

Magna Carta

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Abstract

Magna Carta institutionalized constraints on royal power and equal rights among the ruling elites. How did it happen that a small rebel coalition of barons with few resources and led by ordinary members was able to force a powerful king to accede to a more ‘inclusive’ power-sharing agreement? The current literature cannot explain this because it assumes that there already *is* a coalition. It cannot capture the difficulty of sustaining a coalition of rich and powerful members who have more to lose from changing the status quo. We thus construct a coalitional bargaining game to depict how the rebel coalition is formed and how it obtains Magna Carta. Each baron is induced to join or lead a rebel coalition that has sufficiently large resources, but that threshold is increasing in the baron’s power. In equilibrium, Magna Carta occurs when: the rebel coalition’s resources just clear the threshold of the rebel leader, implying that the resources can be small if the rebel leader is not powerful; when the king is powerful, and when the initial distribution of power among the barons is egalitarian, both of which imply that any baron who leads the rebellion has a low threshold. To provide empirical support, we build a unique dataset of the universe of English barons, their family networks, and their baronies and resources between 1199 and 1270.

JEL Codes: N00, N13, C72, C78, D74, N43

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For rights that were not open to all alike would be no rights. If the people secured their end at the hands of one just and good man, they were satisfied with that; but when such was not their good fortune, laws were invented, to speak to all men at all times in one and the same voice

Cicero (1913, Book II.xii)

No Freeman shall be taken or imprisoned, or be disseised of his Freehold, or Liberties, or free Customs, or be outlawed, or exiled, or any other wise destroyed; nor will We not pass upon him, nor condemn him, but by lawful judgment of his Peers, or by the Law of the land

Magna Carta, Clause 39

Who were the barons that now impose limits on royal tyranny and placed themselves in the vanguard of liberty?

Stubbs (1874, 539)

1 Introduction

In 1215 rebellious barons forced King John of England (r. 1199-1216) to agree to limit his powers and to grant equal rights among the barons. This agreement, Magna Carta, was a critical juncture in the history of constitutional government (Fukuyama, 2011, 529; Acemoglu and Robinson, 2012, 363; Acemoglu and Robinson, 2019, 174–177). Issued in 1215 and later incorporated into law, it laid the foundations for the rise of Parliament and through this to the Glorious Revolution of 1688, and the American Declaration of Independence in 1776.

We investigate the origins of Magna Carta from a political economy perspective. While Magna Carta has been widely studied by historians and legal scholars (e.g., Holt (1992)), with the exceptions discussed below, it has received much less attention from social scientists. In this paper, we ask how Magna Carta emerged as an optimal power-sharing agreement that allocated rights between the king and his barons, and among the barons. Why did the barons cooperate to propose an agreement that, while curtailing the king's rights, also prevented any baron from gaining more rights over other barons? Why did the king accede to it? In other words, how did

the king and the barons come to agree to *mutually* tie their hands?¹

Such questions are central in understanding how institutions change. There is a formal and empirical literature on institutional change. This literature has studied important episodes of democratization (Acemoglu et al., 2005a), the abolition of serfdom (Acemoglu and Wolitzky, 2011; Bailey, 2014; Ashraf et al., 2025), and state building (Gennaioli and Voth, 2015) as well as many other topics. Nonetheless, Magna Carta is a distinctive and particularly puzzling episode. The rebellion succeeded despite being small, modestly resourced, and led by ordinary, not especially powerful barons. Standard accounts of institutional change would not predict such a rebellion to achieve its goals. Models that treat the elite as a single, already-formed bloc can only predict that larger, more powerful, and more unified coalitions are more likely to succeed in constraining the ruler. They cannot explain why a coalition that looked weak by every conventional measure nonetheless prevailed.

Thus, in this paper, we explicitly depict how coalitions are formed, to show how difficult it is to sustain a large coalition of powerful elites who have much to lose from changing the status quo. We then conduct empirical tests using a newly constructed dataset of the universe of barons in the periods surrounding Magna Carta.

The adoption of Magna Carta in 1215 essentially involved two key steps. First, the barons formed two coalitions: a rebel coalition, and the king’s loyalist coalition. Then the rebel coalition demanded that the king agree to a new settlement, Magna Carta, which the king accepted to head off a battle between the loyalist and rebel coalitions. The settlement was initially fragile – within months John had the charter annulled by the Pope and England fell into civil war. Nonetheless, Magna Carta survived, and was reissued in 1216, 1217 and 1225.

We thus propose a model of coalitional bargaining among the barons and the king, each of whom holds some power under a status-quo power-sharing agreement. We construct a dynamic game in which we first depict the formation of the rebel and loyalist coalitions. Then the rebel leader decides whether to abort the rebellion, or to threaten war against the king unless the latter agrees to a new power-sharing agreement in which the king’s power is decreased, while the

¹In a landmark book on constitutional history, Stubbs (1874) asks: who were the barons who rebelled and why did they place constraints on the king? This, however, is only one side of a two-sided argument; in constraining the king, the barons also constrained themselves.

residual power is shared equally among the barons.

Our main theoretical results characterize when this bargaining succeeds in changing the status quo. While the formation of the rebel coalition is a necessary condition for institutional change, it is not sufficient. The change occurs only if the rebel coalition's resources are large enough such that its leader is willing to go to war, but this threshold of resources is increasing in the leader's power. The intuition is that the leader will not risk war unless he expects to be better off than he is in the status quo. He thus requires a higher probability of successful rebellion, which in turn requires larger resources.

This has an immediate, and at first glance counterintuitive, implication: a rebel coalition need not be large or resource-rich to succeed. A powerful leader, who has much to lose from changing the status quo, requires a large and well-resourced coalition behind him. But a less powerful leader, who has more to gain, requires only a small, modestly-resourced one. The same logic applies to the coalition's own members, whose individual thresholds for joining are likewise increasing in their own power. Institutional change can therefore occur via a coalition that is small in membership and modest in resources, provided it is led and populated by less powerful barons.

This matches the historical record closely. Only 56 of 186 active barons were in rebellion by June 1215, and together they held just 37 castles – about a third of the 95–107 that King John held himself, and fewer than the 47 held by the 35 loyalist barons. The rebellion that produced Magna Carta was neither large nor rich, nor led by the realm's most powerful barons; our model shows why that was still enough.

Two further conditions make institutional change more likely. An extractive king leaves little residual power to his barons, which makes it likely that any baron who becomes a rebel leader has sufficiently low power such that his threshold for threatening war against the king is easily met. Similarly, an egalitarian distribution of power among the barons also makes it likely that any one of them who leads a rebellion has sufficiently low power to clear his own threshold. Thus, institutional change is more likely to occur when the ruler is extractive and when the initial distribution of power among the barons is egalitarian. This helps to explain why other medieval revolts did not produce institutional change and why there was no equivalent to Magna Carta

in France, where baronial inequality was much greater. We show that prior to the adoption of Magna Carta in 1215, King John was more extractive than his predecessors, and that the distribution of land and other resources among the barons was more egalitarian compared to other periods.

While we cannot directly test our main theoretical results – Magna Carta was a single historical event, with no meaningful variation across realms or episodes to exploit – we can verify whether a baron’s decision to join the rebel coalition is consistent with the model. In a feudal realm, a baron who is in rebellion can take back any resources he has pledged to the king, but only those that he can secure or protect, such as his baronial castles and surrounding lands nearby. Such resources we term ‘non-appropriable’, since the king cannot easily seize or appropriate them without cost. When a baron joins the rebel coalition, he increases the fighting capacity of the coalition by contributing his non-appropriable resources. Because a larger fighting capacity increases the probability of military victory against the king, a baron deciding whether to join the rebel coalition will look at the non-appropriable resources of the other members – if it clears his threshold, then he joins, and the coalition grows in size as well as in (non-appropriable) resources. Thus, in equilibrium, *any* baron is more likely to be in the rebel coalition the larger the non-appropriable resources of the members of that coalition.

We thus test the hypothesis that the probability of a baron being in the rebel coalition increases with the size of the non-appropriable resources of that coalition, using newly constructed data on the universe of English barons alive between 1199 and 1270. As there is only one rebel coalition, we get cross-sectional variation by subsetting, for each baron, the rebel members of the coalition who are in the baron’s family network. Our proxy for non-appropriable resources is the number of baronial castles. Castles were the critical military resource of the age and allowed a baron to defend their nearby land against the king (Desierto and Koyama, 2026). For each baron, we sum the number of castles held by each rebel in his family network, weighted by network distance.

A challenge to causal identification is that the distribution of castles is affected by many other variables that also might shape political loyalties. We show that castles are not simply a reflection of baronial wealth. Nor can the distribution of castles be easily explained by geography.

To deal with the problem of the king determining castle ownership based on political loyalties, we instrument the number of castles held by all the rebels in the baron's network with the number of castles held by the *ancestors* of those rebels in the network. Many castles were inherited and therefore allocated long before the reign of King John, and we provide quantitative evidence that the historical distribution of castles was not linked to dynastic or family patterns of loyalty.

We find that the probability that a baron is in the rebel coalition increases with the sum of castles held by the rebels in the baron's family network. A one standard deviation increase in these castles raises the probability that a baron joined the rebellion by 10 percentage points, about 33 percent of the baseline rate. These results are robust and not driven by measures of wealth, commercial activity or market access. They also do not qualitatively change when we vary how we weight family connections or directly control for network connectivity. They are also robust to dropping barons with particular characteristics.

As a test of the mechanism, we run the same regressions, but in lieu of castles, we use the value of the land surrounding each castle – within 5, 10, 20, 50, and 150 kilometers. The closer land is to a baronial castle, the easier it is to protect and, therefore, the more non-appropriable it is. We indeed find that not only does the value of protected land held by the rebels in a baron's network increase the probability that the baron is in the rebel coalition, but that the effect increases the closer that land is to the castle. (The effect disappears when land is 150 kilometers away from a castle.)

Finally, the model is not only specific to the events in 1215. It is applicable to any similar institutional change that puts constraints on the ruler's power and grants equal rights among the subjects. Thus, at the very least, they should also hold in subsequent re-issuances of Magna Carta by other kings, and other contracts of which the initial 1215 Magna Carta is the legal precedent.

