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The Effect of the Spanish Reconquest on Iberian Cities

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Summary

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. Using a generalized difference in differences approach, we find that the Reconquest had an average significant negative effect on the relative population of the main Iberian cities even after controlling for a large set of country and city-specific geographical and economic indicators, as well as city-specific time trends. Nevertheless, our results show that this negative shock was short-lived, vanishing within the first one hundred years after the onset of the Reconquest. These results can be interpreted as weak evidence on the negative effect that war and conflict have on urban primacy. They also 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.

Keywords: Locational Fundamentals, City Growth, Lock-in Effects, Warfare and Cities
JEL Classification: R12, N9

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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. Using a generalized difference in differences approach, we find that the Reconquest had an average significant negative effect on the relative population of the main Iberian cities even after controlling for a large set of country and city-specific geographical and economic indicators, as well as city-specific time trends. Nevertheless, our results show that this negative shock was short-lived, vanishing within the first one hundred years after the onset of the Reconquest. These results can be interpreted as weak evidence on the negative effect that war and conflict have on urban primacy. They also 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.

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1. Introduction

The persistence of negative shocks on a city's population has long been studied in the urban economics and economic geography literature. 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

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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.

A different strand of the literature spurred by the 2002 paper by Glaeser and Shapiro studies the effect of warfare and conflict on cities' population. In particular, Glaeser and Shapiro distinguish between four possible theoretical effects. The first one is what they call the 'safe harbour effect' that indicates that in periods of conflict people tend to concentrate in cities since they offer better protection than rural locations. The second effect (target effect) acknowledges the fact that cities are often the main target of conflict and therefore people may move to rural areas (or small cities) in periods of conflict. Third, Glaeser and Shapiro consider the disruptive effect that conflict may have on transportation which, in turn implies an added value of locating in cities. Finally, conflicts cause direct destruction in cities, inducing less people to live there.

In this paper we use a historical event that allows us to formally study the behaviour of several cities after a period of conflict and warfare – the Spanish Reconquest. Our focus is on the striking population shifts that took place in the Iberian Peninsula during the 700-2000 time interval. This period of time witnessed the invasion of the peninsula by the Moors[1] armies from Northern Africa in 710, and its subsequent expulsion at the end of the Reconquest, around 1500.[2]

[1] The Moors were the medieval Muslim inhabitants of Morocco, Western Algeria, Western Sahara, Mauritania, Septimania, Sicily and Malta. While many members of the army were Berbers, the invasion force also had Arabs and the attacks were done in the name of the Umayyad dynasty which was Arab and based in Damascus.
[2] We also include the 1500-2000 period in our analysis to capture possible long run effects of the Reconquest.

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[3] 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 Christian population.[4] 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 advanced towards Galicia, in the furthest northwest of the Iberian Peninsula, and, thorough a lengthy process, 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 (or 1400) period.[5] The Christian kings of Spain ruling in the 13th century reconquered more land from the Muslims than all their previous predecessors.

In his excellent account of the Reconquest, O'Callaghan (2003) argues that around the mid 11th century the Spanish Reconquest became a Christian crusade that was quite explicitly sponsored by the pope. Pope Alexander II (1062-1073) and most of his successors up until the 14th century encouraged European Christian knights to carry out expeditions into Spain and offered the same spiritual rewards that were offered to those who would fight in the crusades in Jerusalem: relief

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

[4] 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 1479 when the crowns of kingdoms of Aragon and Castile united.

[5] For most of the 9th, 10th, and 11th centuries the Christians were at the mercy of the Muslims and could only make weak and ineffectual efforts to oppose their intrusions. In the 12th century, however, given changing political conditions, the possibility of a Reconquest became very real and from that point on the Reconquest ideology filled the pages of the Christian chronicles (O'Callaghan 2003, p.18).

from penance and remission of sins.[6]Figure 2 presents a histogram with the Reconquest years in our sample of cities and shows that most cities were reconquered in this time interval.

FIGURE 2 HERE

As stated by O'Callaghan, the purpose of war against Islam in the Iberian Peninsula was to drive the Muslims from the peninsula, not convert them. Claiming descent from the Visigoths, Christian rules argued that they had a right to expel the Muslims who were wrongfully occupying territory that by right belonged to the Christians.

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, with the former experiencing a huge decline at the expense of the latter.[7] Unfortunately, the lack of accurate city-level 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 to the fact that they stayed in the city after converting to Christianity. 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) in Figure 3 shows.

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 an average significant and negative effect on the urban population share of the main Iberian cities. However, our estimates suggest

[6] Pope Innocent IV (1242-1254) was instrumental in financing Fernando III, king of Castile-León, in his crusade against the Muslim.
[7] This is a similar evolution as the one observed in Figure 2 in Bosker et al. (2013) for the European Muslim urban population from 800 to 1800.

that, after controlling for the timing of the Reconquest in each specific city and a large set of variables, the average treatment 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 6 and, finally, Section 7 concludes.

2. Literature

Our paper is mostly linked to the literature that attempts to distinguish between first and second nature forces in determining city size and city growth. The former are characteristics related 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.[8] There are a number of recent empirical papers that consider 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. Fernihough and O'Rourke (2014) also find that geographical proximity to coal had a strong influence on city population; according to their estimates, being close to coal mines explains at least 60% of the growth in European city populations from 1750 to 1900. Another study on 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. All 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

[8] 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 dramatically affected the country's population to 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 bombing of Hiroshima and Nagasaki during World War II affected the population of these two cities. Their main finding is that, in spite of the huge decline in population immediately after the atomic bombs were dropped, both cities recovered very quickly, returning to their initial size in a few decades.[9] 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 with respect to the pre-war period, suggesting that initial conditions were indeed crucial to understand the evolution of population in these cities. Brata et al. (2014) 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 most of the existing literature, they find that the effects of these natural disasters on population dynamics were only temporary.

Our paper is 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 critical 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 much before and after the Reconquest, whereas in Nitsch's paper the territory occupied by the Austro-Hungarian Empire dramatically decreased after 1918. Second, our quasi-natural

[9] Bosker et al. (2007) use the bombing of Germany during World War II to test for the presence of multiple equilibria in city growth in German cities.

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.

We also clearly relate to the work of Chaney and Hornbeck (2013)'s study of the effect of the expulsion of the Muslim descendants (moriscos) from Spain in 1609. Focusing on the region of Valencia (east of the Iberian Peninsula), they find a significant negative effect on income per capita associated with this expulsion. Our paper differs from theirs in that our main variable of interest is city population and not income per capita. Moreover, we seek to analyse the dynamics of population in the main Iberian cities, not just in one region, and our time span is much longer than theirs.

Finally, as mentioned in the introduction, our paper also relates to the study by Glaeser and Shapiro (2002) on the effect of warfare and conflict on urban primacy. Their paper considers a sample of cities that have been involved in some kind of terrorist attack or war during the period 1968-1977 and find that there is a weak positive effect of terrorism on city population. One interpretation of their results is that the safe-harbour and transportation effects mentioned above slightly dominate the target effect of the direct negative effect of terrorist attacks and warfare on urban population. In a similar vein, Blomberg et al. (2007) study the impact of terrorism on urban form using two datasets that allow them to estimate the probability of a terrorist attack and its effect on urban structure. As opposed to Glaeser and Shapiro (2002), their main finding is that terrorism has a statistically significant negative effect on urbanization.[10] Finally, using historical data from Bairoch et al. (1988), Dincecco and Gaetano (2015) analyse the relationship between military conflict and city population growth in Europe from the fall of Charlemagne's empire to the start of the Industrial Revolution. They argue that cities were safe harbours from conflict threats and test this argument using a database including the locations of 1,062 conflicts and 676

[10] Sheppard (2009) uses data on land use and terrorist attacks and concludes that there exists a large negative impact of terrorism on the development of land for urban purposes.

cities between 900 and 1799, finding a significant, positive, and robust relationship between conflict exposure and city population growth.[11]

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.[12] The Christian struggle against Islamic Spain can be described as "a war of both territorial aggrandizement and of religious confrontation" (O'Callaghan 2003, p,7). While the king might hope to increase the size of his kingdom, the soldiers who did his bidding often were motivated by the desire to enrich themselves and to raise their social standing by the acquisition of booty or to look for pasturage for their flocks.

During most of the Reconquest the Iberian Peninsula was divided in a few relatively small kingdoms: Asturias, Castile, Navarra, Leon, Portugal, Aragon, and Catalonia. The princes and kings of these kingdoms were often fighting over territories and successions, and in some instances they even make alliances with the Muslims. The Reconquest should therefore be seen as a very long series of battles between these kingdoms and the *taifas* - independent Muslim-ruled principalities - that lacked a central coordinator. The lack of a standing army essentially made all military operations ad hoc, usually planned a few months earlier. This lack of a coordinated plan seems consistent with the fact that we cannot find evidence of any other geographical pattern in the timing of the Reconquest of the Iberian cities. In particular, the Spearman correlation between cities' population (log scale) and the year at which the Reconquest took place is just 0.3 and not significant at conventional levels, indicating that the timing of the Reconquest was not driven by the size of the Iberian cities in the years preceding their Reconquest by Christian troops. To confirm this idea, we run regressions to explain the historical date of the Reconquest by city using different explicative variables: the city population

[11] Unfortunately, their database does not include information on military conflicts in the Iberian Peninsula over the period analysed here.

[12] Álvarez-Nogal and Prados de la Escosura (2013) study Spain's comparative performance over the half-millennium between the end of the Reconquest and the beginning of modern economic growth by the mid-nineteenth century.

the period before the Reconquest to discard any kind of relationship between city size and Reconquest, and the geographical location of the city (measured by latitude and longitude). Table 1 reports the results. Column 1 shows a significant relationship between the Reconquest date and the latitude of the city, indicating that the geographical location mattered in the timing of the Reconquest across cities, while columns 2 and 3 show no significant effect of longitude and population on the date.[13] This offers strong evidence in favour that, other than moving towards the South, the Christian troops conquered cities in a random way.

