Empty Thrones: Medieval Politics, State Building and Contemporary Development in Europe*

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Abstract

The development of modern state institutions is a major legacy of the medieval period in Europe. In this paper, we investigate the effects of medieval politics on contemporary economic development through their effect on the success or failure of medieval state building efforts. During the Middle Ages, most European polities operated under a norm that gave only the close male relatives of a deceased monarch a clear place in the line of succession. When no such heirs were available, succession disputes were more likely, with more distant relatives and female(-line) heirs laying competing claims to the throne. These disputes often produced violent conflicts that destroyed existing state institutions and stunted the subsequent development of the state. We therefore hypothesize that a shortage of male heirs to a European monarchy in the Middle Ages has a deleterious effect on levels of development across contemporary European regions ruled by that monarchy. We find that regions that were more likely to have a shortage of such heirs are today poorer than other regions. Our finding highlights the importance of the medieval period in European development, and show how luck works in combination with both institutions and norms in shaping development trajectories.

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Key Words: political instability, conflict, state-building, economic development, gender bias, political norms and institutions, European history

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1 Introduction

Europe today—prosperous as it is in comparison to many other parts of the world—exhibits a great deal of internal variation in development levels across its regions. In this paper, we argue that a substantial part of this variation is due to the uneven development of state institutions across medieval European polities. Authors such as Strayer (1970) and Tilly (1992) have argued that European polities began to develop state institutions starting in the medieval period, and that some polities built stronger and more durable states than others. In addition to this, recent scholarship has argued that strong state institutions, at both the local and central level, are essential for economic development (Besley and Persson, 2011; Migdal, 1988; Herbst, 2000). In light of these arguments, we conjecture a link between medieval state building and contemporary development. If differences in state institutions have persisted over time—from the medieval period to now—we might be able to trace some of the variation in contemporary economic outcomes back to the uneven development of these institutions more than five hundred years ago.

The difficulty, however, is that we lack reliable measures of medieval state development. Moreover, even if we could directly observe state institutions at the level of medieval polities, it is likely that state development was affected by a host of factors, including many unobservable characteristics of these regions that could directly affect modern development. Given these empirical challenges, we focus instead on identifying the effects of one source of exogenous variation in medieval state development: the likelihood of the availability of male heirs to medieval European monarchs. Our approach is based on a simple theory connecting political gender bias and succession norms to conflict, political instability and state-building.

During the medieval period, most polities operated under a norm that gave the close male relatives (e.g. sons and brothers) of the ruling monarch a relatively clear place in the line of succession, but did not specify clear succession rules for female (and female-line) heirs. A shortage of male heirs could, therefore, destabilize the polity by creating conflict among the nobility, rival relatives and opportunistic foreigners. Typically, more distant male relatives would claim the throne over closer female or female-line relatives, leading to a succession dispute. In many cases, these disputes turned into violent wars. These wars in turn destroyed state institutions and reduced political cohesion. Simultaneously, ruling families and local elites in areas ruled by monarchs with relatively few close male relatives anticipated such

conflict, and became less willing to invest in building a strong and cohesive state in the first place. Both this underinvestment in state-building, and the damage caused by violent conflict had a detrimental effect on contemporaneous and subsequent levels of development.

In areas with several potential male heirs, on the other hand, the high level of political stability afforded by a series of unambiguous and uncontested successions enabled certain polities to establish strong and lasting state institutions, making them more resistant to internal conflict and foreign influence, and even enabling them to conquer and exploit other less politically stable areas. Paris, for example, is one of Europe's most prosperous metropolises today in large part because it enjoyed the uninterrupted reign of a single dynasty in the medieval period for more than three centuries from 987-1316AD. It was in this period that Capetian monarchs laid the foundations of the modern French state with their city as its capital. Naples, by contrast, was a much more prosperous city than Paris in the early Middle Ages, but lost ground due to a series of destructive civil wars brought on by a number of succession disputes. Our theory accounts for this reversal.

To provide evidence for the theory, we measure the likelihood that male heirs were available and abundant using different variables, each with different strengths. For example, we use the total number of legitimate sons and brothers of all monarchs that ruled a region from 1000-1500AD that were alive at the time of the monarch's death or replacement. We also use the number of times a monarch had zero male heirs to succeed him at the time of his death or replacement. Since these measure may be affected by a number of endogenous characteristics of regions through their effect on family size and survival rates, we also use the precent of male children born to monarchs of a region, as well as the fraction of males among firstborn children of monarchs. Although the first measure could be affected by male-preferred fertility stopping rules, the second one cannot. (Actually, however, we find no evidence for such stopping rules in the data.) None of these measures are perfect indicators of the availability of male heirs, but they likely to be strong predictors of it. Our main finding is that no matter how we measure it, the likelihood of having of male heirs has a substantial positive effect on contemporary GDP per capita across European regions.

This result survives a number of robustness checks. For example, we show that it holds even when we look exclusively within Northern Europe, as well as when we look exclusively within Eastern Europe. The result is even robust to the inclusion of country-fixed effects, meaning

that it holds even after we account for cross country differences. Furthermore, we are able to trace our effects over time. We show that the likelihood of having male heirs affected urban density in each century between 1300 and 1800, even though it had no discernible effect on urban density in the year 1000. Moreover, we provide data in support of our mechanism. For example, we show that the likelihood of having male heirs has negative effects on the occurrences of a coup or a violent internal conflict in the polity, but has positive effects on the average length of a dynasty and measures of the quality of contemporary state institutions. Finally, we find that the effect of having an abundance of male heirs is lower in polities where inheritance norms were more institutionalized.

Our work relates to a vast literature that argues that societal and economic conditions preceding the period of Western industrialization, and spanning much of Europe's history, played an important role in shaping the development paths of different European polities. By focusing on pre-1500 conditions and the role of historical norms and prejudices in shaping long-run outcomes, our paper contributes to a lively debate on how far back the different development trajectories of modern societies are discernible, and what caused these divergent paths in the first place. Some scholars, such as Pomeranz (2009) and Acemoglu, Johnson and Robinson (2002), for example, have argued that development trajectories became well-defined only in the post-1500 period, and really only after the Industrial Revolution. Others, such as Maddison (2007), Putnam, Leonardi and Nanetti (1994), Guiso, Sapienza and Zingales (2008), Abramson and Boix (2014) and Chaney (2014) have argued that pre-1500 conditions also played an important role in setting the development trajectories of many European polities. While some of these authors (e.g., Acemoglu, Johnson and Robinson, 2005) highlight the persistence of institutions in explaining development paths, others emphasize the importance of culture and social norms (e.g., Guiso, Sapienza and Zingales, 2008). By stressing the importance of historical norms and prejudices in shaping institutional paths, our paper combines these two perspectives.[1]

Finally, our argument is complementary to the "critical junctures" theory of development, which stresses the importance of large, often deliberately initiated, macro-historical events in

[1]In this way, it is also relates to the work of Tabellini (2010), who also studies variation in development outcomes across European regions, but argues that culture is the channel by which historical institutions explain contemporary development across European regions, rather than institutions being the channel by which historical norms influence modern development outcomes.

shaping long term political and economic development (Collier and Collier, 2002; O'Donnell and Schmitter, 1986; Lipset and Rokkan, 1967). While our results agree with this literature in showing that the development process can be highly path dependent, they also differ with this literature by showing that under particular norms and institutions, the accumulated effects of a series of small random events can also affect a society's development path for centuries.

2 Theoretical Background

Our theory links the availability of male heirs to Europe's monarchies in medieval period to contemporary development via three main factors: conflict, political instability and state-building. The theory can be schematically summarized as follows:

$$\begin{array}{c}\text{shortage of}\\ \text{male heirs}\end{array} \Rightarrow \begin{array}{c}\text{conflict and}\\ \text{instability}\end{array} \Rightarrow \begin{array}{c}\text{persistently weaker}\\ \text{state institutions}\end{array} \Rightarrow \begin{array}{c}\text{persistently weaker}\\ \text{development outcomes}\end{array}$$

In this section, we discuss each of these links. The literatures that relate conflict and political instability to state development, and state development to development outcomes, are already rich; so we rely mostly on existing work to substantiate the second and third arrows above. We focus on substantiating the first, and less intuitive, link, which relates the availability of male heirs to conflict and political instability in the medieval period.

2.1 Conflict, State Building and Development

Previous authors have already highlighted the harmful effects of political instability and conflict for the development of state institutions, as well as the ways in which of state building can promote long term development. Tilly (1992) and Strayer (1970) emphasized the importance of the medieval period for long-term state-building. In turn, Migdal (1988), Evans (1995) and Herbst (2000) emphasized the importance of state building for development. We argue, in accord with this literature, that developing state institutions that are capable of providing market supporting public services, law enforcement, and protection of private property rights, is essential for economic development.[2] However, in line with the work of Bates (2001) and others, we also argue that although these state functions are important for development,

[2]Migdal (1988) and Herbst (2000) also argue in the context of Africa that the failure of the state to exercise control over conflicting factions can be very harmful for development.

building such state institutions in the presence of political instability and conflict can be challenging.[3] In the face of high instability, rulers know that they could be ousted at any time, and have little incentive to invest in state-building. And, in the presence of frequent conflict, their incremental investments would be periodically destroyed anyway.[4] These arguments give us a basic relationship between state capacity and development that has been summarized and extended formally by Besley and Persson (2010). We rely on their work as well as the previous literature to substantiate the second and third links of our theory in the schematic diagram above, though our theory requires three important additions that are necessary in our context.