To demonstrate this, we extend our empirical analysis into the reign of Henry III (r. 1216–1272) and, in particular, to the baronial rebellion led by Simon de Montfort in 1258 and 1264. In both cases, we also find that the number of castles of the rebels in a baron's network increases the probability of that baron being in the rebel coalition. We conclude by discussing how Edward I (r. 1272–1307) accepted most of the principles of Magna Carta, eventually incorporating it into

law and entrenching the practice of regular parliaments based on the principle of representation that “what touches all must be approved by all” (*Quod Omnes Tangit*). The parliament of 1295, to which the shires and boroughs sent representatives with full powers (*plena potestas*) to bind their communities, made this principle a settled feature of English government (Post, 1964).

Magna Carta has been the subject of an extensive historical literature that we build upon, especially Holt (1961, 1992) and Carpenter (2015). More generally, our study relates to the literature on how constitutional rules are made and sustained, including Katznelson and Weingast (2005), Weingast (1997), and Mittal and Weingast (2013) and to the broader literature on the rise of self-governing institutions in medieval Europe (Congleton, 2011; Stasavage, 2016; Abramson and Boix, 2019; Stasavage, 2020; Salter and Young, 2023).² North (1990) argued that institutions that limited the power of the executive and granted political representation to property holders provide the best incentives for investment and trade. And this argument was taken up empirically by scholars such as Delong and Shleifer (1993), Acemoglu, Johnson, and Robinson (2005a,b); Acemoglu and Robinson (2012), and Pascali (2017).³

Recent scholarship has documented the rise and fall of representative institutions across Europe (Zanden et al., 2012; Greif and Rubin, 2023; Henriques and Palma, 2023); and explored the link between parliaments and conflict (Becker, Ferrara, Melander, and Pascali, 2020; Cox, Dincecco, and Onorato, 2024), or towns (Abramson and Boix, 2019). Mokyr and Tabellini (2024), for example, link the rise of representative institutions in Europe (and their absence in China) to social organizations at the city-level. Angelucci, Meraglia, and Voigtländer (2022) examine the role that self-governing towns played in the development of parliament and inclusive institutions in medieval and early modern England. In a related theoretical contribution, Angelucci et al. (2025) model a ruler’s delegation of administrative authority to urban rather than landed elites. Similar to our use of individual data on English barons, Jha (2015) uses data on English members of Parliament to study support for Parliament during the English Civil War.

Magna Carta was also important for legal developments, particularly the emergence of the

²Congleton (2011, 119) considers Magna Carta as the most celebrated medieval tax constitution focusing in particular on its inclusion of an enforcement mechanism in the form of a council of 25 barons.

³Note that such institutions are not always associated with better economic outcomes. Ogilvie and Carus (2014) argue that parliaments representing only landed interests tended to grant rents to elites and this came at the expense of broad-based economic growth.

rule of law (see Berman, 1983). Studies of the English common law tradition (see Porta et al., 1998; Shleifer et al., 2008) suggest that the common law tradition was better at constraining executive power and protecting property rights. Glaeser and Shleifer (2002) argued that the English and French legal systems diverged after the early 13th century. Absent Magna Carta, legal developments in England would plausibly have gone in a different direction.

Our paper also speaks to the formal political economy literature on institutional change in general, and on the emergence of limited government in medieval and early modern Europe in particular. The canonical account is that of Acemoglu and Robinson (2000, 2006), who model institutional change as a concession made by elites who face the threat of revolution. This unitary set of elites extends the franchise to citizens because redistribution today cannot credibly commit them to redistribution tomorrow. Besley and Persson (2011) model an interaction between a ruler and a representative elite, in which the incentive to invest in fiscal and legal capacity depends on how constrained the executive is. Myerson (2008) shows that an autocrat’s promises to his supporters are credible only if they can collectively punish him when he breaks them, so that a council of supporters able to act against the ruler is the foundation of the constitutional state. Gennaioli and Voth (2015) model the ruler’s investment in state capacity facing a representative nobility, with the cost of war and prior political cohesion determining which states build it. Kenkel and Paine (2023) model a bilateral bargain between a ruler and a single powerful elite, in which the mobility of elite wealth in the face of external invasion sets how much the ruler must concede. Relatedly, Cox et al. (2024) document empirically how war drew the crown into bargaining with urban communities.

These theoretical contributions, however important, do not employ coalitional bargaining games. They depict the ruler facing either a single representative elite, or an undifferentiated set of supporters or of non-elites. Such models therefore struggle to explain how a coalition with modest aggregate resources succeeds while a larger, richer one fails.

Lastly, we contribute to the literature on coalition formation and bargaining (see Ray (2007)). Individual barons initially belong to one grand coalition encompassing the entire realm, but can break away and form a rebel coalition. We add the element of violence by allowing fighting between rebel and loyalist coalitions. To the best of our knowledge, this paper, along with

Desierto and Koyama (2025), is the first to apply coalitional bargaining to feudal history.

The paper is structured as follows. Section 2 provides the historical background for understanding Magna Carta. We present the model in Section 3, and generate conditions under which Magna Carta is adopted in equilibrium. Section 4 provides empirical tests using data on the initial 1215 rebellion, while Section 5 performs the same tests using data on the second baronial rebellion in 1258-1264. Section 6 concludes.

2 Historical Background

Magna Carta exemplifies Acemoglu and Robinson’s (2012) notion of a critical juncture, a point at which a particular institution can be decisively shaped. Acemoglu and Robinson (2019, 174) view Magna Carta as both “the foundation of England’s political institutions and a critical example of society checking the state,” setting in motion a “red queen” process producing both Parliament and a stronger monarchy.

Other leading accounts of the rise of liberalism foreground Magna Carta. For Fukuyama (2011, 529), Magna Carta was important because the “English barons claimed to speak on behalf of the whole national community, including the church and ordinary Englishmen, and demanded constitutional protections for their rights”. Stasavage (2020) argues that Magna Carta did not (at least initially) have the importance attributed to it by later scholars because earlier kings had bargained with their nobles. Nonetheless, he agrees that “[u]ltimately, where Magna Carta was most important is in creating a focal point of agreement for future advocates of consensual government and the rule of law” (Stasavage, 2020, 203). Modeling the relationship between the king and the barons, Leon (2020) sees Magna Carta as part of a broader strategy of extending the size of the political elite.

Magna Carta led to the rise of Parliament. It “carried three most fundamental assumptions anticipating the cardinal principles on which the power of Parliament was eventually founded” (Butt, 1989, 60). It implied that the king was subject to the rule of law, that taxes were to be granted with the consent of the governed, and that the ruled did not owe unconditional obedience to the crown. Its ideological significance was revived in the 17th century and played an important role in the conflict between the crown and Parliament that culminated in the English Civil War

and the Glorious Revolution.

In sum, Magna Carta marks the beginning of a gradual process that laid the foundations for constitutional and limited government. For this reason, understanding how it came into being requires an appreciation of the political and economic environment that characterized medieval England circa 1200. This environment is typically labeled “feudal”.⁴

2.1 *A Feudal Political Economy*

Following the Norman conquest in 1066, the kings of England were comparatively powerful, but their power did not rest on their ability to tax or on a standing army. Rather, as military force was decentralized, the king’s power rested on the fact that he was at the top of the feudal hierarchy i.e. that other lords owed him homage for their lands.

Thus, while the king was the largest landowner and had considerable income from the royal demesnes, a key feature of the feudal polity was the king’s reliance on lords who pledged their own military resources to the king, in exchange for a grant of some share of the entire realm. After such allegiance is made, the lord can only renege on his commitment by rebelling against the king.

Feudalism imposed numerous restrictions on property rights. The king ultimately owned all land in England. In theory, land he granted to his nobles reverted to him on their deaths. Over time, hereditary possession became a presumptive right, but this was still conditional on the discretion of the king.⁵ For instance, the king could choose to charge the tenant a fee when he took possession of the land. Also, if an heir of a noble was a minor, he and his land could be taken into wardship by the king. Wardships could also be sold.⁶ Similarly, the lands of widows could be reapportioned by the king. All of these rights could be abused by a monarch in need of additional revenue. Complaints to this effect were growing during the reign of John’s predecessors.

⁴Historians have debated the value of the term “feudalism” (see Abels, 2009). However, it is hard to understand the demands made of the king without a term that describes the distinctive legal and military organization of England and France in the 11th to 13th centuries.

⁵This evolution is discussed by North, Wallis, and Weingast (2009, 79-82).

⁶Pollack and Maitland (1895, 343) report several examples: “in 1193 the Bishop of Ely, William Longchamp, for 220 marks buys from the king, the wardship of Stephen Beauchamp and the right to marry him wherever he may please . . . Archbishop Hubert gives 4,000 marks for the wardship and marriage of Robert Stuteville, though the king reserves a certain veto on the choice of a bride”.

Land ownership was tied to military service. Lords who were granted a share of land by the king owed him military service. Military service could be substituted by a cash payment. By the late 12th century, these payments, known as scutage, were increasingly common (particularly for lords who were too old to serve or lacked sons of military age). But the cost of scutage was calibrated to be financially much more onerous than serving in the field.⁷ Military service could not be partially commuted. Tenants had the option of either providing their full military service (in terms of knights owed) or paying scutage.⁸

2.2 *England under the Angevins*

The direct male line of William the Conqueror ended in 1135 when Henry I (r. 1100-1135) died without a male heir. The civil war that followed only ended with the accession of Henry II (r. 1154-1189), Matilda's son, count of Anjou, and Duke of Normandy. Through his marriage to Eleanor of Aquitaine, Henry II acquired vast territories in Western France, sometimes referred to as the Angevin "empire".⁹ The strenuous efforts made to retain this far-flung collection of territories were a key background condition for Magna Carta.

While Henry II was a successful king, his reign also provoked rebellions among the aristocracy. Angevin rule was unpopular among English barons and these grievances intensified under his son, Richard I (r. 1189-1199). All Angevin monarchs sought to increase royal revenue in the face of inflation. Barlow terms the entire period between 1189-1216 as the "Angevin Despotism".