To further support this result, we estimate the nonparametric relationship between the Reconquest dates and the city population (log scale), and its latitude and longitude using a local polynomial smoothing.[14] Figure 4 shows the results, including the 95% confidence intervals. Again, the relationship between latitude and the Reconquest dates is clearly negative and significant while the effect of the longitude is not clear. The explanation is that, as the figure shows, cities in the same longitude were reconquered at different periods. Thus, even if the Christian army would have moved toward the south of the Peninsula in a straight line we would not have obtained any effect of the longitude.[15] Finally, the Figure also shows no significant effect of the population on the date of the Reconquest by city.

TABLE 1 HERE

FIGURE 4 HERE

As the Christians advanced, the Moors retracted to the south of the peninsula, where they ended up concentrating in the city of Granada.[16] O'Callaghan describes this process in his book:

[13] Sample size is lower in column 3 because in some cases population data the period before the Reconquest is not available.

[14] The local polynomial provides a smoother fit for Reconquest date to a polynomial form of each explicative variable (population, latitude and longitude) via locally weighted least squares. We used the lpolyci command in STATA with the following options: local mean smoothing, a Gaussian kernel function to calculate the locally weighted polynomial regression, and a bandwidth determined using Silverman's rule-of-thumb.

[15] Historical sources and our results suggest the Christians moved down in a zigzag pattern.

[16] The evidence suggests that Christian and Muslim societies were mutually exclusive, by reason not only of social and legal differences, but above all because of religion which suffused every facet of life. While daily interaction

"…After a siege of sixteen months, Seville capitulated on 23 November 1248. […] In the course of the month the Muslims sold their property and went into exile, carrying their movable goods, money, and arms. […] Some were given safe conduct to Jerez while others were carried to Ceuta in Morocco on five ships and eight galleys. Most probably withdrew to Granada." After the subjugation of Seville, however, there were still many Muslims in the peninsula, and they were subject in varying degrees to Christian rule.

Another salient feature of the Reconquest is that there was substantial heterogeneity with regards to the year in which specific cities were reconquered by Christians (Figure 5). 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 this shock on the population of a large number of cities.

FIGURE 5 HERE

The historical characteristics of the Reconquest impose several constraints on the type of data that we can use in the paper. While these data are described in detail in Section 5, we briefly discuss these constraints here, since they shape all the analysis that follows. Ideally, given that the Reconquest was a conflict between Christians and Muslims, 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.[17]

An alternative strategy would be 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

between Christians and Muslims did contribute to a degree of acculturation, especially in matters and social usage, there was no real possibility of the full integration of Christians into Muslim society or Muslims into Christian society. In each instance, Christians or Muslims could only be protected minorities with limited political and legal rights (O'Callaghan 2003, p.10).

[17] 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 converted to Christianity rather than leave Spain and Portugal in the early 1500s) from 1527 to 1786. However, to our knowledge, these data are only available for the region of Valencia.

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), 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, p. 144).

The lack of reliable data on city-specific changes in religious affiliation implies that it is in principle possible that the Reconquest was a relatively pacific event and that, in cities that were mostly populated by Muslims, their dwellers simply converted to Christianity once they were taken by Christian troops. This view would imply that the Reconquest indeed had a negligible effect on the population of Iberian cities. Indeed, even in the presence of open conflict between Christians and Muslims, the typical medieval warfare strategy to take a city was to siege it for a long period of time until its population eventually surrendered. Such sieges could be argued to cause a relatively low number of deaths compared to open field battles. Nevertheless 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, p.140).

On the other hand, 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 Christianity – 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 safe-conduct to Muslim territory. The Muslims similarly evacuated Palma, Borriana, and Valencia, but a significant number remained in Jaime I's dominions, assured of religious liberty and the observance of Islamic law."* (O'Callaghan 2003, p.139-140).

A final issue to take into account is to what extent the reconquered cities' infrastructure was affected by 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."* However, lack of data makes it once again difficult to identify any systematic pattern across cities in relation to the extent of infrastructure damage.

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; if the Reconquest had indeed 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 Reconquest did have an initial negative – although temporary - effect on the cities that were reconquered. 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, perhaps because these cities were direct targets of Christian armies and so their dwellers may have migrated to the countryside or to smaller cities. However, the potentially 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. Another consistent explanation for our findings is that the geographic characteristics that made the main Iberian cities good locations for the Moorish remained attractive for the dominant Christian population after the Reconquest, and therefore the Muslims who died or flew these cities were roughly replaced by equal numbers of Christians who were eager to live in these cities.

4. Empirical Strategy

Our empirical strategy consists of two steps. We first estimate a generalized difference in differences panel data model that includes a dummy variable which takes a value of one if a city in a given period was subject to or has already suffered the Reconquest. Moreover, we also include another dummy to control the possible effects before the Reconquest. This regression is a simple and clear way to identify the average treatment effect of the Reconquest on city sizes after controlling for several city and country covariates as well as different time and fixed effects. Second, we estimate a modified version of the previous model that allows us to quantify the average duration of this treatment effect. To do so we add as regressors city-specific time dummies that take into account how many periods have passed until/since the start of the Reconquest in each city. Before moving to the regression analysis, we discuss the cases of some relevant cities.

4.1. Some examples

There exists strong historical evidence that, around the year 800 and before the onset of the Reconquest, Cordoba, Granada, and Seville were the three dominant urban centres in the Iberian Peninsula. Indeed, Cordoba was often considered the most populated city in the world in 1000 (Chandler and Fox, 1974; Chandler, 1987). Figure 6 shows the evolution of these cities population. Similar figures for the rest of cities for which we have data in the years around their Reconquest are shown in the Appendix.[18] Figure 7 shows how the Moorish population relocated over time from Cordoba to Granada, with a time interval in between when Seville – not shown in the map – became the main city of the caliphate.

FIGURE 6 HERE

FIGURE 7 HERE

Cordoba was the main city of the Caliphate of Cordoba between 929 and 1031. It is apparent that its population experienced a dramatic increase between 929 and 1200 and then a steady until around 1700. One possible explanation for this decline is that the Muslim dwellers of Cordoba, which were likely to be the overwhelming majority around those years, anticipated the arrival of the Christians and left the city. After the Reconquest, Cordoba's population stabilized. The city experienced rapid growth around 1900, but, as it is clear from the other graphs in the Appendix, this was a common pattern in most Spanish cities and it's related to the unprecedented growth in urbanization in Spain around that year.

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, consistent with the hypothesis of Acemoglu et al (2005).

[18] Out of 50 cities, 29 of them don't have population data available around their Reconquest year. We include these cities in our main regressions but in some of the robustness checks we exclude them to test if their inclusion simply adds noise to our estimation.

4.2. Benchmark model

We begin by estimating the following model:

$$p_{it} = \alpha_i + \beta' X_{it} + \lambda' Z_{jt} + \delta pre\_REC_{it} + \gamma REC_{it} + \phi Years\_before_{it} + \mu Years\_after_{it} + \theta' \varphi_t + \varepsilon_{it}. \quad (1)$$

The dependent variable p_{it} denotes the measure of the population of city *i* at year *t*. We consider three measures of population by city: the share of a city on the Iberian urban population, the city's population (log scale) and the city's population growth. Urban shares are defined as the fraction of the city's population over the total Iberian urban population (Portugal and Spain), where urban population is calculated as the population living in cities greater than 5,000 inhabitants.[19] REC_{it} is the Reconquest dummy that takes a value of one if city *i* in period *t* was subject to or has already suffered the Reconquest, and zero otherwise. In a similar fashion, $pre-R_{it}$ is a pre-Reconquest dummy that takes a value of one if city *i* in period *t* was one or two periods (100 or 200 years) before its Reconquest, and zero otherwise. While the Reconquest dummy captures the average effect of the Reconquest on city size for our sample of cities, the pre-Reconquest dummy aims to capture the possible anticipated effects; on the one hand, city dwellers could decide to run away when the Christian army was approaching their city, and on the other hand cities could receive population from other previously reconquered cities.[20]

The explanatory variables included are similar to those considered by Henderson (2000) in his account of the main determinants of urban primacy across countries and Nitsch (2003). The vector Z includes the following country-specific variables: the country's total urban population, per capita Gross Domestic Product, the length of waterways and a measure of road density (proxied by Roman roads density) interacted with per capita GDP in order to capture the differential effect of infrastructure and income. X is a vector of city-specific explanatory

[19] The 5,000 cutoff to define urban population is standard in historical data. See, for example, Bairoch et al. (1988). Our results are qualitatively the same using the population living in cities with more than 2,000 inhabitants.

[20] Our pre-Reconquest dummy is defined allowing for anticipated effects only up to two periods before. A wider temporal horizon generates problems of multicollinearity. Nevertheless, we consider all the periods before the Reconquest when we estimate the dynamic effect of the Reconquest, see Section 4.3.

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 a dummy variable to control whether the city was taken after siege by the Christian army. City fixed effects are also included. Moreover, we add the number of years before/after the Reconquest by city as regressors $Years\_before_{it}, Years\_after_{it}$ to reduce potential measurement error: population data comes in 100-year intervals, so some cities were reconquered in a date close to the year of the observation, but others were reconquered many years before, having almost a century to recover from the shock. For example, for the city of Toledo, which was reconquered in 1085, the variable Years_before would take a value of 85 in the year 1000 and a value of 0 in the year 1100. Similarly, the variable Years_after would take a value of 0 in the year 1000 and a value of 15 in the year 1100. Finally, we also include several time controls: an overall time trend and its square, city-specific time trends and their squares in order to capture the particular behavior of each city in our panel over time, and time fixed effects. ε is a standard error term.