First, the previous work cited above has focused on the argument that internal conflict and political instability reduce investments in state capacity, in turn reducing economic investments and hurting development. In particular, in many previous models of conflict and state capacity such as that of Besley and Persson (2010), violent internal conflict does not have any direct destructive impact on state institutions or development outcomes; it simply diverts resources away from productive activities. In our theory, we include the possibility that such conflict damages existing state institutions as well, and therefore hurts development via this second, more direct, channel.[5]

Second, most previous work provides only a proximate theory of the impact of state capacity on development. We, on the other hand, argue that differences in state development that arose in the distant past have persisted until today. Our argument is that European polities in which conflict destroyed or stunted the development of the state in the medieval period have always lagged behind polities in which such conflict did not destroy state institutions

[3]See also Alesina and Perotti (1996) and Barro (1996) who provide empirical evidence that political instability is harmful for development.

[4]This, in fact, gives rise to the following development "trap:" although strong states are often required to limit conflict, conflict itself inhibits the development of strong states. See Cox, North and Weingast (2013) for a closely related argument.

[5]Besley and Persson (2010) draw the distinction between internal conflicts (civil wars) and external conflicts (interstate wars) and argue that internal conflicts hurt state building while external conflicts promote state building. This distinction was, in fact, first made by Tilly (1992) who argued that interstate wars in Europe promoted the development of state institutions. For our purposes, the relevant wars are internal wars, because conflicts emerging from succession disputes are more likely to be internal (though some important wars emerging from succession disputes, such as the Hundred Years War, would count as both internal and external). Nevertheless, because in our theory war may have a direct destructive effect on state institutions, the net effect of external conflict on state development may also be negative.

as severely. This element of our argument is consistent with an influential literature that argues that historical institutions are generally very persistent, and their development over time tends to be incremental (North, 1990; Acemoglu, Johnson and Robinson, 2005; Acemoglu and Robinson, 2008).

The argument is based on the observation that the Middle Ages are a period where the link between state building and long run economic development is likely to have been especially strong, since it was during this period that many of the basic structures of modern states were being created or failing to be created. In particular, several of the achievements of successful medieval states have obvious economic relevance. These include the reduction of the ability of petty lords to levy arbitrary taxes and customs duties (North, 1973), the reduction in violence (especially the so called "private wars") within the borders of the state (Tilly, 1992), and the development of more institutionalized and disciplined court systems that made the implementation of law more predictable (Harding, 2002). All of these made investments in economic activity more attractive since the possibility of expropriation by greedy locals, bandits, and corrupt royal officials was appreciably reduced. Protection from a large coercive monopolist with long term interests made obsolete many of the ad hoc techniques that medieval traders had developed to protect against these types of expropriation (Greif, 1993; Milgrom, North and Weingast, 1990).

Third, and finally, whereas previous work (e.g. Besley and Persson, 2010) has focused on economic fundamentals such as natural resource rents and real wages as accounting for variation in the propensity for conflict, we argue that social norms and random contingent factors—in particular, the degree of institutionalization of informal succession rules that prefer male heirs combined with the random differences in the availability of such heirs—may also drive variation in the propensity for conflict. That is, the first link in the schematic diagram above is unique to our theory, and we discuss it in more detail below.

2.2 Male Heirs, Conflict and Political Instability

In nearly all of medieval Europe, inheritance practices contained a strong element of gender bias, preferring male heirs over female heirs, and male lines of descent over female lines.[6] While

[6]In fact, all European monarchies had some form of male-preferred inheritance up to 1980: no European monarchy practiced absolute (gender-neutral) primogeniture before 1980 (Corcos, 2012).

matrilineal inheritance systems are common in some parts of Africa, Southeast Asia and pre-Columbian America (Hartung, 1985), they were virtually unknown in pre-modern Europe, a continent that is also noted for having had a strong pro-male gender bias relative to other areas of the world (Boserup, 1970; Alesina, Giuliano and Nunn, 2013). European aristocracy felt strongly that women would be incapable of exercising military power, and that a married woman would be heavily influenced, if not controlled, by her husband (McLaughlin, 1990; Jansen, 2002). Moreover, certain polities of the former Carolingian Empire that practiced "Salic law," outright prohibited inheritance through female lines of descent (Herlihy, 1962).

Under these prejudices, some polities adopted agnatic systems of succession, where the order of succession gave priority to the monarch's brothers; others adopted a system of primogeniture, giving priority to the first-born child. In all of these polities each close male relative of the ruling monarch received a relatively clear place in the order of succession.[7] Even in the few polities that used elections to select a new monarch, it is worth noting that 47% of successors were close male relatives (specifically, either sons or brothers) of the deceased monarch, as compared to 60% of successors in areas that practiced agnatic succession or male-preferred primogeniture. When close male relatives were not available, most polities, regardless of the succession rules they used, would experience a great deal of conflict and instability resulting primarily from competing claims to succession. The throne might be claimed by living daughters and their husbands, or more distant relatives, who would cite various conflicting inheritance rules as justification. Without clear laws or oral customs, these claims were difficult to adjudicate in ways other than violent conflict. Moreover, nobles and foreign rulers eagerly took sides in such conflicts, increasing their intensity and duration. Indeed, it is difficult to point to any part of the continent where the lack of a close male heir was not associated with a destructive war arising from such competing claims. Particularly notorious examples include the Norman Conquest of England (1066-1070), the War of the Bretton Succession (1341-1364), the War of the Thuringian Succession (1247-1264), the Portuguese Interregnum (1383-1385), and named succession wars in Austria (1251-1276), Bohemia (1457-1471), Hungary (1382-1386) and Denmark (1332-1376).

Given these facts, we hypothesize the availability of male heirs in the medieval period

[7]For example, in agnatic systems, sons of the monarch would have a clear place in the succession order that followed the monarch's brothers, and in male-preferred primogeniture systems, brothers of the monarch would also have a clear place that followed the monarch's sons.

should influence the likelihood of internal conflict and political instability. For reasons argued in Section 2.1 above, variation in the availability of close male relatives to ruling monarchs is likely to drive variation in medieval state building. This, in turn, has driven variation in the quality of state institutions and economic development from the medieval period to today.

2.3 The Institutionalization of Inheritance Norms

Our theory has additional implications. One such implication (not represented in the schematic diagram above) is that a shortage of male heirs should affect conflict and instability less—and therefore have a smaller effect on contemporary development—in polities where succession norms are more strongly institutionalized. Put another way, where succession rules are well-defined, the ambiguity in succession caused by a lack of males is much easier to resolve.

The main theoretical concept behind this element of our argument is that of *coordination*. After a ruler dies, the nobles (and other members of the polity, more generally) must find a way to coordinate around a successor if they are to avoid conflicts arising from succession disputes. The customs and institutions (formal or informal) that give rise particular succession norms provide the polity with the opportunity to peacefully coordinate on a successor. In weakly institutionalized polities, these norms are ambiguous and potentially in conflict with each other, giving rise to the possibility of a disputed succession.

For example, consider a polity where it is ambiguous if inheritance is based on "Salic law," a highly sexist custom that prohibits inheritance through female-lines of descent (Potter, 1937), or if it is based on male-preferred primogeniture, which gives priority to the first born son of the monarch, but allows female(-line) heirs to inherit the throne when direct male heirs are not available (Ward, 2014). If it is not clear whether Salic law trumps male-preferred primogeniture in deciding whether female-line descendants of a monarch have priority over more distant male-line relatives, then there is potential for conflict. Indeed, the Hundred Years War is a well-known example of a conflict emerging from a dispute about whether the French throne descended, by Salic law, to Phillip of Poitiers, uncle of the deceased King John I (the Posthumous) or whether it descended to John's half sister, Joan II of Navarre, and subsequently to Edward III of England (Sumption, 2009).

