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 performance. 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.

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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; Fenizia, 2022). 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

[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."

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 therefore also captures other factors. In addition, while the timing of the transition is exogenously determined by death, the appointment of the subsequent leader is endogenous. Finally, there is no systematic causal analysis of the role of leaders in history, where it has been debated most intensely. 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 c. 1000-1800, assembling a novel dataset on (cognitive) ruler ability and state performance at the *reign* level. To identify the causal effect of ruler ability, we exploit two salient 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, Europe's nobility was unaware of the negative effects of inbreeding. Knowledge about its negative health effects only emerged in the early 20th century, when methods for its measurement were first developed. 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 339 monarchs from 13 states, building on the work by historian Frederick Adams Woods (1873-1939, commonly cited only by his second surname), 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. This variable measures how genetically related the parents of an individual are, with higher values raising the risks of "inbreeding depression." We collect this variable for all rulers with the necessary information on family lineages from a rich genealogical database. To assess state performance during a ruler's reign, we use three different outcome variables. First, a coding of broad state performance that is based on several underlying metrics, summarizing the work by numerous historians (Woods, 1913). We refer to this variable as *State Performance* throughout. Because there are natural concerns with this subjective coding, we use two additional, objective measures. Our second outcome variable is the change 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 1100-1790. 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 more inbreed rulers fared significantly worse along all three measures of state performance: A one-standard deviation (std) increase in the coefficient of inbreeding led to a reduction of 0.25 std in broad *State Performance*, a five percent loss in territory, and a four percent loss in urban population. We show that this reduced-form effect is at least in part driven by ruler ability: Inbreeding is a strong and robust predictor of ruler ability, and our IV results suggest a sizeable effect of (instrumented) ruler ability on all three dimensions of state performance. A one-std increase in ruler ability leads to a 0.8 std higher broad *State Performance*, to an expansion in territory by 16 percent, and to an increase in urban population by 14 percent. In examining other possible characteristics that may have been affected by inbreeding, our findings suggest that the effect ran mostly through rulers' cognitive ability (about 75%, according to an exploratory mediation analysis), to a much smaller degree through non-cognitive ability (e.g., emotional stability), and not through physical attributes such as strength, body height, longevity, or number of offspring. In exploring mechanisms, we find that 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, but when they did, won a larger proportion of battles, leading to an expansion of their territory into urbanized areas. This suggests that capable rulers chose conflicts 'wisely,' resulting in expansions into valuable, densely populated territories.

We also examine whether institutions mitigated the effect of rulers. We construct a novel state-year specific measure of constraints on rulers, combining definitions of the modern Polity IV score with historical sources on factors such as the power of parliaments. We find that inbreeding and ability of *unconstrained* leaders had a strong effect on state borders and urban population in their reign, while the of *constrained* rulers (those who faced "substantial limitations on their authority") made almost no difference.

We run a battery of checks to confirm the robustness of our results and the validity of our IV strategy. We also verify and extend Woods' (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, and to adding Hungary, Poland, Bohemia, and Bavaria to the 13 states in our baseline sample. We also show that inbreeding affected GDP growth via ruler ability, using annual data for six states in our sample. 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] In examining whether inbreeding was related to state performance through channels other than ruler ability, we exploit the timing in our setting: a monarch's inbreeding was determined by the genetic closeness of his/her parents, i.e., in the previous generation ($t-1$). Thus, potential threats to the exclusion restriction must have been determined in $t-1$, while affecting state performance in t. For instance, such a threat would arise if monarchs made strategic decisions on kin marriage for reasons that were correlated with the *subsequent* state performance. We address this possibility by excluding the component of inbreeding that resulted from the 'naive' relationship of a ruler's parents (e.g., whether they were cousins), exploiting only the *hidden* component of inbreeding that resulted from the complex networks of kin marriage over previous generations ($t-2, t-3$, etc.). Our IV results hold when we use 'hidden' inbreeding, and they are even robust to controlling for the 'naive' parent-generation part of inbreeding from $t-1$. Thus, candidates for a violation of the exclusion restriction would have to be correlated with 'hidden' inbreeding in $t-2$ (or earlier), not correlated with the component of inbreeding determined in $t-1$, and correlated with state performance in t. While this raises the bar for potential confounders, we nevertheless provide a host of additional checks, such as controlling for the role of conflict, strategic marriage outside the kin network, lagged state performance, and 'founders vs. descendants' effects within dynasties.[4]

[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.

[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

Related Literature. 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 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 paper contributes to the literature on political leaders that we discussed in the opening paragraphs.[7] We also relate to the rich literature on business leaders. There are two broad approaches to quantify the importance of individual managers. Both ultimately rely on leadership *transitions* for causal identification. One exploits deaths or hospitalizations of leaders (Johnson, Magee, Nagarajan, and Newman, 1985; Becker and Hvide, 2022; Bennedsen, Pérez-González, and Wolfenzon, 2020), similar in spirit to Jones and Olken

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).

[7]Other related contributions in political economy study the local effects of national leaders (Assouad, 2020, c.f.[]), the effects of local political leader characteristics on local outcomes (Ferreira and Gyourko, 2014; Yao and Zhang, 2015; Logan, 2020; Carreri and Payson, 2021), as well as those of social (rather than politically elected) leaders (Dippel and Heblich, 2021).

(2005); the other estimates manager fixed effects (Bertrand and Schoar, 2003; Malmendier and Tate, 2005). While these papers convincingly establish *that* leaders matter, neither approach can deliver a causal answer as to *why* this is the case.[8] We contribute to these literatures by introducing a novel form of quasi-random variation due to inbreeding of historical leaders, by showing that this affected state performance, and by highlighting a concrete feature through which leaders mattered: their (cognitive) ability.

Our results on the role of institutional constraints relate to research in political economy and management that examine in which environment leaders matter.[9] Finally, our paper relates to the literature on selection into politics. Dal Bó, Finan, Folke, Persson, and Rickne (2017) show that a democracy can generate leadership that is both competent and socially representative. In contrast, Europe's hereditary monarchies produced leadership that was never socially representative and often incompetent.

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.

[8]Where progress has been made in identifying the effect of such features, it has focused on personal characteristics of business leaders, such as being the son of the former CEO or having a military background (e.g. Bennedsen, Nielsen, Pérez-González, and Wolfenzon, 2007; Benmelech and Frydman, 2015). Another approach documents the importance of management practices more generally (Bloom and Van Reenen, 2007), and a separate, extensive literature correlates CEO characteristics with various firm-level outcomes (c.f. Pérez-González, 2006; Cai, Rouen, and Zou, 2022; Bandiera, Prat, Hansen, and Sadun, 2020; Kaplan, Klebanov, and Sorensen, 2012; Demerjian, Lev, and McVay, 2012).

[9]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. Our results focus *only* on hereditary leaders. 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.[10] One often-cited case is the series of able rulers accompanying Prussia's rise from small polity to great power in the 18th century.[11] 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. The context of Spain provides an illustrative example for the variation that we exploit: within the same state over time. 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 due to the build-up of consanguinity over generations. 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 (as high as for children of siblings), 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 gen-

[10]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."