4.3. Dynamic effects of the Reconquest

The estimate of the parameter γ in Eq. (1) informs us about the (variance weighted) average change in the measure of city population after the Reconquest controlling for fixed and time-specific shocks. In this subsection we seek to analyze the dynamics of the Reconquest shock on the average Iberian city introducing a set of time dummies in our benchmark model.[21] We estimate the following model:

$$p_{it} = \alpha_i + \sum_{k=1}^{7} \zeta_k pre\_d_{kit} + \sum_{k=1}^{13} \rho_k post\_d_{kit} + \beta' X_{it} + \lambda' Z_{jt} + \phi Years_{it} + \theta' \varphi_t + u_{it}, \qquad (2)$$

where p_{it} and the vectors X and Z are the same as in Eq. (1) and u_{it} is the error term. This model differs from the one previously discussed in that we introduce dummies to capture the

[21] This methodology has been recently used by Sánchez-Vidal et al. (2014) to study the effect of city age on U.S. urban growth.

dynamic effect of the shock. We include 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 and other seven dummies to capture the anticipated effect before the Reconquest in a given century. For instance, $post\_d_{1it}$ is a dummy variable that takes a value of one in the first period after the Reconquest started in city *i*, and zero if the Reconquest has not yet taken place. Similarly, $post\_d_{2it}$ 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, $post\_d_{Granada,1}=1$ in the year 1500, $post\_d_{Granada,2}=1$ in the year 1600, etc. In a similar way, pre_d_{1it} is a dummy variable that takes a value of one in the first period before the date of city *i*'s Reconquest, and zero in any other case. Thus, for Granada $pre\_d_{Granada,1}=1$ in the year 1400, $pre\_d_{Granada,2}=1$ in the year 1300, etc. Therefore, these dummy variables measure the number of periods (centuries) before/after the onset of the Reconquest for each city, capturing its dynamic effect on the city's population. As Jacobson et al. (1993) noted, this estimation approach generalizes the 'difference-in-differences' technique, which uses a comparison group to estimate the population changes that would have occurred in the absence of the Reconquest, by accounting for the effects of time-varying variables and by allowing the effects of the Reconquest to vary by the number of periods relative to the historical date of the event. In some specifications we also include the city-specific time trends in order to capture the particular behavior of each city in our panel over time. The estimates of the time dummies in Eq. (2) allow us to determine the average treatment effect of the Reconquest on cities' population in different periods and so to test if effect declines or grows over time.

5. Data

Our panel includes data from fifty Iberian cities. We consider 42 cities from the Iberian peninsula that are located in today's Spain: Algeciras, Alicante, Almería, Ávila, Badajoz, Barbastro, Barcelona, Burgos, Cáceres, Cádiz, Calahorra, Cartagena, Córdoba, Cuenca, Ecija, Gerona, Granada, Guadalajara, Huesca, Jaén, Jerez de la Frontera, León, Lérida, Madrid, Málaga, Mérida, Morella, Murcia, Palma, Pamplona, Salamanca, Sevilla, Soria, Tarragona,

Teruel, Toledo, Tortosa, Tudela, Valencia, Valladolid, Zamora and Zaragoza. We also include 8 (currently) Portuguese cities: Coimbra, Elvas, Evora, Faro, Lisbon, Porto, Santarem and Vizeu.[22]

We choose these cities based on two criteria: first, these were, on average, the most populated cities during the period considered in the paper. This is a necessary choice since data for smaller cities is very sparse.[23] Figure 6 displays the evolution over time of the cities that were the largest ones for at least one period (one century in our data) during 800-2000: Cordoba, Sevilla, Granada and Madrid in Spain and Lisbon in Portugal.[24] Although all of them were the largest city in at least one period, this plot displays a high variance in the evolution of population across cities and over time; some cities were thriving, while others experienced a decline in population over time. We use city-specific trends to capture this variability in city sizes. Second, from a geographical point of view, this selection of cities covers the vast majority of the peninsula, as it is apparent from Figure 5. Furthermore, this sample of cities provides substantial variation in the timing of the Reconquest across cities.

Our sample covers the 800-2000 period. City populations for the 800-1800 period are taken from Bairoch et al. (1988).[25] To construct the urban shares we use data on total urban population in the country from the same source.[26] The last two centuries (1900-2000) are completed using data from the national official censuses. Per capita Gross Domestic Product data is taken from Maddison (2003). 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. (2013). The

[22] The Appendix shows the evolution of the population for all the Iberian cities in our panel for which we have data on population around the years of the city's Reconquest. A causal glance at these plots suggests that in most cases there is a marked decline in population in the years around the Reconquest (e.g. in Almería, Palma, Seville, and Valencia).

[23] 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 are only available for the last periods of our sample.

[24] Lisbon was the largest city in Portugal in all periods but 1200, when Coimbra was the most populated one.

[25] 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).

[26] 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 the urban share.

source of information on the presence of a Roman road is Talbert (2000).[27] As in Bosker et al. (2013), we identify locations where two (or more) Roman roads crossed as hub locations. Port cities are identified using maps and other geographical information. Finally, data on sieges is collected from Sáez Abad (2009). According to this source 18 cities in our sample were reconquered after siege by the Christian army. As discussed above, having been subject to a siege may have significant effects on its population.

6. Results

6.1. The average treatment effect of the Reconquest on Iberian Cities

The estimation of Eq. (1) gives us the average treatment effect of the Reconquest on our panel of Iberian cities. The Appendix displays the evolution of the population for cities with data around the Reconquest, showing a clear change around the onset of the Reconquest in some of them.[28] Table 2 reports the estimates of Eq. (1). All the estimates are weighted by city population to avoid giving a disproportionate weight to small cities.[29]

TABLE 2 HERE

In columns 1 to 3 we simply estimate the effect of the Reconquest on our measures of city population controlling only for the number of years before/after the Reconquest, sieges and an overall time trend. We obtain a negative and significant effect of the Reconquest on city size, measured by either the urban share or the population. The effect on population growth is also negative, but not significant. The dummy capturing the anticipated effect of the Reconquest is

[27] 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 his data.

[28] As a preliminary analysis, we explored the presence of structural breaks for some cities in our data using the Perron and Vogelsang (1992) test. Although these results cannot be considered robust because of the short number of temporal observations (a maximum of 13 periods), the structural breaks detected coincide or are located very close to the Reconquest dates in most of the cities. These results are available from the authors on request.

[29] The qualitative results remain unchanged when the regressions are run without population weights. These results are available from the authors upon request.

negative and significant in the three regressions, indicating that, on average, our sample of Iberian cities was already losing population before the Reconquest.

Once we control for the different covariates discussed in the previous section (columns 4 to 6) and we include city and time fixed effects as well as city-specific time trends (linear and square), the coefficient associated with the Reconquest dummy dramatically decreases but it remains negative, although it is significant only in the regression with the urban share (column 4). The anticipated negative effect of the Reconquest vanishes, remaining significant at the 10% only for population growth (column 6). The siege dummy becomes now significant and its sign changes from positive (columns 4 and 5) to negative (column 6). One interpretation of this result is that in the regressions using the urban share and the population, the dummy is acting as a proxy for large cities (small cities had not walls and hence they were not subject to sieges) while in the regression with the population growth the dummy reflects the negative effect of the siege on growth. Not surprisingly, total urban population has a positive impact on the absolute and relative measures of city size (population and urban share, respectively); the higher the total urban population the greater the cities in our sample. Finally, most of the rest of controls are not significant.

These results indicate that the Reconquest may have had an average negative effect on the main cities in the Iberian peninsula, although evidence supporting the robustness of this negative effect is mixed: the effect on the urban shares is significant, while the effect on the population and population growth turns insignificant when all the controls and the city-specific time trends are included.

From the point of view of the conflict/warfare literature, one interpretation of these results is that, in this particular historical context, the negative effects of war on urban shares seem to dominate the positive ones. Using the terminology first advanced in Glaeser and Shapiro (2002), the target effect and the direct effects of physical destruction appear to dominate the safe harbour

and transportation effects, although we don't have accurate data to explicitly distinguish between these effects.

6.2. Dynamic effects of the Reconquest

In the previous subsection we found some evidence that the Reconquest had an average negative impact on the urban shares of the main cities of the Iberian Peninsula. One possible explanation for the not very robust negative effect when we use other measures of city size (log population or population growth) is that the shock was indeed transitory. Here we aim to identify the persistence of this negative shock, i.e. how long it took these cities to recover from the shock caused by their Reconquest by Christians. To address this question, we estimate the average dynamic effect of the Reconquest using city-specific time dummies that take into account how many years elapsed since the beginning of the Reconquest in each specific city, as explained in Section 4. We also estimate the anticipated effect of the Reconquest by period. The results are displayed in Table 3, where again all the regressions are weighted by city population to ensure that small cities are not driving the results.

TABLE 3 HERE

Columns 1 to 3 report the results with the basic set of controls: the number of years before/after the Reconquest, sieges and an overall time trend. Column 1 shows that all the coefficients of the dummies measuring the number of periods before the Reconquest have a positive sign. Interestingly, these coefficients are significant but, as we approach to the date of the Reconquest, they decrease and become not significant. This indicates that urban shares were declining even before the Reconquest. After the Reconquest the time dummies have a negative sign, but the coefficients are not significant. In the case of city population (column 2), we observe the same pattern: pre-Reconquest time dummies are positive (and significant in some cases), but as we approach to the Reconquest date they decrease and become not significant. The post-Reconquest

time dummies are negative, but this time they are significant in most of the periods. This would suggest that these cities were growing before they experienced the Reconquest although this growth was declining as the Christian troops approached, perhaps because the Muslim dwellers anticipated it. The negative coefficients after the Reconquest are also consistent with the negative effect of the Reconquest on city populations and its persistence, although they are not statistically significant. Finally, in the case of population growth (column 3), none of the time dummies is significant.

Columns 4 to 6 show the results once we include all the controls, city and time fixed effects and city-specific time trends. After adding all the controls and the time-specific city trends, any pre- or post-Reconquest effect disappears (the only exception is the coefficient of the time dummy 8 periods after the Reconquest in column 4). These final results can be interpreted as evidence that, for the average Iberian city, the negative effect of the Reconquest was at most temporary, confirming the analysis carried out in the previous section. In terms of the economic geography literature, one interpretation of our results is that, in the historical episode 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, in spite of their initial population loss.