Conversly, when the polity is strongly institutionalized and succession rules are clearly and deeply specified, there is less ambiguity and the nobles can coordinate their support around

a particular successor. Even if a competitor tries to gain supporters to claim the throne, he is likely to fail since the nobles do not want to be on the losing side, and they expect the rest of the polity to coordinate around the individual that has priority according to the succession rule that is in use.[8]

The main empirical implication of this element of our theory is that the shortage or abundance of male heirs should have a *weaker* effect on conflict, state-building and development in regions that had stricter norms surrounding succession and inheritance because the potential for conflict would be lower where there is less ambiguity. For example, there tended to be more clarity about succession norms in the non-tribal regions of Europe that used Roman law, as opposed to the tribal regions of central Europe that relied on the less codified Germanic laws. Consequently, we expect the effect of male heirs on development to be weaker in the non-tribal areas. Similarly, in light of the fact that most regions in our study eventually institutionalized (male-preferred) primogeniture as their succession norm, the effect of the availability of male heirs should be weaker in polities that were early adopters of this norm. In fact, inheritance norms such as primogeniture might themselves have become stronger in places where the abundance of male heirs limited the frequency with which the norm was challenged, in turn reinforcing the norm. We investigate this implication of our theory as well, and show that the availability of male heirs did affect the institutionalization of primogeniture over time.

Finally, we note that our theory is agnostic as to whether the effect of male heirs should be stronger or weaker in regions that practiced Salic law. On the one hand, if gender bias was higher in Salic law regions than elsewhere, violent conflicts resulting from succession disputes could be more common in Salic law regions when close male heirs are scarcer. On the other hand, because succession disputes often arose from female-line heirs prosecuting their claims to the throne, violent conflict might actually be rarer in regions that practiced Salic law since female-line heirs in these regions would less frequently dispute successions by more distant male-line relatives when closer male heirs were not available. It is possible that these female-line relatives knew that they would have a hard time forming a coalition of nobles to violate

[8]Importantly, the succession rule must be both *clearly* and *deeply* specified. That is, it must clearly specify the order of succession and this order must be long enough that the potential for conflict does not arise. To illustrate the distinction, consider a succession rule that privileges the sons of a monarch in the order in which they were born, followed by the brothers of the monarch in the order of their birth. While this is certainly a clear succession rule, it is possible that the monarch does not have any sons or brothers alive at the time of his death. In such an instance the rule would not be considered deep enough.

the Salic tradition and support their bids for power. In this case, the availability of male heirs might have a smaller effect on development in areas that practiced Salic law because gender bias is so highly institutionalized that conflict between male- and female-line heirs is rarer when close male heirs are not available. We let the data adjudicate these two possibilities, and find evidence for the latter view.

3 Illustrative Examples

Before starting our empirical analysis, we draw on the experiences of Naples, France and Castile to illustrate our theory.

3.1 Naples

One of the most striking examples of how violent conflict could destroy even a highly organized polity comes from the experience of Naples. The Norman Kingdom of Sicily was generally considered one of the best governed medieval polities in the 12th century, with some already strong state institutions, such as a large bureaucracy and tax gathering apparatus that drew on pre-existing Arab and Byzantine traditions (Takayama, 1993). In the next three hundred years, however, the state was comprehensively destroyed by a series of civil wars brought on by a shortage of male heirs. The final and most destructive of these began in 1343, when King Robert died without any living sons, leaving the throne to his grand-daughter Joanna. This led to a series of conflicts over Joanna's marriage, resulting in the murder of her first husband, as well as vicious conflicts between the supporters of Joanna and the supporters of the more distant male line heir, Charles of Durazzo. The result was a complicated civil war, intertwined with the rivalries of the Neapolitan nobility, as well as with the contending claims of two rival popes. The conflict did not end when Joanna was strangled in prison in 1381. By this time, the division between supporters of her claim—eventually vested in the kings of France, and the Durazzo claim, eventually vested in the kings of Aragon—ran deep within the kingdom's political class. In the next century and a half, the two factions would conduct five successful coups, usually with the support of foreign money and mercenaries (Jones, 2000).

3.2 France

The experience of Naples can be contrasted to the experience of France, which enjoyed the exceptional stability of its royal family for more than three centuries from 987-1316AD. Every one of the Capetian kings was succeeded by an adult son in this period, a run of genetic good luck unparalleled in all of Europe. Historians, such as Lewis (1981), have argued that dynastic stability was a key factor in the rise of the Capetians from a regional power in the Ile-de-France to become the rulers of a centralized state covering much of Western Europe. Not only were the Capetians spared the problem of internal conflict, but the stability of their dynasty put them in an advantaged position to expand their holdings by marrying their sons to the females heirs of their neighbors. This enabled them to acquire the territories of several rulers who had once rivaled them in wealth and power, including the Counts of Toulouse (1271) and Champagne (1314). The end of their run of good luck came with the death of Charles IV in 1328, which started the Hundred Years War, a destructive conflict that was nevertheless the only such dispute threatening France in the entire medieval period.[9]

3.3 Castile

The political uncertainty created by a lack of male heirs was by no means concentrated in the period after the death of a monarch. By clouding the political future, a lack of male heirs created incentives to challenge the ruler (since he had no clear successor to avenge him or carry on his feuds) and jockey for a position in the anticipatory dispute over succession. An example of this comes from political crises of the reign of Henry IV ("the Impotent") of Castile, whose inability to produce an acceptable heir would dominate Spanish politics for two decades (1454-74). Henry's first marriage had ended in annulment on the grounds of impotence, after a tawdry trial before the papal courts. His only child from his second marriage, Juana, was widely rumored to be the illegitimate daughter of the queen's lover. The nobility were divided between supporters of Juana—backed by the Portuguese court—and supporters of the king's

[9]The Hundred Years War illustrates two key aspects of our theory. First, the fundamental dispute of war was whether the French throne should descend to the king's closest male cousins over closer female-line relatives—an indication of the political uncertainty associated with weakly institutionalized gender-biased norms. Second, the war involved the kings of England prosecuting their claim to the Kingdom of France, demonstrating how the tangled pattern of elite marriages could result in external rulers having plausible claims to the thrones of other monarchies.

sister Isabella—backed by Isabella's father-in-law, the King of Aragon. The result was a reign beset by faction, in which powerful nobles defied the king's authority and consolidated their hold over their own domains (Miller, 1972). These preparations proved useful when the King died, prompting a four year war of succession, ultimately won by the Isabellians.

4 Empirical Approach

Our goal is to establish that the availability of close male heirs to monarchs who ruled within the boundaries of a modern European region in the period 1000-1500AD has a positive effect on contemporary development in that region; and then to provide evidence for the mechanism implied by our theory in Section 2. We focus on the period 1000-1500AD primarily because his five hundred year period corresponds to historians' definitions of the "High" and "Late" Middle Ages—periods of early state development in most European regions.[10] We present our data, baseline sample and empirical strategy as follows.

4.1 Data

To measure contemporary development we use the Log of GDP per capita, adjusted for purchasing power, and averaged across 2007-09. These data are from the Quality of Government (QoG) EU Regional Database and are measured at the "NUTS 2" level, which are the largest subnational units of statistical reporting used by the European Union (Charron, Dijkstra and Lapuente, 2014).

The majority of modern NUTS regions can be associated with medieval polities that had a single ruler for most years between 1000-1500AD. We collected data on 853 unique rulers that reigned in this five hundred year period, and associated them to these regions for all years in which the ruler controlled more than 80% of the region that year. For each ruler, we collected data on the numbers of legitimate and illegitimate male and female children, how many of each died as infants, how many were alive at the time of the ruler's death and on how each ruler was replaced. Since the legitimate brothers of a monarch were also considered to be

[10]Before 1000, data on the children of monarchs are scarce. After 1500, European polities already resemble much more institutionalized territorial states. These states, with their written succession laws and control over the nobility, should be less vulnerable to instability caused by a lack of male heirs, though the shortage of male heirs remained a common source of territorial conflict in Europe until the 19th century. Examples include the War of the Spanish Succession (1701-14) and the War of the Austrian Succession (1740-48).

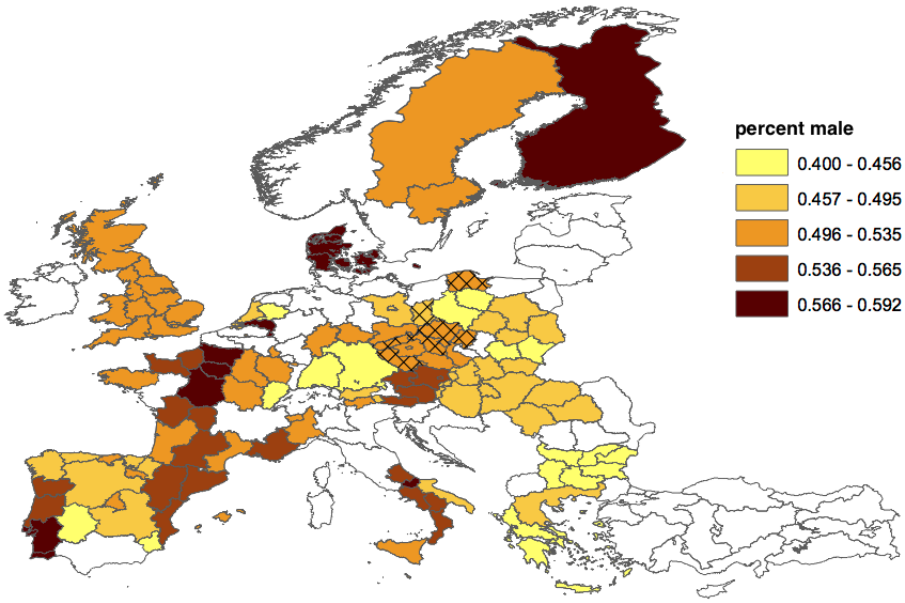

Figure 1. Shaded regions show the proportion of male children of rulers in the period 1000-1500AD. Hatched regions indicate the regions that were ethnically cleansed after the World War II, which we removed from our baseline sample. White regions either fall below our 200 year cutoff, or are regions in non-EU states (Turkey, Norway, Switzerland).

potential heirs to the throne (including in polities that used primogeniture) we also collected data on the number of brothers that were alive at the time of a monarch's death. Our coding of the data is based primarily on McNaughton (1973) and Morby (1989). Royal genealogies are one of the few data sources of medieval society that were recorded will some regularity, and overall, we are missing data on only 5.5% of region-years.