[11]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).

erations. The degree of inbreeding was of no concern (not even the 'visible' uncle-niece dimension) when Carlos II's parents married in 1649.[12]

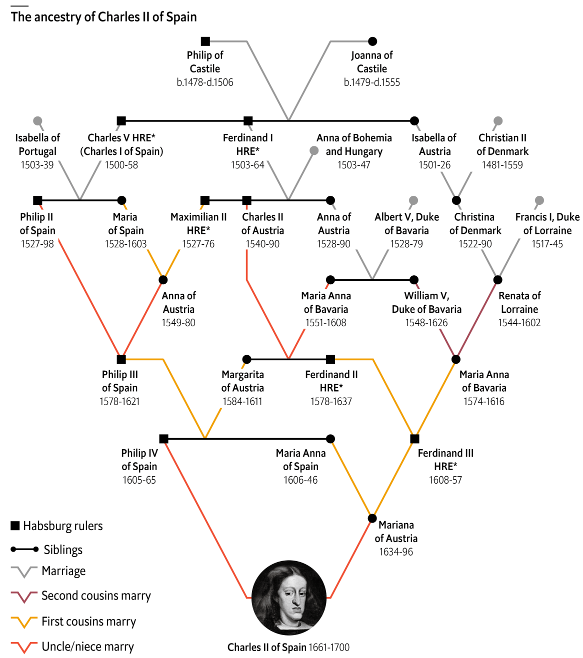

Figure 1: Pedigree of Carlos II. of Spain

Note: The figure shows the pedigree of Carlos II, King of Spain 1665-1700. 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.

The "inbreeding depression" resulting from intermarriage over generations left Carlos II hostage to physical and mental fragility. He only started talking at age 4, and walking at age 8. Álvarez, 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

[12]The consanguinity in Carlos II's pedigree was, if anything, interpreted as a positive feature, signaling a 'clean' royal bloodline (Fleming, 1973). Knowledge about the adverse effects of inbreeding only emerged in the early 20th century.

[13]Accordingly, we follow Woods (1913) 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. See Section A.1 in the Supplemental Appendix (Ottinger and Voigtländer, 2024, henceforth, "App. OV (2024)").

in power." Woods' assessment of Carlos II is brief, characterizing him as an "imbecile." Spain under Carlos II was characterized by "misery, poverty, hunger, disorders, decline..." (Woods, 1913, p.331). He 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 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). Carlos III's reign saw the "continued improvement in financial and commercial conditions, including agriculture and the useful arts" (Woods, 1913, p. 331).

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. In most cases, hereditary succession took the form of primogeniture, which determines that the eldest living offspring of the current monarch 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

[14]Philipp V (ruled from 1700 to 1745) and Ferdinand IV (1745-1759). As Carr (1991, p. 131) notes: "both 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)." 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.

[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

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 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, all kings of France until the Revolution in 1789 were direct descendants of Hugh Capet, who had ruled from 987 to 996 and founded the "Capetian dynasty."

2.3 Intermarriage Among Dynasties

Intermarriage among ruling European dynasties was common. The leaders of the Spanish and Austrian Habsburgs, for instance, practiced cousin marriage over multiple generations, culminating in Carlos II, as described above. Álvarez 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 enforced for European monarchs.[18] 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

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 (1913) coded these reigns by regents separately. Our results are robust to excluding these.

[18]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).

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).[19] Children of first cousins have a five times higher risk of intellectual disability (Morton, 1978) and significantly reduced cognitive ability.[20] At the same time, the literature on leadership traits has emphasized that these cognitive capabilities are important attributes of successful leaders (c.f. Judge, Colbert, and Ilies, 2004).[21] In sum, previous work has established a link from inbreeding to (cognitive) ability, and from the latter to successful leadership.

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 (1913) as systematically less capable – despite the fact that Woods had the opposite hypothesis (see footnote 4).

3 Data

In this section we describe our dataset with observations at the level of individual reigns for ruler ability, state performance, inbreeding, and constraints on ruler power. Section A.2 in the Supplemental Appendix (Ottinger and Voigtländer, 2024, henceforth, "App. OV (2024)") describes the construction of control variables.

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[19] Humans are diploid, i.e., they have two sets of chromosomes (one from each parent). For recessive disorders to appear, both copies need to be deleterious. Hence, the more related the parents are – i.e., the more gene copies they inherited from common ancestors – the higher the risk of recessive gene disorders in their offspring. This "dominance hypothesis" is the prevailing explanation for "inbreeding depression" in genetics (c.f. Charlesworth and Willis, 2009). Importantly, note that the offspring of two inbred but unrelated individuals will not be inbred unless the parents have, by chance, the same harmful recessive genes. Cf. Hamilton (2009, ch. 2.6) or Hartl (2020, ch. 3).

[20] Overall, a substantive body of research has documented negative effects of inbreeding on cognitive ability (c.f. Afzal, 1993; McQuillan et al., 2012; Fareed and Afzal, 2014a,b). This literature has found that cousin marriages can reduce cognitive ability by as much as 27 points (almost two standard deviations) on the IQ scale (Fareed and Afzal, 2014a). These estimates need to be interpreted cautiously, as they rely on self-reported cousin marriage, which in turn can correlate with poverty (Hamamy et al., 2011; Mobarak et al., 2019). Such concerns can be partially addressed by analyzing large genomic samples, measuring homozygosity directly in the genes: Joshi, Esko, Mattsson, et al. (2015) find a reduction in cognitive ability due to genetic relatedness at the level of first cousins by 0.3 standard deviations. This estimate aligns with earlier ones by Jensen (1983). Other work has examined physical outcomes: Inbreeding 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 producing dynastic heirs (Álvarez et al., 2009). We control for these physical dimensions in App. OV (2024), Section D.1.

[21] 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.

3.1 Ruler Ability and State Performance

Ruler ability. Our measure of (cognitive) ruler ability builds on the work by Frederick Adams Woods (1906, 1913). A lecturer in biology at MIT at the beginning of the 20th 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 "graded" hundreds of members of noble families based on their mental and moral qualities. For each ruler, Woods (1913) then 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 moral and mental ability was heritable.[23] Our core analysis builds on Woods' coding of mental (cognitive) ability; we refer to this as 'ruler ability' throughout the paper.[24]

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 broad *State Performance* for more than 300 European reigns.[25] 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. As

[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.

[24] As described in Woods (1913, p. 5), his coding of ruler ability focused exclusively on mental skills: "Moral traits are, as far as possible, left out of consideration while making up the classification for intellect." Thus, our measure of ruler ability reflects cognitive (as opposed to non-cognitive) skills, as defined in the modern literature (e.g., Lindqvist and Vestman, 2011; Heckman, Stixrud, and Urzua, 2006). In Section D.1 in App. OV (2024), we also present a coding of non-cognitive ruler ability.

[25] The states covered are Castile, Aragon (Spain), Portugal, France, Austria, England, Scotland, Holland, Denmark, Sweden, Prussia, Russia, and Turkey. Figure A.1 in App. OV (2024) provides a timeline of coverage for each state.

an 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 (RA) and *State Performance*. Out of 339 reigns for which we have information on both the monarch's ability and the performance of the state, 128 rulers are rated as clearly incapable, 123 as clearly capable, and 88 as neither; regarding *State Performance*, 104 reigns are rated as clearly bad, 143 as clearly good, and 92 are neither. Section A.1 in App. OV (2024) provides further detail.