6.3. Robustness checks

In this section we carry out different robustness checks.[30] First, we include 23 European cities (from the current Austria, Belgium, France, Germany, Italy, the Netherlands, Switzerland and the UK) that were not subject to the Reconquest shock as a control group. We choose the cities that were the largest ones in their country for at least one period. [31] The results are displayed in Table

[30] We display here only robustness checks associated with the average treatment effect regressions. The results with the dynamic regressions are harder to interpret since many observations are lost and so several time dummies are eliminated from the estimation. The results are however consistent with those presented here and are available from the authors upon request.

[31] These cities are: Wien from Austria, Antwerpen, Brugge, Gent and Ieper from Belgium, Laon and Paris from France, Augsburg, Berlin, Hamburg, Koeln and Regensburg from Germany, Napoli, Palermo, Roma and Venezia

4. It is apparent that these estimates are similar to those of Table 2. The Reconquest has a negative impact on the different measures of city's population, but this effect becomes insignificant after adding more controls. Second, we consider the 1000-1300 period as the treatment effect, i.e. we study the effect of being reconquered in this period on cities' population. Several historical accounts state that these were the years in which the Reconquest became more aggressive in large part due to the active role that the popes took in promoting it. Table5 shows that the results of estimating the average treatment effect in this case are quite similar to those of Table 2. With the basic controls we observe a strong negative impact of the Reconquest on a city's population, although it only remains statistically significant after controlling for other variables in the case of the share of Iberian urban population. Table 6 maintains the 1000-1300 period as the treatment effect, but also includes the 23 European cities that were not subject to the Reconquest and the results are barely affected.[32] Third, in Table 7 we remove cities that have no population data around the Reconquest year since it is possible that these observations simply add noise to our regressions. The main findings are robust to this omission. Finally, in Table 8 we remove the year 2000 from the estimation since most Iberian cities grew very fast around this year as a result of very rapid urbanization between 1900 and 2000. Once again, the main results of the empirical exercises survive after this robustness check.

TABLES 4 TO 8 HERE

7. Conclusions

In this paper we analyse the unique quasi-natural experiment offered by the Spanish Reconquest on the population of the main Muslim cities of the Iberian Peninsula. This 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.

from Italy, Amsterdam, Utrecht and Zwolle from the Netherlands, Basel, Geneve and Zuerich from Switzerland, and London from the UK.

[32] Using 1200-1500 as the treatment period leads very similar results.

We find that cities that were affected by the Reconquest experienced a temporary decline in their relative population. We also find a negative effect on population and growth, but this effect is not robust to controlling for a set of controls and city-specific time trends. Moreover, when we analyse the duration of this negative shock we conclude that it was short-lived, vanishing within the first seven hundred years after the onset of the Reconquest or becoming insignificant once other controls are taken into account.

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. From the perspective of the literature on city size and conflict, we provide some weak evidence that the Reconquest had a negative impact on the relative population size of the cities that were affected by it, suggesting that the target effect and the effect of direct destruction from the war dominated the safe harbour and the transportation effects in this historical context, at least in the short run.

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 shed light on the future evolution of these cities and therefore offers guidance for policymakers that seek to evaluate the need and/or the effect of policies aimed to help planning the recovery of cities that have experienced 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.

Anselin, L., and S. Rey (1991), "Properties of Tests for Spatial Dependence in Linear Regression Models." *Geographical Analysis*, 23(2): 112–131.

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.

Blomberg, B., S. Sheppard and E.L. Glaeser (2007), "The Impacts of Terrorism on Urban Form." *Brookings-Wharton Papers on Urban Affairs*, 257–294.

Bosker, M., E. Buring, and J. L. Van Zanden (2013), "From Baghdad to London: unraveling urban development in Europe, the Middle East and North Africa, 800-1800." *Review of Economics and Statistics*, 95(4): 1418–1437.

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 (2014), "The Impact of the Indian Ocean Tsunami and the Nias Earthquake on the Spatial Distribution of Population in Northern Sumatra." *Bulletin of Indonesian Economic Studies*, 50(1): 101–121.

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.

CIA World Factbook, https://www.cia.gov/library/publications/the-world-factbook/

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.

Dincecco, M., and O. M. Gaetano (2015), "Military Conflict and the Rise of Urban Europe." SSRN working paper, available at SSRN: http://ssrn.com/abstract=2341713

Fernihough, A., and K. Hjortshøj O'Rourke (2014), "Coal and the European industrial revolution." NBER Working Paper No. 19802.

Glaeser, E.L, and J.M. Shapiro (2002), "Cities and Warfare: The Impact of Terrorism on Urban Form." *Journal of Urban Economics* 51, 205–224.

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.

Jacobson, L. S., R. J. LaLonde, and D. G. Sullivan (1993). "Earnings Losses of Displaced Workers." *The American Economic Review*, 83(4): 685–709.

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.

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.

Perron, P., and T. Vogelsang (1992), "Nonstationarity and level shifts with an application to purchasing power parity." *Journal of Business and Economic Statistics*, 10: 301–320.

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." *Journal of Economic Growth* 8(1), 5-46, March.

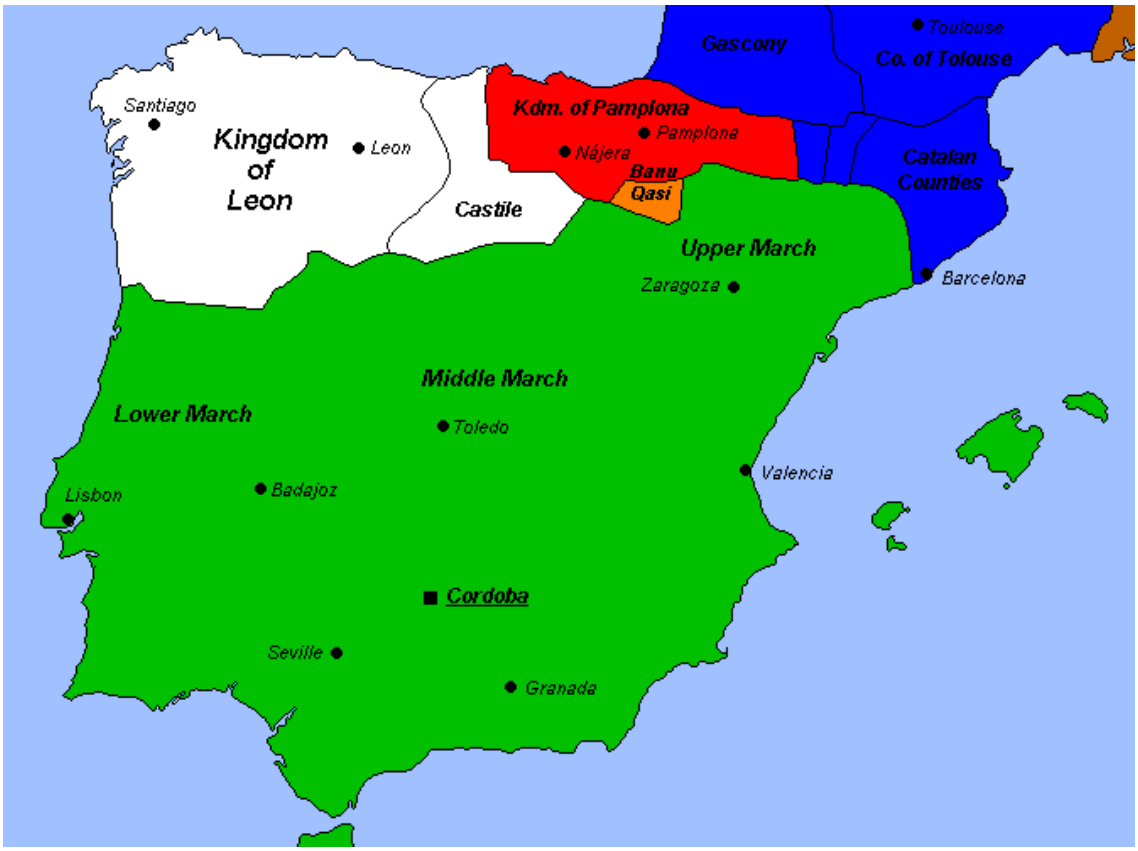
Sáez Abad, R. (2009). "*Los grandes asedios en la Reconquista de la Península Ibérica*." Madrid: Almena.

Sánchez-Vidal, M., R. González-Val and E. Viladecans-Marsal (2014), "Sequential city growth in the US: Does age matter?". *Regional Science and Urban Economics*, 44: 29–37.

Sheppard, B. (2009), "Urban Structure in a Climate of Terror." Chapter 7 in *Guns and Butter: The Economic Causes and Consequences of Conflict*, edited by Gregory D. Hess, Cambridge: MIT Press.

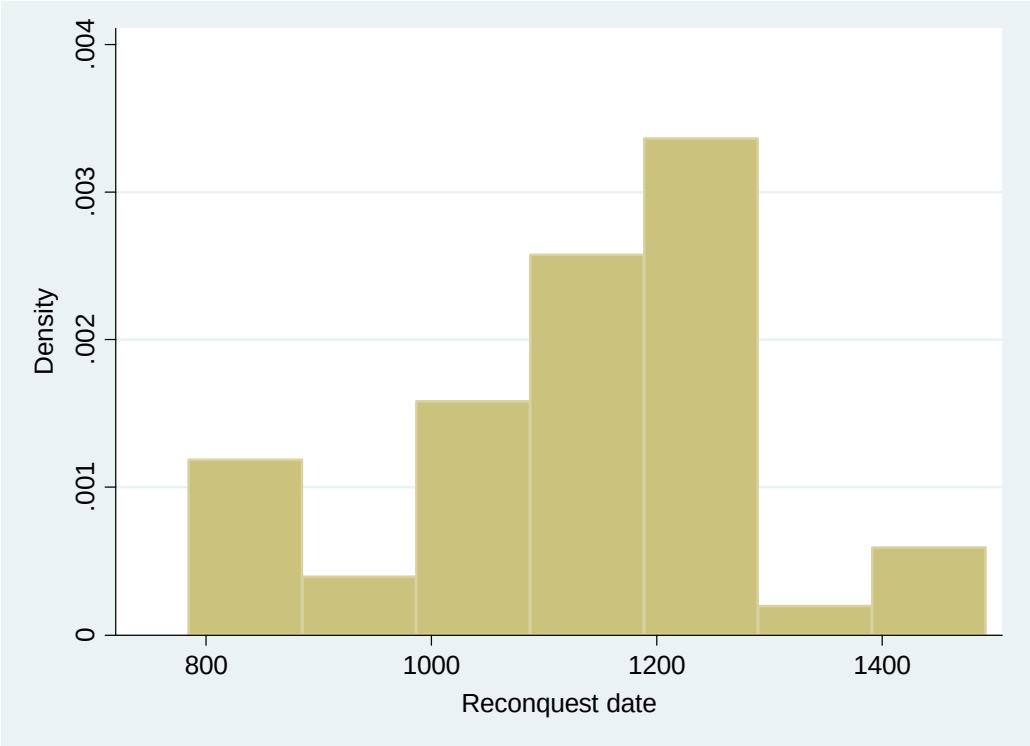
Talbert, R. J. A., (2000), "*Barrington atlas of the Greek and Roman world*." Princeton: Princeton University Press.

