HISTORY'S MASTERS:
THE EFFECT OF EUROPEAN MONARCHS ON STATE PERFORMANCE

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ABSTRACT

We create a novel reign-level dataset for European monarchs, covering all major European states between the 10th and 18th centuries. We first document a strong positive relationship between rulers' cognitive ability and state-level outcomes. To address endogeneity issues, we exploit the facts that i) rulers were appointed according to hereditary succession, independent of their ability, and ii) the wide-spread inbreeding among the ruling dynasties of Europe led over centuries to quasi-random variation in ruler ability. We code the degree of blood relationship between the parents of rulers, which also reflects 'hidden' layers of inbreeding from previous generations. The 'coefficient of inbreeding' is a strong predictor of ruler ability, and the corresponding instrumental variable results imply that ruler ability had a sizeable effect on the performance of states and their borders. This supports the view that 'leaders made history,' shaping the European map until its consolidation into nation states. We also show that rulers mattered only where their power was largely unconstrained. In reigns where parliaments checked the power of monarchs, ruler ability no longer affected their state's performance. Thus, the strengthening of parliaments in Northern European states (where kin marriage of dynasties was particularly wide-spread) may have shielded them from the detrimental effects of inbreeding.

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"It was a time ... 'when the destinies of nations were tied to bloodlines'."

– Robert Bartlett ("Blood Royal: Dynastic Politics in Medieval Europe," 2020, p.432)

1   Introduction

A growing literature points to the importance of leaders for the performance of their firms and organizations (c.f. Bertrand and Schoar, 2003; Malmendier and Tate, 2005). Likewise, local political leaders have substantial effects on public goods provision and conflict in the region or community under their control (c.f. Chattopadhyay and Duflo, 2004; Logan, 2020; Do et al., 2020; Eslava, 2020). However, identifying such effects at the *national* level is difficult. The question whether national leaders can shape their countries' fortunes has been widely debated in the social sciences over the past two centuries. Early advocates proposed the strong view that the "history of the world is but the biography of great men" (Carlyle, 1841, p. 47). Subsequent qualitative analyses of biographies and comparative studies have lent support to an important role played by individual leaders.[1] On the other hand, a literature in the Marxist tradition has argued that underlying structural demographic and economic forces determine both a state's performance and the endogenous emergence of its leaders. Scholars in this strand view leaders as "history's slaves" (Tolstoy, 2007, p. 605); in the words of Braudel and Reynolds (1992, p. 679): "Men do not make history, rather it is history above all that makes men."[2]

Economists have brought identification to this debate. Jones and Olken (2005) show that random leadership transitions due to natural death or accidents are followed by changes in economic growth over the post-WWII period, providing convincing evidence that leaders do indeed matter. Besley, Montalvo, and Reynal-Querol (2011) expand the underlying data to 1875-2004, documenting that random departures of educated leaders cause particularly strong reductions in growth. While these results are an important step forward in identifying a causal effect of leader capability on state performance, some open issues remain: The actual "quality" of leaders is unobserved; it is estimated as average economic growth a few years before and after a random death, and it therefore also captures other factors. In this context, Easterly and Pennings (2020) point out that the

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[1]See for example Kennedy (1988) and Gueniffey (2020). A literature in political psychology has also underlined the importance of leaders' cognitive capabilities (c.f. Simonton, 2006). Horowitz, Stam, and Ellis (2015, p. 11) conclude that "leaders do matter in systematic ways that we can understand."

[2]In his magnum opus War and Peace, Russian writer Lev Tolstoy attested to leaders that "every act of theirs...is...predestined from eternity" (Tolstoy, 2007, p. 605). Karl Marx wrote: "Men make their own history, but they do not make it as they please; they do not make it under self-selected circumstances, but under circumstances existing already, given and transmitted from the past. The tradition of all dead generations weighs like a nightmare on the brains of the living" (Marx, 1907, p. 5). Friedrich Engels elaborated: "But that in default of a Napoleon, another would have filled his place, that is established by the fact that whenever a man was necessary he has always been found: Caesar, Augustus, Cromwell, etc." (Engels, 1968, p. 704). This alternative view, cautioning the interpretation of history through the biography of individuals, is well alive in the modern debate as well. March and Weil (2009, p. 97) assert that "it is not at all clear ... that major differences in the success of organizations reflect differences in the capabilities of their leaders, or that history is the product of leaders' actions."

high volatility in growth makes it difficult to distinguish between random spikes and actual effects of individual leaders. In addition, while the timing of the transition is exogenously determined by death, the appointment of the subsequent leader is endogenous. Finally, the necessary annual GDP data is only available for the modern period, so that the causal role of leaders in history (where it has been debated most intensely) has not been examined. To make progress on these fronts, the ideal experiment would feature a sequence of randomly appointed leaders with varying, observed capabilities who govern over a long horizon. While this is empirically unattainable, Europe's monarchies over the late medieval and early modern period provide a context that, in some ways, resembles such a setting.

We study European monarchs over the period 990-1795, assembling a novel dataset on ruler ability and state performance at the *reign* level. To identify a causal effect of ruler ability, we exploit two imminent features of ruling dynasties: first, hereditary succession – the pre-determined appointment of offspring of the prior ruler, independent of their ability; second, variation in ruler ability due to the widespread inbreeding of dynasties. Importantly, the negative effects of inbreeding were not understood until the 20th century; if anything, rulers believed that inbreeding helped to preserve 'superior' royal traits. In addition, the full degree of consanguinity (genetic similarity) was unknown due to complex, interrelated family trees over generations. Together, these features deliver quasi-random variation in ruler ability.

We collect data on the ability of 336 monarchs from 13 states, building on the work by historian F.A. Woods (1906, 1913), who coded rulers' cognitive capability based on reference works and state-specific historical accounts. While Woods explicitly aimed to assess rulers' ability independent of the performance of their states, this coding nevertheless raises endogeneity concerns. We thus instrument for cognitive ruler ability with the coefficient of inbreeding of rulers. We collect this variable for all rulers with the necessary information on family lineages from a rich genealogical database. The coefficient of inbreeding is a strong and robust predictor of ruler ability. To assess state performance during a ruler's reign, we use three different outcome variables. First, a coding of state performance that is based on several underlying metrics and summarizes the work by numerous historians (Woods, 1913). Because there are natural concerns with this subjective coding, we use two additional, objective measures. Our second outcome variable measures changes in land area during each ruler's reign. We derive this variable from Abramson (2017), who provides European state borders at five-year intervals over the period 1100-1795. Finally, we also calculate the change in urban population within the (potentially changing) area ruled by each monarch, combining border changes with the urban population data of Bairoch, Batou, and Chèvre (1988).

We find that ruler ability is strongly associated with all three measures of state performance, and our IV results suggest that this relationship is causal. A one-standard-deviation (std) increase in

ruler ability leads to a 0.8 std higher state performance, to an expansion in territory by 18 percent, and to an increase in urban population by 19 percent. In exploring possible mechanisms, we find that inbreeding affected state-level outcomes via rulers' cognitive ability, but not via physical attributes such as longevity, number of offspring, body height, or their non-cognitive abilities. Less inbred, capable rulers tended to improve their states' finances, commerce, law and order, and general living conditions. They also reduced involvement in international wars, while at the same time expanding their territory into urbanized areas. This suggests that capable rulers chose conflicts 'wisely,' resulting in expansions into valuable, densely populated territories.

We also study the institutional circumstances under which individual rulers mattered particularly strongly. We construct a novel state-year specific measure of historical constraints on rulers, combining definitions of the modern Polity IV score with historical sources on factors such as the power of parliaments. To bypass endogeneity issues, we use constraints on rulers in the year just before they were appointed, and we only focus on our two 'objective' outcome variables because historians' subjective assessment of state performance may be influenced by the state's institutions. We find that the ability of *unconstrained* leaders had a strong effect on state borders and urban population in the reign, while the capability of *constrained* rulers made almost no difference.

We run a battery of checks to confirm the robustness of our results and the validity of our IV strategy. Our baseline regressions include state fixed effects and are thus driven by variation in ruler ability and state performance *within* states over time, filtering out time-invariant features and differences in average state performance across Europe. Our findings are unaffected when we exclude episodes of governments by regents (for example, when rulers were minor at the time of their appointment), when excluding episodes of foreign rule, or those when the same monarch governed more than one state. We also verify and extend Woods' (1906; 1913) coding of ruler ability and state performance, showing that our results are robust to using only our own assessments, to extending the sample period until 1914, to adding Poland and Hungary to the 13 states in our baseline sample, and even to a conservative coding that specifies ambiguous cases in Woods' coding so that they work against our main finding. Finally, we confirm the robustness of our results in alternative pair-level regressions in differences that compare concurrent rulers *across* states, filtering out not only state fixed effects but also time trends specific to the period of the reigns.[3]

Our IV results, in particular, are robust to excluding cases of high inbreeding coefficients and to a battery of additional robustness checks. We also discuss potential threats to the exclusion restriction, which requires that inbreeding was not related to state performance via channels other than ruler ability. For instance, such a threat would arise if monarchs made strategic decisions on

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[3]Accounting for time trends is not straightforward in our main regressions because there is no clear-cut time variable: Reigns begin and end at different times in different states, and they also often span across centuries. In our pair-level regressions, we identify for each monarch all rulers from other states that had at least a one-year overlap in their reigns.

kin marriage for reasons that were correlated with the *subsequent* state performance under their heir's reign. We address this possibility by excluding the component of inbreeding that resulted from each ruler's parents, exploiting only the *hidden* component of inbreeding that resulted from the complex networks of kin marriage over previous generations. This 'hidden' coefficient of inbreeding could only be assessed with methods in genetics that emerged in the early 20th century. We confirm our IV results based on this restrictive measure of inbreeding. We further show that past state performance predicts neither current state performance nor ruler ability, and our IV results are robust to controlling for lagged state performance.[4] In addition, we address other potential confounders such as strategic marriage for territorial expansions, the relationship between family ties and conflict, as well as 'founders vs. descendants' effects within dynasties. The table at the end of the online appendix summarizes our discussion of identifying assumptions and threats to identification, and it provides links to our historical and empirical evidence that addresses these.

Our paper makes novel contributions both in terms of data collection and empirical results. We are the first to track the performance of all major European states at the *reign* level over a horizon of several centuries, accounting for the frequent changes in borders. In contrast, previous seminal papers have typically used today's country borders as their unit of analysis, and they have relied on (half-) century level outcomes such as GDP per capita or urbanization (c.f. Acemoglu, Johnson, and Robinson, 2005; Nunn and Qian, 2011; Dittmar, 2011). Our dataset thus opens a new dimension to study Europe's history. In addition, we introduce the coefficient of inbreeding as a source of quasi-random variation.[5] Using this novel dataset, we contribute to a large literature that has debated the role of rulers for nationwide outcomes. We analyze a period that has been at the center of this debate since its beginning in the 19th century.[6] Our paper is the first to provide

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[4]For our first, subjective, measure of state performance, the exclusion restriction could also be violated if inbreeding affected the *assessment* of state performance by historians – for example, if they hypothesized negative effects of inbreeding on rulers, and in turn of bad rulers on states. This is unlikely because Woods was a proponent of 'Social Darwinism,' viewing history as a process of natural selection. Woods' (1913) hypothesis was that moral and intellectual ability is inheritable, so that kin marriage among successful dynasties would produce *better* rulers. This introduces a bias *against* our findings. In addition, the negative effects of inbreeding on fitness were not accepted in biology until the second half of the 20th century (see Wolf, 2005, for detail on this debate). Correct measures of inbreeding were first developed by Wright (1921). Building on these, Asdell (1948) showed that Woods' Social-Darwinist hypothesis was wrong, using Woods' (1906) own coding of ruler ability.

[5]In related work, Benzell and Cooke (2021) exploit variation in the pedigree of nobility that was not a direct choice of the nobles themselves, studying how changes in kinship ties between *alive* ruler pairs (due to random deaths in the family network) affected conflict. Dube and Harish (2020) use the gender of the first-born children of European monarchs to predict whether the next ruler was a queen, showing that conflict was more common under female rulers. Similarly, Becker et al. (2020) use the gender of first-born children of nobles to predict conflict between German cities and study its effect on local institutions.

[6]For proponents of the "rulers matter" view see for example Carlyle (1841), Weber (1922), William (1880), and Spencer (1896). For the opposite view that "history makes men" see Marx (1907), Engels (1968), Braudel and Reynolds (1992). More recent contributions to this theoretical and empirical debate include March and Weil (2009), Simonton (2006), and Xuetong (2019), as well as Acemoglu and Jackson (2015), Alston (2017), and Alston, Alston, and Mueller (2021).

causal identification of the importance of European rulers over the late medieval and early modern period. State performance during this period had long-lasting consequences, as the foundations for the modern nation states were laid across Europe. Our findings suggest that the territorial organization of Europe as we know it is at least in part the result of chance, embodied in the ability of individual rulers.

We also contribute to a strand of the literature that has underlined the importance of individual characteristics of leaders in both managerial and political settings.[7] In the managerial literature, Clark, Murphy, and Singer (2014) have documented that CEOs matter less when they are constrained by a well-defined governance structure, echoing the findings on constrained politicians by Jones and Olken (2005) and Besley et al. (2011). Similarly, Besley and Reynal-Querol (2017) document higher economic growth under hereditary (as compared to non-hereditary) leaders when constraints on them were weak, using data from 1875 onwards. Besley and Reynal-Querol (2017) interpret these correlations as evidence that hereditary leaders have a longer time horizon, improving policy choices.[8] Our results focus *only* on hereditary leaders, showing that their ability (which is not observed by Besley and Reynal-Querol, 2017) had strong effects on state performance – unless it was checked by institutional constraints. This latter finding is particularly interesting because inbreeding became more severe in the 17th and 18th century, after centuries of accumulated intermarriage. By that time, parliaments across Northern Europe had expanded their power, constraining national rulers (Van Zanden, Buringh, and Bosker, 2012). Thus, our results suggest that parliaments protected (some) European states from the adverse effects of their ruling dynasties' inbreeding.