We used these data to construct a variety of measures of the availability of male heirs in each region for the period 1000-1500AD. One of the most straightforward ways to measure this is to consider the number of times a monarch died or was replaced without a male heir (an inverse measure of the independent variable). Another way is to take the total number of legitimate sons and brothers of a monarch that were alive at the time of the monarch's death or replacement, and sum over monarchs that ruled in the five-hundred year period. A third way is to construct the weighted average number of male heirs to each monarch using the lengths of the monarchs' reigns as weights. And, a fourth way is to consider the fraction of years that the polity was ruled by a monarch who had a living heir. The main challenge with each of these four measures is that they are likely to be affected by unobservable

characteristics of regions that affect family size and survival rates, and may have a direct effect on development. To mitigate these endogeneity concerns, we use the fraction of males among legitimate children of monarchs that ruled the region over the period 1000-1500AD. We call this variable "percent male" and depict it in the map of Figure 1. As an estimate of the probability that a region's monarchs will produce a male heir (given the choice to produce a child) this variable provides a suitable measure of the likelihood of having a male heir and is unlikely to be affected by unobserved characteristics of the region, though it may be affected by endogenous male-preferred stopping rules. However, because we find no evidence for such stopping rules (see Section 7.3), we treat this variable as our main independent variable and report analyses using this measure.[11] Finally, to eliminate any remaining concerns about the possibility that endogenous stopping rules are at work, we also use a sixth measure of the likelihood of producing a legitimate male heir, which is the fraction of first born legitimate children of a region's monarchs that were male. This variable cannot be affected by any kind of stopping rule. We note that all of these measures of the independent variable that we describe in this paragraph are correlated in the right way with each other, and all of our main substantive results hold no matter which one we choose.[12]

4.2 Baseline Sample

Our empirical approach assumes that political actors in regions with similar cultural biases and exposed to similar incentive structures. Therefore, to create our baseline sample, we excluded the following region-years from the data: (i) region-years in which the region was controlled by multiple rulers, usually because they were divided among several petty lords, or because the modern political boundary cuts across a medieval one, (ii) region-years in which the region was not ruled by traditional monarchs, but rather by the church or by urban republics, or was populated by unorganized tribal groups, and (iii) region-years in which the region was controlled by Muslims, who had very different inheritance and marriage practices than non-Muslims in Europe (Blaydes and Chaney, 2013).[13] After excluding these region-

[11] We also substantiate the claim that our percent male variable is unlikely to vary with region characteristics in Section 7.1

[12] Results showing that our main substantive findings hold across all of these measures of the independent variable are available upon request.

[13] The exclusion of the urban republics, which are primarily located in central and northern Italy, is important to note since several influential accounts of the long term influence of medieval politics have focused on the

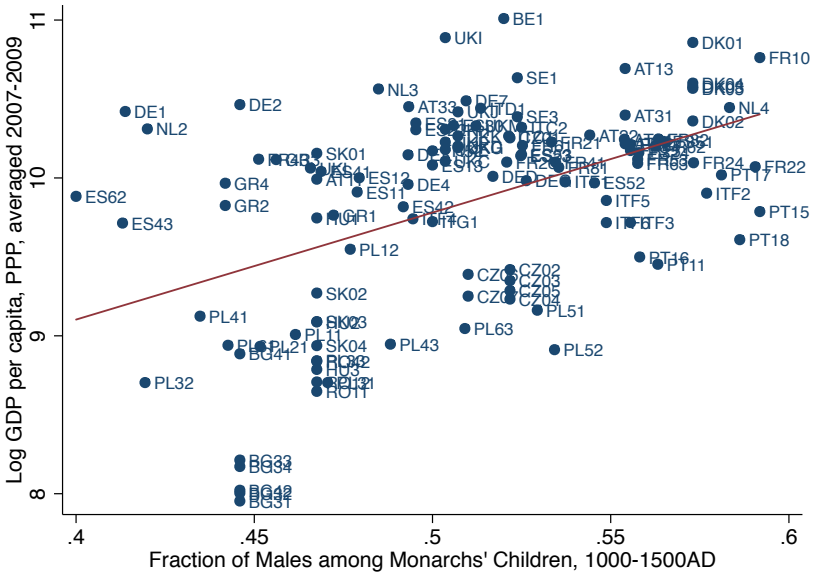

Figure 2. The fraction of males among all legitimate children of monarchs in the period 1000-1500AD plotted against Log of GDP per capita adjusted for purchasing power and averaged between 2007-09. The unit of data are NUTS regions, and data points are labeled by their NUTS code. The Ile-de-France is FR10 and the Subcarpathian province is PL32.

years, some regions have very few years of data, so we excluded regions with less than 200 years of data to avoid basing our inferences on regions where the consequences of (Christian) monarchy were historically unimportant. Although the choice of 200 years is arbitrary, we show that our results are robust to varying this cutoff.

Finally, in arguing that the long-term consequences of medieval inheritance practices have persisted over time, we have implicitly assumed that there is some level of continuity in the population of these areas between that time and ours. In seven regions of contemporary Poland and the Czech Republic, we know this assumption to be false.[14] These regions were populated by German speakers (and ruled by Germanic rulers during the Middle Ages) but their entire populations were forcibly removed after World War II and replaced by Poles and Ukrainians. Given a population change of nearly 100%, we have no reason to expect that medieval events

positive impact of these independent city states (Guiso, Sapienza and Zingales, 2008; Putnam, Leonardi and Nanetti, 1994). Since we are excluding the regions of Europe with the highest levels of wealth and political participation, our estimates of the long-term persistence of medieval political patterns are probably more conservative than they otherwise would be.

[14]These are Dolnoslaskie, Jihozapad, Lubuskie, Opolskie, Pomorskie, Severovychod and Severozapad.

could affect contemporary outcomes in these areas by either cultural or institutional means. Therefore, we exclude these regions from the main analysis, even though their inclusion does not affect *any* of our results.[15] After excluding these regions, we are left with 117 regions, which comprise our baseline sample. These are depicted in the map of Figure 1.

4.3 Unit of Analysis

Although we take the unit of analysis to be defined by modern region boundaries, these modern regions were not the unit of treatment. In particular, single medieval rulers often ruled over multiple modern-day regions, suggesting that the treatment was assigned at units larger than the modern region. For example, the three observations in Wallachia that enter our dataset all have the same values of our independent variables because all three of these regions were ruled in the medieval period by the same sequence of monarchs. The same is true for the eight observations in Hungary and the five observations in Denmark. Even areas with different sets of monarchs in different periods are not fully independent of each other because of their shared membership in supra-local political units like the Holy Roman Empire, "France," or "Poland." To partially account for this dependence, we classify every modern region as belonging to a particular "macro-polity" that existed at the start of the period of our analysis, and we report standard errors clustered at the macro-polity level when appropriate.[16] The key upside to clustering errors at this level is that the borders of macro-polities are stable, unlike the borders of the medieval polities; and, although different rulers ruled over different sets of regions, most of them ruled over regions that belong to a single macro-polity.

Although clustering errors at the macro-polity level is useful, the obvious downside with this approach is that even the macro-polities were not the unit of treatment, and occasionally in some of our analyses with few data points standard errors are negatively correlated within the boundaries of the macro-polity. Therefore, we also examine the robustness of our results to defining the the unit of analysis to be the "medieval polity" at each of five 100 year intervals

[15] Tables with these seven regions included are available upon request.

[16] These macro-polities are the Byzantine Empire, Denmark, England, France, the Holy Roman Empire, Hungary, Iberia, Poland, Scotland, Sicily, Sweden and Wallachia. While the formal boundaries of "France" did not correspond to the territory ruled by French kings until after 1500, areas within these boundaries came to share a deference to the Parisian court well before 1500, which shaped their political experiences. Some of these polities were divided into warring minor units, but their boundaries continued to provide the structure for political contention.