Figure 1: The Caliphate of Cordoba c. 1000



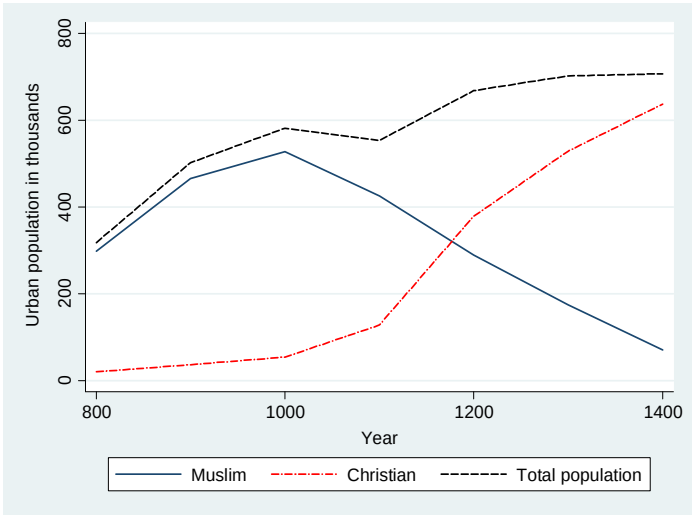
Source: Wikipedia

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

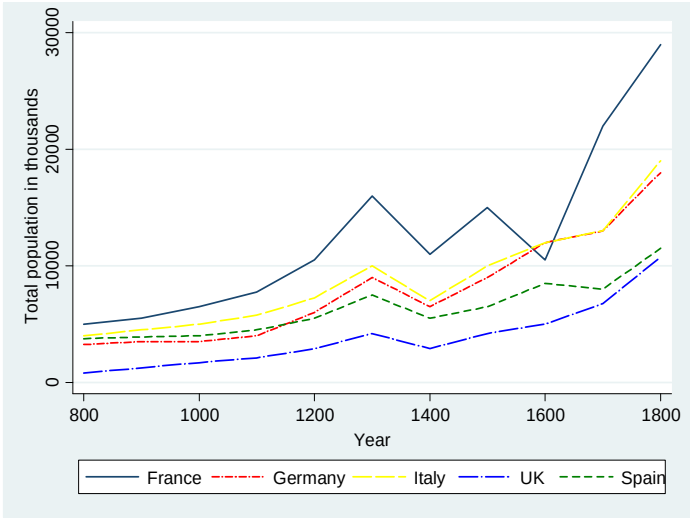


Note: Fifty Iberian cities (42 Spanish cities and 8 Portuguese cities) are considered.

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: Nonparametric relationship between the Reconquest dates latitude, longitude and city population (log scale)

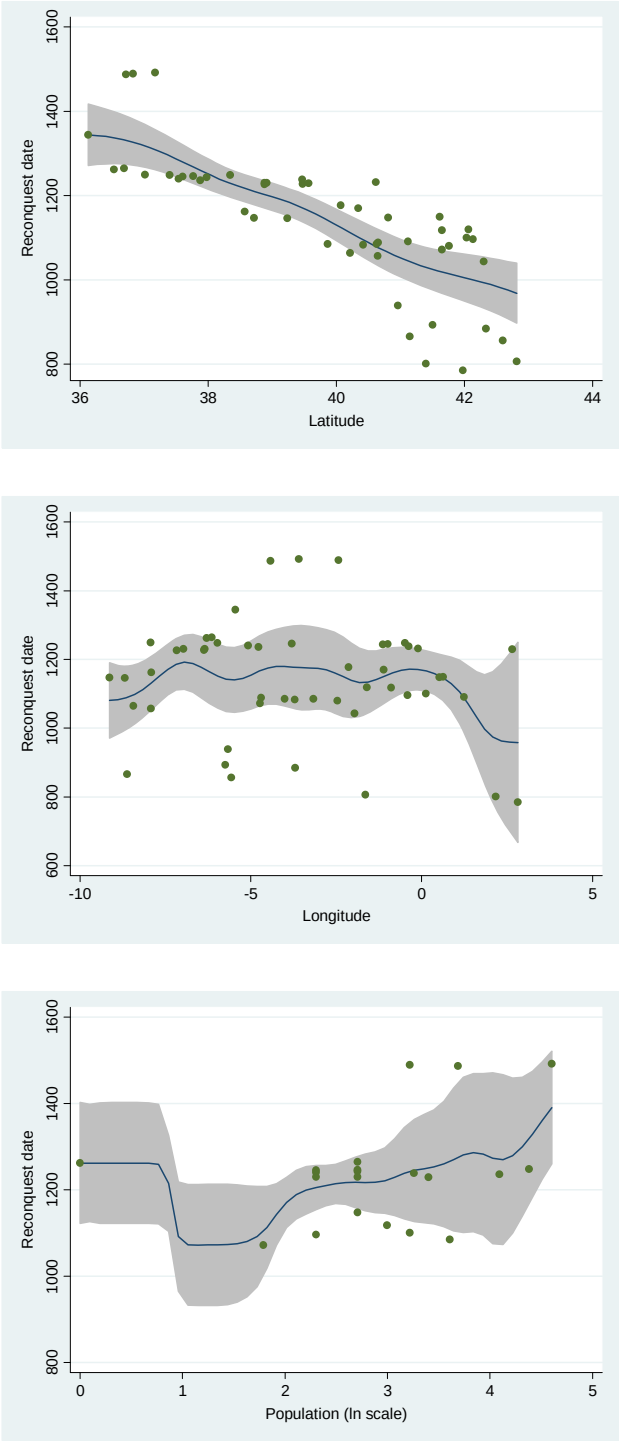


Figure 5: Reconquest data in the most important Iberian cities

Source: Wikipedia

Figure 6: Evolution over time of population (log scale) in the largest Iberian cities

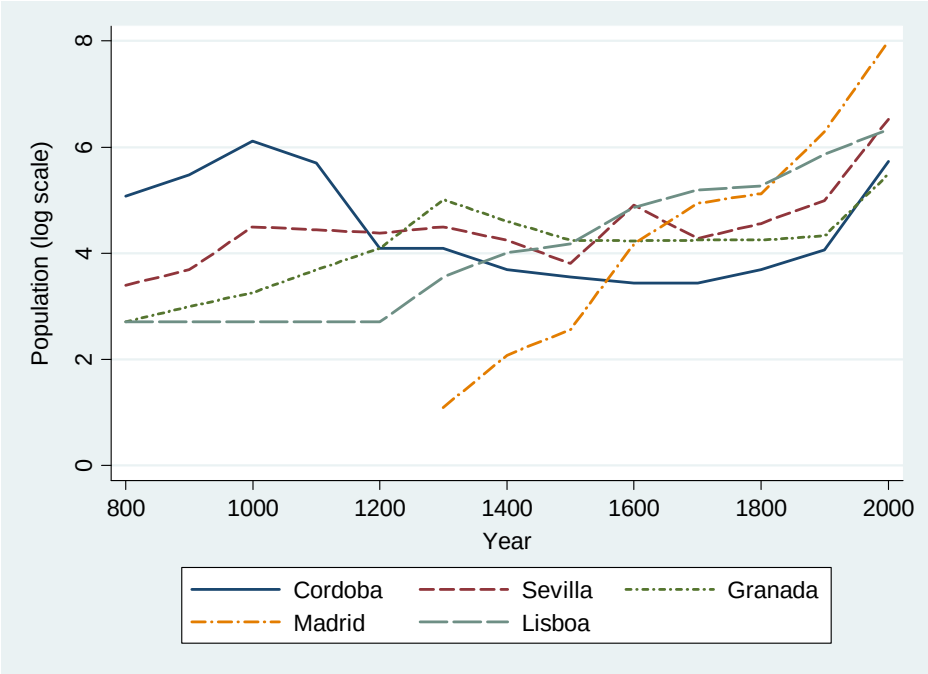
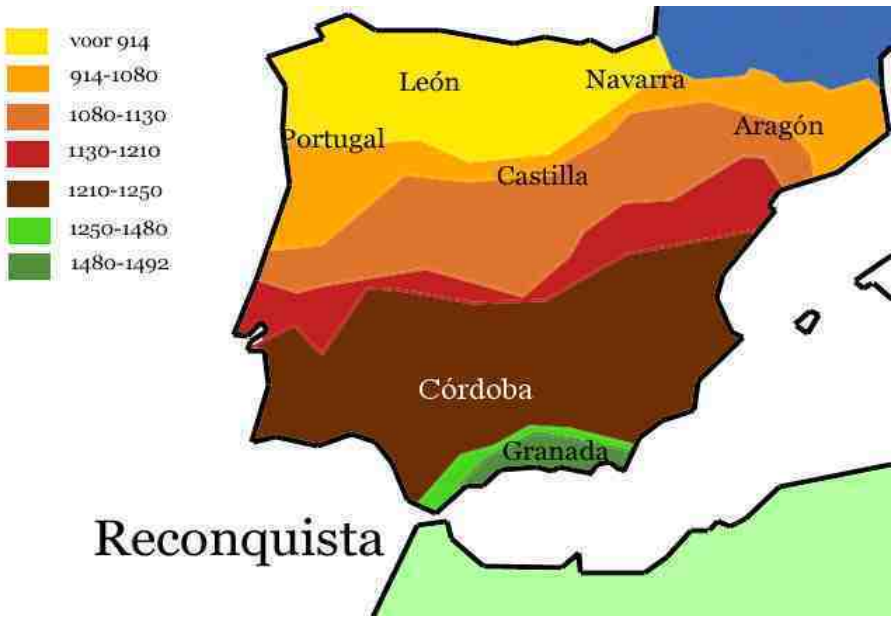