The paper is organized as follows. Section 2 introduces the historical background of European monarchs. Section 3 discusses our data sources and coding. Section 4 shows our main empirical results, discusses our identification strategy, and sheds light on possible mechanisms. Section 5 examines heterogeneity by institutional constraints on rulers. Section 6 concludes.

2   Historical Background: Europe under Dynastic Rule

This section briefly reviews the historical background of European monarchs in the late medieval and early modern period. We pay particular attention to those features that render the setting a rich testing ground for identifying the causal effect of national leaders on state performance.

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[7]C.f. Bertrand and Schoar (2003), Malmendier and Tate (2005), Bloom and Van Reenen (2007), and Becker and Hvide (2022) for the importance of managerial traits; and Ferreira and Gyourko (2014), Yao and Zhang (2015), Logan (2020), Assouad (2020), Dippel and Heblich (2021), and Carreri and Payson (2021) for work on traits of political leaders and their effects.

[8]A related literature studies political dynasties in modern democracies, where some prominent families repeatedly have members *elected* to important offices (c.f. Dal Bó, Dal Bó, and Snyder, 2009; George and Ponattu, 2018). In contrast, in our setting, succession was guaranteed by custom, and dynasties were the central governing bodies over the course of centuries.

2.1 Rulers and State Performance

A plethora of studies in a variety of fields have argued that national leaders affect the fortunes of their countries. For example, the literatures in historiography and political science are full of cases linking the fate of countries to their rulers' actions and abilities.[9] One often-cited case is the series of able rulers accompanying Prussia's rise from small polity to great power in the 18th century.[10] Similarly, Kennedy (1988) notes that one of the factors aiding Sweden's "swift growth from unpromising foundations" was "a series of reforms instituted by Gustavus Adolphus and his aides," increasing the efficiency of administration and allowing Sweden under Gustavus to play an outsized role in the Thirty Years War, despite the fact that Sweden "militarily and economically [...] was a mere pigmy" when Gustavus ascended to the throne. Conversely, the *shortcomings* of individual monarchs have been linked to political failures, such as in the case of John I of England (1199-1216), whose personal incapability in military matters resulted in Britain losing most of its continental possessions. In the words of (Bradbury, 1999, p. 349): "The explanation of the defeat ... rests between John's fault as a commander and his faults as a man."

A Tale of two Carloses

In our baseline empirical analysis, we exploit the variation of ruler ability over time within the same state. In what follows, we provide an illustrative example: Carlos II was King of Spain from 1665 to 1700. Hailing from a line of successive marriages of relatives from the Spanish and Austrian Habsburgs, he was highly inbred and commonly described as an incapable ruler with little effective power. While his parents technically were 'merely' uncle and niece, the build-up of consanguinity over previous generations due to marriage among relatives resulted in Carlos II's parents sharing as many genes as siblings would. As the pedigree in Figure 1 shows, all of Carlos II's grandparents descended from Joanna and Philip I of Castile. Repeated marriage between cousins as well as between uncles and nieces ultimately led to the majority of Carlos II's inbreeding being 'hidden' in the deeper layers of the pedigree: His coefficient of inbreeding was 25.36, of which 12.5 was due to his parents being uncle and niece, with the remainder being a 'hidden' component due to accumulated inbreeding over previous generations. The degree of inbreeding was of no concern

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[9]Biographies published by historians consistently emphasize the importance of certain individuals and their leadership qualities in shaping the nations they ruled – see for example Roberts (2018) and MacCulloch (2018) for the effects of Cromwell's and Churchill's actions and convictions upon their native England. Nicholas (2021) writes: "In any age and time a man of Churchill's force and talents would have left his mark on events and society."

[10]In particular, Frederick William I. (the "Soldier King," who reigned 1713-1740) and his son, Frederick II (the "Great," 1740-1786), facilitated the rise of Prussia into the rank of a Great Power of Europe with their administrative reforms and military decisiveness. And even if – by his father's achievements – "Frederick the Great came into a rich inheritance, [...] the favorable circumstances do not in the least explain his great success" (Woods, 1913, p. 159). The often idiosyncratic decisions of earlier rulers also shaped Prussia, as for instance that of Elector John Sigismund to convert to Calvinism in 1613 (Clark, 2007, p. 115).

(not even the 'visible' uncle-niece dimension) when Carlos II's parents married in 1649.[11]

The "inbreeding depression" resulting from intermarriage over generations left Carlos II hostage to physical and mental fragility.[12] He only started talking at age 4, and walking at age 8. Alvarez, Ceballos, and Quinteiro (2009) describe him as "physically disabled, mentally retarded and disfigured." As Carlos II became king of Spain when he was 4 years old, his mother Mariana became regent and influenced his policies until he turned 18.[13] When he took over as ruler, Charles II's inability sent Spain into decline (Mitchell, 2013). As Hamilton (1938, p. 174) notes: "Diseased in mind and body from infancy, and constantly preoccupied with his health and eternal salvation, Charles II was incapable not only of governing personally but of either selecting his ministers or maintaining them in power." Woods' (1906) assessment of Carlos II is brief, characterizing him as an "imbecile" with negative virtues. Carlos II died without an heir, marking the end of the Spanish Habsburg dynasty.

The power struggles that followed Carlos II's death brought a new dynasty to the Spanish throne – the Spanish Bourbons. The ranks of the Bourbon dynasty first led to two relatively undistinguished monarchs.[14] In 1759, the capable Carlos III came to inherit the throne through hereditary succession from his half-brother, who had left no heirs. Carlos III's parents were merely cousins of third degree, and the accumulated 'hidden' component of inbreeding was also small, resulting in a degree of inbreeding of only 3.9 – significantly smaller than that of his predecessors. Woods (1906) characterized Carlos III as "enlightened, efficient, just, and sincere. Not brilliant, but had a very well-balanced mind." Spain flourished under Carlos III's reign, and contemporaries and historians hold him in high regards: He "was probably the most successful European ruler of his generation. He had provided firm, consistent, intelligent leadership [...and] had chosen capable ministers" (Payne, 1973, p. 371). Consequently, Carlos III's reign saw the "continued improvement in financial and commercial conditions, including agriculture and the useful arts" (Woods, 1913, p. 331).

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[11]As we discuss below, restrictions on cousin marriage were not enforced among the European nobility. Knowledge about the adverse effects of inbreeding only emerged in the early 20th century and was not widely accepted even in academic circles until the second half of the 20th century. In addition, the 'hidden' degree of inbreeding in Carlos II's pedigree was, if anything, interpreted as a positive feature, signaling a 'clean' royal bloodline (Van Den Berghe and Mesher, 1980; Scheidel, 1995).

[12]While population biology strongly suggests that inbreeding was responsible for Carlos II's mental fragility, such assertions cannot be proven definitely for historical cases, because genetic samples are not available.

[13]Accordingly, we follow Woods (1906) and distinguish two separate reigns, one from 1665 to 1679 where mostly Carlos II's mother served as a Queen regent, and one under his direct reign until his death in 1700. Both ruler ability of Mariana and state performance under her reign are coded separately.

[14]Philipp V (ruled from 1700 to 1745) and Ferdinand IV (1745-1759). "[B]oth were undistinguished rulers frequently incapacitated by near lunacy (Philip V dined at 5 a.m. and went to bed at 8 a.m., refusing to change his clothes)" (Carr, 1991, p. 131). Philipp V's coefficient of inbreeding was 9.27, and that of his successor, Ferdinand VI, was 9.55 – both were thus more inbred than first-degree cousins (6.25), but significantly less than Carlos II. In both reigns, Spain's economic fortune improved moderately, starting off from the low levels left behind by Carlos II.

2.2 Dynastic Rule and Hereditary Succession

The vast majority of European monarchs came to power according to fixed rules of succession. While these rules differed across states and time, hereditary succession became increasingly common, that is, rulers were the offspring of the prior ruler. In most cases, hereditary succession took the form of primogeniture, which determines that the eldest living offspring of the current ruler becomes the state's next ruler. This practice was common on the Iberian peninsula early on, from where it spread to other states quickly (to England in 1066 and France in 1222). It gradually replaced the two other common forms of successions – by siblings and other relatives of the current ruler, and election of rulers by feudal elites.[15] Typically, agnatic primogeniture was practiced, implying that the eldest living *male* offspring was heir apparent.

In the absence of an heir (for instance, due to the premature death of the current ruler), the reign typically passed on to close relatives according to hereditary rules of succession. In general, the reign passed on to those individuals with the closest genealogical distance to the last male monarch.[16] For the majority of rulers in our dataset, there is explicit, unambiguous information for ascension to the throne by hereditary succession. Deviations from hereditary succession in our dataset are mostly due to interim reigns by regents when the heir apparent was still young.[17]

Due to hereditary succession, dynasties often stayed in power for centuries. For example, until the French Revolution, all kings of France were direct ancestors of Hugh Capet, who had ruled eight centuries earlier (from 987 to 996) and founded the "Capetian dynasty."[18]

2.3 Intermarriage Among Dynasties

Intermarriage among ruling dynasties was common, even *across* the states of Europe. The leaders of the Spanish and Austrian Habsburgs, for instance, practiced cousin marriage over multiple generations in the 16th century, culminating in Carlos II, as described above. Alvarez et al. (2009) argue that the frequent dynastic marriages ultimately resulted in the extinction of the Spanish Habsburgs. While the Catholic Church had formal restrictions on cousin marriage, these were rarely

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[15]Tullock (1987) describes theoretically that both current monarchs and elites favor primogeniture over other forms of succession, as it delivers political stability. Kokkonen and Sundell (2014) provide empirical evidence for this theory during our sample period. Often, kings crowned their sons while they were still alive to ensure a stable succession (Bartlett, 2020, p. 93).

[16]Whether this included female lines of succession as well as the exact definition of genealogical distance differed by ruling dynasty according to their "house law." In some cases, such laws of ascension were incomplete and left multiple potential claimants to the throne, so that succession was determined by the former ruler, by parliaments, or by an usurpation of the throne. As in the case of the heirless death of Carlos II, this often resulted in succession crises, sparked conflicts, and, later, amendments to succession laws (Acharya and Lee, 2019; Kokkonen and Sundell, 2020).

[17]As we describe in detail below, Woods (1906) coded these reigns by regents separately. Overall, there are 65 such cases in our core dataset. Our results are robust to excluding these.

[18]While the direct line of succession broke twice when kings died heirless, the title always passed to someone related to Hugh Capet. This happened first in 1328 (triggering a succession crisis that resulted in the Hundred Years War), when the Valois dynasty came to power, and again in 1589 with the rise of the Bourbon dynasty.

enforced for European monarchs.[19] The pope could – and usually did – grant "dispensations" (exemptions) for Catholic rulers. As a result, intermarriage among royal dynasties actually *increased* throughout the early modern period (Benzell and Cooke, 2021), aided also by Protestantism lifting the cousin marriage ban entirely.

2.4   The Negative Effects of Inbreeding on Capability

A crucial feature of our identification strategy is that more inbred heirs to the throne were less likely to become capable monarchs. It is well-documented that inbreeding reduces genetic diversity and evolutionary fitness; it systematically increases the risk of genetic disorders, affecting physical and mental capability (c.f. Robert et al., 2009; Ceballos and Álvarez, 2013; Royuela-Rico, 2020). Children of first cousins have a five times higher risk of intellectual disability (Morton, 1978), and their intelligence is reduced by as much as 27 points (almost two standard deviations) on the IQ scale (Fareed and Afzal, 2014a). Similarly, the average IQ score for uncle-niece offspring is 37 points lower than that of non-inbred individuals (Fareed and Afzal, 2014a). Inbreeding further results in lower height and weight (Fareed and Afzal, 2014b), and it decreases fertility while raising child mortality (Fareed et al., 2017), thus lowering the probability of successfully producing heirs for the dynasty (Alvarez et al., 2009). Most important for our context, inbreeding depresses many individual psychological traits that are associated with successful leadership.[20]

European royal families did not defy the laws of biology. After the methodology for computing coefficients of inbreeding became available, Asdell (1948) showed that more inbred rulers had been assessed by Woods (1906) as systematically less capable – despite the fact that Woods had the opposite hypothesis (see footnote 4).[21]

3   Data

In this section we describe our dataset with observations at the level of individual reigns for ruler ability, state performance, inbreeding, constraints on ruler power, as well as control variables.

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[19]Restrictions on cousin marriage had been put in place starting from the 8th century – but *not* because of concerns about the physical or mental effects of inbreeding. Instead, these restrictions were meant to weaken the political power of closed kinship networks and to inhibit their further formation (Ausenda, 1999; Schulz, Bahrami-Rad, Beauchamp, and Henrich, 2019; Schulz, 2016); they also increased the likelihood that bequests would fall to the Church (Goody, 1983).

[20]The literature on leadership traits has emphasized the importance of cognitive capabilities for leadership (c.f. Judge, Colbert, and Ilies, 2004). Adams, Keloharju, and Knüpfer (2018) provide direct evidence, showing that cognitive and non-cognitive ability (measured during military tests in Sweden) are strong positive predictors of individuals assuming leadership roles – becoming CEO's – later in life. At the same time, there is a large literature documenting that inbreeding negatively affects cognitive ability (Afzal, 1993; McQuillan et al., 2012; Fareed and Afzal, 2014b,a).

[21]A recent literature has argued that – in modern data – the size of the negative effects of marriages among first cousins may be confounded by poverty (Hamamy et al., 2011; Bittles, 2012; Mobarak et al., 2019). However, our results do not depend on first-cousin marriage, as consanguinity due to complex intermarriage over generations (and beyond first cousins) drives our first stage. Furthermore, this literature largely considers health and socio-economic consequences of inbreeding. In contrast, we emphasize cognitive abilities, and control for the physical consequences of inbreeding (such as lower body height and life expectancy) in our robustness checks.