Table 1 – Baseline Results with Alternative Independent Variables

Dependent variable is Log of GDP per capita averaged 2007-09

	Total Male Heirs	Weighted ave. # Male Heirs	# of Zero Male Heirs	% Yr with Male Heir	% Male	Firstborn % Male
	(1)	(2)	(3)	(4)	(5)	(6)
Coef. Estimate	0.012	0.283	−2.725	1.074	7.308	1.340
	(0.004)**	(0.070)**	(1.111)*	(0.343)**	(1.118)**	(0.327)**
	[0.006]†	[0.135]†	[1.605]	[0.533]†	[2.894]*	[0.603]*
Effect of 1 s.d. rise	20.6%	25.6%	−14.2%	19.8%	39.8%	26.6%
N	114	114	114	114	114	114
R^2	0.085	0.128	0.051	0.081	0.276	0.133

†p < .10; *p < .05; **p < .01

Note: OLS estimates of the effects of various independent variables on Log of GDP per capita adjusted for PPP and averaged between 2007 and 2009. The independent variable in column (1) is total male heirs, in column (2) is the weighted average number of male heirs to each monarch using the lengths of the monarchs' reigns as weights, in column (3) is the number of times a monarch died or was replaced without any close male relatives, in column (4) is the fraction of years ruled by a monarch who had at least one male heir at the time of death or replacement, in column (5) is percent male, and in column (6) is firstborn percent male. Standard errors in parentheses. Standard errors clustered at the macro-polity level in brackets.

in the five-hundred year period of our study. We look at these different snapshots in time because the boundaries of the medieval polity changed over time as rulers frequently gained and lost territory throughout the Middle Ages.

5 Baseline Results

Figure 2 shows the simple bivariate relationship between percent male and contemporary log of GDP per capita with data points labeled by their NUTS code, and Table 1 presents coefficient estimates from OLS regressions of the effect of each of our six measures of the independent variable described in Section 4.1 on contemporary Log of GDP per capita. We interpret the estimates as showing that the effect of medieval politics is substantial. For example, a one standard deviation increase in percent male (roughly 0.046) is associated with a rise in GDP per capita of 39.8%, which is considerably large. We take column (5) of Table 1 as our "baseline specification" and in the remainder of this section, we examine the robustness of our results to alternative samples, specifications and empirical approaches more generally.

Table 2 – Baseline Results within Regions and with Country Fixed Effects

Dependent variable is Log of GDP per capita averaged 2007-09

	(1)	(2)	(3)	(4)
% Male	1.579	15.877	−0.837	1.594
	(0.784)*	(3.033)**	(1.060)	(0.850)†
	[1.452]	[4.325]*	[0.179]*	
Effect of 1 s.d. rise	7.2%	55.2%	−3.8%	7.6%
N	53	31	30	114
R^2	0.074	0.486	0.022	0.878
Sample/Specif.	N. Europe	E. Europe	S. Europe	Country FE

†p < .10; *p < .05; **p < .01

Note: OLS estimates of the effects of percent male on Log of GDP per capita for three subsamples and one specification that includes country fixed effects. Columns (1)-(3) are subsamples of eleven countries in Northern Europe, seven in Eastern Europe and four in Southern Europe, respectively. Column (4) is the baseline sample with country dummies included. Standard errors in parentheses. Standard errors clustered at the macro-polity level in brackets.

5.1 Regional Blocs and Cross-National Differences

The fact that the map in Figure 1 reveals substantial differences in our main independent variable across larger regional blocs (such as "Northern Europe" or "Eastern Europe") raises concerns that our estimates are spuriously capturing broad differences between these blocs. For example, most of Poland is poorer than most of France, and has much lower percent male. To address these concerns, we look within the larger regional blocs in Table 2. Columns (1) and (2) show that the effect of percent male is positive when we look exclusively within Northern Europe, and within Eastern Europe, respectively, but is weaker in Northern Europe than it is in Eastern Europe. The effect of a one standard deviation increase in percent male (roughly 0.044) is a much more modest increase in GDP per capita of 7.2% in Northern Europe, but in Eastern Europe the effect of a one standard deviation increase in percent male (roughly 0.028) is quite large at 55.2%.[17]

[17]Our definition of Northern Europe includes Austria, Belgium, Denmark, Finland, France, Greece, Luxembourg, Netherlands, Sweden, the UK and former West Germany. Eastern Europe includes Bulgaria, the Czech Republic, former East Germany, Hungary, Poland, Romania and Slovakia. We choose to treat East and West Germany separately because they had very different political institutions for a large part of the 20th century;

Column (3) shows that our result does not hold in Southern Europe, where we have only thirty observations across four countries, namely Italy, Malta, Portugal and Spain. In Appendix Table A.1, we show that the null-result for Southern Europe is driven mainly by the five regions of Portugal, which are underperforming today even though Portugal was relatively stable, politically, during the Middle Ages and performed very well, economically, in the Late Medieval and Early Modern periods.[18] However, Portugal began a prolonged economic decline in the Early Modern period. One event in this period, particularly relevant to our theory, was the failure of the House of Avis to produce any male heirs in the period just after 1500. This led to Portugal's annexation by the King of Spain (the female-line heir). The long period of absentee rule that ensued is associated with the beginning of Portuguese decline (see, e.g., Kindleberger, 1996, p. 71).

Lastly, column (4) of Table 1 shows that our results hold not just across the borders of modern states, but also within them. This column reports our estimate of the effect of percent male on contemporary development when we introduce country dummies to our baseline specification. Here, the estimated effect of percent male diminishes to approximately one fifth of its effect without the country dummies, but is still significant at the 10% level. The substantive effect of a one standard deviation increase in percent male on GDP per capita is now only 7.6%. However, it is important to note that this estimate almost certainly suffers from post-treatment bias, primarily because the political map of Europe changed frequently and very dramatically even after 1500 and these changes might be correlated with unobservable factors that affect contemporary development in ways that bias our results. Nevertheless, it is reassuring that our main result holds even when we account for cross-national differences through modern country fixed effects.

however, the choice to do this does not affect our results at all. In particular, all of our results would hold if we put all of present Germany in Northern Europe or even if we put all of it in Eastern Europe.

[18] In 1500, Lisbon was one of Europe's largest cities, and one of its most important commercial centers, as the center of the spice trade. At this time, Portugal was also the third most urbanized state in Europe (after Italy and the Netherlands) and nearly twice as urbanized as Britain (calculated using the urban density data that we discuss in Section 6). Outside Europe, Portuguese sailors were building an expansive empire through conquests in Brazil and many parts of Africa and Asia.

Table 3 – Using the Medieval Polity as the Unit of Analysis

Dependent variable is Log of GDP per capita averaged 2007-09

	(1)	(2)	(3)	(4)	(5)	(6)
% Male	4.133	3.146	5.679	4.939	3.979	5.472
	(2.272)†	(2.013)	(2.240)*	(2.185)*	(2.068)†	(2.684)*
N	25	32	33	33	28	20
R^2	0.123	0.128	0.151	0.141	0.124	0.187
Medieval Polity Year	1000	1100	1200	1300	1400	1500

†p $< .10$; *p $< .05$; **p $< .01$

Note: OLS estimates of the effect of percent male on Log of GDP per capita using the medieval polity as the unit of analysis. Since medieval borders are changing, we define these polities at snapshots of 100 year intervals. Standard errors in parentheses.

5.2 The Medieval Polity as the Unit of Analysis

We have taken our unit of analysis to be the modern European region, even though one might think of the treatment as being assigned to at the level of the "medieval polity." The problem with using the medieval polity as the unit of analysis is that medieval borders are changing rapidly and dramatically over the five-hundred-year period of our analysis, as medieval rulers gained and lost territory frequently. For example, the kings of England gained and lost much of modern France in our period, and the kings of Castile gradually gained a great deal of territory from their Muslim neighbors. To define the borders of a medieval polity, we would thus need to fix a particular year, which would conceal much of the internal variation in dynastic experiences, and would dramatically reduce the number of observations for any particular year, since most rulers ruled over multiple regions. Despite this, we show in Table 3 that our results are largely robust to redefining the unit of our analysis to be the medieval polity by choosing the political boundaries at 100 year intervals in the five hundred year period of our analysis. (A "medieval polity in year 1000," for example, consists of the area that was ruled by a particular ruler in year 1000.) The table shows that are results are fairly robust to using these medieval polities across these snapshots in time, rather than modern regions. In fact, 1100 is the only year in which our estimates fall just short of being significant at 10%.[19]

[19]We computed contemporary Log of GDP per capita for such polities by using data on GDP per capita by region, and regional population. Again, our coding is not perfect because some modern regions were divide

5.3 Additional Robustness Checks

As mentioned in Section 4.2, our results are robust to including the seven omitted regions of Poland and the Czech Republic, as well as varying the 200 year cutoff that defines the baseline sample. This results are reported in column (1) of Appendix Table A.1, which adds the seven omitted regions to our baseline sample, and columns (2) and (3) of the same table which use 100 year and 300 year cutoffs, respectively.