Other reign characteristics. Section A.2 in App. OV (2024) describes our coding of other characteristics of reigns, such as regencies, the length of reigns, or whether there was regicide of the previous ruler. We also describe our coding of numerous ruler characteristics, including physical features and non-cognitive ability.

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 Section A.4 in App. OV (2024), showing that our independent coding of the same variables led to very similar values.

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 App. OV (2024), Section 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.

3.2 State Border Changes and Urbanization

Because our broad 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 1790.[26] Figure 2 shows the evolution of state borders in our sample. We calculate the percentage change in area ruled during a reign, $\Delta log(Area)$. For example, during the reign of Maria Theresa (1740 to 1780), Austria lost Silesia to Prussia, while it gained areas from Poland (see App. OV (2024), Figure A.3). In net terms, Austria increased its area by 7%.

While territorial expansions typically led to praise for medieval rulers (Machiavelli, 1532), such expansions do not unambiguously imply better state performance. For example, an expansion into thinly populated territory differs in important ways from conquering urbanized areas.[27] To address this issue, we also code changes in urban population in the territory ruled by each monarch. While only a small share of the population lived in cities, these were prestigious targets for ambitious rulers. In addition, after the Commercial Revolution in the 12-14th century, rulers increasingly taxed commerce, which disproportionately took place in urban areas (Angelucci, Meraglia, and Voigtländer, 2022). 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). For each reign, we calculate the total urban population within the state borders at the beginning and at the end of each reign (see App. OV (2024), Section A.6 for detail). We then calculate the

[26]We are grateful to Scott Abramson for kindly sharing his data on European state borders. We describe how we link state borders to reigns in Section A.5 in App. OV (2024) and explain how we ensure consistency with the historical record, given that borders are only observed in 5-year intervals.

[27]In fact, "overexpansion" may weaken the power of a state (Kennedy, 1988), and smaller states were more likely to survive after the military revolution in 1500 (Abramson, 2017). However, Baten, Keywood, and Wamser (2021) show that expansions of territory went hand-in-hand with increases in taxes per capita, and they thus use territorial expansions as a proxy for state capacity. We also explored an alternative that adjusts each state's territory by the grid-cell specific caloric suitability. Using this variable yields very similar results (available upon request).

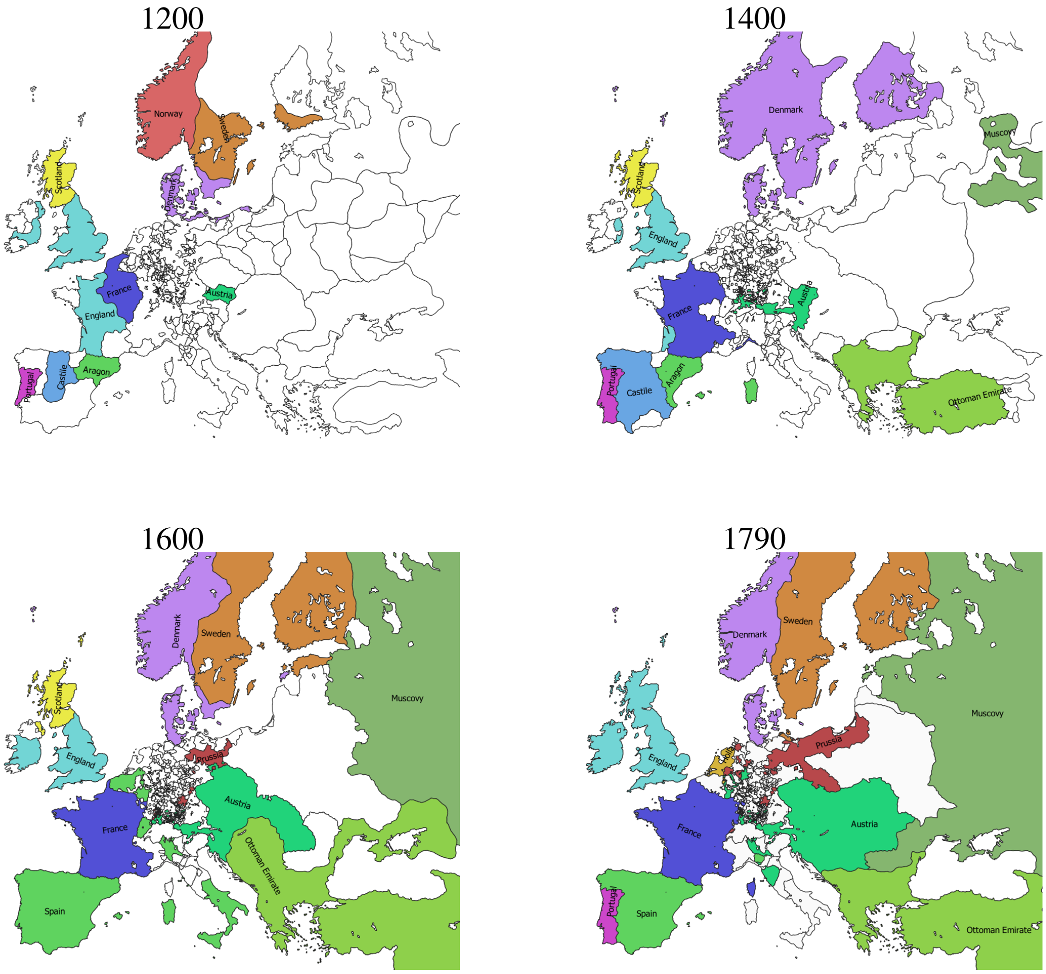

Figure 2: States in Sample

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 App. OV (2024), Section A.1 for detail.

percentage change in total urban population $\Delta log(UrbPop)$.

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, I (in the literature frequently also referred to as F), is the probability that both gene copies in an individual are identical by descent, i.e., from a common ancestor. Higher I thus means lower diversity in an individuals' gene pool, and thus higher risk of recessive gene disorders (see Section 2.4). Offspring of siblings or of parent-child couples have a coefficient of inbreeding of $I = 25$, while offspring of uncle-niece couples have $I = 12.5$, and offspring of first cousin couples have $I = 6.25$.[28]

[28] 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,

We collect I for 256 monarchs from http://roglo.eu/, a crowd-sourced online data source of the genealogy of European noble families. For 238 of these monarchs, Woods (1913) assessed 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.[29] 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 $I = 25.36$, he was more inbred than an offspring of siblings would be. Yet, his parents were "merely" uncle and niece (which in itself would imply $I = 12.5$). Similarly, Adolphus Frederick, King of Sweden 1751-71 had almost the uncle-niece degree of inbreeding, even if his parents were merely first cousins. The difference in both cases reflects the 'hidden' degree of inbreeding within the complex family trees, which we will use below.