3.1 Ruler Ability and State Performance

Ruler ability. Our measure of ruler ability builds on the work by Frederick Adam Woods. A lecturer in biology at MIT at the beginning of the 19th century, Woods took an interest in heredity and, ultimately, history. To understand the heredity of moral and mental ability across generations, Woods turned to the royal families of Europe.[22] In his 1906 publication on "Mental and Moral Heredity in Royalty" (Woods, 1906), he "graded" more than 600 individual members of royal families based on their mental and moral qualities. This grading was based on adjectives used in written sources that describe these individuals. For each ruler, Woods provided a brief summary underlying his assessment and references (see for example his assessment of Carlos II and III that we mentioned above). Based on his sample of royal family members, Woods concluded that mental and moral ability were i) strongly correlated with each other and ii) heritable.[23] Our core analysis builds on Woods' coding of mental (cognitive) ability; we refer to this as 'ruler ability' throughout the paper. In the appendix, we also present a coding of non-cognitive ruler ability.

State performance. Subsequently, Woods ventured beyond the realm of biology to the "Great Men" debate in history (Carlyle, 1841). For the state of Portugal, he had already noticed a correlation between mentally able rulers and favorable political and economic outcomes. In Woods' (1913) publication "The Influence of Monarchs," he extended his 1906 tabulation of the cognitive ability of rulers and also added a systematic coding of their states' performance for 13 states, ranging from their foundation until the French Revolution. This publication is a central data source for our empirical analysis. It contains the ability of rulers and state performance for more than 300 European reigns. Figure 2 shows the covered states in different time periods.[24] Similar to Woods's earlier work, this grading is largely based on the assessment of historians and contemporaries, as distilled by Woods from reference works and state-specific histories. In terms of state performance, Spain under Carlos II is characterized by "misery, poverty, hunger, disorders, decline, especially in agriculture, finances, and strength of the army" while a century later, Carlos III's reign saw "continued improvement in financial and commercial conditions, including agriculture and the useful

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[22]The appeal of this group of people to study heredity was manifold to Woods: The pedigrees of royal families were (and are) comparably well-documented over multiple generations. Further, for most of these individuals, their life, character, and achievements were documented from letters, court biographies, or other written sources.

[23]Woods was part of a (then active) research agenda in biology on heredity sparked by the publication of Darwin's "Origin of Species" in 1859 and Galton's "Hereditary Genius" in 1869. Social Darwinism, foremost that of Grant (1919), had an influence on the eugenics crusade in the United States and on the US immigration legislation after World War I (Saini, 2019). Over the course of the 20th century, the scientific underpinnings of Social Darwinism were discredited, as was the concept of heritability of traits such as mental or moral qualities at the level of *societies*. While heritability of intelligence at the individual level is sizable (Neisser et al., 1996; Devlin, Daniels, and Roeder, 1997), differences between population groups are resulting from other environmental differences (Lewontin, 1970). In an earlier systematic analysis of the data of Woods, Simonton (1983) analyzed the intergenerational transmission of individual characteristics.

[24]The states covered are Castile, Aragon (Spain), Portugal, France, Austria, England, Scotland, Holland, Denmark, Sweden, Prussia, Russia, and Turkey. Appendix Figure A.1 provides a timeline of coverage for each state.

arts." As an additional example, consider Maria Theresa, who reigned over Austria from 1740 to 1780, and was judged by Woods as "able and very industrious." Under her reign, "the various portions of the kingdom [were] unified and centralized" and "Austria gained slightly in territory and greatly in prestige," while "industry, commerce, and agriculture improved."

Core sample. Our core sample consists of 336 reigns for which both ruler ability and state performance are available from Woods' coding (Table A.1 lists the number of observations for the different variables in our analysis). Woods assigned a "+" to rulers with high cognitive ability, a "-" to incapable ones, and "±" to those not clearly capable or incapable. In his coding of state performance, Woods covered the following dimensions: "finances, army, navy, commerce, agriculture, manufacture, public building, territorial changes, condition of law and order, general condition of the people as a whole, growth and decline of political liberty, and the diplomatic position of the nation, or its prestige when viewed internationally," while purposefully *excluding* "literary, educational, scientific, or artistic activities" (Woods, 1913, p. 10). Woods coded a three-valued variable summarizing the political and economic performance of the state during each reign, using again the three-tier scale "+, ±, -." We transform these into "1," "-1," and "0" and create the variables *Ruler Ability* and *State Performance*, respectively. Out of 336 reigns for which we have information on both the monarch's ability and the performance of the state, 127 rulers are rated as clearly incapable, 122 as clearly capable, and 87 as neither; regarding state performance, 112 reigns are rated as clearly bad, 143 as clearly good, and 98 are neither.[25]

Regencies. About one-fifth of our sample (65 reigns) are instances of regents ruling. In most cases, these occurred because of so-called "minorities" of the heir to the throne: While the heir could not perform the duties due to young age, close relatives or other influential persons at the court took over as regents. Often, these regencies were divided among more than one person. We follow Woods in specifying these as separate reigns and identifying the most important among the regents whenever possible. For more than half of the regencies, either a specific regent cannot be identified, or the regent does not have any known relationship links in our genealogical data, implying that they were likely not of royal ancestry themselves.[26] Our results are robust to excluding regencies.

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[25]Woods collected information for 366 reigns in total. Especially for early and short reigns, Woods did not provide an assessment. In instances of co-reign, as for Ferdinand and Isabella of Castile from 1479 to 1504, we generally take the assessment of one individual if it is only available for one of two rulers. When both are available, we use the assessment of the individual working against our hypothesis. In cases where Woods expressed a doubt by, say, "+ or ±," we use the average (in this example, 0.5). In a robustness check, we recode all these cases conservatively so as to work against our baseline findings.

[26]For this subset of regencies, Woods adopted the following convention: "When a regency is in non-royal hands ... I shall treat the period as if it were a period in which the monarchs were 'minus,' that is, absent or weak. If the conditions are favourable or 'plus' when the monarchical rule is absent, it counts so much against the influence of monarchs." (Woods, 1913, p. 13) Note that these observations do not affect our instrumental variable results, since the degree of inbreeding is unknown.

Coding concerns and data checks. The fact that both ruler ability and state performance were coded by the same historian gives rise to obvious endogeneity concerns. We address these in several ways, including extensive checks of Woods' coding, our IV strategy, as well as the use of alternative outcome variables. We discuss the quality and reliability of Woods' coding in Appendix A.3. For example, Thorndike (1936) had numerous research assistants "grade" the morality and intellect of more than 300 members of the European nobility.[27] This data quality assessment resulted in correlations of the cognitive grade across different graders (including Woods) ranging from 0.73 to 0.82. We similarly asked research assistants to assess the capability of individual rulers, as well as state performance, on a three-point scale based on articles in online encyclopedias (and without reference to Woods' coding). This exercise also largely confirms Woods' data (see Appendix A.3).

Why use Woods as the core sample? Our extensive checks of Woods' data allow us to run our empirical analysis also based on our own coding (we report these results in Appendix B.1). Nevertheless, we use Woods' original coding as our baseline because Woods' hypothesis works against our IV strategy: Woods believed that more kin marriage among "successful" dynasties produced *more* capable rulers (see footnote 4). In this regard, our baseline results provide a conservative benchmark.

Extended sample. In addition to our validation of Woods' coding, we also provide robustness checks with an extended sample – both in terms of time period (until World War I) and states covered (adding Hungary and Poland). We coded this extended sample using Woods' original sources, as well as modern encyclopedias. The two states and additional century of data add 101 reigns to our baseline sample (see Appendix A.5 for coding and Appendix B.3 for results using the extended sample).

3.2 State Border Changes and Urbanization

Because our outcome variable 'state performance' is ultimately a subjective measure, we construct two additional outcome variables. First, we calculate changes in the size of a state's territory during the reign of each monarch. Abramson (2017) provides borders and the area of the independent polities of Europe at five-year intervals from 1100 to 1795. We link these to the beginning and end of each reign and calculate the percentage change in area ruled during a reign, $\Delta log(Area)$.[28] Figure 2 shows the evolution of state borders in our sample between 1200 and 1790. For example, during the reign of Maria Theresa (1740 to 1780), Austria lost Silesia to Prussia, while it gained

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[27]Thorndike's student, Dr. Edith E. Osburn "read what was printed about each of about four hundred of the persons studied by Woods, in each of the six biographical dictionaries used by him. This occupied her about forty hours a week for about eight weeks. She then read through the entire set of references again" (Thorndike, 1936, p. 322). At the same time, Thorndike (who, like Woods, was a eugenicist) had five more research assistants independently do the same coding.

[28]We are grateful to Scott Abramson for kindly sharing his data on European state borders. We discuss how we link state borders to reigns in Appendix A.4.

areas from Poland (see Appendix Figure A.3). In net terms, Austria increased its area by 7%.

Territorial expansions do not necessarily and unambiguously imply better state performance. For example, an expansion into thinly populated territory differs in important ways from conquering urbanized areas.[29] To address this issue, we also code changes in urban population in the territory ruled by each monarch. We impute the total urban population within the boundaries of each state by combining the borders provided by Abramson (2017) with city population data from Bairoch et al. (1988).[30] For each reign, we calculate the total urban population within the state borders at the beginning and at the end of each reign. We then calculate the percentage change in total urban population $\Delta log(UrbPop)$. For an additional check, we also decompose this measure into an intensive margin (changes in city population within the existing borders) and extensive margin (conquering/losing cities).

3.3 Coefficient of Inbreeding for European Monarchs

The first correct measure of the degree of similarity in the genes of offspring due to common ancestors was developed by Wright (1921). This "coefficient of inbreeding" (henceforth, F) is the probability that both gene copies in an individual are identical by descent, i.e., from a common ancestor. Higher F thus means lower diversity in an individuals' gene pool. Diversity has a positive effect because humans are diploid, i.e., they have two copies (one from each parent), and for recessive disorders to appear, both copies need to be deleterious. Hence, the more related the parents of an offspring are – i.e., the more gene copies they inherited from the same ancestor(s) – the lower diversity, and the higher the risk of recessive gene disorders. This "dominance hypothesis" is the prevailing explanation for "inbreeding depression" in genetics (c.f. Charlesworth and Willis, 2009). Offspring of siblings or of parent-child couples have a coefficient of inbreeding of $F = 25$, while offspring of uncle-niece couples have $F = 12.5$, and offspring of first cousin couples have $F = 6.25$.[31]

We collect F for 256 monarchs from http://roglo.eu/, a crowd-sourced online data source of the genealogy of European noble families. For 235 of these monarchs, Woods (1913) assessed

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[29]In fact, "overexpansion" may weaken the power of a state (Kennedy, 1988). However, Baten, Keywood, and Wamser (2021) show that expansions of territory go hand-in-hand with increases in taxes per capita, and thus use territorial expansions as a proxy for state capacity. We mainly use territorial changes as an objective (i.e., not coded by historians) and high-frequency measure of state performance.

[30]More precisely, we use the amended Bairoch et al. data from Voigtländer and Voth (2013). These data are available at the century or half-century level. We use linear interpolation to obtain city population in five-year intervals (corresponding to the border data frequency), assuming a linear growth rate. We geocode the location of each city to determine the polity it belonged to at each five-year interval.

[31]The coefficient of inbreeding ranges from 0 to 100 (%). Humans inherit one gene copy from each parent. Because humans carry two gene copies (alleles) on the same region (locus) of each of their two chromosomes, the probability to pass on a particular allele to a particular offspring is 0.5. Hence, the offspring of self-fertilization would have $F = 50$, as there is a one-half chance for each locus that the entire pair of alleles was passed on. Hypothetically, with repeated self-fertilization, F would approach 100. Offspring of completely unrelated parents have $F = 0$. We provide more detail on the calculation and an illustrative example in Appendix A.6.

both state performance and ruler ability. We begin by identifying each monarchs' parents. For these, in turn, http://roglo.eu/ calculates the coefficient of inbreeding for their offspring, relying on rich data on relationships between their ancestors.[32] Figure 3 shows a histogram of the coefficient of inbreeding for all monarchs in our dataset. The figure also provides two illustrative examples. Carlos II is the individual with the highest coefficient of inbreeding. With $F = 25.36$, he was more inbred than an offspring of siblings would be. Yet, his parents were "merely" uncle and niece (which in itself would imply $F = 12.5$). This points to an important feature of our setting: A sizable amount of the observed inbreeding is not the result of just one generation of consanguineous mating, but rather driven by a "build-up" of inbreeding over previous generations.[33] We use this 'hidden' component of inbreeding to support the validity of the exclusion restriction.

3.4   Constraints on Ruler Power

We collect data on the legal and de facto constraints on the power of monarchs from a variety of sources. Our baseline variable refines and extends the measure "constraints on the executive" following Acemoglu et al. (2005), which is available between 1000 and 1850 (first at the century level and after 1700 CE in fifty-year intervals). Acemoglu et al.'s measure was coded following the approach of the Polity IV project (Marshall, Jaggers, and Gurr, 2017) at the level of today's states. Using the same coding approach, we refine the coding of "constraints on the executive" on a *year-by-year* basis at the *historical state* level, guided by the Polity IV rating, and using the same primary sources as Acemoglu et al. (2005). Appendix E provides further detail.