6 Evidence for the Mechanism

In this section, we provide additional evidence to support our theory. We first show that the effects of percent male on development can be traced through time. We also provide some evidence for the intermediate links in our theory, as well as evidence for the interactions with the institutionalization of inheritance norms that we discussed in Section 2.3.

6.1 Tracing the Effects Through Time

If the availability of male heirs in the medieval period has had a persistent effect on development, then we should be able to trace the effects of our main explanatory variable, percent male, on measures of economic development over time. Since direct measures of development are generally not available over the time period that we study, we use urbanization data to measure development, which is the standard practice in the literature (see, e.g., DeLong and Shleifer, 1993; Acemoglu, Johnson and Robinson, 2002). Our urbanization data are mostly from Bairoch (1991), and are a subset of the data used by Nunn and Qian (2010). From these data, we constructed urban densities, which are total urban populations divided by area of the region (see the note under Table 4). Table 4 shows that there is essentially no relationship between percent male and urban density in the year 1000, as our theory would predict. However, in the year 1300, we begin to see a positive relationship, which gets stronger in subsequent centuries, implying a growing divergence in economic prosperity over time. This is consistent with theories of development in which shocks affect the trajectories rather than levels of development. Also, note that the significance of the estimates appears to diminish,

among medieval rulers.

Table 4 – Tracing the Effects Through Time

Dependent variables are Log of Urban Density, various years

	1000	1300	1400	1500	1600	1700	1800
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
% Male	1.541	3.371	3.505	3.402	3.529	4.286	4.982
	(1.103)	(1.567)*	(1.705)*	(1.765)†	(2.105)†	(2.327)†	(2.563)†
	[1.195]	[1.804]†	[1.370]*	[2.143]	[2.006]	[2.371]†	[3.097]
Effect of 1 s.d. rise	7.3%	16.7%	17.4%	16.9%	17.6%	21.7%	25.7%
N	114	114	114	114	114	114	114
R^2	0.017	0.040	0.036	0.032	0.024	0.029	0.033

†p < .10; *p < .05; **p < .01

Note: OLS estimates of the effects percent male on Log of Urban Density in the years 1000, 1300, 1400, 1500, 1600, 1700 and 1800 in columns (1)-(7) respectively. Urban Density is defined as (1+urban population) divided by area of the region in square km. Standard errors in parentheses. Standard errors clustered at the macro-polity level in brackets.

which is consistent with the view that over time, other intervening shocks and developments have made the relationship between percent male and urbanization more noisy.

6.2 Coups, Conflict and Quality of Government

In this section we provide additional evidence for our mechanism by showing that percent male has an effect on conflict and political instability as well as on contemporary measures of the quality of state institutions. Recall that our theory is that the likelihood of having male heirs affects the occurrence of conflict and political instability, which in turn affect contemporary development via state-building. Columns (1)-(4) iof Table 5 provide evidence for the first link in this mechanism. Column (1) shows that percent male has a negative effect on the number of monarchs that were removed from power in a coup in a given region between 1000-1500AD—either by being killed or by being forcibly deposed—which we treat as a proxy for political conflict. Column (2) shows that it has a positive effect on the average length of rule by a single dynasty, which we consider to be a measure of political stability. Columns (3) shows that in a panel logistic regression with regional and decade fixed effects, the effect of the lagged number of legitimate male heirs on the occurrence of an internal war is negative and highly significant. Finally, column (4) of the table shows that percent male has a positive

Table 5 – Coups, Conflict and Quality of Government

	Number of coups	Average dynasty length	War	Quality of Government (QoG)
	(1)	(2)	(3)	(4)
% Male	−6.888	0.798		8.324
	(3.253)*	(0.282)**		(2.101)**
	[9.213]	[0.482]		[6.101]
Lagged Legitimate Male Heirs			−0.046	
			(0.006)**	
N	117	117	49,165	114
R^2/# NUTS	0.038/	0.065/	/119	0.123/

$^{\dagger}p < .10$; $^{*}p < .05$; $^{**}p < .01$

Note: OLS estimates of the effects of percent male on number of coups, the average length of reign of a dynasty, and regional Quality of Government (QoG) in columns (1), (2) and (4) respectively. Column (3) reports estimates from a panel logistic regression of the occurrence of war (1 if occurred, 0 if didn't) on the lagged number of legitimate male heirs in a specification that includes both region and decade fixed effects. Standard errors in parentheses. Standard errors clustered at the macro-polity level in brackets.

effect on contemporary institutional quality, as measured by the "Quality of Government" (QoG) index from the Quality of Government EU Regional database.[20]

6.3 The Institutionalization of Inheritance Norms

Different areas of medieval Europe had different degrees of institutionalization of inheritance norms. For example, many areas of the former Carolingian Empire practiced Salic law, which prohibited inheritance through female lines of decent. At the same time, polities that were not part of the former Carolingian Empire may have had equally high amount of un-coordinated, or un-institutionalized, cultural gender bias against female-line inheritance, but they did not institutionalize a tradition that outright prohibited it. In this section, we are interested in understanding how the effects of our percent male variable vary with the degree of institu-

[20]The QoG index is a composite measure of three sub-composites: Quality, Impart and Corrupt, all of which are contemporary measures based on surveys conducted in the last ten years. "Quality" is a composite measure of the quality of healthcare provision, public education and law enforcement, the extent to which corruption exists in regional elections, and the extent to which the media reports corruption by politicians. "Impart" is a measure of impartiality in the provision of heath, education and law enforcement. "Corrupt" is a measure of the control of corruption in the provision of health, education and law enforcement as well as perceived control on corruption in the public sector.

Table 6 – Interactions with Inheritance Norms and Women Rulers

Dependent variable is Log of GDP per capita

$Z =$	Salic	Nontribal	Women
	(1)	(2)	(3)
% Male	8.691	12.226	7.245
	(1.290)**	(1.533)**	(1.449)**
Z	4.769	5.055	0.006
	(1.229)**	(1.104)**	(0.569)
% Male $\times$ Z	−8.542	−9.959	0.019
	(2.367)**	(2.163)**	(1.132)
N	114	114	114
R^2	0.398	0.383	0.266

†p < .10; *p < .05; **p < .01

Note: OLS estimates of models interacting percent male with other variables, with Log of GDP per capita as the dependent variable. Column (1) is the interaction with regions that used Salic law, column (2) with non-tribal regions that adopted Roman law as opposed to Germanic law, and column (3) with the number of women rulers. Standard errors in parentheses.

tionalization of inheritance norms.

As we mentioned in Section 2.3, theory is silent as to whether we should expect percent male to have a higher or lower effect on contemporary development in Salic law regions than elsewhere. To recapitulate, if cultural gender bias was very much higher in Salic law regions than elsewhere, violent conflicts resulting from succession disputes could be more common in Salic law regions when percent male is lower and close male relatives are scarcer. Alternatively, because succession disputes often arose from female-line heirs prosecuting their claims to the throne, violent conflict might actually be rarer in regions that practiced Salic law because female-line heirs in these regions would less frequently dispute successions by more distant male-line relatives when close male relatives were not available. In this case, percent male might have a smaller effect on development in areas that practiced Salic law, because gender bias is so highly institutionalized that conflict between male- and female-line heirs is rarer. The results of column (1) in Table 6 support the second perspective: percent male has essentially no effect on contemporary development in areas that practiced Salic law, whereas it has a very large effect on contemporary development in other regions.

Another instance of variation in the degree of institutionalization of succession rules comes

from comparing the tribal areas that practiced Germanic law to those that were exposed to Roman legal traditions. Because Germanic law tended to be less than Roman law, we would expect to see the effect of percent male be lower in the non-tribal areas that were exposed to Roman law than in the tribal areas that practiced Germanic law. This hypothesis is confirmed in column (2) of Table 6. This column shows that in the non-tribal polities of medieval Europe that had Roman and Greek traditions, the effect of percent male is significantly lower than it is in the tribal areas that had more weakly institutionalized succession rules. Again, the historical evidence points to succession disputes being more frequent in the tribal areas than in polities that drew on their Roman and Greek traditions to establish coordinated rules governing succession when close male relatives were unavailable.[21] These polities, like those that practiced Salic law, had more precise and more deeply specified succession rules that their citizens and nobles could rely on even when the monarch had no close male relatives.[22]

The results of columns (1) and (2) suggest that the degree of institutionalization of succession rules matters more for explaining variation in the effect of percent male on contemporary development, than does any possible variation in gender bias that might account for variation in the adoption of these norms. Indeed, Boserup (1970) has argued that gender bias was very high across all of Europe, and did not vary much from one European region to another. This view is supported by the fact that there is a total of only 91 women rulers in our data (only 10.6% of the total number of rulers), and the number of women rulers does not vary much with geography. It is also supported by the result of column (3) in Table 6, which shows that the effect of percent male does not vary in any discernible way with the number of female rulers. We also find that the number of female rulers has no discernible effect on contemporary Log of GDP per capita.[23]

[21] We do not have direct evidence on differences in the frequency of succession disputes in tribal versus non-tribal areas, but we do see that the average number coups from 1000-1500AD for tribal areas is higher, at 4.746, than for non-tribal areas, at 3.056, with the difference being statistically significant at the 1% level.