Figure 7: The evolution of the Caliphate of Cordoba



Source: Wikipedia

Table 1. Explaining the Reconquest dates

	[1]	[2]	[3]
Latitude	-68.77***		
	(8.104)		
Longitude		-5.613	
		(7.352)	
Log(Population)			39.147
			(31.826)
Constant	3875.548***	1120.14***	1124.207***
	(318.909)	(37.265)	(90.226)
R^2	0.652	0.012	0.098
Number of observations	50	50	21

Notes: The dependent variable is the date of each city's Reconquest. Robust standard errors clustered by city in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 2. The average impact of the Reconquest on Iberian cities

	Dependent variable					
	Share of Iberian population	Log(Population)	Population growth (log scale)	Share of Iberian population	Log(Population)	Population growth (log scale)
	[1]	[2]	[3]	[4]	[5]	[6]
Reconquest dummy	-0.260**	-3.763***	-0.361	-0.043**	-0.467	-0.639
	(0.111)	(0.919)	(0.297)	(0.021)	(0.373)	(0.420)
Pre-Reconquest dummy	-0.146**	-1.296***	-0.446**	-0.007	-0.055	-0.608*
	(0.061)	(0.418)	(0.176)	(0.018)	(0.215)	(0.318)
Years since Reconquest	0.000**	0.002***	0.001***	0.000	0.006	0.003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.006)
Years before Reconquest	-0.000	-0.001	0.002**	-0.000	-0.004*	-0.003
	(0.000)	(0.001)	(0.001)	(0.000)	(0.002)	(0.005)
Siege	0.015	0.440	-0.080	0.175***	16.553***	-25.400***
	(0.019)	(0.634)	(0.101)	(0.058)	(1.149)	(2.633)
Trend	-0.008**	0.313***	0.145***	-0.203	-3.352	-4.828***
	(0.004)	(0.087)	(0.026)	(0.222)	(3.516)	(1.709)
Trend^2				-0.024*	-0.366	0.031
				(0.013)	(0.245)	(0.060)
Hub city				-0.043	-2.966***	-2.875
				(0.056)	(0.889)	(2.823)
Port city				-0.276**	-9.777***	-11.281***
				(0.105)	(1.284)	(4.090)
Log (Total urban pop,t)				0.065***	1.013***	-0.768
				(0.023)	(0.252)	(0.515)
Log (pc GDP, t)				-0.655	-59.782	301.503
				(3.436)	(43.385)	(420.812)
Log (pc GDP, t)^2				0.070	4.054	-22.834
				(0.225)	(2.788)	(32.152)
Log (Waterways)				-0.359	5.293	-58.496
				(0.446)	(8.705)	(57.144)
Log(Road density) ×Log(pc GDP)				-0.348	0.984	-44.284
				(0.326)	(6.073)	(49.047)
Log(Road density) ×Log(pc GDP)^2				0.021	-0.059	3.375
				(0.020)	(0.359)	(3.849)
Time fixed effects	No	No	No	Yes	Yes	Yes
City fixed effects	No	No	No	Yes	Yes	Yes
City×time	No	No	No	Yes	Yes	Yes
City×time^2	No	No	No	Yes	Yes	Yes
R^2	0.455	0.463	0.480	0.966	0.983	0.813
Number of observations	472	472	420	472	472	420

Notes: The before- and after-Reconquest periods are defined according to the historical dates, see Figure 6. All estimates weighted by city population. Every regression includes a constant. Robust standard errors clustered by city in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 3. Dynamics of the Reconquest shock in Iberian cities

	Dependent variable					
Periods before/after city's Reconquest	Share of Iberian population [1]	Log(Population) [2]	Population growth (log scale) [3]	Share of Iberian population [4]	Log(Population) [5]	Population growth (log scale) [6]
7 Periods before	1.894*	12.153	-1.216	0.136	10.488	-0.596
	(1.053)	(7.434)	(2.519)	(0.574)	(9.929)	(34.504)
6 Periods before	1.595*	10.025	-0.777	0.159	7.015	-0.433
	(0.896)	(6.329)	(2.169)	(0.447)	(7.317)	(25.706)
5 Periods before	1.422*	9.095*	-0.419	0.140	4.361	0.079
	(0.762)	(5.189)	(1.522)	(0.330)	(5.163)	(18.589)
4 Periods before	1.117*	7.158*	0.002	0.180	3.152	0.439
	(0.606)	(4.234)	(1.147)	(0.258)	(3.625)	(12.820)
3 Periods before	0.831*	5.502	-0.366	0.188	2.201	0.486
	(0.452)	(3.287)	(0.977)	(0.194)	(2.404)	(8.237)
2 Periods before	0.501*	3.107	-0.721	0.149	1.407	0.005
	(0.276)	(2.282)	(0.807)	(0.127)	(1.466)	(4.648)
1 Period before	0.125	0.284	0.074	0.046	0.402	0.286
	(0.110)	(1.508)	(0.208)	(0.051)	(0.638)	(1.950)
1 Period after	-0.065	-1.203	-0.080	-0.022	0.081	-0.813
	(0.065)	(1.256)	(0.184)	(0.040)	(0.336)	(1.221)
2 Periods after	-0.064	-1.317	0.005	-0.058	0.148	-2.460
	(0.056)	(1.063)	(0.176)	(0.083)	(0.734)	(3.596)
3 Periods after	-0.054	-1.462*	-0.045	-0.080	0.669	-4.813
	(0.047)	(0.863)	(0.280)	(0.118)	(1.116)	(7.427)
4 Periods after	-0.036	-1.262*	-0.491	-0.088	1.121	-7.672
	(0.039)	(0.644)	(0.377)	(0.142)	(1.450)	(13.302)
5 Periods after	-0.027	-1.356***	-0.239	-0.108	1.232	-10.510
	(0.030)	(0.434)	(0.461)	(0.148)	(1.644)	(22.096)
6 Periods after	-0.015	-0.781**	-0.747	-0.091	1.343	-14.281
	(0.025)	(0.321)	(0.598)	(0.129)	(1.521)	(34.126)
7 Periods after	0.005	-0.833***	-0.324	-0.071	0.880	-18.053
	(0.021)	(0.306)	(0.649)	(0.082)	(0.995)	(50.076)
8 Periods after	0.007	0.118	-0.572	-0.016**	0.123	-22.186
	(0.022)	(0.397)	(0.746)	(0.006)	(0.208)	(70.363)
9 Periods after	0.032	0.453	0.061	0.083	-0.957	-26.586
	(0.040)	(0.815)	(0.851)	(0.123)	(1.666)	(95.554)
10 Periods after	0.074*	2.442*	-0.166	0.212	-2.066	-32.076
	(0.039)	(1.253)	(0.984)	(0.293)	(3.989)	(126.054)
11 Periods after	0.080*	0.831	-0.641	0.425	-3.245	-38.846
	(0.047)	(1.088)	(1.115)	(0.515)	(7.116)	(162.492)
12 Periods after	0.055	1.732	-1.246	0.614	-5.914	-46.278
	(0.049)	(1.292)	(1.012)	(0.796)	(11.175)	(205.323)
13 Periods after	0.052	1.110	.	0.910	-9.425	.
	(0.046)	(1.059)	.	(1.142)	(16.315)	.
Years since Reconquest	-0.000	-0.002	0.001	-0.001	-0.003	-0.008
	(0.000)	(0.002)	(0.001)	(0.001)	(0.012)	(0.060)
Years before Reconquest	-0.003*	-0.019*	0.004	0.000	-0.003	0.023
	(0.002)	(0.011)	(0.004)	(0.001)	(0.016)	(0.058)
Siege	0.028**	1.031***	-0.023	-0.195*	5.459**	-6.855
	(0.013)	(0.254)	(0.063)	(0.113)	(2.502)	(6.698)
Trend	Yes	Yes	Yes	Yes	Yes	Yes
Trend^2	No	No	No	Yes	Yes	Yes
Other controls	No	No	No	Yes	Yes	Yes
Time and city fixed effects	No	No	No	Yes	Yes	Yes
City $\times$ time and City $\times$ time^2	No	No	No	Yes	Yes	Yes
R^2	0.578	0.628	0.595	0.974	0.988	0.847
Number of observations	472	472	420	472	472	420

Notes: The before- and after-Reconquest periods are defined according to the historical dates, see Figure 6. All estimates weighted by city population. Every regression includes a constant. The controls include: a dummy for whether the city is a hub, a dummy for whether the city has a port, log of urban population, log of per capita GDP and its square, log of length of waterways, and log of Roman roads interacted with per capita GDP and its square. Robust standard errors clustered by city in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 4. The average impact of the Reconquest on Iberian cities, including 23 European cities

