***	0.049***	0.031***	0.031***	0.031***	0.031***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.012)	(0.012)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Log (Waterways)	0.006***	0.006***	0.006***	0.006***	0.010***	0.010***	0.004*	0.004*	0.006***	0.006***	0.006***	0.006***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Log(Road density)*Log(Per capita GDP)	0.055	0.060	0.055	0.062	0.080	0.085	0.130**	0.136**	0.054	0.057	0.053	0.054
	(0.069)	(0.070)	(0.069)	(0.069)	(0.096)	(0.096)	(0.064)	(0.064)	(0.069)	(0.070)	(0.069)	(0.069)
Log(Road density)*Log(Per capita GDP)^2	-0.003	-0.004	-0.003	-0.004	-0.005	-0.005	-0.008**	-0.008**	-0.003	-0.003	-0.003	-0.003
	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
ρ	-0.037***	-0.037***	-0.037***	-0.037***	-0.061***	-0.061***	-0.017***	-0.017***	-0.037***	-0.037***	-0.037***	-0.037***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.009)	(0.009)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Wald test of $\rho = 0$	47.315	47.132	45.694	45.478	49.714	49.682	19.572	19.359	48.015	47.867	49.038	48.937
Observations	315	315	315	315	225	225	397	397	315	315	315	315

Notes: The dependent variable is the share of each city on its country's urban population. Every regression includes a constant. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6. Effect on urban share after the Spanish Reconquest, spatial lag models (income measure: city building craftsmen wage)

	Cordoba		Seville		Granada		Toledo		Valencia		Palma	
IBERIA dummy	-0.009	0.047	-0.033	-0.171	0.022	-0.093	-0.007	0.014	-0.015	-0.072	-0.054	-0.207
	(0.041)	(1.367)	(0.042)	(1.366)	(0.049)	(5.197)	(0.041)	(0.577)	(0.041)	(0.842)	(0.041)	(1.085)
IBERIA*time		-0.019		0.027		0.011		-0.015		0.003		0.022
		(0.294)		(0.294)		(0.999)		(0.143)		(0.233)		(0.263)
IBERIA*time^2		0.001		-0.001		0.000		0.001		0.001		-0.001
		(0.015)		(0.015)		(0.048)		(0.008)		(0.015)		(0.015)
Hub city	0.032**	0.032**	0.034**	0.034**	0.022	0.022	0.024	0.024	0.030**	0.030**	0.028**	0.028**
	(0.015)	(0.015)	(0.015)	(0.015)	(0.018)	(0.018)	(0.015)	(0.015)	(0.014)	(0.014)	(0.014)	(0.014)
Port city	0.032**	0.032**	0.034***	0.034***	0.036**	0.036**	0.024*	0.024*	0.033**	0.033**	0.036***	0.036***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.016)	(0.016)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Log (Total urban population,t)	-0.036***	-0.037***	-0.036***	-0.036***	-0.054***	-0.054***	-0.062***	-0.063***	-0.036***	-0.037***	-0.036***	-0.037***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.014)	(0.014)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Log (Road density)	-0.002	-0.003	-0.003	-0.003	-0.307	-0.307	0.178	0.178	-0.004	-0.004	-0.007	-0.007
	(0.238)	(0.238)	(0.238)	(0.238)	(0.270)	(0.270)	(0.260)	(0.260)	(0.238)	(0.238)	(0.237)	(0.237)
Log (Craftsmen wage, t)	-0.260	-0.267	-0.250	-0.252	-1.781	-1.789	0.263	0.250	-0.264	-0.275	-0.266	-0.278
	(1.093)	(1.093)	(1.091)	(1.092)	(1.290)	(1.290)	(1.176)	(1.175)	(1.092)	(1.092)	(1.089)	(1.088)
Log (Crafstmen wage, t)^2	0.030	0.032	0.027	0.028	0.293	0.295	-0.084	-0.081	0.030	0.033	0.030	0.034
	(0.249)	(0.249)	(0.249)	(0.249)	(0.289)	(0.290)	(0.265)	(0.265)	(0.249)	(0.249)	(0.248)	(0.248)
Log (Land area)	-0.021	-0.021	-0.020	-0.020	-0.068***	-0.068***	-0.021	-0.021	-0.020	-0.020	-0.020	-0.020
	(0.015)	(0.015)	(0.015)	(0.015)	(0.022)	(0.022)	(0.016)	(0.016)	(0.016)	(0.015)	(0.015)	(0.015)
Log (Waterways)	0.007***	0.007***	0.007**	0.007**	0.010***	0.010***	0.008***	0.008***	0.007**	0.007**	0.007**	0.007**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Log(Road density)*Log(Craftsmen wage)	-0.072	-0.071	-0.072	-0.072	0.159	0.160	-0.232	-0.231	-0.071	-0.070	-0.069	-0.068
	(0.223)	(0.223)	(0.223)	(0.223)	(0.253)	(0.253)	(0.241)	(0.241)	(0.223)	(0.223)	(0.223)	(0.223)
Log(Road density)*Log(Craftsmen wage)^2	0.028	0.028	0.028	0.028	-0.006	-0.006	0.065	0.065	0.028	0.028	0.028	0.027
	(0.052)	(0.052)	(0.052)	(0.052)	(0.058)	(0.058)	(0.055)	(0.055)	(0.052)	(0.052)	(0.051)	(0.051)
ρ	-0.048***	-0.048***	-0.048***	-0.048***	-0.084***	-0.084***	-0.034***	-0.034***	-0.048***	-0.048***	-0.048***	-0.048***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.016)	(0.016)	(0.007)	(0.007)	(0.010)	(0.010)	(0.010)	(0.010)
Wald test of $\rho = 0$	25.089	25.062	25.188	25.172	26.973	27.000	22.752	22.697	25.073	25.038	25.379	25.346
Observations	240	240	240	240	160	160	313	313	240	240	240	240