[22] This is true, despite the fact that the 42 Salic law regions in our sample are exactly evenly divided between the sets of 54 non-tribal polities and 63 tribal polities.

[23] We ran an OLS regression of our dependent variable, contemporary Log of GDP per capita, on the number of woman rulers that a region had in the five hundred year period of our study across regions in our baseline sample. The coefficient estimate was $-.026$ ($s.e. = .056$, $R^2 = 0.002$).

6.4 Primogeniture

So far, we have put aside the fact that most European polities eventually adopted primogeniture as their succession norm at some point during the five-hundred-year period of our analysis (Kokkonen and Sundell, 2014; Blaydes and Chaney, 2013). In this section, we show that the gradual adoption of primogeniture does not affect our results. In fact, it appears that some part of the adoption of primogeniture was driven by the availability of male heirs.

Which polities adopted primogeniture? We argue that after a series of uncontested male successions, a norm of hereditary succession would gradually emerge. In other words, the abundance of male heirs allowed primogeniture to become formally institutionalized. This is consistent with the data collected and coded by Kokkonen and Sundell (2014), who found that although primogeniture became more common over time in medieval Europe, its acceptance was gradual and uneven, which some states shifting back and forth repeatedly in response to political crises. For instance, according to Kokkonen and Sundell (2014), Bohemia adopted primogeniture in 1230, abandoned it in 1305, readopted it in 1346, and abandoned it in 1419. Notably, both adoptions of primogeniture occurred under sovereigns with multiple male heirs, while both abandonments of it occurred under monarchs with no children.

Column (1) of Table 5 presents indirect evidence for our hypothesis that polities might have strategically adopted and abandoned primogeniture depending on the abundance or shortage of male heirs. It shows that percent male has a positive effect on the fraction of years in the five hundred year period of our analysis that a polity used primogeniture as its succession rule. Columns (2) and (3) also support the view that the abundance of male children in a particular region affected the likelihood that primogeniture was adopted in that regions. These columns report the results of panel logistic regressions where the adoption of primogeniture is the dependent variable (1 if adopted, 0 if not) and the independent variables are, respectively: the number of legitimate male children of the ruler in that region, and a running average of the number of legitimate male children to rulers who ruled in the previous 25 years. The results together are clear: the abundance of male heirs affects the adoption of primogeniture.

Column (4) of Table 6 then shows that the fraction of years between 1000-1500AD that a polity used primogeniture in turn appears to affect contemporary Log of GDP per capita. However, column (5) shows that this is probably because primogeniture is carrying the effect of percent male (since primogeniture loses significance once we include percent male as a

Table 7 – Primogeniture

	% Years Primo.	Adoption of Primogeniture		Log of GDP per capita averaged 2007-09		
	(1)	(2)	(3)	(4)	(5)	(6)
% Male	2.544				7.061	11.770
	(0.680)**				(1.225)**	(1.567)**
	[1.213]†				[2.705]*	[3.673]**
# Male Children		0.100				
		(0.005)**				
25 Yr ave. Male Children			0.565			
			(0.023)**			
% Yr Primo				0.394	0.052	6.051
				(0.169)*	(0.156)	(1.382)**
				[0.430]	[0.267]	[2.544]*
% Male × % Yr Primo						−11.765
						(2, 695)**
						[4.685]*
N	117	36, 622	32, 619	114	114	114
R^2/# NUTS	0.109/	/82	/80	0.046/	0.071/	0.374/

†p < .10; *p < .05; **p < .01

Note: Column (1) is the OLS estimate of the effect of percent male on the fraction of years a region used primogeniture as its succession rule between 1000-1500AD. Columns (2) and (3) are panel logistic regressions with modern region (NUTS) fixed effects, estimating the effort on the adoption of primogeniture (1 if adopted, 0 if not) of (i) the number of legitimate male heirs and (ii) a 25 (preceding-)year running average of the number of legitimate male heirs. Columns (4)-(6) are various OLS model specifications of Log of PPP adjusted GDP per capita, averaged between 2007-2009, on the fraction of years that the region adopted primogeniture as its succession rule. Standard errors in parentheses. Standard errors clustered at the macro-polity level in brackets.

covariate). Finally, column (6) shows that the effect of percent male varies with the fraction of years that a polity used primogeniture in ways similar to how the effect varies with whether or not a polity used Salic Law or Roman Law: the effect of percent male is weaker in polities that increased the degree of institutionalization of their succession rule by adopting primogeniture. We do note, however, that at typical levels of percent male, i.e., close to 50%, the effect of primogeniture itself is insignificant. Therefore, the result of column (6) also supports the institutionalization hypothesis tested above in columns (1) and (2) of Table 6, and shows that our results are not driven by the secular trend towards primogeniture.

7 Endogeneity and Other Concerns

In this section, we address a number of potential concerns with our analysis. The first three subsections address concerns about endogeneity, missing data and gender-related stopping rules. Section 7.4 addresses the question of whether having multiple close male relatives created more opportunities for conflict, causing a deleterious effect on long run development.

7.1 Environmental Factors and Sex Ratios

One possible critique of our main finding is that the sex ratio of children is in fact endogenous to some social or environmental trait of the region. While this may be plausible given the fact that a large literature in demography has showed that the sex ratio of children is affected by the behavior or environment of their parents, we present evidence in this section casting doubt on the concern that it is heavily influencing our results.

The children of monarchs in all regions, even poor ones, were likely to have had access to very high absolute levels of nutrition and attention by the standards of the time. Conditional on being a monarch, we suspect that regional differences in the immediate biological environment of rulers in different regions should be small. Moreover, the effects of environmental factors on sex ratios found in the demography literature tend to be very small, and owe their discovery to the very large datasets common in this literature. Relative to the effects found in the demography literature, the differences we find between rich and poor regions are extremely large, a difference that is shown plainly in Figure 3. The figure shows the effect sizes of various environmental factors, events or family/parental traits on the percent of male births from previous studies, as well as the differences between the top and bottom quartiles of modern regional GDP per capita in the percent male variable of this paper (see the note below the table). The economic stress of the German re-unification, for instance, caused the ratio of male births to increase by .004. World War II, a calamitous event, had an even smaller effect on the precent of male births in Europe. The difference in our percent male variable between the richest and poorest quartiles of European regions, by contrast, is .047. We take this comparison to indicate that any pre-existing difference in the ratio of male children is probably too small to be driving our results.

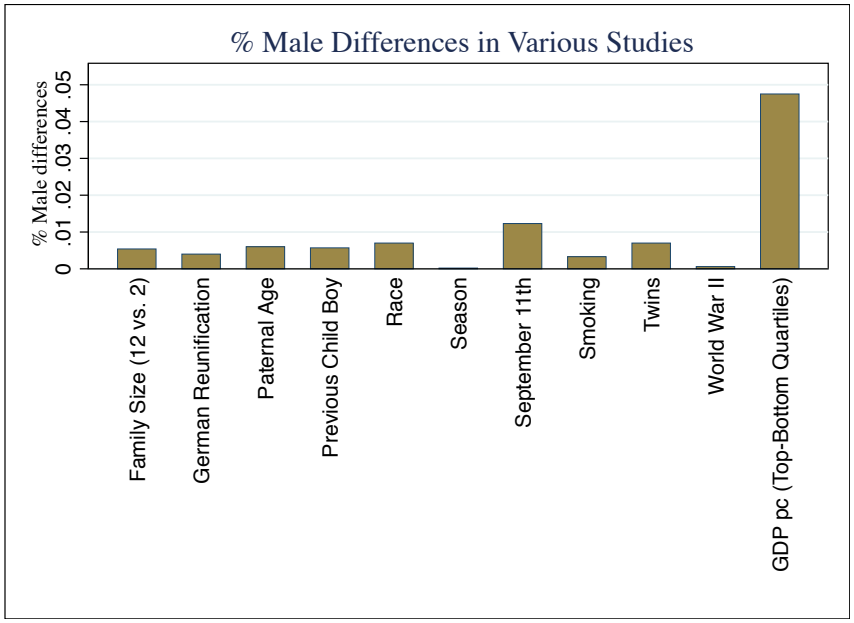

Figure 3. The bars represent observed differences between the proportion male in treatment and control groups in selected studies. Visaria (1967), for instance, found that the percent of male births was .514 for whites and .507 for blacks, giving a treatment effect of .007. Other determinants are season (Lyster, 1971), gender of the previous child (Malinvaud, 1955), family size (Malinvaud, 1955), the calamity of World War II (MacMahon and Pugh, 1954), smoking (James, 1987), twin births (Jacobsen, Møller and Mouritsen, 1999), paternal age (Jacobsen, Møller and Mouritsen, 1999), the calamity caused by the September 11th terrorist attacks (Catalano et al., 2006), and the stress of German re-unification (Catalano, 2003). The bars on the right shows the comparable figure for our percent male variable, comparing percent male for the poorest and richest quartiles using our measure of GDP per capita, adjusted for PPP, and averaged between 2007-09.