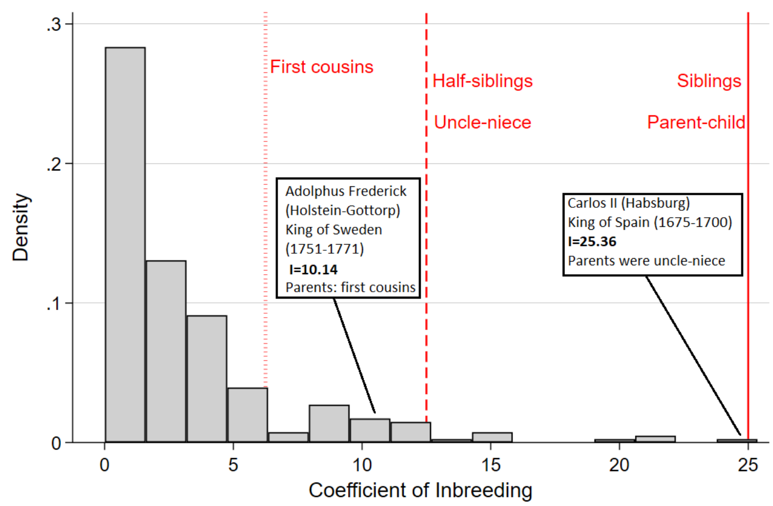

Figure 3: Histogram: Coefficient of inbreeding of Monarchs

Note: The figure shows the distribution of the coefficient of inbreeding (I) – the instrument for ruler ability in our analysis – for the 238 European Monarchs with available genealogical information in our baseline dataset. $I = 0$ indicates no relation among the parents of a monarch, $I = 50$ would theoretically result from self-fertilization.

the probability to pass on a particular allele to a particular offspring is 0.5. Hence, the offspring of self-fertilization would have $I = 50$, as there is a one-half chance for each locus that the entire pair of alleles was passed on. Hypothetically, with repeated self-fertilization, I would approach 100. Offspring of completely unrelated parents have $I = 0$. Further detail on the computation of I is provided by Rédei (2008).

[29] We cross-checked and validated the coefficients we obtained from http://roglo.eu/ extensively with other publications, among them Asdell (1948) and Álvarez 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., $I = 0$), or simply that the information on distant family relationships did not survive. We exclude these cases from our baseline and show robustness to their inclusion in Table A.17.

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 sources as Acemoglu et al. (2005), namely Langer (1972) and Stearns and Langer (2001).

Figure 4 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 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.[30]

Based on our year-reign specific measure for constraints on the executive, we define the variable *Constrained* if the average constraints on the ruler in the five to ten years *prior*

[30] Note that we focus on the constraints faced by the hereditary monarchs, even if those were currently not in power. For instance, when Oliver Cromwell ruled England in the 1650s, our measure of constraints on the hereditary monarch Charles II is at its highest because he was politically powerless (and lived in exile) until the restoration of the monarchy in 1660. However, interregna such as Cromwell ruling England do not enter our IV regressions because inbreeding is not coded during these periods (this results from Woods's (1913) coding convention – see Section B.3 in App. OV (2024) for detail).

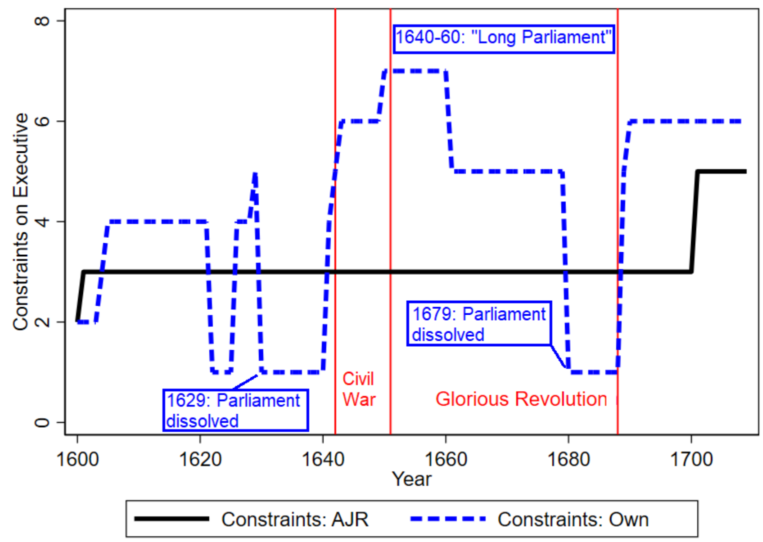

Figure 4: Constraints on Executive: Year-by-year, 17th Century England

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.

to his/her reign were strictly 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."

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 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:

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

where $y_{s,r}$ is one of our three outcome variables for the performance of state s in reign r, as defined in Sections 3.1 and 3.2: broad *State Performance*$_{s,r}$, $\Delta log(Area)_{s,r}$, or $\Delta log(UrbPop)_{s,r}$. Ruler ability is denoted by *RA*$_{s,r}$. For a straightforward interpretation of coefficients, we standardize the assessments of *State Performance* and of *RA* 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 RA is associated with a 0.62 standard deviation (std) increase in *State Performance*.[31] Column 2 shows that this association is unchanged when we add state fixed effects. Thus, our results are not affected by persistent differences across states. The broad *State Performance* variable 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, $\Delta log(Area)$, we document a significant and sizable association with ruler ability (col 3). Again, these results are stable when we include state fixed effects (col 4). A one std increase in ruler ability in the same state is associated with land area expanding by about 11%.[32] Finally, columns 5 and 6 use the change in urban population during a reign, $\Delta log(UrbanPop)$, 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%.

In Section B.1 in App. OV (2024) we show that these results hold when we use our own coding instead of the data from Woods. Section B.2 in App. OV (2024) documents 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. After presenting our IV analysis, we present numerous additional robustness checks (for both our OLS and IV results) in Section 4.4.

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

[32]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 2). Thus, territorial gains were positive on average (see the summary statistics in Table A.2).

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	0.619***	0.622***	0.109***	0.109***	0.110***	0.105***
	(0.051)	(0.050)	(0.030)	(0.033)	(0.016)	(0.017)
State FE		✓		✓		✓
R^2	0.38	0.41	0.07	0.11	0.06	0.09
Observations	339	339	304	304	300	300

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); this variable and Ruler Ability are standardized so they have 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. 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.

4.2 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. 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 genetic closeness among Europe's nobility. In what follows, we first present the reduced-form relationship between inbreeding and state performance. We then show that this relationship works through ruler ability, by introducing our instrument – the coefficient of inbreeding – and documenting that it is a strong predictor of ruler ability, which in turn has a strong positive effect on state performance in our IV results. Finally, we discuss the underlying identification assumptions, possible violations, and ways to address these.

Inbreeding and state performance: Reduced-form results. Panel A in Table 2 shows the reduced-form relationship between inbreeding (I) and our three state-level outcome variables. Odd columns show our baseline results for the full sample; even columns exclude monarchs whose parents were at least as related as uncle-niece pairs, corresponding to $I \geq 12.5$. We find sizeable and statistically highly significant coefficients in almost all specifications. In our baseline results, a one-std increase in inbreeding leads to a decline in broad *State Performance* by about 0.25 std (col 1), to a 5% decrease in land area (col 3), and to a 4% decrease in urban population (col 5). The magnitude of our estimates is comparable to the related literature. Jones and Olken (2005) find that random leadership transitions lead to a 2.1 percentage point (about 0.3 std) change in growth for autocracies. Fenizia (2022) documents that a one-std increase in manager quality raises office productivity in the public sector by 10%.