Figure 5 illustrates our annual measure, using England during its turbulent 17th century. The black solid line shows the institutional score by Acemoglu et al. (2005), which is constant at 3 from 1600 to 1700, indicating "slight to moderate limitation on executive authority." Our measure (the dashed blue line) is more finely grained, reflecting the variability of constraints on the monarch during that century. Consider 1629, when the English parliament was dissolved and "Charles [I] governed without a parliament, raising money by hand-to-mouth expedients, reviving old taxes and old feudal privileges of the crown and selling mentarians contrary to the spirit of the constitution" (Stearns and Langer, 2001, p. 288). This is reflected by a sharp drop of our measure from "substantial limitations on the monarch's authority" (a score of 5) to "no regular limitations on the executive's actions" (score of 1). Constraints became stronger again during the "Long Parliament" from 1640-1660, as a consequence of the "Triennial Act [of 1641], requiring the summoning of

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[32]We cross-checked and validated the coefficients we obtained from http://roglo.eu/ extensively with other publications, among them Asdell (1948) and Alvarez et al. (2009). Turkey is not covered by this source and is thus not included in our IV results. For 43 rulers, no known relationship link is recorded. This could either imply that they were unrelated (i.e., $F = 0$), or simply that the information on distant family relationships did not survive. We thus exclude these cases from our baseline, but we show robustness to their inclusion in Appendix Table A.9.

[33]Consider again the pedigree of Carlos II (Figure 1). While Philipp IV, the father of Carlos II, married his niece, past consanguineous marriages created many pathways to the common ancestors Joanna ("The Mad") and her husband Philip generations earlier.

parliament every three years without an initiative of the crown. [This was] followed by [... a] bill to prevent the dissolution or proroguing of the present parliament without its own consent" (Stearns and Langer, 2001, p. 288). Similar institutional dynamics occurred during the tumultuous period surrounding the Glorious Revolution.

Based on our year-reign specific measure for constraints on the executive, we define the variable *Constrained* if the constraints on the ruler in the year *prior* to the beginning of the reign were above a score of 4 (on a scale of 7), indicating "substantial limitations on executive authority." This cutoff is further defined as follows: "The executive has more effective authority than any accountability group but is subject to substantial constraints by them." In our core sample, this applies to 19 reigns, the majority of which were in England and the Netherlands after 1650. Appendix E provides further detail on our coding.

4 Main Empirical Results

In this section we first document a strong association between the ability of European monarchs and the performance of their states. We show that this association is robust to alternative coding procedures, and that it holds in different samples. We then provide evidence that this relationship is causal, using our identification strategy based on inbreeding.

4.1 Baseline OLS Results

Our baseline regressions are at the state-reign level:

$$y_{r,s} = \beta RulerAbility_{r,s} + \delta_s + \varepsilon_{r,s} , \tag{1}$$

where $y_{r,s}$ is one of our three outcome variables for state s in reign r, as defined in Sections 3.1 and 3.2: *State Performance*$_{r,s}$, $\Delta log(Area)_{r,s}$, or $\Delta log(UrbPop)_{r,s}$. *Ruler Ability*$_{r,s}$ is the assessment of the monarch's ability. For a straightforward interpretation of coefficients, we standardize the assessments of *State Performance* and of *Ruler Ability* so that both variables have mean zero and standard deviation one. We include state fixed effects δ_s, so that we effectively compare rulers of the same state over time. Throughout, we report standard errors clustered at the state level.

Table 1 shows that *Ruler Ability* is strongly associated with *State Performance*. Column 1 reports the raw correlation. The coefficient of interest, β, is highly significant and sizable: A one standard deviation increase in *Ruler Ability* is associated with a 0.62 standard deviation (std) increase in *State Performance*.[34] Column 2 shows that this association is unchanged when we add

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[34]The regression coefficient using the unstandardized measures is 0.6, implying that moving from an incapable ("-1") to a capable ruler ("1") is associated with an increase in (unstandardized) state performance by 1.2 on a scale from "-1" (bad performance) to "1" (good performance). Woods (1913) himself had also manually computed the correlation coefficient of 0.6 in his raw data. He asserted a causal direction from monarch ability to state performance: "Only very rarely has a nation progressed in its political and economic aspects, save under the leadership of a strong sovereign." While Woods was well aware of reverse causality concerns, he provided descriptive evidence in favor

state fixed effects, thus comparing only monarchs who ruled the same state. Thus, it is unlikely that our results are driven by a selection of functional states with capable rulers into our sample. The outcome variable *State Performance* is subject to concerns about biased coding by Woods. We address this by using 'objective' (and also continuous) outcome variables in the next columns. For the reign-specific percentage change in state area, we document a significant and sizable association with ruler ability (column 3). Again, these results are stable when we include state fixed effects (column 4). A one std increase in ruler ability in the same state is associated with land area expanding by about 11%.[35] Finally, columns 5 and 6 use the change in urban population during a reign as outcome variable. We document a sizable association: A one std increase in ruler ability is associated with total urban population of the state expanding by about 10%.

4.2 Robustness of OLS Results

Next, we examine the robustness of our baseline OLS results. Beginning with the baseline sample in column 1, Table 2 introduces numerous restrictions on our sample. In column 2, we focus on reigns in which the ruler was linked to a dynasty. Thereby, we exclude cases of interregna, regencies in which non-royal individuals exerted power, and instances of non-monarchical governance (as in the Netherlands).[36] The coefficient increases slightly and remains highly significant. Column 3 excludes all regencies, independent of whether the regent was a dynasty member or not. The coefficient again increases slightly. Note that the variation explained (R^2) actually increases in columns 2 and 3, indicating that indeed monarchs hailing from dynasties are crucial to the relationship between ruler ability and state performance. Column 4 excludes the few instances of foreign rule.[37] Column 5 excludes all individuals who appeared as rulers in more than a single reign. These are either monarchs that repeatedly came to power in the same state, or who ruled in more than one state contemporaneously. In both columns 4 and 5, the coefficient remains significant and comparable in size to the baseline. Finally, column 6 applies all restrictions of the preceding columns simultaneously. With only about 75% of the initial sample left, the coefficient on ruler ability remains almost unchanged, and the variation in state performance explained by the regression is actually higher than in the baseline.

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of this conclusion. We go beyond Woods' findings by providing additional objective outcome measures, and, in in particular, by providing an identification strategy.

[35]Note that in our setting, land acquisition was not a zero-sum game. Many of the states in our sample started out small and then came to dominate the map over time (see Figure A.1). Thus, territorial gains were positive on average (see the summary statistics in Table A.2).

[36]Interregna are periods between the rule of two monarchs when no monarch was present. Recall that regencies are coded as separate reigns (see Section 3.1). In column 2, we exclude all reigns during which regents from *outside* the designated ruler's dynasty governed the state. We still include cases of rule by relatives of the designated heir until the heir assumed office. For example, Mariana was regent for her son Carlos II of Spain until he reached adulthood.

[37]Foreign rule refers to instances when monarchs of one state temporarily ruled over another state. For example, Philipp II of Spain ruled Spain and Portugal from 1580 to 1598. When excluding episodes of foreign rule, we drop the corresponding observations for Philipp in Portugal, but keep his reign in Spain. When excluding monarchs who governed in more than one state (column 5), we drop both observations, his reign in Spain and that in Portugal.

Columns 7 and 8 present the results for our extended sample. In column 7, we extend the coding of states covered by Woods (1913) until World War I. In column 8, we also add data for Poland(-Lithuania) and Hungary from their foundation until 1914. Both extensions yield results that are very similar to those in the baseline sample. In Table A.4 in the Appendix we show that our results also hold when we use only our *own* coding of state performance and ruler ability for the core sample of Woods.

We document further robustness checks in Appendix B. Table A.5 shows robustness to measurement. We find that our results based on Woods' (1913) original coding are highly robust when we exclude cases that Woods coded with intermediate values for state performance or ruler ability, indicating that he felt a clear judgment was not warranted by the underlying information. In fact, our results are even robust when we recode all those middling values to work *against* a positive association between ruler ability and state performance (Table A.5, col 5).

4.3 Heterogeneity

How does the association between state performance and ruler capability vary across time, space, and personal characteristics of rulers? In Table 3, we include interaction terms between ruler ability and several characteristics. We collect the variables used in this section from encyclopedias and biographies, as explained in detail in Appendix A.1. For column 1, we define a dummy indicating whether a monarch was female, which was the case for 38 of the 312 reigns to which a gender was assignable.[38] The small and statistically insignificant coefficient suggests that the relationship between ruler ability and state performance was similar for male and female rulers. In column 2, we interact *Ruler Ability* with a dummy indicating whether a monarch ascended to the throne before the median age of ascension (28 years). While the interaction term is quantitatively somewhat larger, it remains small compared to the coefficient on *Ruler Ability*, and it is also statistically insignificant. Column 3 uses a dummy indicating whether a ruler was raised as designated heir.[39] The interaction term is positive but minuscule and statistically insignificant. Column 4 shows that the association between ruler ability and state performance is somewhat stronger for those rulers who came to power due to documented hereditary succession – although the association remains strong also for the remaining rulers (e.g., close relatives acting as regents).[40] Finally, in column 5, we interact with a dummy indicating that the prior ruler was executed after trial or murdered (Kokkonen and Sundell, 2014). We find no difference in our baseline association for those reigns.

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[38]For 24 reigns we cannot assign a gender to the ruler. As explained in Appendix A.1, these other instances are interregna or reigns by councils.

[39]Note that we were only able to assess whether monarchs were raised for particular roles for 141 observations, of which 110 where raised as monarchs. Another prominent "track" was being raised for a clerical position in the church. Ramiro II of Aragon, for instance, was an abbot before the unexpected death of his childless brother rendered him a candidate for the throne.

[40]Of the 290 reigns in which a single individual was in power, 222 (76%) are cases where the ruler was the offspring of the prior ruler.

This speaks against the possibility that our results may be primarily driven by able monarchs deposing of their (incapable) predecessor, as for instance Catherine the Great, who ascended to power through the murder of her husband. We also note that of the dummies in Table 3 only one is itself statistically significant – in column 1, indicating that female rulers were associated with somewhat lower state performance (although this coefficient is only marginally statistically significant). One possible explanation is that states led by queens were more frequently involved in warfare (Dube and Harish, 2020). In contrast, age at ascension, being raised as a designated hair, hereditary succession, or regicide of the previous ruler are by themselves not associated with state performance.

Did the relationship between monarchs' ability and state performance change over time? The left panel in Figure 4 depicts the coefficient on *Ruler Ability* for different time periods, showing a statistically highly significant correlation throughout. After 1600, the coefficient size decreases. This period also coincides with the rise of parliaments in Western Europe (Van Zanden et al., 2012). Below, we show that stronger constraints on the executive indeed diminished the importance of ruler ability for their states' performance. The right panel of Figure 4 shows the correlation between ruler ability and state performance for all states in our sample. The coefficients are relatively similar across states, and they are statistically highly significant for all states except Denmark.[41] The coefficient is strongest for Prussia, implying that this state fared particularly well under good rulers and/or suffered particularly strongly under incapable ones. Prussia's institutional setting featured few if any constraints on the monarchs' executive power. The other extreme is England, where the association between ruler ability and state performance is less pronounced. As we discuss further in Section 5, this is driven by the post-1600 period, when the English Parliament gained power vis-à-vis the Crown.

4.4 IV Results

Our OLS estimates are subject to numerous concerns. Omitted variables could influence both the performance of a state and the ability of the ruler in power, and reverse causality is also a possibility – for example, better state performance driving the selection of more capable rulers. In addition, historians may have assessed rulers of better-performing states more favorably (and vice-versa). Our IV strategy seeks to address these concerns (in combination with our 'objective' outcome variables based on border changes). Our identification builds on the combination of two features. First, hereditary succession resulted in pre-determined ruler succession, independent of ability. Second, we leverage the variation in ruler capability due to the wide-spread inbreeding within and between European dynasties. Centuries of intermarriage resulted in a sizable degree of

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[41]A possible explanation is that the Danish Crown had not fully transitioned to a hereditary monarchy. Danish kings were de jure elected by the nobility. However, de facto the oldest son of a ruler was usually elected as his successor (Bartlett, 2020, p. 398). Therefore, Danish monarchs may have been impeded by relatively strong constraints on their executive power.

genetic closeness between the marriage partners of Europe's monarchs. In what follows, we first introduce our instrument – the coefficient of inbreeding – and document that it is a strong predictor of ruler ability. We then present our IV results, showing a positive effect of ruler ability on state performance in the second stage. Finally, we discuss the underlying identification assumptions, possible violations, and ways to address these in the next subsection.

First Stage Results. Our first stage regresses ruler ability for reign r in state s on the ruler's coefficient of inbreeding, which we standardize to mean zero and standard deviation one, and refer to as *Inbreeding$_{r,s}$* throughout, controlling for state fixed effects δ_s:

$$RulerAbility_{r,s} = \gamma Inbreeding_{r,s} + \delta_s + \varepsilon_{r,s} \tag{2}$$

Standard errors $\varepsilon_{r,s}$ are clustered at the state level. Table 4 presents the results. We begin with the raw correlation in column 1, showing that monarchs with a higher coefficient of inbreeding were significantly less capable rulers. This is in line with our discussion in Section 2.4 that genetic closeness between partners carries an increased risk of genetic disorders for their offspring, which in turn reduces cognitive skills that are associated with effective leadership. We obtain a similar result in column 2, where we add state fixed effects (our preferred specification). The effect is sizable: Increasing the coefficient of inbreeding by one std reduces ruler ability by about 0.3 std. Figure 6 shows a binned scatter plot of the variation underlying column 2, with each of the 20 bins corresponding to more than 10 individual rulers. The figure illustrates that the first-stage relationship is not driven by outliers (we use the non-standardized coefficient of inbreeding in this figure, so that the x-axis reflects the actual magnitude of F in the various bins). As an additional check, the next two columns in Table 4 exclude individuals with high coefficients of inbreeding. The first-stage coefficient is unchanged when we exclude Carlos II, whose parents were as related as siblings (column 3), and it even increases slightly when excluding all monarchs whose parents were at least as related as uncle-niece pairs, corresponding to $F \geq 12.5$ (column 4). In column 5, we restrict the sample to rulers with documented hereditary succession, which excludes cases such as regencies by close relatives (with known F) while the designated ruler was a minor. The coefficient remains similar in terms of both magnitude and statistical significance. This is reassuring for our subsequent use of the full sample in the IV strategy.