7.2 Illegitimate Children Placebo Test

As an additional test of this endogeneity critique, we conducted an "illegitimate children placebo test." Since norms against succession by illegitimate children were very strong (though broken in a few notable cases by dynamic men) we have no reason to think that the sex ratio of illegitimate children should have influenced medieval politics.[24] Though illegitimate children are obviously underreported, we have data on several hundred in our period. We ran an OLS model of the effect of the percent of illegitimate male children among all illegitimate children of European monarchs that ruled a particular region of Europe between 1000-1500AD on our main dependent variable, Log of GDP per capita, adjusted for PPP and averaged 2007-09. The coefficient estimate in a sample only slightly smaller than our baseline sample was

[24]There is no example of succession by or through an illegitimate daughter in our data.

small, barely discernible, and actually *negative* at -0.504 ($s.e. = 0.273$, macro-polity clustered $s.e. = 0.506$, $N = 107$, $R^2 = 0.031$). This provides additional justification to our claim that the large positive results we find in our baseline estimates are not driven by underlying environmental differences.

7.3 Male-Preferred Stopping Rules

Another concern with our approach is that the sex ratio of royal children are the product of male-preferred fertility stopping rules within families. We have already shown in Table 1 that such stopping rules are not affecting our results by showing that the percent of *firstborn* children that are male also has a significant and sizable effect on contemporary development. Since the sex of the firstborn child is also an indicator (albeit an imperfect one) of the likelihood of that male heirs are available, but cannot be affect by *any* kind of stopping rule, our results are not driven by any biases created by gender-related stopping rules. In this section, we show that the effects of percent male that we estimate are also unlikely to be affected by a male-preference stopping rule.

The main concern is that because monarchs had strong incentives to continue their dynasties, it is plausible that they would keep having children until they had sufficiently many boys, skewing the distribution of the sex ratio within a family. Within a nuclear family, it is certainly possible that such stopping rules have large effects on the sex ratio averaged across families. In larger populations, however, the effect of such stopping rules can only have a small effect on the population sex ratio, so long as the probability of producing a boy is constant across couples.[25] This is why we prefer calculating proportion of male children among all children of monarchs over the five-hundred-year period of our study, rather than averaging percent male across nuclear families. Nevertheless, it is still possible that male-preferred stopping rules are affecting our results. However, this is unlikely to be the case. Under a male-preferred stopping rule, the fraction of male children within a family (or in a small population of families) should be *negatively* correlated with family size (Keyfitz et al., 2005). We have no evidence of this in our data. In fact, the fraction of legitimate male children in a polity is actually positively

[25]This fact is a basic result in mathematical demography (Keyfitz et al., 2005). Without sex-selective abortion that directly affect the underlying probability of males being born, any stopping rule would merely change the distribution of boys and girls across nuclear families, with some parents keeping their families small after having a boy and other having many girls in order to have a boy.

correlated with the average number of legitimate children of rulers in the 500 year period of our study (the correlation coefficient is +0.34).

7.4 Multiple Male Heirs

One might think that having multiple legitimate male heirs may lead these heirs to conflict over succession, resulting in more destructive conflict, weaker states and weaker development outcomes. To examine this possibility, we test the hypothesis that increasing the fraction of monarchs with multiple legitimate male heirs at the expense of the fraction of monarchs with only one legitimate male heir (i.e., holding fixed the fraction of monarchs with only no legitimate male heirs at the time of their death) is harmful for development. Specifically, we estimate the following model by OLS:

$$\text{Log GDP per capita}_j = \beta_0 + \beta_1 \text{ Zero Heirs}_j + \beta_2 \text{ More than one Heir}_j + \varepsilon_j \qquad (1)$$

where Zero Heirs_j is the fraction of monarchs of region j that had zero legitimate male heirs at the time of death or replacement, More than one Son_j is the fraction of monarchs of region j that had multiple legitimate male heirs at the time of death or replacement, and ε_j is the error term. The hypothesis is that $\beta_2 \leq 0$. We soundly reject this hypothesis in column (1) of Table 8. Columns (2) and (3) of the same table also show that we can reject the hypothesis even in subsamples of polities j that used primogeniture in less than half the number of years, and those that used primogeniture in more than half the number of years.

These results should not be surprising. Most polities, in fact, had relatively clear and institutionalized succession orders, regardless of whether they used primogeniture, agnatic succession or other kinds of succession rules. For example, in polities that used primogeniture the monarch's oldest male son is first in the line of succession, followed by the second oldest male son, etc. Whichever the succession rule, each potential male successor is likely to have known his position in the succession hierarchy. Nobles would have clear and coordinated expectations regarding the succession norm as well. The potential for conflict over succession would, therefore, be limited. Where a female or female-line heir fell in the order of succession was, on the other hand, much less clear. Therefore, in the absence of close male relatives, succession disputes could be common, but they were unlikely to be common when the monarch had many potential male successors.

Table 8 – Multiple Male Heirs

Dependent variable is Log of GDP per capita averaged 2007-09

	(1)	(2)	(3)
Zero Heirs	−0.680	−0.053	0.752
	(1.209)	(0.639)	(2.467)
More than One Heir	4.769	2.905	7.047
	(1.359)**	(0.637)**	(3.055)*
N	114	51	63
R^2	0.146	0.322	0.105
Sample	Baseline	> 50% years primogeniture	< 50% years primogeniture

†p < .10; *p < .05; **p < .01

Note: OLS estimates for equation (1) in the main text using three samples. Column (1) is the full baseline sample. Column (2) is a subsample of regions that used primogeniture as their succession rule in more than 50% of years in our five-hundred year period. Column (3) is a subsample of regions that used primogeniture as their succession rule in less than 50% of years in our five-hundred year period. Standard errors in parentheses. Standard errors clustered at the macro-polity level in brackets.

8 Conclusion

Our findings show that the state building processes that were underway in medieval Europe have had profound consequences for the development of the continent. In regions where chance allowed for a series of uncontested leadership transitions, rulers were able to build up a set of state institutions that have supported economic development. In areas burdened with more potential succession disputes, and thus more politically instability, the path to economic prosperity was much more arduous. These results reinforce finding of the political economy of development literature on the negative effect of violent conflict, and the importance of political institutions for development.

Besides emphasizing the importance of state building in general, our results show the pre-1500 period specifically was an important period in the political development of the modern world, and that within Europe the political trajectories of regions diverged much earlier than is sometimes argued. The emergence of the first modern states in this period was so important, and the states themselves so fragile, that even small disruptions could have long

term consequences—consequences that we have shown are measurable even after centuries of revolution, industrialization, war and institutional growth.

The findings also illustrate the remarkable effect of chance and other contingent factors on political development. Far from being determined by natural resources, disease environments, preexisting political institutions, or even the plans of their rulers, the fortunes of regions like Naples and France were influenced by accidents of biology. The results provide a rejoinder to a focus on large structural predictors of social scientific phenomena, and remind us the glorious chaos of politics in an unpredictable world.

Appendix

Table A.1 below presents additional results mentioned in the main text in Section 4.2 and again in Section 5.3.

Table A.1 – Robustness to Defining Different Samples

Dependent variable is Log of GDP per capita averaged 2007-09

	(1)	(2)	(3)	(4)	(5)
% male	6.957	7.327	7.054	0.814	1.665
	(1.163)**	(1.124)*	(1.231)**	(1.108)	(0.703)*
	[2.750]*	[2.949]*	[2.663]*	[1.590]	[1.127]
N	121	120	93	25	78
R^2	0.231	0.265	0.265	0.023	0.069
Sample	Baseline + 7 omitted regions	100 year cutoff	300 year cutoff	S. Europe - Portugal	W. Europe - Portugal

$^{\dagger}p < .10$; $^{*}p < .05$; $^{**}p < .01$

Note: OLS estimates of the effect of percent male on Log of GDP per capita under alternative samples and specifications. In column (1), we return the seven omitted regions in the Czech Republic and Poland to the baseline sample. Columns (2) and (3) vary the 200 year cutoff described in Section 4.2 to 100 years and 300 years, respectively. In column (4) we remove the five regions in Portugal from the Southern Europe sample used in column (3) of Table 2, while in column (5) we add all of the observations in Northern Europe to the Southern Europe sample without Portugal (giving us "Western Europe" without Portugal). Standard errors in parentheses. Standard errors clustered at the macro-polity level in brackets.

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