To illustrate the magnitude implied by our results, we provide a simple back-of-the-envelope calculation. We consider Spain, which had highly inbred rulers (average $I = 9.71$) and lost 7% of its territories in Europe over the period 1500-1790. We then swap the average Spanish ruler with the average Prussian ruler over this period (average $I = 4.13$). If taken at face value, our reduced-form estimate implies that the Spanish area would grow by 3.9 p.p. (during each reign) under the average Prussian ruler. Accumulated over the 12 reigns in 1500-1790, this translates into a territorial gain of 58%, rather than a loss of 7%.

A noteworthy feature in the reduced-form regressions is that in columns 3-6 of Table 2 (Panel A), both the dependent variables – $\Delta log(Area)$, and $\Delta log(UrbPop)$ – as well as the explanatory variable (I) 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.

Inbreeding and ruler ability: First-stage results. Does the effect of inbreeding on state performance work through ruler ability? To answer this question, we first regress ruler ability for reign r in state s, $RA_{s,r}$ on the ruler's coefficient of inbreeding, $I_{s,r}$, controlling for state fixed effects δ_s:

$$RA_{s,r} = \gamma I_{s,r} + \delta_s + \varepsilon_{s,r} \tag{2}$$

Standard errors $\varepsilon_{s,r}$ are clustered at the state level. Panel B in Table 2 presents the results. We find that more inbred monarchs were significantly less capable rulers. This is in line with our discussion in Section 2.4 that genetic closeness between partners reduces the offspring's cognitive skills, which in turn are associated with effective leadership. Figure 5 shows a binned scatter plot of the variation underlying column 1, 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. The effect is stable throughout all specifications

Table 2: Inbreeding, Ruler Ability, and State Performance: Main Results

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var. (Panels A+C)	*State Performance*		$\Delta log(Area)$		$\Delta log(UrbanPop.)$	
Sample restriction:		$I < 12.5$		$I < 12.5$		$I < 12.5$
A. Reduced-Form Regressions (Dep. Var. as indicated in table header)						
Inbreeding	-0.253***	-0.236***	-0.047***	-0.094**	-0.039**	-0.077
	(0.038)	(0.052)	(0.013)	(0.038)	(0.016)	(0.049)
R^2	0.11	0.08	0.10	0.11	0.04	0.05
Observations	238	230	209	202	208	201
B. First Stage Regressions (Dep. Var.: Ruler Ability)						
Inbreeding	-0.314***	-0.350***	-0.292***	-0.326***	-0.290***	-0.322***
	(0.045)	(0.068)	(0.043)	(0.069)	(0.044)	(0.071)
R^2	0.15	0.13	0.13	0.11	0.13	0.11
Observations	238	230	209	202	208	201
C. IV Regressions (Dep. Var. as indicated in table header)						
Ruler Ability	0.805***	0.676***	0.161***	0.289***	0.136***	0.239**
	(0.094)	(0.175)	(0.046)	(0.105)	(0.048)	(0.120)
First Stage Effect. F-Stat	49.7	26.7	46.2	22.1	43.7	20.7
Observations	238	230	209	202	208	201
State FE (Panels A.-C.)	✓	✓	✓	✓	✓	✓

Note: The table shows the results of reduced-form, first-stage, and IV regressions. For panels A and C, the dependent variables are our three measures of state performance, as indicated in the table header (see notes to Table 1 for a description of variables). In panel B, the dep. var. is ruler ability. The instrument in panel C is the (standardized) coefficient of inbreeding. Even columns exclude all monarchs who were at least as inbred as offspring of uncle-niece couples (corresponding to $I = 12.5$). 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.

(including those that exclude highly inbred monarchs with $I \geq 12.5$), and it is sizable: Raising the coefficient of inbreeding by one std reduces ruler ability by about 0.3 std. This magnitude is broadly in line with the findings in Joshi et al. (2015), where inbreeding at the first-cousin level (which corresponds to 1.5 std in our data) is associated with a reduction in IQ by about 0.3 std.

Second-stage results. Panel C in Table 2 presents our IV results. We find positive and statistically highly significant IV coefficients for all three outcome variables, suggesting that the ability of monarchs had a positive causal effect on the performance of the states they reigned. Note that the instrument is strongly relevant, especially in our baseline specifications for the full sample (in odd columns, showing effective F-statistics above 40).[33]

[33] 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 IV specifications.

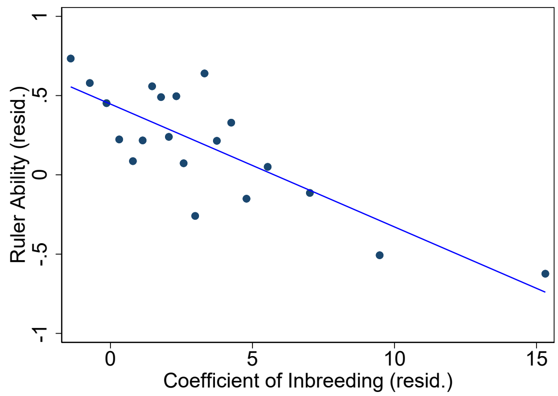

Figure 5: First Stage: Binscatter with state Fixed Effects

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. The 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).

According to our baseline results, a one-std increase in ruler ability leads to an increase in broad *State Performance* by about 0.8 std (col 1), to a 16% increase in land area (col 3), and to a 14% increase in urban population (col 5). The IV estimates tend to be somewhat larger than the OLS coefficients. For instance, the OLS estimate corresponding to the IV coefficient of 0.80 in Table 2, col 1 is 0.62 (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 potential biased assessment of ruler ability and uncovers larger effects.

In sum, the results in this section suggest that inbreeding affected state performance through ruler ability. In what follows, we examine whether inbreeding may also have affected state-level outcomes through other channels.

4.3 IV Results – Discussion of the Exclusion Restriction

The exclusion restriction in our IV strategy is that inbreeding was not related to state-level outcomes via channels other than ruler ability. In order to clarify the timing when our instrument is determined, denote by $M_{r-1}^{r-\infty}$ the set of marriage events during all previous reigns r (i.e., generations), up to a ruler's parents in $r-1$. Thus, $M_{r-1}^{r-\infty}$ represents the family tree, with the number of underlying marriages doubling for each generation (1 for the parents in $r-1$, 2 for grandparents in $r-2$, etc). The inbreeding of ruler r in state s, $I_{s,r}(M_{r-1}^{r-\infty})$, is thus determined by events prior to and within generation $r-1$. To violate our exclusion restriction, a variable X must be related to previous marriage decisions $M_{r-1}^{r-\infty}$ and to *subsequent* state performance $y_{s,r}$. This could be the case if knowledge about the adverse effects of inbreeding systematically affected the marriage decisions of European monarchs. For example, they may have accepted these risks when their state was in a precarious situation, effectively trading off inbreeding against strategic benefits of marrying within their dynasty. Then, the ruler in the next generation would be more inbred and have inherited a low-performing state. In what follows, we begin by describing why the historical background of our study renders this concern unlikely. We then present empirical results that complement and generalize this discussion.

Historical Aspects Supporting the Exclusion Restriction. Could the negative effects of inbreeding have influenced the marriage decisions of European monarchies? Both our own reading and the assessment of experts on European monarchs suggest that the negative effects of inbreeding were unknown to the royal families (see the detailed discussion – including statements by experts whom we contacted – in App. OV (2024), Section C.1). Another 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.[34] In fact, our main data source Woods (1913) had the hypothesis that intermarriage among royal families led to *more capable* rulers.[35] In sum, our setting renders a violation of the exclusion restriction due to knowledge about the effects of inbreeding – either by monarchs or by historians – unlikely. Next, we complement and generalize this discussion with an empirical analysis that is independent of whether or not the ramifications of inbreeding were known to a ruler's parents.