Second-Stage Results. Table 5 presents our second-stage results in Panel A. In column 1 we use Woods' assessed state performance as the outcome. Note that the instrument is strongly relevant (effective F-statistic of 42).[42] The IV coefficient is positive and strongly significant, suggesting that the ability of monarchs had a positive causal effect on the performance of the states they reigned.

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[42]We follow the recommendation by Andrews, Stock, and Sun (2019) and report the effective F-statistic by Montiel Olea and Pflueger (2013), which can be compared to the Stock and Yogo (2005) critical values in our case with one endogenous regressor and one instrumental variable (Andrews et al., 2019). The corresponding critical value for max. 10% relative bias is approximately 16.4 for all three 2SLS specifications.

Column 2 shows that we obtain a similar result when only including monarchs with $F < 12.5$.

Columns 3-6 in Table 5 turn to our second and third outcome variables – the changes in land area and in urban population during the tenure of each monarch. These 'objective' variables can address concerns that our subjectively coded measure *State Performance* may suffer from endogeneity bias. For both $\Delta log(Area)$ and $\Delta log(UrbanPop)$, the IV coefficients point to a positive, large, and significant effect of ruler ability, and the results are robust to excluding rulers with F above 12.5.

The IV estimates tend to be somewhat larger than the OLS coefficients. For instance, the OLS estimate corresponding to the IV coefficient of 0.794 in Table 5, col 1 is 0.618 (Table 1 col 2). A plausible explanation is that – as discussed above – Woods had a bias in favor of rulers hailing from old dynasties, which may have led him to assign higher grades to inbred rulers, and correspondingly, worse grades to less inbred rulers. Our IV strategy corrects for this biased assessment of ruler ability and uncovers larger effects.

Reduced-Form Results. Panel B in Table 5 shows the reduced-form relationship between *Inbreeding* and our three state-level outcome variables. We find sizeable and statistically highly significant coefficients. A one-std increase in inbreeding leads to a decline in state performance by about 0.25 std, to a 5% decrease in land area, and also to a 5% decrease in urban population, according to the estimates in columns 1, 3 and 5, respectively. An alternative interpretation of the magnitudes is that, on average, monarchs with $F < 6.25$ (less inbred than the offspring of first cousins) saw a 12 percentage point larger increase in their territory than more inbred monarchs with $F \geq 6.25$.[43]

A noteworthy feature in the reduced-form regressions is that in columns 3-6 of Table 5 (Panel B), both the dependent variables – $\Delta log(Area)$, and $\Delta log(UrbPop)$ – as well as the explanatory variable (F) are 'objective' measures that cannot be affected by biases in coding. Thus, our results establish a strong negative relationship between inbreeding and state performance independent of historians' (possibly subjective) assessments.

4.5 IV Results – Discussion of Identifying Assumptions

The exclusion restriction in our IV strategy is that inbreeding was not related to state-level outcomes via channels other than ruler ability. We begin by describing why the historical background of our study lends support to the exclusion restriction and then present empirical results that complement this discussion.

Historical Aspects Supporting the Exclusion Restriction. Could the negative affects of inbreeding have influenced the marriage decisions of European monarchies? This is unlikely. As we discussed above, the negative effects of inbreeding were largely unknown to the royal families. In-

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[43]The average (standardized) *Inbreeding* of those with $F < 6.25$ is -.31, and of those with $F \geq 6.25$, 2.08. Hence (2.08+0.31)·0.052=0.12.

stead, the wide-spread belief was that marrying within dynasties *strengthened* noble traits, which would tend to work against our results.[44] Nevertheless, we present results below that would address a possible alternative channel *if* anticipated ramifications of inbreeding led to a relationship between state performance and marriage decisions. Another – more immediate – concern is that historians' assessment of monarchs may have been affected by their ex-post knowledge about inbreeding. This is unlikely because we rely on assessments that were made before the 1920s, when a correct measurement of inbreeding was unknown, and when the negative consequences of inbreeding in humans had not even been accepted in academic circles.[45] In fact, our main data source Woods (1906, 1913) had the hypothesis that intermarriage among royal families led to *more capable* rulers.[46] Therefore, our setting renders a violation of the exclusion restriction through the assessment of monarchs by historians unlikely.

'Hidden' Inbreeding. We now complement our historical discussion with an empirical analysis of possible threats to the exclusion restriction. In this context, it is important to note that the marriage decision that determined a ruler's coefficient of inbreeding was made in his/her parents' generation. Thus, if unobservables led to a violation of our exclusion restriction, they must have affected marriage decisions in the past, and state performance in the *subsequent* period. One such possibility is strategic marriage, to the extent that it was related to future state performance.[47] To address this type of concern, we show that our results also hold when we focus only on the 'hidden' degree of inbreeding – the dimension beyond the parents' relatedness that was embedded in the intertwined family trees of previous generations. We first identify the degree of inbreeding

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[44]After our period of analysis, there is some evidence that monarchs *suspected* that inbreeding might be related to physical shortcomings. One documented instance is Queen Victoria of England (1837 to 1901), who speculated that the hemophilia in her eighth child, Prince Leopold, may have been due to a lack of "some fresh blood...[f]or that constant fair hair and blue eyes makes the blood so lymphatic." (cited in Shaw, 2002, p. 69). However, immediately after this quote, Shaw points out that "It is unlikely that at the time of writing this letter the Queen had any idea precisely what was wrong with her family's blood." In fact, Shaw then suggests that the Queen may have formed her opinion based on the wide-spread legend of the "curse of the Coburgs," from whom she directly descended. The legend alleged that a jealous monk had cursed the Coburgs with the disease.

[45]Darwin was the first to show experimentally that inbreeding depression exists in plants, and then worried that his own offspring might be affected (his wife was his first cousin, cf. Berra, Alvarez, and Ceballos, 2010). It took decades for researchers to become convinced that humans are similarly negatively affected by inbreeding. In 1927, Bronislaw Malinowski, one of the "founding father[s] of social anthropology" (Young, 2004), stated that "biologists are in agreement that there is no detrimental effect produced upon the species by incestuous unions" (Malinowski, 1927). See also Wolf (2005).

[46]"The very formation of royal families was thus a question of selection of the most of able in government and war. From their intermarriage with their own kind, in connection with the force of heredity, we find an explanation for their relative superiority" (Woods, 1906, p. 302). See Section 3.1 for further detail.

[47]For example, high prospects for future state performance may have increased the attractiveness in the marriage market, leading to spouses beyond the dynasty's network and thus lower inbreeding. Such strategic marriage decisions could also expand the territory (c.f. Rady, 2020). Subsequently, the children of such strategic marriage partners would merely benefit from the seeds for state performance that were already sown in their parents' generation. Note in the same context that *if* royal families had concerns about the negative effects of inbreeding, this would have to affect parents' marriage decisions but their offspring's state performance in order to violate the exclusion restriction.

that resulted directly from each ruler's parents' family ties (e.g., parents being first cousins or uncle and niece). Then, we deduct this 'naive' degree of inbreeding from the 'full' coefficient of inbreeding. The resulting 'hidden' degree of inbreeding reflects the more remote layers of the pedigree, beyond the parent generation (see Appendix A.7 for further detail on the calculation). Table 6 replicates our previous IV and reduced-form results, using only the 'hidden' component of the coefficient of inbreeding as an instrument for ruler ability. As for our main instrument, we standardize this variable and refer to it as *Hidden Inbreeding*. Throughout, we obtain very similar results, both in terms of magnitude and statistical significance. Importantly, the first stage also remains strong, with the effective F-statistic either exceeding or being close to the critical value for max. 10% IV bias. These results imply that our results are not driven by unobservables or strategic decisions that affected the marriage decision of a ruler's parents – and many concerns with the exclusion restriction fall into this broad category.

Additional Checks of Potential Threats to Identification. In Appendix C we present additional, more specific, checks of potential threats to our identification strategy. Here, we provide a brief overview. First, the exclusion restriction would be violated if royals married kin when state performance was low, *and* past bad state performance lowered state-level outcomes during the reign of their offspring. Our results on 'hidden inbreeding' can already alleviate this concern – by effectively excluding marriage decisions at the generation of rulers' parents. Nevertheless, we also account for this possibility more directly in Appendix C.1. We show – for each of our three outcome variables – that past state performance predicts neither ruler ability nor subsequent state performance (Tables A.8 and A.7). In addition, controlling for lagged state performance does not affect our 2SLS or reduced-form results. Second, we show that our results are similarly not driven by strategic marriages *outside* of the kin network. Marriage between completely unrelated parents would imply rulers with zero inbreeding ($F = 0$). These are excluded in our baseline 2SLS regressions because there is no traceable kin relationship for their parents (see footnote 32). Table A.9 shows that our IV results are almost identical when we *include* these 43 rulers, coding them as $F = 0$. Third, we examine the possible confounding role of conflict, which may have been related to dynastic networks (Benzell and Cooke, 2021). We show that our results are robust to controlling for conflict during reigns, and to residualizing our *State Performance* measure with respect to territorial changes (Table A.10). Fourth, we account for a possible role of founders vs. descendants in dynasties (George and Ponattu, 2018), whereby founders of dynasties may be at the same time more capable and less inbred than later descendants. Table A.11 documents that our IV results hold when we include fixed effects for rulers' order within dynasties.

Fifth, our baseline sample includes regents and other cases of rulers who ascended to power through modes other than primogeniture. If among the non-hereditary rulers, more inbred ones were more likely to come to power during tumultuous periods (possibly due to their tight kin con-

nections), then this could bias our results upward. To address this, Table A.12 shows that our results hold when we restrict the sample to rulers who came to power due to documented hereditary ascension. Sixth, a related concern is that monarchs may have selected the most able leaders among their offspring as successor (even to the point of 'ridding themselves' of incapable offspring that came earlier in the birth order), or that offspring who were more affected by their parents' consanguineous relationships died in young age, leaving more capable surviving successors. However, both these mechanisms would work against our first stage: Siblings share the same coefficient of inbreeding, and 'eliminating' the least capable ones would reduce the variation in ruler ability that is due to inbreeding. To further address this point, we show in Table A.13 that our results remain strong when we reduce the sample to monarchs with unambiguous information that they were the first-born sons. But what if there were potential claims to the throne by offspring from another marriage of the previous ruler? We address this as well, by restricting the sample to monarchs whose parents had only one marriage or no offspring from any other marriage, showing that our IV results hold (column 3 of Table A.13).

Finally, note that the monotonicity assumption required for IV is likely fulfilled. In our setting, this assumption requires that the instrument does not trigger "defiers," i.e., that inbreeding does not (by accident) lead to ingenious leaders. The literature in genetics documents that "inbreeding depression" only has negative effects on fitness (c.f. Robert et al., 2009; Ceballos and Álvarez, 2013), and therefore in all likelihood on leader ability. It is also not the case that inbreeding increases variance in ability; that is, it is essentially impossible that inbreeding leads to "genius" by accident.

4.6 Ruler-Pair Regressions

So far, our regressions have compared rulers from the same state over time. As we noted in footnote 3, accounting for variation over time is not straightforward because reigns begin and end at different points in different states. Yet, rulers and their states' performance might be affected by continent-wide shocks, such as the Black Death, the Reformation, or long-lasting wars.

In order to account for potential confounding factors over time, we introduce a flexible approach that compares leaders in different states who ruled contemporaneously. For instance, while Spain under Carlos III (1759-88) experienced a "continued improvement," his contemporary Louis XV of France (1731-74, described by Woods as "weak, indolent" and of "inferior capacity") oversaw the "disastrous Seven Years War" and domestically a "decline in commerce," where "[u]nder excessive taxes, the peasantry were reduced to extreme misery."

We identify – for each ruler i – all those rulers j who overlapped in their reign in different states for at least one year. Then, we calculate pairwise differences in their ability, in the performance of their states, and in their coefficients of inbreeding. Based on these variables, we estimate

regressions at the ruler pair-level:

$$\Delta_{ij}\text{State Performance} = \beta\Delta_{ij}\text{ Ruler Ability} + \mu_{s(i)} + \mu_{s(j)} + \gamma X + \varepsilon_{ij} \quad, \tag{3}$$

where Δ_{ij} indicates the difference in a variable between ruler i and j. We estimate 2SLS regressions in this setting using the difference in the coefficient of inbreeding. For the above example of Carlos III and Louis XV, this difference is negative (-5.65): Carlos III had a lower coefficient of inbreeding (3.9) compared to Louis (9.55). In all regressions, we further include state fixed effects for both rulers ($\mu_{s(i)}, \mu_{s(j)}$), and we introduce the following additional fixed effects successively: state-pair fixed effects, ruler fixed effects (of ruler i), and state-pair × century fixed effects. Standard errors are clustered at the state-pair level. In total there are 5,510 pairs of overlapping rulers in our sample with data on ability and *State Performance* for both rulers. For 2,926 of these we also observe the coefficient of inbreeding for both rulers.

We present the ruler-pair results in Table 7. We include state fixed effects as well as state-pair fixed effects. The latter absorb features such as the frequent wars between England and France. The OLS coefficients in Panel A show that differences in the ability of contemporaneous rulers are strongly positively associated with differences in *State Performance* (column 1). Note that the coefficient is very similar to our baseline results in levels (see Table 1), implying that our findings are not driven by time trends. In column 2, we further introduce ruler fixed effects, which prevents that our results may be dominated by individual rulers, as well as state-pair × century fixed effects, thus absorbing for example differences between England and France that were specific to the 17th century. Our results are essentially unchanged. In column 3 we use a more restrictive pair-match, comparing each ruler only with the *one* ruler with whom (s)he shared the largest overlap in reign. Again, the coefficient of interest remains almost unchanged. Columns 4-7 show that the findings for ruler-pair regressions also extend to our 'objective' measures of state performance – changes in territory and in total urban population during each reign.