Notes: The dependent variable is the share of each city on its country's urban population. Every regression includes a constant. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Appendix. Table A1. Cities and Countries used in the study

City	Country	Data years
Wien	Austria	1200-2000
Antwerpen	Belgium	1200-2000
Brugge	Belgium	1000-2000
Gent	Belgium	1000-2000
Ieper	Belgium	1200-2000
Lyon	France	800-2000
Paris	France	800-2000
Augsburg	Germany	1200-2000
Berlin	Germany	1300-2000
Hamburg	Germany	1200-2000
Koeln	Germany	800-2000
Regensburg	Germany	800-2000
Naples	Italy	800-2000
Palermo	Italy	800-2000
Rome	Italy	800-2000
Venice	Italy	900-2000
Amsterdam	Netherlands	1300-2000
Utrecht	Netherlands	1200-2000
Zwolle	Netherlands	1300-2000
Coimbra	Portugal	1200-2000
Lisbon	Portugal	800-2000
Almeria	Spain	900-2000
Badajoz	Spain	1000-2000
Barcelona	Spain	1000-2000
Cordoba	Spain	800-2000
Cadiz	Spain	1200-2000
Gerona	Spain	1300-2000
Granada	Spain	800-2000
Huesca	Spain	1000-2000
Jaen	Spain	900-2000
Leon	Spain	1000-2000
Madrid	Spain	1300-2000
Murcia	Spain	800-2000
Malaga	Spain	1000-2000
Palma	Spain	900-2000
Seville	Spain	800-2000
Toledo	Spain	800-2000
Tortosa	Spain	1300-2000
Valencia	Spain	1000-2000
Zamora	Spain	1300-2000
Zaragoza	Spain	900-2000
Basel	Switzerland	1200-2000
Geneve	Switzerland	1100-2000
Zurich	Switzerland	1300-2000
London	United Kingdom	800-2000

Table A2. An extract of the panel data

Year	Country	City	Iberia dummy	Urban share	Country population	per capita GDP	Wages (craftsmen)	Wages (building labourers)
800	Spain	Cordoba	1	0.49	3750	459.57	8.65	5.27
900	Spain	Cordoba	1	0.47	3900	454.79	8.82	5.64
1000	Spain	Cordoba	1	0.46	4000	450.00	8.58	5.55
1100	Spain	Cordoba	1	0.38	4500	492.21	8.67	5.24
1200	Spain	Cordoba	1	0.11	5500	534.41	8.55	4.99
1300	Spain	Cordoba	1	0.07	7500	576.62	8.61	4.95
1400	Spain	Cordoba	1	0.05	5500	618.82	9.70	7.46
1500	Spain	Cordoba	1	0.04	6500	661.03	7.40	5.11
1600	Spain	Cordoba	1	0.02	8500	853.03	9.07	3.69
1700	Spain	Cordoba	1	0.03	8000	853.02	7.96	3.76
1800	Spain	Cordoba	1	0.02	11500	1007.87	8.92	4.73
1900	Spain	Cordoba	1	0.01	18500	1786.28	8.73	5.18
2000	Spain	Cordoba	1	0.01	40016	15621.72		
800	Germany	Regensburg	0	0.23	3250	409.67	7.29	3.19
900	Germany	Regensburg	0	0.19	3500	409.83	7.65	3.20
1000	Germany	Regensburg	0	0.20	3500	410.00	7.08	3.28
1100	Germany	Regensburg	0	0.14	4000	465.60	6.93	3.10
1200	Germany	Regensburg	0	0.07	6000	521.20	6.75	3.19
1300	Germany	Regensburg	0	0.02	9000	576.80	8.04	3.24
1400	Germany	Regensburg	0	0.02	6500	632.40	9.46	3.57
1500	Germany	Regensburg	0	0.03	9000	688.00	4.21	2.42
1600	Germany	Regensburg	0	0.02	12000	791.00	6.20	3.52
1700	Germany	Regensburg	0	0.02	13000	910.00	5.82	3.47
1800	Germany	Regensburg	0	0.01	18000	1076.85	14.52	4.89
1900	Germany	Regensburg	0	0.00	43000	2984.76	16.48	9.45
2000	Germany	Regensburg	0	0.00	82188	18943.52		
800	France	Paris	0	0.16	5000	434.70	7.72	4.80
900	France	Paris	0	0.13	5500	429.89	7.95	4.95
1000	France	Paris	0	0.08	6500	425.08	7.81	4.86
1100	France	Paris	0	0.17	7750	485.55	7.66	4.77
1200	France	Paris	0	0.17	10500	546.03	7.41	4.61
1300	France	Paris	0	0.14	16000	606.51	7.78	4.83
1400	France	Paris	0	0.28	11000	666.99	9.08	5.67
1500	France	Paris	0	0.19	15000	727.47	7.12	4.42
1600	France	Paris	0	0.19	10500	841.03	6.90	4.30
1700	France	Paris	0	0.21	22000	910.02	6.19	3.83
1800	France	Paris	0	0.14	29000	1134.98	9.59	5.93
1900	France	Paris	0	0.34	41000	2875.69	13.51	9.27
2000	France	Paris	0	0.06	61137	20421.69		

2011

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