'Hidden' Inbreeding. We build on the fact that candidates for a violation of the exclusion restriction, X, must be related to inbreeding $I_{s,r}(M_{r-1}^{r-\infty})$, which is determined by marriages in a ruler's parents' or earlier generations. In what follows, we show that our results hold

[34] 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, Álvarez, 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).

[35] "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, 1913, p. 302). See Section 3.1 for further detail.

even when we focus only on the 'hidden' degree of inbreeding – the dimension beyond parents' close relatedness that was embedded in the intertwined family trees of $r-2$ and earlier generations. We first identify the degree of inbreeding that resulted directly from each ruler's parents' close family ties in $r-1$ (i.e., parents being first cousins or uncle and niece). We denote this 'naive' degree of inbreeding by $I_{s,r}(M_{r-1})$ Then, we subtract this 'naive' degree of inbreeding from the 'full' coefficient of inbreeding. This results in the 'hidden' degree of inbreeding, reflecting the more remote layers of the pedigree, $r-2, r-3$, etc.: $I_{s,r}(M_{r-2}^{r-\infty})$. Note that this measure is conditional on the marriage in $r-1$, as a different parent would also change the family tree in earlier generations. As for our main instrument, we standardize this variable and refer to it as *Hidden Inbreeding*. Odd columns in Table 3 report our IV regressions using *Hidden Inbreeding* as an instrument for ruler ability (Panel A), and reduced-form results (Panel B). In addition, even columns directly control for the 'naive' degree of inbreeding from the parent generation, $I_{s,r}(M_{r-1})$.

Throughout the specifications in Table 3, we obtain results that are very similar to our IV baseline specifications in Table 2, both in terms of magnitude and statistical significance. While the first stage is somewhat weaker, the effective F-statistics continue to exceed the critical value for max. 15% (20%) IV bias in odd (even) columns. Throughout, the reduced-form results in Panel B remain as strong as in our baseline. Note also that in the particularly demanding specifications in even columns, not only do all the *Hidden Inbreeding* results go through; in addition, the control variable for 'naive' parent-generation inbreeding is small and statistically insignificant throughout. These findings render it unlikely that our results are driven by unobservables or strategic decisions that were related to the marriage decision of a ruler's parents in $r-1$. Effectively, these results imply that any candidates for a violation of the exclusion restriction must be related to marriage decisions $M_{r-2}^{r-\infty}$ at least *two* generations earlier and must have influenced state performance in r. In addition, because we directly control for $I_{s,r}(M_{r-1})$, such candidates must have been unrelated to inbreeding in the parent generation. For example, if one is worried that a legacy of 'hidden' inbreeding in earlier generations ($r-2, r-3$ etc.) might still drive the relationship between ruler ability and state performance in r (even after accounting for state fixed effects), then such a 'legacy of inbreeding' would have to stop in generation $r-1$ in order to be unrelated to $I_{s,r}(M_{r-1})$. We are not aware of concrete historical examples that would fulfil these conditions. Nevertheless, we now discuss some cases that may fulfil a subset thereof.

Table 3: Monarchs and State Performance – 'Hidden' Inbreeding

Dependent variable as indicated in table header

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	*State Performance*		$\Delta log(Area)$		$\Delta log(UrbanPop.)$	
	A. IV Regressions (first stage: hidden inbreeding)					
Ruler Ability	0.816***	0.827***	0.212***	0.259**	0.196***	0.251***
	(0.142)	(0.218)	(0.072)	(0.114)	(0.056)	(0.090)
Inbreeding Parent Gen.		0.008		0.035		0.041
		(0.074)		(0.034)		(0.029)
State FE	✓	✓	✓	✓	✓	✓
First Stage Effect. F-Stat	12.8	6.6	14.6	8.5	14.2	8.3
Observations	238	238	209	209	208	208
	B. Reduced-Form Regressions					
Hidden Inbreeding	-0.239***	-0.203**	-0.059**	-0.061**	-0.054**	-0.058**
	(0.069)	(0.090)	(0.023)	(0.027)	(0.021)	(0.025)
Inbreeding Parent Gen.		-0.100		0.006		0.012
		(0.070)		(0.017)		(0.022)
State FE	✓	✓	✓	✓	✓	✓
R^2	0.10	0.11	0.11	0.11	0.05	0.05
Observations	238	238	209	209	208	208

Note: The table repeats all specifications from Table 2, but using only the (standardized) *'hidden'* component of inbreeding as an instrumental variable for ruler ability (Panel A) and in the reduced form (Panel B). The 'hidden' part of the overall coefficient of inbreeding was due to complex intermarriage patterns in the generations *prior* to a ruler's parents. In addition, even columns control for the component of inbreeding that was due to the parent generation. 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% (15%, 20%) relative bias is 16.4 (9.0, 6.6). 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.

Additional checks of the exclusion restriction. In Section C in App. OV (2024) 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 systematically 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 excluding marriage decisions at the generation of rulers' parents. Nevertheless, we also account for this possibility more directly in App. OV (2024), Section C.2. We show – for each of our three outcome variables – that past state performance predicts neither ruler ability nor subsequent state performance, and that controlling for it does not change our results (Tables A.15 and A.16). 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 ($I = 0$). These are excluded in our baseline IV regressions because there is no traceable kin relationship for their parents (see footnote 29). Table A.17 shows that our IV results are almost identical when we *include* these 43 rulers, coding them as $I = 0$. 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.18). 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.19 documents that our IV results hold when we include fixed effects for rulers' order within dynasties.

Finally, we discuss possible selection among offspring, either because monarchs possibly 'rid themselves' of unwanted successors, or because the most affected by inbreeding depression tended to die at young age. Note that 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.20 that our results remain strong when we reduce the sample to monarchs with unambiguous information that they were the first-born sons. We also address a related point: potential claims to the throne by offspring from another marriage of the previous ruler. Column 3 of Table A.20 shows that our IV results hold when we restrict the sample to monarchs whose parents had only one marriage or no offspring from any other marriage.

4.4 Robustness Checks and Additional Results

Robustness to sample restrictions and extended samples. In Section B.3 in App. OV (2024) we impose numerous sample restrictions, such as excluding regencies, excluding monarchs who governed in more than one state, or including only monarchs with historically documented hereditary succession. Table A.6 shows that our results are highly robust throughout these subsamples. In Section B.4 in App. OV (2024) we exclude reigns affected by unions, which may have provided windfall gains in territories (e.g., James, king of Scotland, who also became king of England in 1603 after his cousin, Queen Elizabeth I of England, died). Next, Section B.5 in App. OV (2024) shows that our results also hold when we extend the Woods sample until WWI, and when separately adding the four additional states Poland(-Lithuania), Hungary, Bavaria, and Bohemia for which we collected all core variables until 1790 (see App. OV (2024), Section A.7).