	Dependent variable					
	Share of population	Log(Population)	Population growth (log scale)	Share of population	Log(Population)	Population growth (log scale)
	[1]	[2]	[3]	[4]	[5]	[6]
Reconquest dummy	-0.226***	-2.783***	-0.422***	-0.055	-0.719	-0.559
	(0.050)	(0.501)	(0.126)	(0.103)	(0.650)	(0.406)
Pre-Reconquest dummy	-0.127***	-0.502	-0.526**	-0.008	-0.155	-0.536*
	(0.037)	(0.415)	(0.226)	(0.057)	(0.354)	(0.304)
Years since Reconquest	0.000***	0.001*	0.001***	-0.000	-0.013***	-0.012***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.003)	(0.004)
Years before Reconquest	-0.000	0.003	0.001	-0.001**	0.009***	0.012***
	(0.000)	(0.003)	(0.001)	(0.000)	(0.002)	(0.002)
Siege	0.017	0.416	-0.039	-0.657	-7.635***	-4.383
	(0.020)	(0.590)	(0.114)	(0.395)	(2.673)	(5.743)
Trend	Yes	Yes	Yes	Yes	Yes	Yes
Trend^2	No	No	No	Yes	Yes	Yes
Other controls	No	No	No	Yes	Yes	Yes
Time and city fixed effects	No	No	No	Yes	Yes	Yes
Country fixed effects	No	No	No	Yes	Yes	Yes
Country × time and Country × time^2	No	No	No	Yes	Yes	Yes
City × time and City × time^2	No	No	No	Yes	Yes	Yes
R^2	0.221	0.557	0.201	0.950	0.986	0.820
Number of observations	714	714	639	714	714	639

Notes: The before- and after-Reconquest periods are defined according to the historical dates, see Figure 6. All estimates weighted by city population. Every regression includes a constant. Robust standard errors clustered by city in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5. The average impact of the Reconquest on Iberian cities, treatment years: 1000-1300

	Dependent variable					
	Share of Iberian population	Log(Population)	Population growth (log scale)	Share of Iberian population	Log(Population)	Population growth (log scale)
	[1]	[2]	[3]	[4]	[5]	[6]
Reconquest dummy	-0.160*	-3.425***	-0.121	-0.056**	-0.695	-0.312
	(0.087)	(0.968)	(0.207)	(0.022)	(0.482)	(0.520)
Pre-Reconquest dummy	-0.085**	-0.875***	-0.215	-0.039***	-0.351*	-0.390
	(0.032)	(0.289)	(0.231)	(0.013)	(0.206)	(0.301)
Years since Reconquest	0.000	0.007*	0.002**	-0.000	0.040***	-0.074***
	(0.000)	(0.004)	(0.001)	(0.000)	(0.005)	(0.008)
Years before Reconquest	0.000	-0.003	0.002***	0.001	-0.033***	0.070***
	(0.000)	(0.003)	(0.001)	(0.001)	(0.006)	(0.011)
Siege	0.021	0.495	-0.087	-0.125***	1.677**	-0.430
	(0.017)	(0.380)	(0.108)	(0.034)	(0.664)	(2.095)
Trend	Yes	Yes	Yes	Yes	Yes	Yes
Trend^2	No	No	No	Yes	Yes	Yes
Other controls	No	No	No	Yes	Yes	Yes
Time and city fixed effects	No	No	No	Yes	Yes	Yes
City × time and City × time^2	No	No	No	Yes	Yes	Yes
R^2	0.527	0.489	0.496	0.976	0.988	0.857
Number of observations	355	355	315	355	355	315

Notes: The before- and after-Reconquest periods are defined according to the historical dates, see Figure 6. All estimates weighted by city population. Every regression includes a constant. Robust standard errors clustered by city in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6. The average impact of the Reconquest on Iberian cities, treatment years: 1000-1300, including 23 European cities

	Dependent variable					
	Share of population	Log(Population)	Population growth (log scale)	Share of population	Log(Population)	Population growth (log scale)
	[1]	[2]	[3]	[4]	[5]	[6]
Reconquest dummy	-0.247***	-2.819***	-0.626***	0.140	0.175	-0.174
	(0.055)	(0.567)	(0.202)	(0.193)	(1.083)	(0.447)
Pre-Reconquest dummy	-0.141***	-0.287	-0.554*	0.063	0.100	-0.503
	(0.045)	(0.404)	(0.295)	(0.100)	(0.498)	(0.325)
Years since Reconquest	0.000**	0.001	0.002***	-0.002	-0.014	-0.037***
	(0.000)	(0.001)	(0.000)	(0.002)	(0.012)	(0.011)
Years before Reconquest	-0.000	0.006**	0.001	0.001	0.010	0.027***
	(0.000)	(0.003)	(0.001)	(0.001)	(0.011)	(0.010)
Siege	0.015	0.217	-0.110	1.136***	12.546***	9.424***
	(0.019)	(0.540)	(0.112)	(0.420)	(4.181)	(1.481)
Trend	Yes	Yes	Yes	Yes	Yes	Yes
Trend^2	No	No	No	Yes	Yes	Yes
Other controls	No	No	No	Yes	Yes	Yes
Time and city fixed effects	No	No	No	Yes	Yes	Yes
Country fixed effects	No	No	No	Yes	Yes	Yes
Country × time and Country × time^2	No	No	No	Yes	Yes	Yes
City × time and City × time^2	No	No	No	Yes	Yes	Yes
R^2	0.189	0.542	0.187	0.822	0.892	0.583
Number of observations	597	597	534	597	597	534

Notes: The before- and after-Reconquest periods are defined according to the historical dates, see Figure 6. All estimates weighted by city population. Every regression includes a constant. Robust standard errors clustered by city in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7. The average impact of the Reconquest on Iberian cities, excluding cities without population data available before the Reconquest (sample size = 21 cities)

	Dependent variable					
	Share of Iberian population	Log(Population)	Population growth (log scale)	Share of Iberian population	Log(Population)	Population growth (log scale)
	[1]	[2]	[3]	[4]	[5]	[6]
Reconquest dummy	-0.232**	-3.013***	-0.288	-0.054**	-0.732*	-0.436
	(0.104)	(0.737)	(0.308)	(0.022)	(0.378)	(0.412)
Pre-Reconquest dummy	-0.138**	-1.179***	-0.419**	-0.011	-0.151	-0.511*
	(0.057)	(0.386)	(0.175)	(0.017)	(0.210)	(0.282)
Years since Reconquest	0.001	0.002***	0.001	-0.001	-0.003	0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.004)
Years before Reconquest	-0.001	-0.002	0.002*	0.001	0.003	-0.010***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
Siege	0.054**	1.118***	0.004	-0.118***	-1.352***	0.516*
	(0.021)	(0.177)	(0.087)	(0.031)	(0.298)	(0.239)
Trend	Yes	Yes	Yes	Yes	Yes	Yes
Trend^2	No	No	No	Yes	Yes	Yes
Other controls	No	No	No	Yes	Yes	Yes
Time and city fixed effects	No	No	No	Yes	Yes	Yes
City × time and City × time^2	No	No	No	Yes	Yes	Yes
R^2	0.513	0.560	0.426	0.971	0.971	0.798
Number of observations	250	250	228	250	250	228

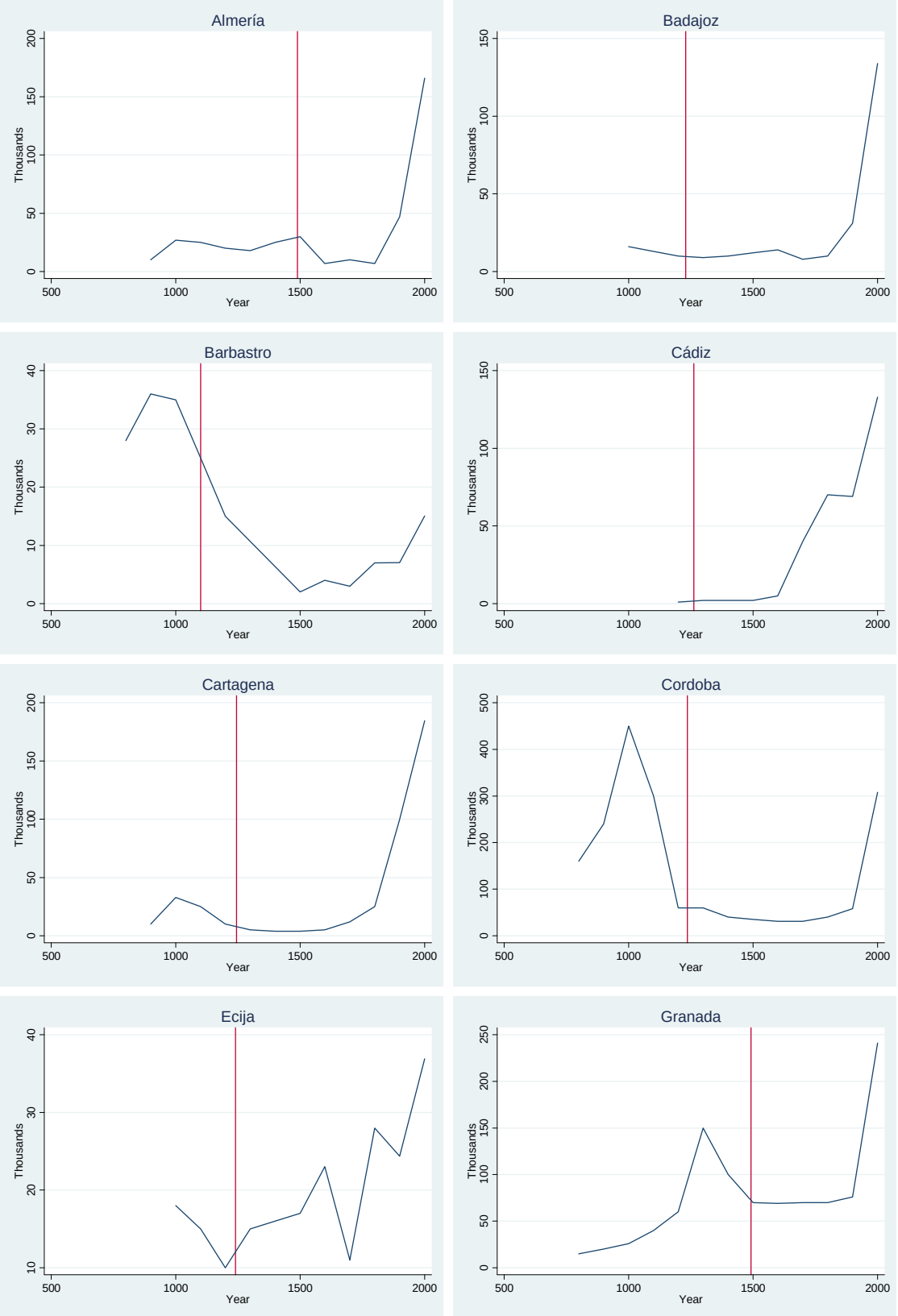
Notes: The before- and after-Reconquest periods are defined according to the historical dates, see Figure 6. All estimates weighted by city population. Every regression includes a constant. Robust standard errors clustered by city in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