2.3 *The reign of King John and the road to Magna Carta*

When John became king in 1199, his claim was contested by his nephew Arthur of Brittany, and he was immediately embroiled in conflict in Northern France. This meant that John, like Richard, was absent from England for the early years of his reign. However, unlike his brother, he was not fortunate in war. By 1204, he had lost Normandy to Philip Augustus of France. Many Norman nobles switched their allegiance to the French king. This was a major blow to John's authority

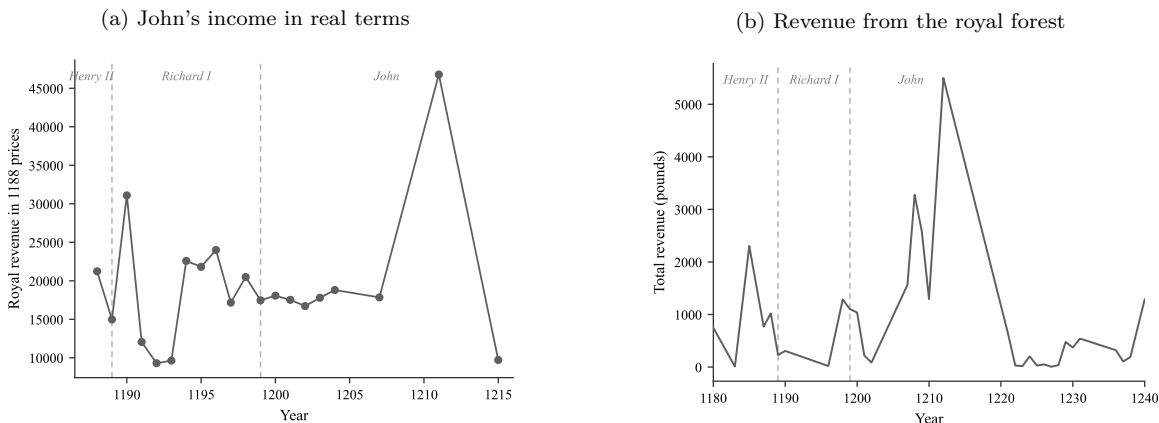
⁷Pollack and Maitland (1895, 271) note that "The appearance of small fractional parts of a knight's fee could hardly be explained, were it not that the king has been in the habit of taking money in lieu of military service, of taking scutage or escuage (*scutagium*), a sum of so much money per knight's fee".

⁸Over time inflation meant the costs of military service were increasing. The equipment required to outfit a knight also became more involved and expensive during the late 12th century (Painter, 1943).

⁹In reality this term is misleading as it was a loose connection of realms lacking any unified apparatus of government. See Gillingham (2001, 2-5) for a discussion.

directly (through the loss of land and vassals) and indirectly (as it reduced his abilities to offer patronage). He devoted the decade after 1204 to mustering resources to reconquer Normandy.

Figure 1: John's Extractiveness



Tax revenue in the reigns of Henry II, Richard I and John. Source: Barratt (1996, 1999, 2001).

Revenue from the royal forest. Data Source: Winters (1999).

The feudal system was exploited to squeeze resources from the nobility. Wardships were used to generate revenue and heiresses sold in the marriage market for profit. Feudal rights, such as these, traditionally used by rulers to cement alliances within the ruling coalition, were exploited by John on an unprecedented scale. John became infamous for “selling” royal justice, extracting lavish gifts and fees in return for favorable legal decisions.¹⁰

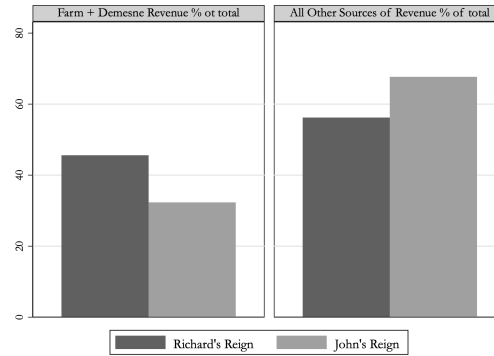
King John relied less on land rents compared to his predecessors. Figure 1a reports tax revenues from Barratt (1996, 1999, 2001) for Richard's and John's reigns. It demonstrates that while Richard's reign saw novel taxes imposed to fund the Third Crusade and pay for Richard's ransom, the revenue John collected was unprecedented.

The composition of John's revenues shifted away from land towards non-landed sources of revenue, such as wardships and fees, the legal system, the forests, and from taxing Jewish moneylenders. In 1130 landed sources of income were responsible for 92% of royal revenue (Barratt, 1999, 77). This fell to around 65% by the beginning of Richard I's reign. It fell further in John's reign whereas non-landed sources of revenue rose in importance (Figure 2).

General taxes in the form of “aides” were imposed. The tax of 1207 “was to be paid by ‘every

¹⁰It is important to note that these policies affected all barons. Many barons who would be loyal to King John in 1215 such as William Marshal had been subjected to fines and other fiscal exactions in previous years.

Figure 2: The Shift to New Sources of Revenue



The composition of royal revenue in the reign of Richard I (r. 1189-1199) and John (r. 1199-1216). Other sources of revenue here refers to feudal income, judicial income, debts owed to the king, income from the Exchequer of the Jewry and other miscellaneous sources of income. Data Source: Barratt (1996, 1999, 2001).

layman of all England of whomsoever's fee he may be'. No lord's authority over his fee was thus to stand in its way" (Carpenter, 2015, 210). The barons in Magna Carta would insist that in future such taxes could only be raised with the consent of the kingdom.

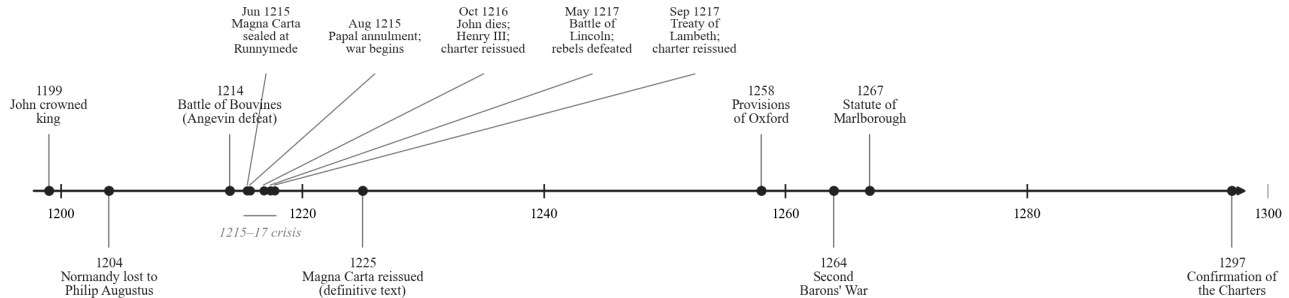


Figure 3: A timeline of the events surrounding Magna Carta, 1199–1297. The five events of the 1215–17 crisis are tightly clustered on the line and shown with fanned labels. A fuller chronology is given in Appendix Table A1.

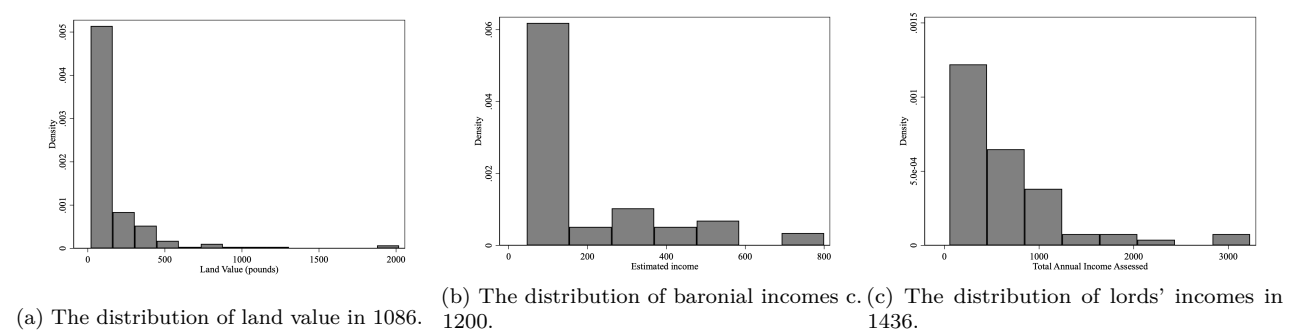
Alongside John's extractiveness, the distribution of land and resources among the baronage was egalitarian compared to other periods of English history. Evidence for this comes from three different periods: the late 11th century shortly after the Norman Conquest; 1200 or just prior to Magna Carta; and 1436.

Painter (1943) estimated the baronial income for 54 barons who he suggests are "a fair sample"

of the baronage in 1200. This data suggests a fairly even distribution of income, with the average income of the barons being £202 (median income £115). Seven barons earned over £400. The richest baron had an income of £800 (Figure 4b). Overall, the level of inequality was modest. We report both the generalized entropy index and Gini coefficients in Figure 4.

Data from the Domesday suggests a more unequal distribution of income in 1086 (Palmer, 2010). Figure 4 reports that the Gini coefficient for the top 200 landowners in 1086 was 0.6, much higher than we estimate for 1200.¹¹ The tax data compiled by Gray (1934) also suggests that the distribution of incomes among elites was more concentrated in 1436 than it had been in 1200. Our preferred measure of inequality – the GE(2) index – increased to 0.479, whereas the Gini coefficient rose to 0.469 (Figure 4).

Figure 4: The Distribution of Baronial Income



	Time Period	GE(2)	Gini	90/10 ratio
Estimates of Baronial Income	1086	1.276	0.602	16.45
	1200	0.397	0.455	10
	1436	0.479	0.469	11.11

Notes: This table reports estimates for the distribution of baronial income in 1086, 1200 and in 1436. The estimate for 1086 is based on the value of the land of the largest landowners. We report three measures (i) the generalized entropy index, parameterized at $\alpha = 2$; (ii) the Gini coefficient; and (iii) the 90/10 ratio. Data for 1086 is from Palmer (2010). Data for 1200 are from Painter (1943). Data for 1436 are from Gray (1934).

In 1214 John invaded France. Had this succeeded, John might have possessed enough resources and prestige to cow all opposition. However, the defeat of the allied army that John had assembled

¹¹As Painter’s sample is representative of the entire baronage, and there were approximately 200 barons in 1200, we report estimates for the top 200 landowners in 1086. If we compare the top 100 landowners we also find a higher Gini coefficient than in 1200. Nonetheless, we interpret this data with caution as the data may not be directly comparable.

at the Battle of Bouvines spelled the failure of his efforts. Defeated and impoverished, he returned to England to confront his rebellious barons in the winter of 1214/1215.

Magna Carta The formation of the coalition that opposed John is not well documented.¹² But by January 1215, several barons were in public opposition. As it became clear that discontent was growing, the rebellious barons openly rose in spring 1215 gathering an army. John called on his supporters but, as the army he raised was not strong enough to overwhelm that of the barons, he came to terms with them. The result was the agreement made on June 15 1215 at Runnymede. This was issued on June 19 as a formal charter, the Great Charter or Magna Carta. This was a momentous occasion as the king conceded the principle that he was under a higher power. Nonetheless, it was a product of the particular circumstances we study in this paper and when those circumstances changed, conflict renewed. John repudiated the charter within months, and the civil war that followed ended only after his death in October 1216. The charter's substance nevertheless survived through the reissues of 1216, 1217 and 1225 (Section 5), so that 1215 begins rather than ends the story of institutional change.