Time trends, placebo exercise, and SUTVA. App. OV (2024), Section B.6 shows that none of our three outcome variables exhibits time trends. Our explanatory variables, however, do show (mild) trends: compatible with our argument, as inbreeding built up over time, ruler ability decreased. Table A.9 shows that our results (first stage, OLS, IV, and reduced form) are robust to introducing time-trend controls: century fixed effects as well as (state-specific) linear and quadratic time trends. In B.7 we check how "exceptional" our results are by implementing a placebo exercise that assigns $I_{s,r}$ from each state's inbreeding distribution to the state's monarchs at random and then runs the reduced-form regressions for our three outcomes. Figure A.6 shows that only a very small percentage of iterations yield coefficients that are either quantitatively larger or statistically more significant than our baseline results. In App. OV (2024), Section B.8 we address possible violations of SUTVA because territorial gains by one ruler may systematically cause losses for other rulers. We adjust for territories that may have been acquired by conflict from another state in our dataset. Excluding these barely affects our results, rendering a SUTVA violation unlikely in our context.

GDP as an outcome variable. In Section B.9 in App. OV (2024) we use annual growth in GDP (both per capita and total) as an outcome variable for six states in our sample with available historical high-frequency GDP data from the Maddison Project. We view this as an exploratory exercise, as many assumptions went into the construction of these data. We discuss the underlying sources and the reliability of implied short-run changes in GDP in the appendix. We construct a yearly panel for the six states, and assign ruler ability and inbreeding to the respective years of each ruler's reign. This allows us to account in more detail for possible time effects, up to the yearly level. In addition, the GDP data provide a useful complement to our area-based outcome variables for states that had relatively stable borders (e.g., England and France). Table A.12 shows highly significant effects that are robust to increasing the frequency of time fixed effects and also to century $\times$ state fixed effects. The coefficients imply that a one-std increase in ruler ability raises annual per-capita GDP growth by about 0.2 percent per year (which is about the mean growth rate over the sample period). The results for growth in total GDP (i.e., including population growth) are even stronger, with effects of about 0.3-0.5 percent higher annual growth. These values are similar to those in Jones and Olken (2005) and Besley et al. (2011), who find that random leadership transitions reduce annual GDP growth by approximately its mean.

Heterogeneity of results. App. OV (2024), Section B.10 examines whether the effect of ruler ability on state performance varied over time, or across ruler- (or reign-) specific characteristics. We begin by presenting non-parametric results, showing that the negative effects of inbreeding are driven by the top three deciles of the inbreeding distribution, in line with levels documented by the medical literature (e.g., Fareed and Afzal, 2014a). Next, we show that our result are relatively stable over time (Figure A.9), but there is a mild decline in the coefficient on ruler ability after 1650, coinciding with the rise of parliaments in Western Europe (van Zanden, Buringh, and Bosker, 2012). Finally, Table A.13 shows that there is no meaningful heterogeneity in the effect of ruler ability by characteristics of the ruler (gender, age at ascension, or ascended after regicide), or by features of the reign (member or target of an alliance).

4.5 Mechanisms

We examine a number of mechanisms behind our results in Section D in App. OV (2024) and summarize the most important insights here. We first ask in Section D.1 whether the (reduced-form) effect of inbreeding on state performance may run through other ruler characteristics that may also have been affected by inbreeding. We distinguish between cognitive ability (our main measure as assessed by Woods) and non-cognitive ability (e.g., emotional stability – see App. OV (2024), Section A.2 for our coding). In addition, we examine the role of physical attributes such as body height, strength, the number of children, and life expectancy, all of which may also have been affected by inbreeding. Table A.21 shows that among these variables, only non-cognitive ability is also significantly related to inbreeding. However, when we control for non-cognitive ability in our IV regressions, the coefficient on (cognitive) ruler ability remains almost unchanged. More generally, our IV and reduced-form results are highly robust to controlling for other ruler characteristics.

In an exploratory mediation analysis, we find that about three-quarters of the effect of inbreeding on state performance is mediated by cognitive ruler ability. Non-cognitive ability mediates a much smaller percentage, and there is no evidence for mediation through other (physical) characteristics of rulers. Of course, these results have to be interpreted with caution because each individual ruler characteristic is measured with error. However, the overall pattern in our findings suggests that at least a sizeable part of the (reduced-form) effect of inbreeding on our outcomes runs through the cognitive ability of monarchs.

In Section D.2 in App. OV (2024) we examine which aspects of Woods' broad *State Performance* measure drive our results. We code detailed outcome variables for various economic and political aspects of each reign based on both Woods' text and information from encyclopedias. We find that ruler ability had particularly strong effects on law and order, finances, 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. Section D.3 studies war and conflict as outcome variables. We find that less inbred, more capable rulers were significantly less likely to experience conflict. Distinguishing between domestic and international conflicts, we then show that this finding is entirely driven by the latter: Capable rulers were less likely to engage in external conflicts. But when they did, their armies were more likely to win their battles (Table A.24). This suggests an interesting mechanism, given that capable rulers also expanded their states' territory and urban population (see Table 2): 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 urban population via the extensive margin (Section D.4). In contrast, on average, capable rulers did not 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 et al., 2022). 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.

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 in our core sample 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 "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 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 five years. 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:

$$\Delta_{ij} y = \beta \Delta_{ij} RA + \mu_{s(i)} + \mu_{s(j)} + \mu_c + \varepsilon_{ij} \quad , \tag{3}$$

where Δ_{ij} is the difference in a variable between rulers i and j, y denotes our three measures of state performance, and RA is ruler ability. We estimate IV regressions in this setting using the difference in 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 century fixed effects (μ_c). We further introduce state-pair fixed effects to absorb features such as the frequent wars between England and France, as well as state-pair $\times$ century fixed effects, thus absorbing for example differences between England and France that were specific to the 17th century. Standard errors are multi-way clustered at the level of both states, both rulers, and each dyad. In total there are 4,152 pairs of overlapping rulers (for at least 5 years) in our core sample. For 2,382 of these we also observe the coefficient of inbreeding for both rulers.

We present the ruler-pair results in Table 4. We show OLS coefficients in Panel A, reduced-form results in Panel B, the first stage in Panel C, and IV results in Panel D. Throughout, we find coefficients that are similar to our baseline regressions in Tables 1 and 2. Note also that 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. All coefficients of interest remain essentially unchanged. In sum, we fully confirm the magnitude and statistical significance of our main findings when we run the regressions in ruler-pair differences, accounting for possible time trends in a variety of ways.