Next, we turn to our IV results in the ruler-pair regressions. Panel B in Table 7 presents the first stage, showing strong negative and highly significant coefficients for all specifications. Comparing contemporaneous rulers, those who were more inbred had lower ability. Building on this strong first stage, Panel C shows our IV results at the ruler-pair level. We document sizable effects of pair-wise differences in ruler ability on cross-state differences in all three outcome variables. The coefficients are similar to our baseline IV specification in Table 5, suggesting that time trends do not confound our identification and causal estimates. Finally, Panel D presents reduced-form results, documenting a highly significant and negative relationship between differences in inbreeding across contemporaneous rulers and differences in the corresponding state-level outcomes.

4.7 Mechanisms

Why did capable monarchs boost their states' performance? In Appendix D we provide several pieces of suggestive evidence that we summarize here. First, we examine whether physical attributes such as body height, strength, or life expectancy could explain our findings. These outcomes may also have been affected by inbreeding (although we find only limited empirical evidence for a systematic association in our data – see Table A.14). Table A.15 shows that our IV results are unchanged when we control for these variables, as well as for the number of offspring, the length of reign, and for whether the ruler had ascended to power after regicide of the previous monarch.[48] Second, we distinguish between cognitive ability (as assessed by Woods) and non-cognitive ability (e.g., emotional stability). We use our own assessment of monarchs' non-cognitive ability (described in Appendix A.2) and find that it is also negatively related to inbreeding. However, when we control for non-cognitive ability in our 2SLS regressions, the coefficient on (cognitive) ruler ability remains almost unchanged. These findings make it unlikely that physical features or other traits that may be associated with inbreeding confound our results.

Third, we examine which aspects of Woods' (1913) broad *State Performance* measure drive our results. To this end, we code detailed outcome variables for various economic and political aspects of each reign based on both Woods' text and information from encyclopedias (see Appendix D.3 for detail). We find that ruler ability had particularly strong effects on law and order, administrative efficiency, and diplomatic prestige of a state. Capable rulers also fostered economic performance (both agriculture and commerce) as well as the living conditions of their populace. Fourth, in Appendix D.4 we examine how ruler ability affected war and conflict. Our IV results show that overall, states with capable rulers were significantly less likely to experience conflict. Distinguishing between domestic and international conflicts as outcome variables, we then show that this finding is entirely driven by the latter: Capable rulers were much less likely to engage in external conflicts (Table A.18). This suggests an interesting mechanism, given that capable rulers also expanded their states' territory and urban population (see Table 5): They avoided conflicts overall, but especially so when these were risky, with potential territorial losses. Lastly, we decompose the change in urban population into an intensive component (growth or decline of urban population within a state's existing borders) and an extensive component (changes in urban population due to territorial gains or losses). We find that able rulers mostly expanded the (taxable) urban population via the extensive margin (Appendix D.5). In contrast, on average, capable rulers did not

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[48]In this context, we note that a rich literature connects birth order to individual and social capabilities, typically finding favorable effects for first-born children (c.f. Rohrer, Egloff, and Schmukle, 2015). Motivated by these differences, Oskarsson et al. (2021) show that firstborn sons are more likely to become politicians today. This could potentially also be a mechanism behind our results: if firstborn children were more capable, and if inbreeding led to more infant death, then the next-in-line successors of inbred royal parents may have been less capable because of a birth-order effect (instead of – or in addition to – a direct effect of inbreeding on cognitive capability). However, this is not the case: As described above, our results also hold in the subsample of firstborn sons (Table A.13, col 2).

cause faster urban growth *within* their states' boundaries. This is compatible with historical facts across early modern Europe, where strong, capable rulers had an ambiguous effect on domestic city growth because they fostered economic prosperity on the one hand, but they also kept cities' ambitions to become independent in check, thereby curbing their potential to grow further (c.f. Angelucci, Meraglia, and Voigtländer, 2017). In sum, the evidence suggests that capable rulers fostered administrative efficiency, the rule of law, and economic prosperity within their realms, while choosing wisely which external conflicts to engage in – with the result that they managed to expand their territories into valuable, urbanized areas.

5   Constraints on Ruler Power

Were European states inevitably at the mercy of incapable, inbred rulers? The literature in political economy and management suggests that leaders matter particularly strongly when they act in institutionally unconstrained environments. Examining CEOs, Clark et al. (2014, p. 358) show that "leaders matter most when ownership and governance structures correspond with a weak or ambiguous institutional logic." Similarly, at the national level in modern data, Jones and Olken (2005) find particularly strong changes in growth when *autocratic* leaders die, while Besley and Reynal-Querol (2017) document higher economic growth under hereditary leaders when constraints on them were weak. Our setting also features important differences in the extent to which rulers were legally and de-facto constrained. In addition, in contrast to previous work, we observe ruler ability. We can thus examine whether institutional constraints mitigated the effects of ruler ability on state performance. We first describe a motivating example – monarchs in England only mattered before a strong parliament emerged – and then present our systematic results based on a novel, finely grained measure of constraints on monarchs' executive power.

5.1   Example: Constraints on England's Monarchs in the 17th Century

Consider the cross-state variation of our baseline OLS association documented in Figure 4. The coefficient for England was relatively small, especially when compared to other Western European monarchies, such as France and Spain. We can explain this pattern by splitting England into two periods, before and after 1600: In the first period, the coefficient for England is large and similar to Scotland's. In contrast, after 1600, we no longer observe a relationship between ruler ability and the state's performance – the coefficient becomes small, negative, and statistically indistinguishable from zero (results available upon request). A possible explanation is that in the 17th century, the Civil War and the Glorious Revolution led to increased constraints on the monarch in power (see Figure 5 and the discussion in Section 3.4). In what follows, we examine the mitigating effect of constraints on executive power systematically.

5.2 Results: Constrained Monarchs Matter Less

To assess whether the ability of constrained European monarchs mattered less, we estimate the following specification:

$$y_{r,s} = \beta_1 Ruler\,Ability_{r,s} + \beta_2 Constrained_{r-1,s} + \beta_1 Ruler\,Ability_{r-1,s} \times Constr_{r,s} + \delta_s + \varepsilon_{r,s} \quad (4)$$

where $Ruler\,Ability_{r,s}$ is the assessed capability of monarch of state s in reign r and $Constrained_{r-1,s}$ is a dummy variable indicating whether the ruler faced 'substantial constraints' (as described in Section 3.4). In order to alleviate concerns about endogenous state institutions, we measure the variable $Constrained$ at the end of the previous reign $r-1$.[49] Similarly, regarding the broad outcome variable *State Performance*, a valid concern is that Woods' (1906; 1913) assessment may have been affected by the states' institutions. For this reason, we only use our two 'objective' outcome variables $y_{r,s}$, namely the change in territory and in urban population during each reign. Finally, δ_s denotes state fixed effects. In our IV results, we instrument for *Ruler Ability* with $Inbreeding_{r,s}$, and for the interaction term with $Constrained_{r-1,s} \times Inbreeding_{r,s}$.[50]

Table 8 presents our results. While we draw our conclusions from the IV results, we also report the OLS coefficient for both outcome variables, because these results i) provide a consistency check and ii) draw on a larger sample of rulers, since our instrument – the coefficient of inbreeding – is not observed for all rulers. We find a sizable *negative* interaction term that is statistically significant in both IV specifications, and of very similar magnitude as the (positive) coefficient on *Ruler Ability* in levels. These results suggest that the ability of rulers did not matter when they faced "substantial limitations on executive authority." A one-std increase in the ability of an *unconstrained* ruler increases the state's area by about 15%, and its urban population by 19%.[51] In contrast, the overall effect of raising ruler ability of a *constrained* ruler is significantly smaller (approximately 5% for both outcome variables). At the same time, the indicator for constrained rulers itself also has a statistically significant relationship with territorial change and urban growth, indicating that this institutional variable also has a direct effect, independent of ruler ability.

Overall, our results suggest that the capability of monarchs mattered less when and where their actions were constrained by institutions. In our setting, parliaments – and therefore the con-

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[49]This specification directly addresses the possibility of reverse causality. A remaining concern with the lagged *Constrained* variable is that past institutional constraints may have affected past state performance, which in turn may have influenced the marriage decision of the current ruler's parents and therefore his/her ability (via inbreeding). However, as we have shown in Tables A.7 and A.8, past state performance predicts neither ruler ability nor present state performance.

[50]The exclusion restriction is that the interaction term $Constrained_{r-1,s} \times Inbreeding_{r,s}$ affected changes in territory and urbanization only via the ruler ability-constraints channel. While it is possible to imagine violations of this condition, two features can help to alleviate such concerns: The variable $Constrained_{r-1,s}$ in levels is included in both the first and second stage regressions, and it is measured *before* the respective ruler came to power.

[51]Recall that we standardize *Ruler Ability* so it has mean zero and standard deviation 1.

straints on monarchs – became gradually stronger in North-Western Europe after the 16th century (Van Zanden et al., 2012). At the same time, the dynasties ruling Europe increasingly drew on an ever smaller pool of potentially suitable royal marriage partners. In turn, this increased the coefficient of inbreeding throughout, and particularly so in Northern Europe. One fascinating implication of our results is thus that the emergence of strong parliaments in North-Western Europe may have shielded these states from the negative effects of ever more inbred royal elites.[52]

6   Conclusion

The importance of national leaders for the course of history has been subject to continued debate since the time of Napoleon. The Emperor of the French also illustrates a central identification problem: rather than 'great men' shaping history, historical circumstances may give rise to famous leaders who find their way into office even when born to a modest family on a on a Mediterranean island far from the centers of power. In other words, it is hard to disentangle a causal effect of leaders on their state's performance from unobserved factors or even reverse causality. We explored the period that has been most prominently debated in this context: Europe between the 10th and 18th century.

Our paper is the first to provide systematic causal evidence that more capable European rulers boosted outcomes for the states they governed. To identify these effects, we exploited the fact that European monarchs ascended to power by hereditary succession, independent of their ability. In addition, ruler ability varied because of century-long inbreeding within dynasties. The detrimental effects of inbreeding were unknown until the 20th century; in fact, a popular belief among European dynasties was that kin marriage helped to preserve royal virtues. In addition, a significant part of inbreeding was 'hidden' in the history of kin marriage during previous generations. In combination, these features yield quasi-random variation in ruler ability, allowing us to identify its causal effect on state performance. We find sizeable coefficients, with capable leaders boosting their states' performance along multiple dimensions, including economic outcomes, administrative efficiency, urban growth, and territorial gains. The latter is particularly striking, given that capable rulers were less likely to engage in conflicts. In combination, these two observations suggest that able rulers chose wisely which conflicts to engage in, favoring those that promised territorial gains. Overall, our results imply that European rulers did 'make history,' with their actions shaping the European map during the period that laid the foundation for modern nation states.

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[52]One may wonder whether this result could also be driven by inbreeding depression being "purged" over time (Ceballos and Álvarez, 2013). This is unlikely. We exploit differential changes in constraints on executives across states, while the elimination of deleterious alleles via purging would have been common a trend across Europe (if it was quantitatively important at all). In addition, this channel would be captured by two other robustness checks that we present: i) ruler-pair regressions (which implicitly absorb time trends, in section 4.6) and ii) our regressions that include dummies for each ruler's order in the dynasty (in Appendix C.4). Neither of these checks diminishes our main coefficient of interest.

We also showed that the effect of ruler ability on state performance was muted in states with strong institutional constraints on their monarchs. The most important institution exerting such constraints were parliaments, and these, in turn, were most active in North-Western Europe. At the same time, inbreeding of dynasties surged in North-Western Europe between the 15th and 18th century. Our results suggest that parliaments shielded Northern Europe's states from the adverse effects of inbreeding within their ruling dynasties.

Our findings complement earlier causal analyses of national leaders today, as this literature similarly finds more substantial effects for more autocratic and less constrained leaders. We extend these conceptually as we open the black box of national leader effects by emphasizing the importance of particular individual traits in shaping state performance. We hope that future work on modern national leaders similarly moves from the identification of leader effects to causal analysis of *why* national leaders matter.