The resulting agreement was both a peace treaty and a statement of the demands of the baronial elite, a statement that contained within it the kernel of a much more general idea—that of subjecting the sovereign to the rule of law. There were 63 clauses, and while many focused on specific injustices John had done to the barons, there were also clauses of general importance for the development of the rule of law.

Clause 38 protected against arbitrary accusations. Clause 39 is celebrated for protecting “free men” from arrest or imprisonment “save by lawful judgement of [their] peers or by the law of the land”. Clause 40 denounced the sale of justice. The charter also had clauses to protect freeholders and the towns. In this sense it had a “comprehensive quality” and was “a grant to all free men throughout the realm” (Holt, 1992, 239). As Bartlett (2000, 65) writes: “it is much more than a political settlement and most of its clauses have a permanent and general character. The Charter is, indeed, in the form of a royal grant to all free men in perpetuity. In it the king promises to limit his authority and observe certain procedures” (Bartlett, 2000, 65).

¹²The chronicler Robert of Wendover suggests that a core opposition to John formed in October 1214 but “[w]e do not know any details of the meeting, or who was present” (Barratt, 2018, 272). Holt (1992, Appendix 1) is highly skeptical that such a meeting took place.

Important for the development of representative government, Clause 14 called for “the common counsel of the kingdom” to be consulted prior to the assessment of any tax. This laid the foundations for the idea that a Parliament was required for granting of any new taxes (Butt, 1989; Vincent, 2012). Consultation itself was not new. Anglo-Saxon kings had governed with the advice of the *witan*, an assembly of elites that was central to the ordinary business of kingship: “when the witan was unable to meet or only able to meet irregularly, much of the business of kingship was put on hold” (Roach, 2013, 212). But after 1066 even this tradition of government by consent largely lapsed. Moreover, the witan played no formal role in granting taxation, although fiscal matters may well have been discussed within it, and did not appear to constrain the behavior of Anglo-Saxon kings like Ethelred the Unready. So what was new in 1215 was not consultation but its transformation into a binding constraint on the king, backed by the threat of coordinated baronial resistance.

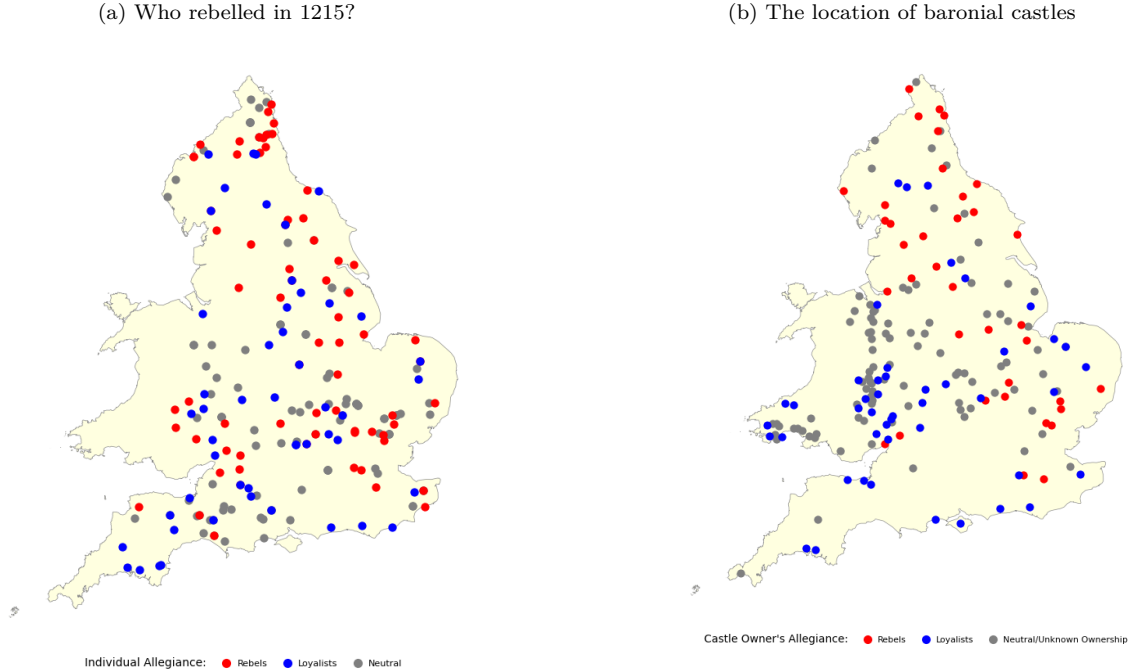
Who Supported Magna Carta? We have a unique dataset on the universe of barons in 13th century England and the characteristics of each of the baronies they held. There were 280 barons during the entire reign of King John, 186 of whom were alive during the Magna Carta crisis and who constitute our main sample. To study the Second Barons’ War (1264–1267), we extend our sample to include all barons alive in 1258–1264.

Many barons were not involved in the Magna Carta crisis (some were too old or too young; others did not wish to take a side). 56 barons were in rebellion by the end of June 1215, and 35 supported John. The remaining 95 were inactive.¹³ Explaining the decision to rebel poses several puzzles. As Figure 5a indicates there was no geographical pattern to the rebellion. Similarly, balance tests reported in the Appendix (Table A5) suggest only slight differences between rebels and loyalists on a range of metrics.

Note that the rebellion was not led by the most powerful barons or those close to the throne. In Appendix Table A15, we rank the top 10 barons (excluding the king) by how central they are to the entire network of barons using their eigenvector centrality (as used by Cruz et al. (2017)). Notably, while there were three eventual rebels out of the top 10 most central barons, these

¹³Appendix B describes how we code each baron’s allegiance, and Appendix Table A9 reports our main estimates under alternative codings.

Figure 5: Rebellion and Baronial Castles in 1215



Left: the geographical distribution of barons who rose in open rebellion, were loyal to John, or remained inactive in 1215. *Right:* the location and allegiances of baronial castles in 1215. Data sources: see main text and Appendix B.

barons were *not* among the rebel leaders.

Some barons rebelled because they had personal grievances against the king (Figure 6). But these only explain a small proportion of the barons who eventually joined the rebellion. This speaks to Tullock’s “paradox of rebellion” (Tullock, 1987). As no individual baron could feasibly rebel against the king, any successful rebellion had to be based on a coalition of barons who believed that they had a chance of success. That is, a baron’s decision to rebel against the king should have taken into account the probability that the rebellion would be successful. Thus, we posit that the strength of the entire rebel coalition would have driven the baron’s decision. In other words, we would expect that the characteristics of the coalition would explain the baron’s decision to rebel, while his individual characteristics would only have limited explanatory power.

To depict how the rebel coalition could have formed, why they proposed Magna Carta, and why the king acceded to it, we propose a model below.

3 A Model of Institutional Change in the Feudal World

To explain Magna Carta, one has to understand that the political economy of 13th century England was feudal. By this we mean, *à la* Bloch (1961), a decentralized system in which elites of the realm each have economic and military resources, which they can pledge to a ruler in exchange for a share in the realm.

The resulting political and economic order is a coalition of elites and the ruler, held together by an agreement on how resources in the realm are allocated. The agreement, however, is non-binding – once resources are pledged to the ruler, any member of the coalition can, at any point, take back her resources by rebelling or exiting the coalition. The ruler can also force the (re-)entry of elites into the coalition through battle, or elites can (re-)enter voluntarily. This feudal process of coalition formation through repeated bargaining, possibly violent, is formally depicted in Desierto and Koyama (2025). As the focus of that paper is the early stage of feudalism, it demonstrates how a realm consolidates into one grand coalition under a ruler.¹⁴

We develop a different model to study Magna Carta, because the realm in 1215, while still feudal, was already consolidated. Elites rebelled, not in order to establish independent kingdoms, but to pressure the ruler to accede to their demands. In the case of Magna Carta, the rebels demanded a more egalitarian allocation of rights in the realm and to limit the ruler’s discretion.

3.1 The Feudal Order

To begin, we formally set up a feudal environment. There is a realm Π composed of a set of barons $N = \{i\}$ and a king k . At any time period t , each $i \in N$ and k are endowed with his own productive and military resources, respectively denoted as $\{e_i\}$ and e_k , with $e_i, e_k \in \mathbb{R}_{\geq 0}$.¹⁵ A portion $n_i \in [0, e_i]$ of each e_i and a portion $n_k \in [0, e_k]$ of e_k can be easily seized by one’s enemies and are, therefore, *appropriable*. (An example is indefensible farmland.) The resources that are

¹⁴An important result is that large resources that the ruler cannot easily appropriate make consolidation more likely. In this case, elites can reclaim a lot of resources that they have initially pledged to the ruler, which makes rebellion more costly to the ruler and induces her to keep sharing rents to prevent rebellion. In equilibrium, the realm is consolidated.

¹⁵We capture a Malthusian economy in which per capita incomes were not growing over time. Therefore we assume that $\{e_i\}$ and e_k do not vary over time.

non-appropriable – those which their owner can keep secure, are $\{(e_i - n_i)\}$ and $e_k - n_k$.¹⁶

At any time period in which a baron is not in rebellion against the king, he contributes his entire resource endowment to the realm, in exchange for a share in the total resources of the realm. At any time period in which he is in rebellion, he is an enemy of the king, who therefore only gets the portion of his endowment that is appropriable. The rebel baron keeps the non-appropriable portion. As the king cannot rebel against himself, he contributes e_k to the realm at each t . Thus, at any time period t , the total resources of the realm, E_t , are the sum of the entire resource endowment of the king and of every baron, minus the non-appropriable resources of the rebels. That is, $E_t = e_k + \sum_{i \in N} e_i - \sum_{i \in R_t} (e_i - n_i)$, where $R_t \subseteq N$ denotes the set or coalition of rebels in that period (which may be empty).

Meanwhile, rebel barons pool together their non-appropriable resources, and so the total resources of the rebel coalition are $E_{R_t} = \sum_{i \in R_t} (e_i - n_i)$. The rebels allocate E_{R_t} among themselves according to shares $\{\sigma_R\}$, with $\sum_{R=1}^{|R_t|} \sigma_R = 1$. For concreteness, one can partition $\{\sigma_R\}$ into $\{\sigma_R\} = \{\sigma', \{\sigma''\}\}$, where σ' is the share of the leader of the rebel coalition, and σ'' the share of an ordinary member.