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. 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 capable (or incapable, inbred) rulers 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

In our data, the relationship between ruler ability and state performance is relatively small for England as compared to other Western European monarchies such as France or Prussia. 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 Spain's and France's. In contrast, after 1600, we no longer observe a relationship between ruler ability and state 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

Table 4: 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	0.675***	0.656***	0.644***	0.114***	0.096***	0.096***	0.079***
	(0.039)	(0.041)	(0.048)	(0.025)	(0.024)	(0.024)	(0.023)
R^2	0.49	0.59	0.61	0.15	0.31	0.09	0.22
Observations	4,152	4,152	1,588	3,538	3,538	3,402	3,402
Panel B. Reduced-Form Regressions							
Δ_{ij} Coefficient of Inbreeding	-0.261***	-0.202***	-0.210***	-0.033*	-0.037**	-0.050**	-0.047**
	(0.046)	(0.044)	(0.040)	(0.016)	(0.016)	(0.016)	(0.017)
R^2	0.16	0.33	0.33	0.15	0.26	0.06	0.23
Observations	2,382	2,382	1,588	1,970	1,966	1,950	1,946
Panel C. First Stage Regressions							
Δ_{ij} Coefficient of Inbreeding	-0.250***	-0.235***	-0.241***	-0.251***	-0.221***	-0.251***	-0.221***
	(0.038)	(0.042)	(0.046)	(0.034)	(0.038)	(0.034)	(0.038)
R^2	0.16	0.26	0.27	0.16	0.28	0.16	0.28
Observations	2,382	2,382	1,588	1,970	1,966	1,950	1,946
Panel D. IV Regressions							
Δ_{ij} Ruler Ability	1.045***	0.859***	0.872***	0.132**	0.168**	0.201***	0.212***
	(0.083)	(0.143)	(0.126)	(0.055)	(0.074)	(0.063)	(0.080)
First Stage Effect. F-Stat	59.4	34.4	27.4	82.5	39.0	83.0	39.7
Observations	2,382	2,382	1,588	1,970	1,966	1,950	1,946
Fixed Effects (Panels A-D)							
State	✓	✓	✓	✓	✓	✓	✓
Paired-state	✓	✓	✓	✓	✓	✓	✓
Century	✓	✓	✓	✓	✓	✓	✓
State-pair		✓	✓		✓		✓
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 all variables relative to all rulers of other states whose reign overlapped for at least five years. Column 3 keeps for each ruler only the one ruler from all other states with whom s/he shared the largest temporal overlap. Panel C 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 ruler-pair level. Standard errors (in parentheses) are multi-way clustered at the level of both states, both rulers, and each dyad. * p<0.1, ** p<0.05, *** p<0.01.

in power (see Figure 4 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:

$$y_{s,r} = \beta_1 RA_{s,r} + \beta_2 Constr_{s,r,lag} + \beta_3 RA_{s,r} \times Constr_{s,r,lag} + \delta_s + \varepsilon_{s,r} \qquad (4)$$

where variables are defined as above and $Constr_{s,r,lag}$ is a dummy variable indicating whether ruler r in state s faced "substantial limitations on executive authority" (as described in Section 3.4). In order to alleviate concerns about endogenous state institutions, we us a time lag: the average constraints on the executive over the period of five to ten years before reign r started.[36] Similarly, regarding the broad outcome variable *State Performance*, a concern is that Woods' (1913) assessment may have been affected by the states' institutions. For this reason, we only use our two 'objective' outcome variables $y_{s,r}$, namely the change in territory and in urban population during each reign. In our IV results, we instrument for $RA_{s,r}$ with inbreeding $I_{s,r}$, and for the interaction term with $Constr_{s,r,lag} \times I_{s,r}$.[37]

Table 5 presents our results. While we draw our conclusions from the IV and reduced-form results, we also report the OLS coefficients 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. Our IV results in columns 2 and 5 show a sizable and statistically significant *negative* interaction that is of similar magnitude as the (positive) coefficient on ruler ability $RA_{s,r}$. 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 14%, and its urban population by 16%. In contrast, the overall effect of

[36] Using instead the constraints from exactly 5 years before reigns started gives very similar results. Lagging the constraints-on-executive variable directly addresses the possibility of reverse causality. A remaining concern with the lagged *Constr* 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.15 and A.16, past state performance predicts neither ruler ability nor present state performance.

[37] The exclusion restriction is that the interaction term $Constr_{s,r,lag} \times I_{s,r}$ 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 $Constr_{s,r,lag}$ in levels is included in both the first and second stage regressions, and it is measured *before* the respective ruler came to power.

raising ruler ability of a *constrained* ruler is significantly smaller; in fact, it is slightly below zero (but statistically indistinguishable from zero) for both outcome variables. One limitation in these IV regressions with two endogenous regressors is the low first-stage F-statistic for the interaction term. To address this, we also present the reduced-form results in columns 3 and 6. These show a similar pattern, with a strong and significant interaction term between inbreeding and $Constr_{s,r,lag}$ that outweighs the (also statistically significant) negative effect of inbreeding on the outcomes. Finally, the indicator for constrained rulers itself has a statistically significant relationship with territorial change and urban growth in most specifications, indicating that this institutional variable also has a direct effect, independent of ruler ability (or inbreeding).

Table 5: The Role of Institutional Constraints on Ruler Power

Dependent variable as indicated in table header

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.		$\Delta log(Area)$			$\Delta log(UrbanPop.)$	
Estimation:	OLS	IV	RF	OLS	IV	RF
Ruler Ability	0.097***	0.142***		0.103***	0.156***	
	(0.031)	(0.035)		(0.018)	(0.050)	
Constrained Ruler	0.068*	0.036	-0.000	0.247***	0.199*	0.164*
	(0.032)	(0.057)	(0.021)	(0.066)	(0.105)	(0.079)
Constrained Ruler × Ruler Ability	-0.093***	-0.178**		0.032	-0.223*	
	(0.030)	(0.070)		(0.044)	(0.132)	
Inbreeding			-0.040***			-0.043**
			(0.012)			(0.016)
Constrained Ruler × Inbreeding			0.085***			0.109***
			(0.013)			(0.033)
State FE	✓	✓	✓	✓	✓	✓
SW F-Stat (Ruler Ability)		37.1			37.1	
SW F-Stat (Constr. × Ruler Abil.)		5.3			5.3	
R^2	0.09		0.03	0.09		0.04
Observations	301	206	206	298	206	206

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 over the period five to ten years before the start of each ruler's reign. See Section 3.4 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.

In Section B.11 in App. OV (2024) we show that these results also hold when we use an alternative measure for constraints on monarchs: parliamentary activity from van Zanden et al. (2012), who compile the frequency of parliamentary meetings across European states from the 12th to the 18th century. Despite the coarseness of this measure (it is only available at the century level), Table A.14 confirms the magnitude and significance of our results: Parliamentary meeting frequency above the 75th percentile (more than 0.5 meetings per year, on average over a century) 'neutralizes' the effect 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 constraints on monarchs – became gradually stronger in North-Western Europe after the 16th century (van Zanden et al., 2012). Meanwhile, consanguinity of European monarchs was also on the rise. A possible 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.[38]

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 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 evidence that European rulers mattered for the states they governed. To identify these effects, we exploit 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 was that kin marriage helped to preserve royal virtues. In addition, a significant part

[38]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 a common 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 App. OV (2024), Section C.5). Neither of these checks diminishes our main coefficient of interest.

of inbreeding was 'hidden' in the complex trees of kin marriage over previous generations. In combination, these features yield quasi-random variation in ruler ability. We show that inbreeding of rulers had a strong negative effect on the performance of their states, and that this relationship worked largely through their lower cognitive ability. Thus, we not only show *that* leaders mattered, but also shed light on *why* they did, emphasizing the importance of specific individual traits in shaping state performance.

We find sizeable effects, with less inbred, more capable leaders boosting their states' performance along multiple dimensions, including economic outcomes, administrative efficiency, territorial gains, and growth in urban population. Capable rulers expanded their territories despite the fact that they engaged in fewer wars. This suggests that they chose their conflicts wisely, which is further supported by a higher proportion of battles won.

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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