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FIGURES

The ancestry of Charles II of Spain
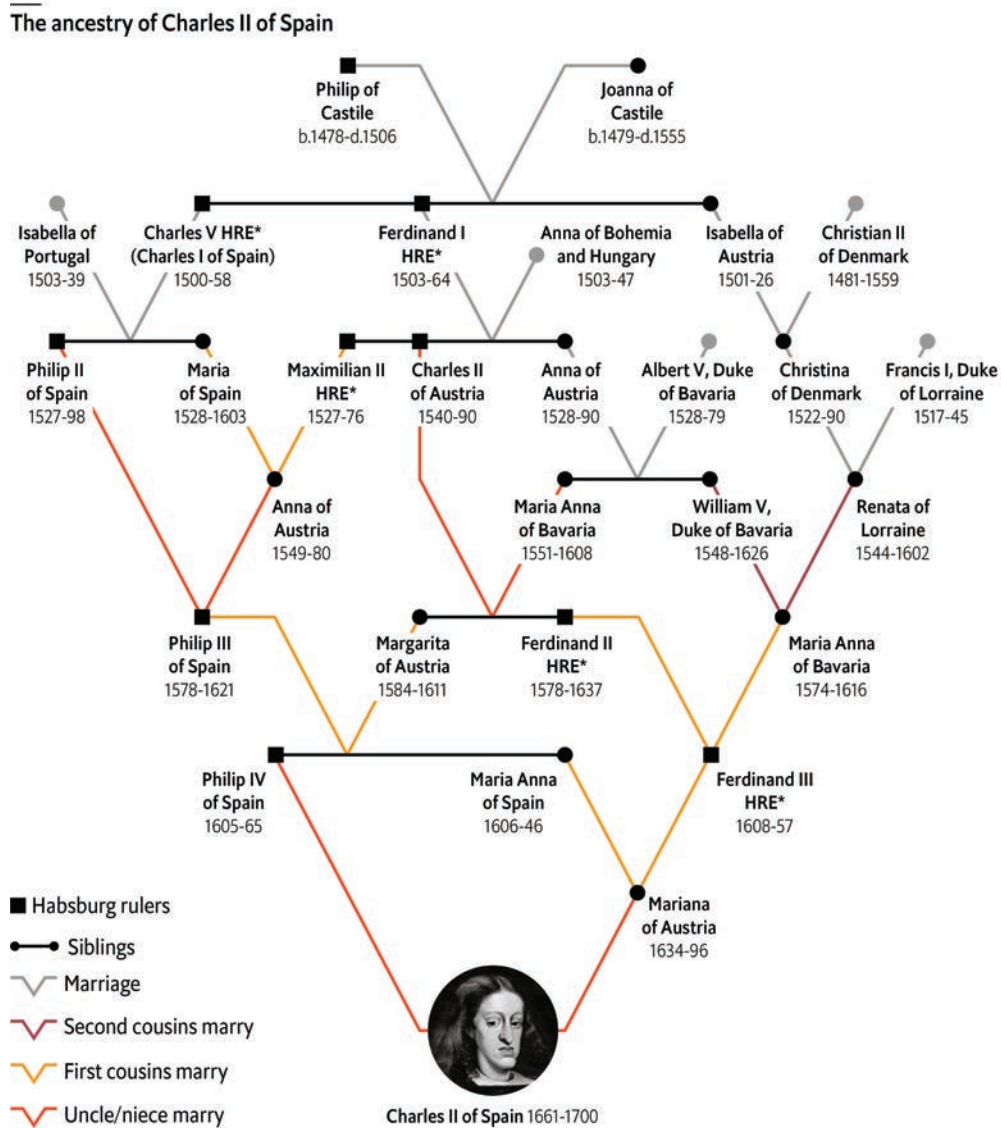
Figure 1: Pedigree of Carlos II. of Spain

Note: The figure shows the pedigree of Carlos II, King of Spain from 1665 to 1700. Note the intricate links to common ancestors of both his parents, stretching back over multiple generations. From The Economist's coverage of this paper on February 20th, 2021 © The Economist Newspaper Limited, London. All rights reserved.

Figure 2: States in Sample

Note: The figure shows the boundaries of the states in our baseline sample at four points in time: 1200, 1400, 1600, and 1790. Data on state boundaries are from Abramson (2017). See Appendix A.1 for detail.
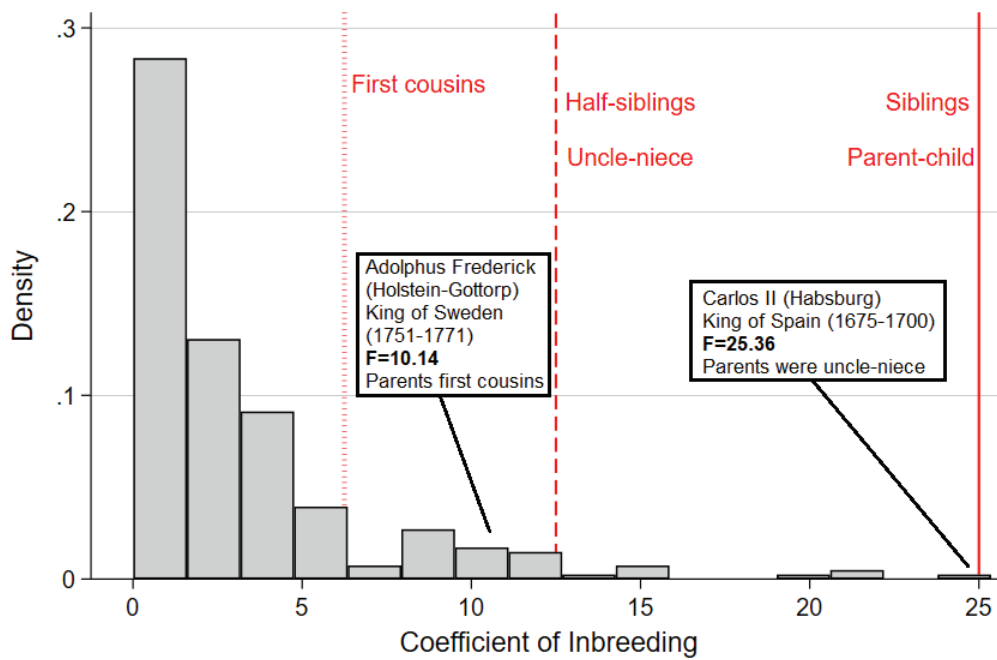
Figure 3: Histogram: Coefficient of inbreeding of Monarchs

Note: The figure shows the distribution of the coefficient of inbreeding (F) – the instrument for ruler ability in our analysis – for the 235 European M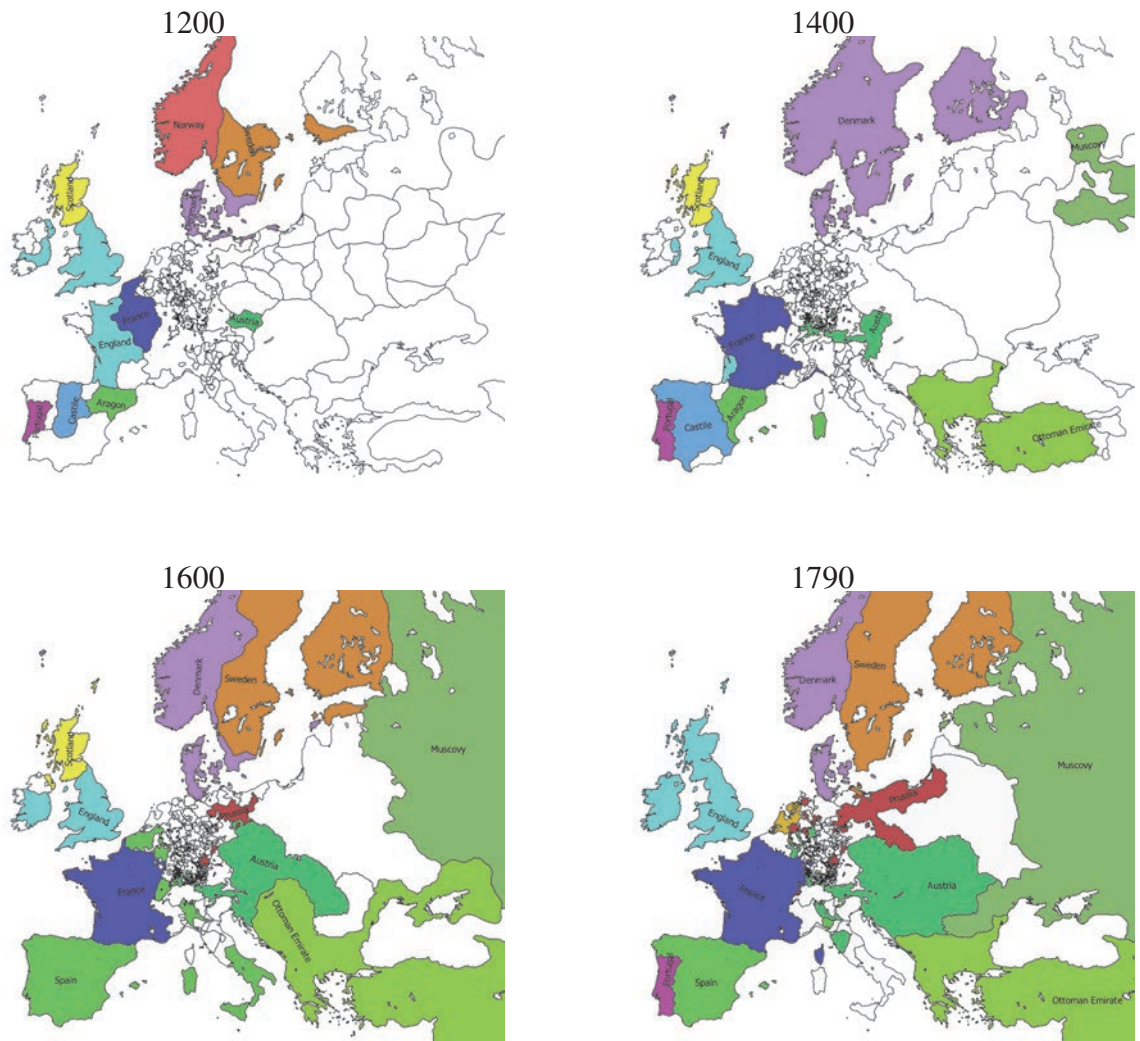onarchs with available genealogical information in our baseline dataset. $F = 0$ indicates no relation among the parents of a monarch, $F = 50$ would theoretically result from self-fertilization.
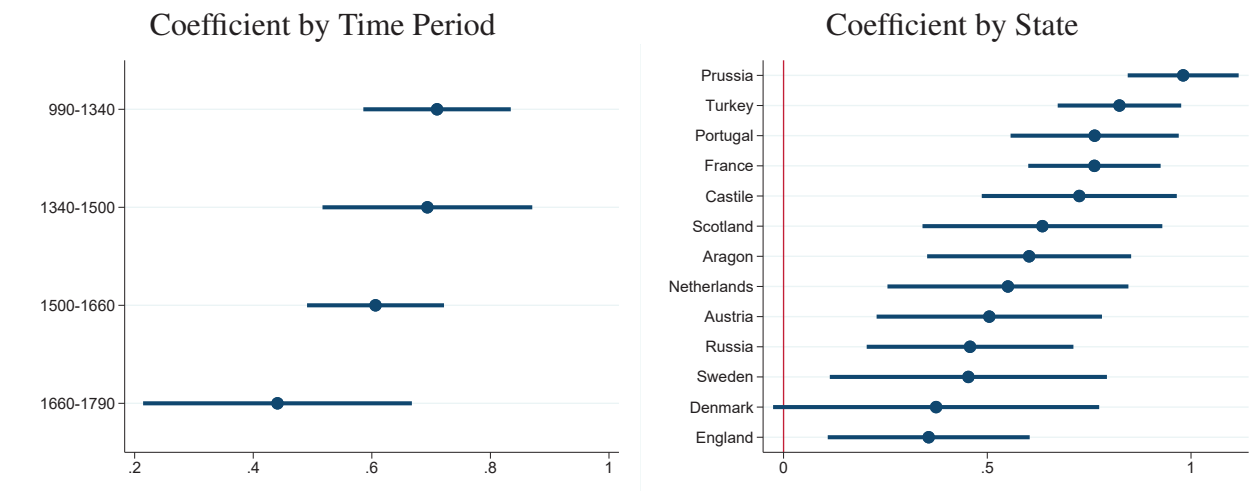
Figure 4: Association between Monarch Ability and State Performance by Period and State

Note: The figure shows coefficients of regressing ruler ability on state performance by time period (left panel) and by states in our baseline sample (right panel). Underlying each panel, we run a joint OLS estimation that includes state fixed effects. The figure also shows 90% confidence intervals (based on robust standard errors).

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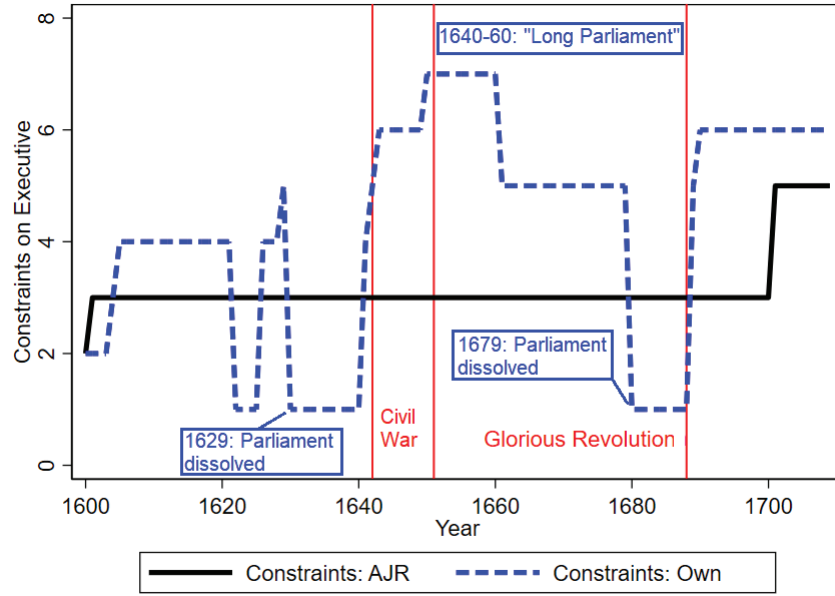
Figure 5: Constraints on Executive: Year-by-year, 17th Century England

Note: The figure shows changes in constraints on the executive for England in the 17th century, using the Polity IV score that ranges from 1 (least constraints) to 7 (most constraints). The black solid line depicts the century-level coding by Acemoglu et al. (2005), while the blue dashed line shows our annual variable, which can then be mapped to individual reigns. Section 3.4 explains our coding.
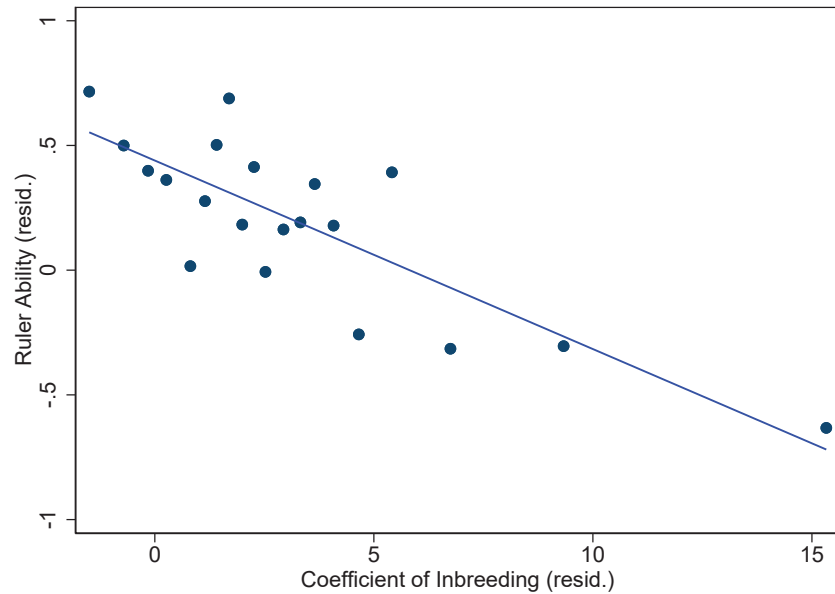
Figure 6: First Stage: Binscatter with state Fixed Effects

Note: The figure shows a binned scatter plot for our first-stage regression of ruler ability on the coefficient of inbreeding, controlling for state fixed effects. Each of the 20 bins in the graph corresponds to more than 10 individual rulers. Note that figure uses the non-standardized coefficient of inbreeding so that the x-axis reflects its actual magnitude, coherent with Figure 3 (while our regressions use the standardized *Inbreeding* variable).