At any time period in which there is rebellion, the king can attempt to bring back the rebels and recover the lost non-appropriable resources. He does so by assembling a coalition of loyalists $K_t \subseteq N \setminus R_t$ who can fight the rebel coalition by using their resource endowments and incurring some cost of fighting. That is, the loyalist coalition's fighting capacity at t is $F_{K_t} = \sum_{i \in K_t} (e_i - c_i)$, with $c_i \in [0, e_i]$ denoting baron i 's fighting cost. The rebel coalition's fighting capacity at t is $F_{R_t} = \sum_{i \in R_t} (e_i - n_i - c_i)$. If there is fighting, rebels can only use their resource endowments that are non-appropriable, while loyalists can use their entire endowments. The probability that the rebels would win over the loyalists in a fight is $\rho_t = Pr[\gamma \leq F_{R_t} - F_{K_t}] \in (0, 1)$, where

¹⁶The size of a baron's resources, e_i , and the portion n_i that is appropriable we take as given at the time of the 1215 rebellion. We can nonetheless derive it from deeper factors (see Appendix K). Briefly, a baron's resources are produced using a vector of inputs $\mathbf{x}_i$, net of the cost of production, as well as the cost of protection whenever ownership of such inputs is contested, e.g. under rebellion. Let θ index how difficult it is to protect the inputs from seizure. The appropriable portion of a baron's resources is then the gap between what he can hold when protection is costless and what he can hold when it must be provided, $n_i = f(\mathbf{z}_i)$ with $\mathbf{z}_i = (\mathbf{x}_i, \theta)$, and it is increasing in θ . Two implications matter for what follows. First, every result below is stated as a threshold on the size of non-appropriable resources, and makes no reference as to what constitutes it, so the results are unchanged when n_i is derived rather than assumed. Second, the derivation tells us what a good empirical measure of non-appropriability must be: a technology that lowers θ . Castles are precisely such a technology, which is why they serve as our proxy in Section 4.

$\gamma \in \mathbb{R}$ is a random variable with a density function that exists everywhere and is differentiable, single-peaked and symmetric around zero.

Finally, the feudal realm is governed through a power-sharing agreement between the king and the barons. In particular, the king has complete discretion over a share σ_k of the total resources of the realm E_t , while baron $i \in N$ has complete discretion over share σ_i , with $\sigma_k + \sum_{i \in N} \sigma_i = 1$. A king with σ_k close to one has a lot of power. Likewise, a baron with a larger share is more powerful than a baron with a smaller share. Thus, the baron with the largest share among N is the most powerful baron.

This power-sharing agreement is an institution that is mutually upheld by the king and every baron, unless there is a proposal for a new agreement which all parties mutually accept, either peacefully or through combat. (See subsequent game for how such institutional change occurs.) This means that a baron retains power σ_i in the realm even when he is in rebellion. This is a feature of the feudal world – barons retain their positions and are not automatically stripped of their titles, even when they are rebelling.

At any time period, the political and economic order in a feudal environment can be succinctly described as a coalition structure and a division of resources in that period. That is, the feudal order is a partition of the realm into the king, a coalition of rebels, a coalition of loyalists, and a set of ‘inactive’ barons who do not belong to either coalition, and an allocation of the sum of the individual resources of each member of the realm, some of which are appropriable and others non-appropriable. Formally (dropping time subscript t):

Definition 1. *The **feudal order** is a pair $f = (\Pi, \sigma)$, with $\Pi = (k, K, R, \{N \setminus K \setminus R\})$ a partition of the realm into a king k , a coalition of loyalists $K \subseteq N$, a coalition of rebels $R \subseteq N$, $K \cap R = \{\emptyset\}$, and a set of inactive barons $N \setminus K \setminus R$; and $\sigma = (\sigma_k, \{\sigma_i\}, \{\sigma_R\})$ an allocation of resources $(E + E_R)$, where share σ_k of E accrues to the king and shares $\{\sigma_i\}$ accrue to each baron $i \in N$, with $\sigma_k + \sum_{i \in N} \sigma_i = 1$, while shares $\{\sigma_R\}$ of E_R accrue to the rebels, with $\sum_{R=1}^{|R|} \sigma_R = 1$.*

3.2 The Magna Carta Game

Magna Carta limited the ruler’s discretionary power and made the realm more inclusive, à la (Acemoglu et al., 2005b; Acemoglu and Robinson, 2023). It curtailed royal extraction (Stubbs,

1874, 534) and, at the same time, established the principle of equal treatment of barons under the law, ending the king's use of the judicial system to extract from, or favor, particular barons (Harding, 2001, 139).

We propose a coalitional bargaining game, hereafter game M , by which a status quo feudal order $f_0 = (\Pi_0, \sigma_0)$ can change into a new feudal order $f_m = (\Pi_0, \sigma_p)$, where σ_p captures the power-sharing agreement that is espoused in Magna Carta – in particular, one in which the king's power is less than in the status quo, and each baron shares equally in the residual power of the realm.

At the beginning of the game, $t = 0$, the feudal order is $f_0 = (\Pi_0, \sigma_0)$, where $\Pi_0 = (k, K_0, R_0, \{N \setminus K_0 \setminus R_0\}) = (k, \{0\}, \{0\}, N)$ and $\sigma_0 = (\sigma_k, \{\sigma_i\}, \{\sigma_R\})$. That is, there is no rebellion, and the status quo power-sharing agreement is such that fraction σ_k of all resources not taken by rebels (presently, all resource endowments) is controlled by the king and $\{\sigma_i\}$ by the barons, while any non-appropriable resources taken by (future) rebels are allocated as $\{\sigma_R\}$ among the rebels.

At the end of the game, $t = T$, the feudal order is $f_T = \delta f_m(\Pi_0, \sigma_p) + (1 - \delta)f_0(\Pi_0, \sigma_0)$, where $\sigma_p = (\sigma_{k'}, \{\frac{1-\sigma_{k'}}{N}\}, \{\sigma_R\})$ is the power allocation under Magna Carta, with $\sigma_{k'} < \sigma_k$, and $\delta \in [0, 1]$ the extent to which Magna Carta is fully implemented. Thus, under Magna Carta, the king is less powerful than in the status quo, while the residual power in the realm, $(1 - \sigma_{k'})$, is shared equally by the barons.¹⁷ δ is endogenous – we will show that it is an equilibrium outcome, while $\sigma_k, \{\sigma_i\}, \sigma_{k'}, \{\frac{1-\sigma_{k'}}{N}\}$, and $\{\sigma_R\}$ are all exogenously given.

The following events occur sequentially from $t = 0$ to $t = T$.

3.2.1 Sequence of Events

1. At $t = 0$, Nature chooses γ and a baron $p \in N$ who, from $t = 1$ to some end period $T \leq |N| - 1$, will be a member and the leader of the rebel coalition.¹⁸

¹⁷Magna Carta does not actually have any prescription as to how rebel resources E_R are allocated among rebels. We merely keep $\{\sigma_R\}$ fixed to simplify the game and ignore the process by which it is determined. As with the status quo and Magna Carta allocations σ_0 and σ_p themselves, we treat $\{\sigma_R\}$ – including the individual shares σ' and σ'' used below to denote, respectively, the rebel leader's and a baron-follower's share of $\mathcal{E}_R$ – as exogenously given. Endogenizing the coalition's internal division of resources is a natural extension, but orthogonal to our focus here, which is on the conditions under which a transition between the two given regimes σ_0 and σ_p occurs.

¹⁸The random draw of leader captures the specific situation prior to Magna Carta, where there was no obvious natural leader of the baronial opposition. The nominal rebel leader was Robert Fitzwalter, but it could easily

Step 2 below occurs repeatedly from $t = 1$ until some end period $T \leq |N| - 1$. Thus, the set of baron-followers is also denoted as $T \subseteq (N \setminus p)$.

2. A baron-follower q is randomly drawn, without replacement, from the set of inactive barons $N \setminus R_{t-1} \setminus K_{t-1}$, and decides whether to join the existing rebel coalition R_{t-1} to form R_t with fighting capacity F_{R_t} , or the existing loyalist coalition K_{t-1} to form K_t with fighting capacity F_{K_t} .¹⁹
3. At T , p decides whether or not to propose to the king k power-sharing agreement $\sigma_p = (\sigma_{k'}, \{\frac{1-\sigma_{k'}}{N}\}, \{\sigma_R\})$.²⁰
4. If no proposal has been made, the rebellion ceases. If a proposal has been made, k decides whether to accept or reject it. If he accepts, the game ends and σ_p is implemented indefinitely. If he rejects, K_T and R_T fight. If R_T wins, σ_p is implemented indefinitely. If K_T wins, the status quo power-sharing agreement $\sigma_0 = (\sigma_k, \{\sigma_i\}, \{\sigma_R\})$ remains indefinitely. R_T wins with probability $\rho_T = \Pr[\gamma \leq F_{R_T} - F_{K_T}] \in (0, 1)$.

3.2.2 Players, Strategies, Payoffs

The set of players of game M is a subset of the realm Π_0 : the king k and each baron $i \in (T \cup p) \subseteq N$ drawn as rebel leader p at $t = 0$ or drawn as baron-follower q at $t = 1, 2, \dots, T$. We thus define a strategy profile as a vector that specifies an action of the king, and an action of each baron drawn to play either as p or q . That is, let α_k denote the probability that the king accepts the proposal at T , μ_p the probability that the rebel leader p makes the proposal at T , ψ_t the probability that a follower q drawn at t joins existing rebel coalition R_{t-1} (and $1 - \psi_t$ the probability he joins existing loyalist coalition K_{t-1}). A strategy profile is $\Sigma = \{\alpha_k, \mu_p, \{\psi_q\}_{i \in T \subseteq (N \setminus p)}\}$, where $\{\psi_q\}_{i \in T \subseteq (N \setminus p)} = (\psi_1, \psi_2, \dots, \psi_T)$ is the collection of baron-follower actions, with ψ_1 denoting the

have been another baron. Assuming a random draw also allows us to generate results that are robust to the identity or specific attributes of the rebel leader.

¹⁹There exists no historical record as to the sequential order by which barons joined the rebel or loyalist coalitions. We thus make the draw of baron-followers random to generate results that are robust to any ordering. Note that since T can be less than $|N| - 1$, we allow for the possibility that not all barons join either coalition. In fact, many barons remained inactive or neutral during the Magna Carta rebellion.