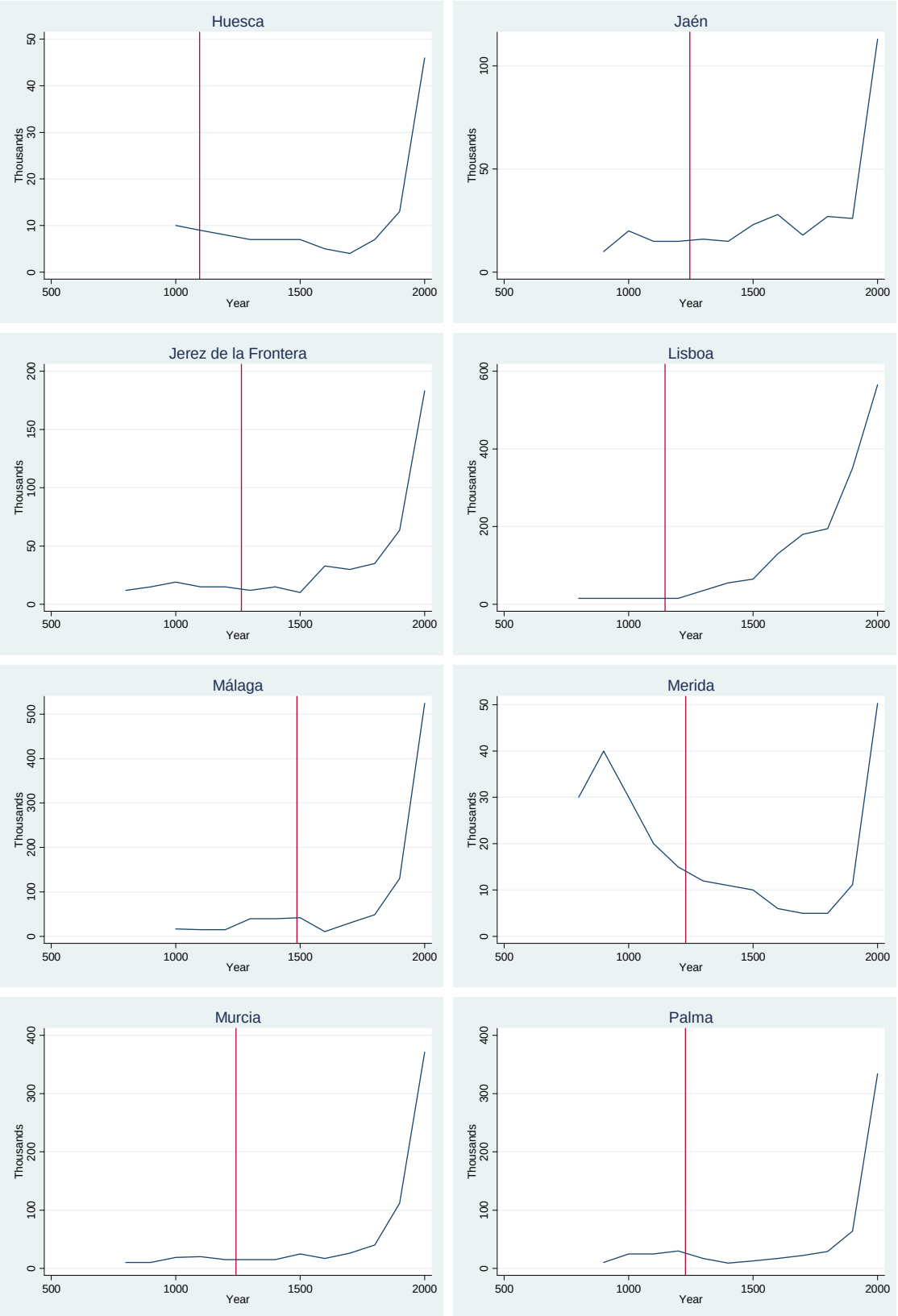
Table 8. The average impact of the Reconquest on Iberian cities, excluding the last period (year 2000 or 1990-2000 growth rate)

	Dependent variable					
	Share of Iberian population	Log(Population)	Population growth (log scale)	Share of Iberian population	Log(Population)	Population growth (log scale)
	[1]	[2]	[3]	[4]	[5]	[6]
Reconquest dummy	-0.261**	-2.760***	-0.102	-0.034	-0.342	-0.777
	(0.102)	(0.812)	(0.257)	(0.022)	(0.365)	(0.500)
Pre-Reconquest dummy	-0.144**	-1.074**	-0.334**	-0.003	0.009	-0.669*
	(0.056)	(0.403)	(0.158)	(0.018)	(0.206)	(0.336)
Years since Reconquest	0.000**	0.002***	0.001***	0.000	0.014***	0.011
	(0.000)	(0.000)	(0.000)	(0.000)	(0.005)	(0.011)
Years before Reconquest	-0.000	-0.002	0.002*	-0.000	-0.011***	-0.009
	(0.000)	(0.001)	(0.001)	(0.000)	(0.003)	(0.010)
Siege	0.050**	0.970**	0.019	0.257	12.149**	4.281
	(0.023)	(0.383)	(0.084)	(0.246)	(5.951)	(3.319)
Trend	Yes	Yes	Yes	Yes	Yes	Yes
Trend^2	No	No	No	Yes	Yes	Yes
Other controls	No	No	No	Yes	Yes	Yes
Time and city fixed effects	No	No	No	Yes	Yes	Yes
City × time and City × time^2	No	No	No	Yes	Yes	Yes
R^2	0.446	0.349	0.258	0.966	0.963	0.720
Number of observations	422	422	370	422	422	370

Notes: The before- and after-Reconquest periods are defined according to the historical dates, see Figure 6. All estimates weighted by city population. Every regression includes a constant. Robust standard errors clustered by city in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Appendix: Evolution of the population (thousands) by city, 800-2000

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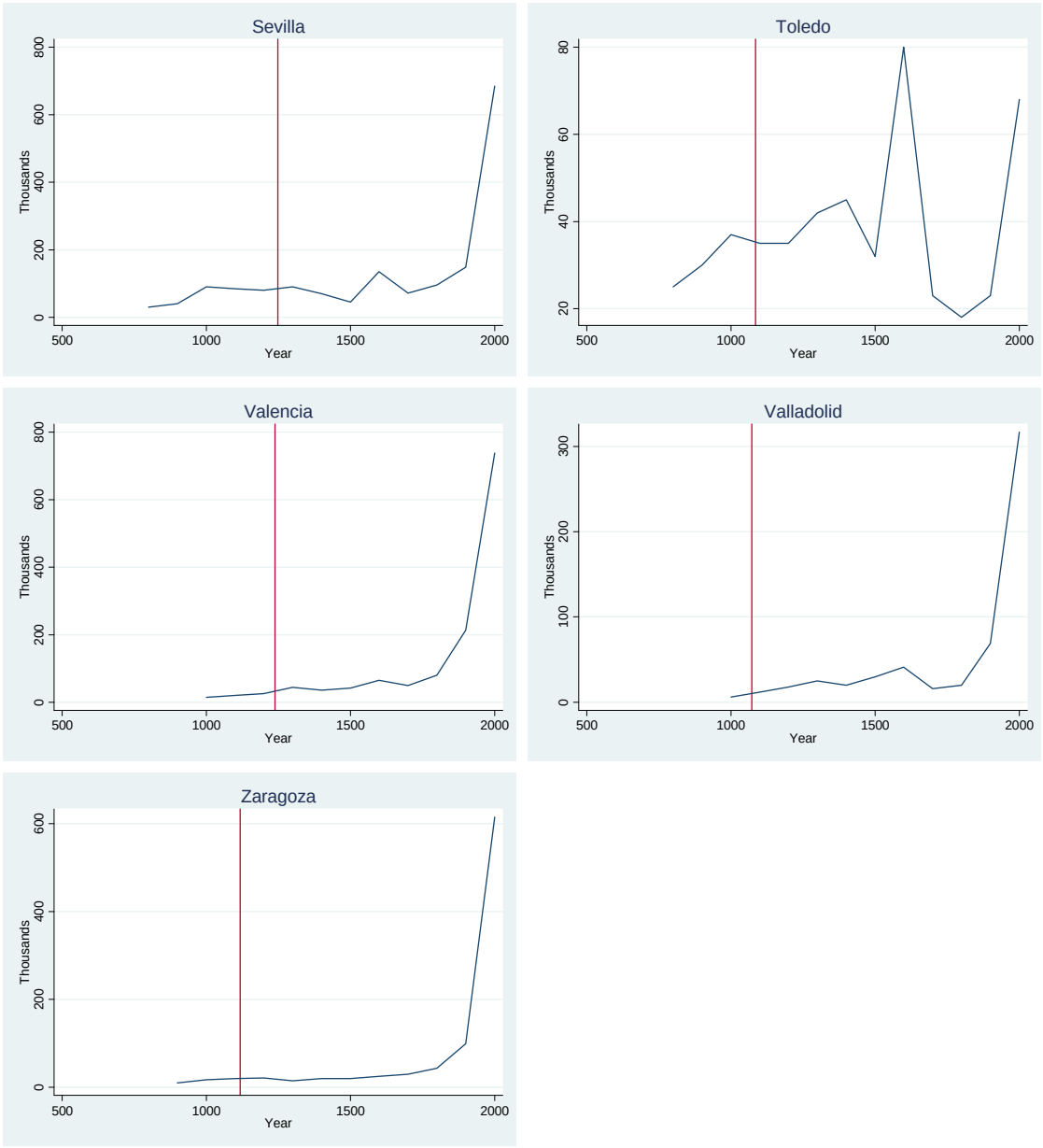

Note: The vertical line indicates the date of the city's Reconquest. Only cities for which there are population data available in the years before and after the Reconquest are included.

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