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TABLES

Table 1: Monarchs and Performance of State – OLS Results

Dependent variable as indicated in table header

Dep. Var.	*State Performance*		$\Delta log(Area)$		$\Delta log(UrbPop)$	
	(1)	(2)	(3)	(4)	(5)	(6)
Ruler Ability	0.616***	0.618***	0.117***	0.113***	0.110***	0.098***
	(0.052)	(0.050)	(0.032)	(0.035)	(0.028)	(0.027)
State FE		✓		✓		✓
R^2	0.38	0.41	0.07	0.11	0.05	0.10
Observations	336	336	298	298	289	289

Note: The table documents a strong relationship between ruler ability and our three measures of state performance at the reign level. *State Performance* in columns 1-2 is a comprehensive measure based on the coding by Woods (1913); the variable is standardized so it has mean zero and std one. $\Delta log(Area)$ in columns 3-4 is the change in a state's land area during a monarch's reign, and $\Delta log(UrbPop)$ in columns 5-6 is the change in total urban population during a reign. *Ruler Ability* is standardized. All regressions are run at the reign level. Standard errors clustered at the state level in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

Table 2: Robustness of OLS Results: Different Samples

Dep. Var.: *State Performance*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Notes:	Baseline	Only Dynasty Members	Exclude Regencies	Exclude Foreign Rule	Exclude Multi-Reign Rulers	All Restrictions	Extended Sample until 1914	incl. PL & HU
Ruler Ability	0.618***	0.653***	0.687***	0.626***	0.616***	0.670***	0.532***	0.554***
	(0.050)	(0.058)	(0.070)	(0.052)	(0.053)	(0.071)	(0.044)	(0.042)
State FE	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.41	0.45	0.50	0.42	0.41	0.50	0.34	0.34
Observations	336	290	262	325	317	235	374	437

Note: The table documents the robustness of our baseline regression (col 2 in Table 1) to using different samples. The dependent variable *State Performance* is a (standardized) comprehensive measure based on the coding by Woods (1913). *Ruler Ability* is also standardized. See Section 4.2 for a detailed description of the sample restrictions in cols 2-6. In column 7 we extend the sample (based on our own coding) for all states included in Woods until 1914. In column 8 we extend the sample to further include Poland and Hungary, again until 1914 (see Appendix A.5 for detail). All regressions are run at the reign level. Standard errors clustered at the state level in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

Table 3: OLS Results – Heterogeneity by Ruler Characteristics

Dep. Var.: *State Performance*

Dummy for:	(1) Female Ruler	(2) Young Ascension	(3) Raised as Heir	(4) Hereditary Succession	(5) Regicide of Prior Ruler
Ruler Ability	0.607***	0.552***	0.578***	0.411***	0.612***
	(0.062)	(0.092)	(0.186)	(0.099)	(0.063)
Dummy $\times$ Ruler Ability	0.027	0.122	0.015	0.238**	-0.003
	(0.124)	(0.099)	(0.193)	(0.108)	(0.199)
Dummy	-0.207*	0.009	-0.233	0.105	0.007
	(0.107)	(0.069)	(0.154)	(0.121)	(0.192)
State FE	✓	✓	✓	✓	✓
R^2	0.40	0.40	0.45	0.39	0.40
Observations	312	305	141	290	191

Note: The table shows results of interacting our baseline regression (col 2 in Table 1) with different ruler characteristics. In column 1, the interaction variable is a dummy that takes on value one if the ruler was a woman; in column 2, for rulers ascending to the throne below the median age of 28 years; in column 3, it indicates rulers who were raised as designated heir; in column 4 it indicates rulers who raise to power due to hereditary succession; and in column 5 the dummy indicates whether the prior ruler was murdered or executed after trial. The dependent variable, *State Performance*, is a (standardized) comprehensive measure based on the coding by Woods (1913). *Ruler Ability* is also standardized. All regressions are run at the reign level. Standard errors clustered at the state level in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

Table 4: Inbreeding and Monarch Ability – First-Stage Results

	Dependent Variable: Ruler Ability				
	(1)	(2)	(3)	(4)	(5)
Note:			Only $F < 25$	Only $F < 12.5$	Hereditary Succession
Inbreeding	-0.284***	-0.318***	-0.320***	-0.348***	-0.275***
	(0.048)	(0.049)	(0.057)	(0.070)	(0.054)
State FE		✓	✓	✓	✓
R^2	0.09	0.15	0.15	0.12	0.16
Observations	235	235	234	227	191

Note: The table shows our first-stage regressions of ruler ability on the coefficient of inbreeding, which measures the increased risk of genetic disorders resulting from the consanguinity of a monarch's parents. Both variables are standardized with mean zero and std one. Column 3 excludes Carlos II of Spain, whose parents shared as many genes as offspring of siblings (children of siblings have an inbreeding coefficient $F = 25$). Column 4 excludes all monarchs whose parents shared at least as many genes as offspring of uncle-niece couples (corresponding to an inbreeding coefficient of $F = 12.5$). Column 5 includes only documented cases where rulers ascended to power due to hereditary succession. All regressions are run at the reign level. Standard errors clustered at the state level in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table 5: Monarchs and State Performance – IV and Reduced-Form Results

Dependent variable as indicated in table header

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	*State Performance*		$\Delta log(Area)$		$\Delta log(UrbanPop.)$	
Note:		F < 12.5		F < 12.5		F < 12.5
A. Second Stage Regressions						
Ruler Ability	0.794***	0.645***	0.176***	0.311**	0.194***	0.304**
	(0.100)	(0.185)	(0.051)	(0.123)	(0.051)	(0.123)
State FE	✓	✓	✓	✓	✓	✓
First Stage Effect. F-Stat	42.2	24.6	39.1	21.1	34.8	21.3
Observations	235	227	203	196	198	191
B. Reduced-Form Regressions						
Inbreeding	-0.253***	-0.225***	-0.052***	-0.102**	-0.056***	-0.098**
	(0.045)	(0.053)	(0.015)	(0.040)	(0.014)	(0.043)
State FE	✓	✓	✓	✓	✓	✓
R^2	0.11	0.08	0.10	0.11	0.07	0.08
Observations	235	227	203	196	198	191

Note: The table shows the results of second-stage and reduced-form regressions for our three outcome variables (see notes to Table 1 for a description of variables). The instrument is the standardized coefficient of inbreeding. Column 2, 4, and 6 exclude all monarchs whose parents share as many genes as uncle and niece (corresponding to an inbreeding coefficient of $F = 12.5$). The table reports the first-stage effective F-statistic from the Montiel Olea and Pflueger (2013) robust weak instrument test; the corresponding critical value for max. 10% relative bias is 16.4. All regressions are run at the reign level and include state fixed effects. Standard errors clustered at the state level in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table 6: Monarchs and State Performance – 'Hidden' Inbreeding

Dependent variable as indicated in table header

Dep. Var.	(1)	(2)	(3)	(4)	(5)	(6)
	State Performance		$\Delta log(Area)$		$\Delta log(UrbanPop.)$	
Note:		F < 12.5		F < 12.5		F < 12.5
A. Second Stage Regressions						
Ruler Ability	0.757***	0.710***	0.161**	0.234**	0.199***	0.270***
	(0.132)	(0.201)	(0.064)	(0.105)	(0.057)	(0.098)
State FE	✓	✓	✓	✓	✓	✓
First Stage Effect. F-Stat	17.2	14.0	19.8	16.3	19.5	16.3
Observations	235	227	203	196	198	191
B. Reduced-Form Regressions						
Hidden Inbreeding	-0.254***	-0.225**	-0.051**	-0.072*	-0.063**	-0.084**
	(0.071)	(0.079)	(0.022)	(0.034)	(0.025)	(0.037)
State FE	✓	✓	✓	✓	✓	✓
R^2	0.11	0.09	0.10	0.10	0.07	0.08
Observations	235	227	203	196	198	191

Note: The table repeats all specifications from Table 5, but using only the (standardized) *'hidden'* component of inbreeding as an instrumental variable for ruler ability. The 'hidden' part of the overall coefficient of inbreeding was due to complex intermarriage patterns in the generations prior to a ruler's parents. See Appendix A.7 for detail. The table reports the first-stage effective F-statistic from the Montiel Olea and Pflueger (2013) robust weak instrument test; the corresponding critical value for max. 10% relative bias is approximately 16.4. All regressions are run at the reign level and include state fixed effects. Standard errors clustered at the state level in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table 7: Ruler-Pair Regressions

Dependent variable as indicated in table header

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. Var.		*State Performance*		$\Delta log(Area)$		$\Delta log(UrbanPop.)$	
Note:			One-ruler match				

Panel A. OLS

Δ_{ij} Ruler Ability	0.633***	0.594***	0.577***	0.124***	0.100***	0.112***	0.092***
	(0.013)	(0.017)	(0.032)	(0.011)	(0.012)	(0.011)	(0.013)
R^2	0.46	0.81	0.89	0.18	0.72	0.14	0.67
Observations	5,510	5,495	1,678	4,518	4,505	4,154	4,122

Panel B. First Stage Regressions

Δ_{ij} Coefficient of Inbreeding	-0.051***	-0.045***	-0.044***	-0.048***	-0.031***	-0.046***	-0.031***
	(0.005)	(0.006)	(0.008)	(0.006)	(0.005)	(0.006)	(0.006)
R^2	0.17	0.70	0.77	0.17	0.71	0.17	0.71
Observations	2,926	2,888	1,678	2,258	2,231	2,098	2,064

Panel C. Second Stage Regressions

Δ_{ij} Ruler Ability	0.856***	0.663***	0.638***	0.125**	0.256***	0.154***	0.175*
	(0.094)	(0.084)	(0.124)	(0.060)	(0.095)	(0.059)	(0.106)
First Stage Effect. F-Stat	90.48	54.25	23.98	74.81	27.11	68.44	22.10
Observations	2,926	2,888	1,678	2,258	2,231	2,072	2,098

Panel D. Reduced-Form Regressions

Δ_{ij} Coefficient of Inbreeding	-0.043***	-0.030***	-0.024***	-0.006**	-0.008***	-0.007**	-0.005*
	(0.005)	(0.004)	(0.005)	(0.003)	(0.002)	(0.003)	(0.003)
R^2	0.13	0.72	0.81	0.14	0.69	0.10	0.69
Observations	2,926	2,888	1,678	2,264	2,231	2,104	2,064

Fixed Effects (Panels A-D)

State	✓	✓	✓	✓	✓	✓	✓
State-pair	✓	✓	✓	✓	✓	✓	✓
Ruler		✓	✓		✓		✓
State-pair × Century		✓	✓		✓		✓

Note: The table shows results from ruler-pair regressions (see notes to Table 1 for a description of variables). For each ruler, we compute the pairwise difference in their ability, their coefficient of inbreeding, and the outcome variable, relative to all concurrently ruling monarchs (i.e., all rulers of other states that overlapped with a given ruler for at least one year in their reign). Column 3 keeps for each ruler only the one ruler from all other states with whom s/he shared the largest temporal overlap. Section 4.6 provides further detail. The table reports the first-stage effective F-statistic from the Montiel Olea and Pflueger (2013) robust weak instrument test; the corresponding critical value for max. 10% relative bias is 16.4. All regressions are run at the reign-pair level. Standard errors, clustered at the state-pair level, in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Table 8: The Role of Institutional Constraints on Ruler Power

Dependent variable as indicated in table header

	(1)	(2)	(3)	(4)
Dep. Var.	$\Delta log(Area)$		$\Delta log(UrbanPop.)$	
Estimation:	OLS	IV	OLS	IV
Ruler Ability	0.104**	0.155***	0.095***	0.192***
	(0.034)	(0.042)	(0.026)	(0.053)
Constrained Ruler	0.108***	0.054*	0.300***	0.220***
	(0.010)	(0.032)	(0.037)	(0.025)
Constrained Ruler $\times$ Ruler Ability	-0.109**	-0.106***	-0.040	-0.139**
	(0.039)	(0.035)	(0.032)	(0.059)
State FE	✓	✓	✓	✓
First Stage F-Stat		15.4		13.4
R^2	0.10	0.05	0.10	0.03
Observations	295	200	286	195

Note: The table shows that the effect of ruler ability on the performance of their states was muted when their executive power was constrained. The dummy *Constrained Ruler* indicates "substantial limitations" on ruler power, as measured at the end of the *previous* ruler's reign. See Section 3.4 and Appendix E for detail on our historical reign-level coding of institutional constraints, based on the Polity IV scale. All regressions are run at the reign level. Standard errors clustered at the state level in parentheses. * p<0.1, ** p<0.05, *** p<0.01.