²⁰Magna Carta was a take-it-or-leave-it offer, and not a product of alternating bargains between the king and the barons. The rebels presented the document to the king, likely on June 10, 1215, and gave the king an ultimatum to sign it by June 15th.

action of the baron-follower drawn at $t = 1$, ψ_2 the action of the baron-follower drawn at $t = 2$, etc. These baron-follower actions specify the composition of the rebel and loyalist coalitions at each time period. That is, $\{\psi_q\}_{q \in T \subseteq (N \setminus p)}$ maps on to $\{(K_t, R_t)\} = ((K_1, R_1), (K_2, R_2), \dots, (K_T, R_T))$. A strategy profile Σ induces respective expected payoffs $V^k(\Sigma)$, $V^p(\Sigma)$, $\{V^q(\Sigma)\}_{q \in T \subseteq (N \setminus p)}$ for the king k , rebel leader p and each baron-follower q , where the expected payoff of a player is the expected (infinite) stream of resources that accrues to the player. (See Appendix L for details on the construction of the payoffs.)

3.2.3 Equilibrium

A strategy profile $\Sigma^* = \{\alpha_k^*, \mu_p^*, \{\psi_q^*\}_{q \in T \subseteq (N \setminus p)}\}$ is an equilibrium of game M if α_k^* is an optimal action of k , μ_p^* an optimal action of p , and ψ_q^* an optimal action of q for every baron-follower q , each derived by backward induction. At T , the king compares his expected payoff from accepting and rejecting p 's proposal, taking the composition of the rebel and loyalist coalitions as given; the rebel leader p compares his expected payoff from proposing or not, expecting the king's response. Moving backward through $t = T - 1, T - 2, \dots, 1$, each baron-follower, drawn in turn, compares his expected payoff from joining the existing rebel coalition against joining the existing loyalist coalition, expecting the actions of the king, the rebel leader, and every baron-follower drawn after him, and taking as given the composition of the coalitions formed before him. (See Appendix L for the full derivation of each player's payoffs.)

3.3 Results

Denote as $\mathcal{E}_R \equiv \sum_{i \in R_T} (e_i - n_i)$ the one-period non-appropriable resources of the final coalition of rebels (fully formed at T), and $\mathcal{K}_R \equiv \sum_{i \in R_T} c_i$ its cost of fighting. Similarly, let $\mathcal{E}_L \equiv \sum_{i \in K_T} e_i$ denote the one-period resources of the final coalition of loyalists (fully formed at T), and $\mathcal{K}_L \equiv \sum_{i \in K_T} c_i$ its cost of fighting.

One can then obtain the following results. (All proofs are in the Appendix.)

Lemma 1. *1. For a king whose power in the realm (i.e. share of E) is σ_{k_0} , there exists a threshold: a collection of (minimum) values $\{\underline{\mathcal{E}}_R^k, \underline{\mathcal{K}}_L^k\} \equiv \{\mathcal{E}_R, \mathcal{K}_L\}$ and (maximum) values $\{\bar{\mathcal{E}}_L^k, \bar{\mathcal{K}}_R^k\} \equiv \{\mathcal{E}_L, \mathcal{K}_R\}$, such that he will accept proposal σ_p if the threshold is met, i.e. whenever $\mathcal{E}_R \geq \underline{\mathcal{E}}_R^k$, $\mathcal{K}_L \geq \underline{\mathcal{K}}_L^k$, $\mathcal{E}_L \leq \bar{\mathcal{E}}_L^k$, and $\mathcal{K}_R \leq \bar{\mathcal{K}}_R^k$, and reject it otherwise.*

2. For a rebel leader $p \in N$ whose power in the realm (i.e. share of E) is $\sigma_{i=p}$, there exists a threshold: a collection of (minimum) values $\{\underline{\mathcal{E}}_R^p, \underline{\mathcal{K}}_L^p\} \equiv \{\mathcal{E}_R, \mathcal{K}_L\}$ and (maximum) values $\{\bar{\mathcal{E}}_L^p, \bar{\mathcal{K}}_R^p\} \equiv \{\mathcal{E}_L, \mathcal{K}_R\}$, such that p will propose σ_p to the king if the threshold is met, i.e. whenever $\mathcal{E}_R \geq \underline{\mathcal{E}}_R^p$, $\mathcal{K}_L \geq \underline{\mathcal{K}}_L^p$, $\mathcal{E}_L \leq \bar{\mathcal{E}}_L^p$, and $\mathcal{K}_R \leq \bar{\mathcal{K}}_R^p$, and not propose otherwise.
3. For each baron-follower $q \in T \subseteq (N \setminus p)$ whose power in the realm (i.e. share of E) is $\sigma_{i=q}$, there exists a threshold: a collection of (minimum) values $\{\underline{\mathcal{E}}_R^q, \underline{\mathcal{K}}_L^q\} \equiv \{\mathcal{E}_R, \mathcal{K}_L\}$ and (maximum) values $\{\bar{\mathcal{E}}_L^q, \bar{\mathcal{K}}_R^q\} \equiv \{\mathcal{E}_L, \mathcal{K}_R\}$, such that q is in the rebel coalition if the threshold is met, i.e. whenever $\mathcal{E}_R \geq \underline{\mathcal{E}}_R^q$, $\mathcal{K}_L \geq \underline{\mathcal{K}}_L^q$, $\mathcal{E}_L \leq \bar{\mathcal{E}}_L^q$, and $\mathcal{K}_R \leq \bar{\mathcal{K}}_R^q$, and in the loyalist coalition otherwise.

Lemma 1 implies that, generally, any baron-follower is more likely to be in the rebel coalition, any rebel leader more likely to propose, and any king more likely to accept the proposal, the larger the non-appropriable resources of the rebel coalition, the lower its fighting cost, the smaller the resources of the loyalist coalition, and the larger its fighting cost. Note, however, that each player has a unique threshold. Thus, for instance, the amount of non-appropriable resources that would induce one baron to be in the rebel coalition may not be enough to induce another baron. Similarly, this may be enough to induce a baron to propose if he is drawn to be the rebel leader, but may not be sufficient if another baron were to be the rebel leader. In particular, a less powerful player – with a lower share in the realm – requires a smaller amount than a more powerful one. Thus, for the same $\mathcal{E}_R$, the former is more likely than the latter to be in the rebel coalition, is more likely to propose if drawn to be the rebel leader, and is more likely to accept if he is the king. Lemma 2 formalizes this.

Lemma 2. Fix $\mathcal{K}_L$, $\mathcal{E}_L$, and $\mathcal{K}_R$ at any common values. Then each threshold $\underline{\mathcal{E}}_R^k$, $\underline{\mathcal{E}}_R^p$, and $\underline{\mathcal{E}}_R^q$ from Lemma 1 is strictly increasing in the corresponding player's power in the realm:

1. For a king with a larger status-quo share σ_{k_0} , the threshold $\underline{\mathcal{E}}_R^k$ is larger.
2. For any two potential rebel leaders $p, p' \in N$ with $\sigma_{i=p} < \sigma_{i=p'}$, $\underline{\mathcal{E}}_R^p < \underline{\mathcal{E}}_R^{p'}$.
3. For any two baron-followers $q, q' \in T \subseteq (N \setminus p)$ with $\sigma_{i=q} < \sigma_{i=q'}$, $\underline{\mathcal{E}}_R^q < \underline{\mathcal{E}}_R^{q'}$.

Consequently, for the same realized $\mathcal{E}_R$ (holding $\mathcal{K}_L, \mathcal{E}_L, \mathcal{K}_R$ fixed), a player with a lower share of power in the realm is more likely than one with a higher share to have his threshold met.

Lemma 1 determines the unique equilibrium of the game:

Theorem 1. Let $T_k = \{0, 1\}$ be an indicator variable equal to one if the king's threshold is met, $T_p = \{0, 1\}$ an indicator variable equal to one if rebel leader p 's threshold is met, and $T_q = \{0, 1\}$ an indicator variable equal to one if baron-follower q 's threshold is met. Game M has a unique equilibrium $\Sigma^* = \{\alpha_k^*, \mu_p^*, \{\psi_q^*\}_{i \in T \subseteq (N \setminus p)}\}$, where:²¹

$$\alpha_k^* = \begin{cases} 1 & \text{if } T_k = 1 \\ 0 & \text{otherwise} \end{cases} \quad \mu_p^* = \begin{cases} 1 & \text{if } T_p = 1 \\ 0 & \text{otherwise} \end{cases} \quad \psi_q^* = \begin{cases} 1 & \text{if } T_q = 1 \\ 0 & \text{otherwise} \end{cases}$$

From the foregoing, we can derive key conditions under which institutional change occurs, that is, when the feudal order changes from the status quo, i.e. $f_0 = (\Pi_0, \sigma_0)$, towards one that abides by the principles of Magna Carta, i.e. $f_m(\Pi, \sigma_p)$.

The feudal order after game M is played is $f_T = \delta f_m(\Pi_0, \sigma_p) + (1 - \delta)f_0(\Pi_0, \sigma_0)$, which is different from the status quo feudal order whenever $\delta > 0$, and comes closer to a feudal order prescribed by Magna Carta as $\delta \rightarrow 1$. Now δ is an equilibrium outcome of game M . It is the (ex-post) probability that σ_p is implemented.

To see this, assume first that proposal σ_p is made, i.e. $\mu_p^* = 1$. Then σ_p is implemented in either of two ways: peacefully, if the king accepts the proposal ($\alpha_k^* = 1$); or violently, if the king rejects it ($\alpha_k^* = 0$) but his loyalist coalition is defeated by the rebels. Thus, in this case, the expected feudal order is $f_T = \alpha_k^* f_m(\Pi_0, \sigma_p) + (1 - \alpha_k^*)[\rho_T f_m(\Pi_0, \sigma_p) + (1 - \rho_T)f_0(\Pi_0, \sigma_0)]$, where $\alpha_k^* = \{0, 1\}$ and $\rho_T = \Pr[\gamma \leq (F_{R_T} - F_{K_T})] \in (0, 1)$ is determined by the relative fighting capacities of the rebel and loyalist coalitions that are formed in equilibrium.

This means that when the king accepts σ_p , then, setting $\alpha_k^* = 1$, $f_T = f_m(\Pi_0, \sigma_p)$, which implies that $\delta = 1$. If the king rejects σ_p , then, setting $\alpha_k^* = 0$, $f_T = \rho_T f_m(\Pi_0, \sigma_p) + (1 - \rho_T)f_0(\Pi_0, \sigma_0)$, which implies that $\delta = \rho_T$.

²¹This equilibrium does not depend on the order in which baron-followers are drawn. Since each T_q depends only on the aggregate $\mathcal{E}_R, \mathcal{K}_R, \mathcal{E}_L, \mathcal{K}_L$ of the coalitions ultimately formed and on q 's own type, the set of barons who are in R_T is the same regardless of the sequence in which they are asked. Thus, randomizing the draw order is without loss of generality for our results.

Meanwhile, if no proposal is made, i.e. $\mu_p^* = 0$, then the feudal order returns to the status quo after the game is played. Thus, there is no institutional change: $f_T = f_0(\Pi, \sigma_0)$, which implies that $\delta = 0$.

Since $\delta = \{0, \rho_T, 1\}$ and $\rho_T \in (0, 1)$, Magna Carta is implemented to some extent, i.e. with positive (ex-post) probability, if the proposal is made in equilibrium. When $\mu_p^* = 1$, either $\delta = \rho_T$ or $\delta = 1$. Conversely, it is not optimal for rebel leader p to propose Magna Carta, hence $\mu_p^* = 0$, if there is no chance that it will be implemented. The intuition, of course, is that in proposing Magna Carta, the rebel leader risks going into war, which he will not do unless there is some probability of victory, i.e. $\rho_T > 0$.

What guarantees a change in the status quo feudal order $f_0(\Pi, \sigma_0)$ towards $f_m(\Pi, \sigma_p)$, that is, with probability $\delta > 0$, is $\mu_p^* = 1$. In turn, the latter requires $T_p = 1$ for the baron $p \in N$ who is drawn to lead the rebel coalition (by Theorem 1). It can also be shown that if p happens to be the most powerful baron, and $T_p = 1$ for that baron, then if p happens to be any other, less powerful, baron, then it is also true that $T_p = 1$ for that baron. Thus, institutional change is robust to the draw of rebel leader if $T_p = 1$ for the most powerful baron.

The following result is immediate.

Theorem 2. *The feudal order $f_0 = (\Pi_0, \sigma_0)$ will change towards $f_m = (\Pi_0, \sigma_p)$, i.e. with probability $\delta > 0$, if and only if $T_p = 1$ for the baron $p \in N$ drawn to be rebel leader. If p happens to be the most powerful baron, and $T_p = 1$ for that baron, then the change will also occur even when any other, less powerful, baron is drawn to be the rebel leader.*

This implies that while institutional change always occurs if the rebel leader threshold is met for the most powerful baron, it does not require that the rebellion is led by the most powerful baron. Institutional change can still happen even when the rebel leader is less powerful, as long as his own threshold is met.

The rebel leader threshold of a less powerful baron is less onerous than that of the most powerful baron, since the former has more to gain if the status quo changes. For the less powerful baron, the relative fighting capacity of the rebel coalition need not be very large – the non-appropriable resources of the rebel coalition need not be very large, nor their fighting cost very low, to induce him to propose σ_p . In contrast, for the most powerful baron to want to

change the status quo, his rebel leader threshold is harder to meet – he requires a much stronger rebel coalition (with larger non-appropriable resources and lower costs of fighting).

Theorem 2 suggests that Magna Carta was highly contingent. The 1215 rebellion occurred under the leadership of less powerful barons. As shown in Table A15, neither Robert Fitzwalter, nor the other baronial leaders were economically prominent or central to the network of barons. For these barons, the rebel coalition’s non-appropriable resources happened to be just large enough (and fighting costs small enough) to induce them to push for Magna Carta. Other, more powerful, barons in their stead could have looked at the same rebel coalition, assessed their fighting capacity, and aborted the rebellion.

This observation is not just about the leader, as it extends to the rest of the coalition. Thus:

Corollary 1. *Institutional change can occur via a rebel coalition that is small in membership and modest in aggregate resources: if the realized coalition R_T , and leader p , are drawn from among the less powerful barons in N , then, by Lemma 2, their thresholds $\underline{\mathcal{E}}_R^q$ and $\underline{\mathcal{E}}_R^p$ are correspondingly low, so a modest $\mathcal{E}_R$ contributed only by these barons can satisfy $T_q = 1$ for each member of R_T and $T_p = 1$ for the leader – without requiring the participation of more powerful, resource-rich barons.*

Corollary 1 says institutional change does not require the rebel coalition to be large or resource-rich. What matters is that the coalition’s aggregate non-appropriable resources clear the thresholds of its own members and its leader, and by Lemma 2 those thresholds are lower precisely because these are less powerful players.

This offers a formal account of why the 1215 rebellion – a small group of barons, led by men who, as Table A15 shows, were not economically prominent – did not need to be large or resource-rich to succeed.²²

Two more theoretical results proceed directly from Theorem 2, both operating through the same channel. Anything that shrinks the share σ_i of the most powerful baron makes it easier to meet his rebel leader threshold, so that $T_p = 1$ for the most powerful baron and, by Theorem 2, institutional change becomes more likely after a rebellion led by *any* baron $i \in N$. First,

²²As Section 4 shows, only 56 of the 186 active barons were in rebellion by June 1215, and together they held just 37 castles – about a third of the 95–107 castles King John held himself.

a very extractive king, i.e. σ_{k_0} close to one, leaves a small residual share of the realm to the barons collectively, and hence a small share even to the most powerful of them. Second, a more egalitarian allocation of the realm among the barons keeps the largest individual share close to the (necessarily small) average, for the same reason. Thus:

Corollary 2. *1. The more extractive the existing feudal order, i.e. $f_0 = (\Pi_0, \sigma_0)$, $\sigma_{k_0} \rightarrow 1$, the more likely that a rebellion led by any baron $i \in N$ will change the feudal order towards $f_m = (\Pi_0, \sigma_p)$.*

2. The more egalitarian the feudal order, i.e. $f_0 = (\Pi_0, \sigma_0)$, $(\max\{\sigma_i\} - \min\{\sigma_i\}) \rightarrow 0$, the more likely that a rebellion led by any baron $i \in N$ will change the feudal order towards $f_m = (\Pi_0, \sigma_p)$.

This corollary has empirical support: King John was more extractive than his predecessors, and the distribution of land and resources among the baronage was egalitarian compared to other periods of English history (see Section 2, Figure 4).

More broadly, the corollaries suggest why Magna Carta happened in England and not in France where the king was relatively less extractive, and the most powerful barons were indeed very powerful (see Section 5.2 and Appendix J).²³ In such a context, there is not much inducement to constrain an already weak king, nor to relinquish privileged positions and fight for equal rights among the barons.

Game M can be played by different sets of players and with Nature drawing different values of γ , which bolster or weaken the coalitions' relative fighting capacities.²⁴ King John's reneging on Magna Carta and the ensuing First Barons' War, Henry III's peaceful re-issuance, and the crisis of 1258 and the Second Barons' War of 1264–1267 are each interpretable as another play of game M under a different realization of γ . We treat this in detail in Section 5.

²³Until the reign of Philip Augustus (r. 1180–1223) no French monarch was close to being powerful enough to eat into the surplus of the leading barons. Computed from data of Cappelen and Hariri (2026b), the crown's share of castles over 1066–1300 averages 12 percent in England against 4 percent in France, and the English share exceeds the French in every year before 1215.

²⁴ γ can thus be interpreted as shocks to the legitimacy of the ruler, an important determinant of the medieval ruler's power (see, e.g., Greif and Rubin (2023)).

4 Testing Lemma 1.3: Who Joins the Rebel Coalition?

We now test whether barons behave as predicted by our model during the Magna Carta crisis. In particular, Lemma 1 (number 3) implies that a baron is more likely to be in the rebel coalition when the latter has large non-appropriable resources.

There are two main challenges to identification. First, in equilibrium, there is only one rebel coalition (and one loyalist coalition), and therefore, for each baron, the size of the non-appropriable resources of the rebel coalition is the same.

To get cross-sectional variation, for each baron, we take a subset of the rebel coalition by including only the rebels in the baron's family network. We then add the non-appropriable resources held by each of the rebels in that network. Our hypothesis is the following:

Hypothesis: A baron is likely to be in the rebel coalition if the rebels in his family network have large non-appropriable resources.

Since each baron has a different family network, there is baronial-level variation in the non-appropriable resources of the (subset of) rebel coalition. This solution is not merely mechanical, but reflects the empirical setting of Magna Carta. Historians argue that blood relationships among barons were an important factor in the formation of the rebel coalition. (See Painter (1949)). By subsetting the rebel coalition by family network, we can actually simultaneously test their claim and ours – that is, whether the baron's family network affects his decision to rebel, or whether the size of the non-appropriable resources of the rebel barons in his network also matters. In other words, do family networks only have a direct role, or can they also influence the baron through the size of their non-appropriable resources?

This hypothesis is a stricter test of Lemma 1, since we are not counting the non-appropriable resources of all the rebels, but only a subset thereof and hence a smaller amount. If a baron is induced to join the rebels with this amount, he should be more likely to join with a larger amount of non-appropriable resources, i.e. that of the entire rebel coalition.

There remains the second issue, however, of the possible endogeneity of such network-specific rebel non-appropriable resources. In the first place, many marriages were strategic alliances. If a baron's family network is not a random assignment of barons, but rather one that is entered

into by barons for considerations of, for instance, wealth, then the size of the non-appropriable resources of that network is also non-random. Second, even if family networks are exogenous, non-appropriable resources themselves may be related to other reasons that would make a baron want to rebel. The king may have been more abusive to barons who have less, or more, non-appropriable resources. While we control for a baron’s personal grievances against King John, this may not capture all possible grievances. We address these concerns with an instrumental-variables strategy in Section 4.6.

4.1 *Data*

Our main source of information on barons is the Oxford Dictionary of National Biography (ODNB). We relied on the ODNB, supplemented with other sources described in Appendix B, to gather personal and political characteristics about each baron alive during King John’s reign. We also collected data on each land held by each baron from Sanders (1960). Specifically we can associate each baron with the caput of one or more baronies (the exact borders of medieval baronies are unknown). Appendix B provides more details.

We collect a host of baron and barony-level covariates. Baron-level characteristics include their age; the year they attained their barony; their gender; their past military experience; whether or not a baron had a personal grievance against King John (or to the contrary had good relations with him prior to 1215); and whether they had refused to serve in John’s Poitou campaign in 1214. We also know which baronial castles a baron was in possession of in 1215. Our barony level characteristics include a host of geographic variables such as ruggedness, soil quality, proximity of a river, Roman road or sea coast, a variable that reflects its economic importance such as the presence of markets, and other variables such as “knights fee” which was an estimate of how many knights the barony could support, and a measure of the barony’s least-cost travel path to London. We create fixed effects for the county or region a barony was in.

To measure baronial wealth, we assemble a rich set of proxies. First, we have information on markets and fairs that are matched to each barony. Second, we construct an estimate of land value based on Domesday Book of 1086, together with the number of watermills it records on each baron’s holdings. Third, as a different source of landed resources we use knight-fee assessments and scutage payments. We built a fourth and independent measure of potential

commercial wealth by using data on urban taxpayers from 1334. We also built measures of market access following the approach of Donaldson and Hornbeck (2016) as implemented with parameters appropriate for the medieval economy by Jedwab et al. (2024). We report summary statistics in Table A4. Details of variable construction are provided in Appendix B. We also report balance on these variables in Table A5.

We also collect information on whether a baron had a specific personal grievance against King John. Our analysis will focus on structural factors, but historians have long emphasized the importance of personal grievances. In the context of our model, these can be collectively captured by random event γ preceding a rebellion. Grievances against King John came in four categories: (i) barons whom John had taken hostages from; (ii) barons in debt to John; (iii) barons whom John had fined; and (iv) grievances that concerned the king’s loose sexual morality. Appendix Figure A5 depicts the geographical distribution of these personal grievances. Figure 6 reports the correlation between individual level baron characteristics and whether a baron rebelled.

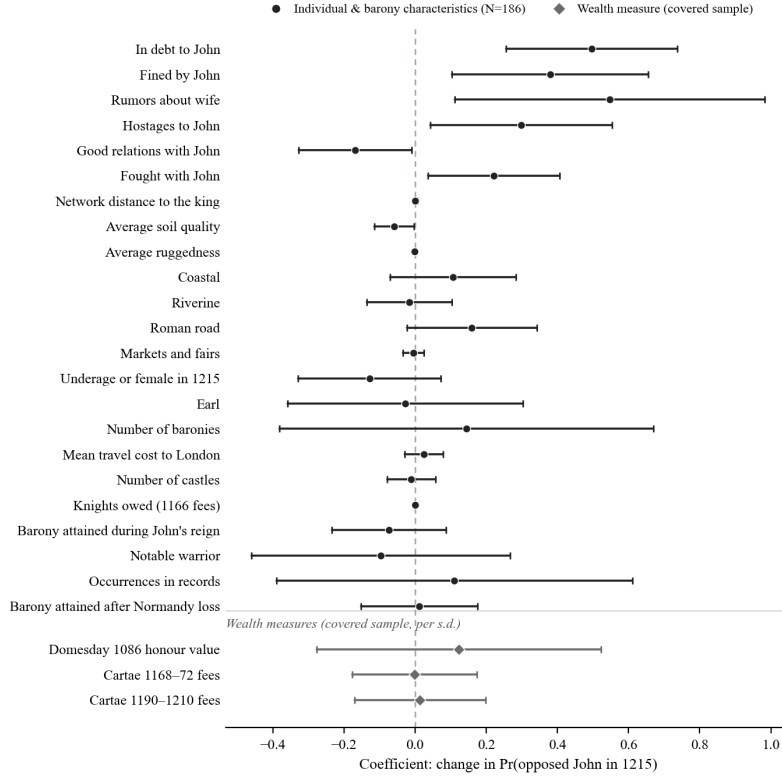
4.2 *Baronial Castles as a Measure of Non-Appropriable Resources*

The non-appropriable resources of the rebel coalition cannot be easily seized by the king and determine the coalition’s fighting capacity. That is, they are the resources that the rebel coalition can use in the event that they challenge the king’s coalition.

Our measure of non-appropriable resources is the number of castles owned by a baron. This was a crucial military resource. As Brown (2004, 123) observed “the military role of the castle was not just defensive but also offensive”. Indeed, the latter was more important as “it was the offensive capacity of the castle, its function as a base, heavily defended, for active operations by means of which the surrounding countryside could be controlled, that gave it much of its value in war, made it the prized object of attack”. In “the minds of contemporaries control of England consisted in the mastery of its more important castles” (Pounds, 1990, 114-115). In the language of our model, castles were a military resource that the king could not easily seize in the event of a rebellion. This is supported by statements by historians who note that “pretensions of the barons hinged on their control of castles” (Pounds, 1990, 117).

We collect data on all baronial castles in early 13th century England from Brown (1959).

Figure 6: Individual-Level Predictors of Joining the Magna Carta Rebellion



Individual-level correlates of opposing King John in 1215. Filled circles report coefficients from a linear-probability regression of opposition to John on baron and barony characteristics ($N = 186$), with 95% confidence intervals from standard errors clustered at the baron level: $\text{Opposed to John in 1215}_i = \alpha + \mathbf{Baron\ Characteristics}_i + \epsilon_i$. Gray diamonds denote the landed and fiscal wealth measures.

We geolocated these and matched them to the list of English baronies in Sanders (1960) by baron. The location of these baronial castles is provided in Figure 5b. For further details on these baronial castles see Appendix B.²⁵

In a non-experimental setting, it is natural to be concerned about the location and distribution of castles. The location of individual castles reflected several factors. According to Brown (2004, 164) “[t]he distribution of English castles (as of castles elsewhere) in any given period ... is

²⁵The 56 rebel barons together held just 37 castles in 1215 – about 21 percent of the privately held castles in England recorded in Brown (1959)’s census, and only about a third of the 95–107 castles that King John held himself. Only 24 of the 56 rebels held any castle at all, and the largest rebel castle-holder, John de Lacy, had four (Richard de Clare and Robert de Ros had three), while the loyalist barons, though fewer (35), together held more castles (47) than the entire rebel coalition. By this measure, the coalition that obtained Magna Carta was not a militarily formidable one – consistent with Corollary 1, which shows that institutional change does not require a large or resource-rich coalition.

chiefly the arbitrary result of innumerable local plans and ad hoc decisions”. Indeed, there is no consensus about the determining factors behind the geographical distribution of castles. Scholars agree, however, that the castle location was uncorrelated with population density, income, or economic development (Liddiard, 2012, 25).²⁶

Clearly, too, wealth was a precondition for possessing a castle. Castles were extremely expensive to maintain and indeed the number of castles had declined in the late 12th century in part because of the cost of maintenance (Painter, 1961a, 127).²⁷ Fortifications that were no longer necessary or up-to-date were allowed to fall into disrepair.

Our rich data on baronial wealth and our host of geographical controls do, however, allow us to directly address both of these concerns. In Appendix Table A2 we demonstrate that castles were not associated with favorable trade geography (see also, Appendix Figure A1). There is a modest and expected correlation with ruggedness and other geographical variables (which disappears when we use fixed effects). Wealth does predict castle-holding, as one would expect given what it cost to build and maintain a stronghold. Appendix Table A25 regresses each baron’s castle count on every measure of his landed and fiscal wealth and finds robust positive correlations for most of these wealth proxies. The association is modest, between 0.14 and 0.39. Wealth was a precondition for holding a castle without being a good proxy for one. And for this reason, we control for baronial wealth directly in every specification (Table 2).

Another concern is whether an individual baron was in possession of a castle was endogenous to political economy considerations. Brown (2004, 166), for instance, argues that “[a]ny king worth his salt . . . would look to the castles of his realm, look after his own, seek to ensure, by the exercise of his huge power of patronage, that as many castles as possible were in the hands of those he could trust”. Nonetheless, the king could not deprive a lord of a baronial castle without good reason (Painter, 1961a, 135). Overall, while there were incentives for the king to ensure that important castles were in the possession of his friends and allies, he could only do this (at low cost) for royal castles. As Painter explains: “feudal custom limited a suzerain’s control over

²⁶Historians note that “there is no straightforward correlation between castle-building and population density” (Liddiard, 2012, 25).

²⁷Painter (1961a, 127) notes by far “the larger number were simply abandoned by their lords. The maintenance of a castle was expensive and could only be justified by great necessity. The stern peace enforced by the Angevin kings made baronial castles less vital to their masters’ safety”.

property which he had granted to a vassal as a fief. Thus for practical purposes a lord may be said to have owned what he held in demesne. The castles situated on the king’s demesne were royal and those on the demesne of his barons baronial” (Painter, 1961a, 135).

In Appendix Figure A2, we show that the personal characteristics of the barons, including whether or not they had grievances with King John, largely do not predict castle ownership. The characteristic most clearly associated with it is whether a baron was one of the twenty earls (who formed the feudal elite within the baronage). Barons with castles were also more likely to have served in John’s 1214 campaign in Poitou which raises the concern that favored barons may have been more likely to possess their own castles. We address this concern with an instrument based on the castles held in earlier generations (Section 4.6).

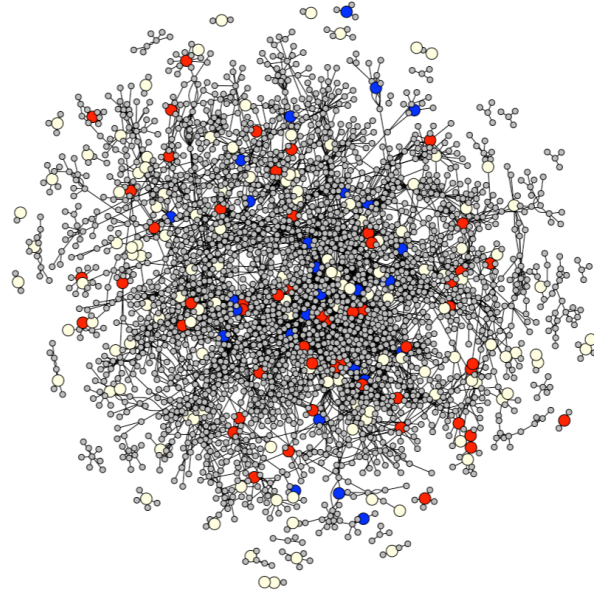
4.3 Family Networks

To construct each baron’s family network, we use information from the *ODNB* and *WikiTree*. In order to implement our instrumental variable strategy we perform the same exercise for the fathers and grandfathers of each baron in our dataset. Family networks were of critical importance in a feudal society. Contemporaries were acutely aware of the blood relations that bound them.²⁸ We construct each baron’s entire family network up to 16 links. For each of the barons in a network, we note whether the baron was a rebel or a loyalist. Figure 7 depicts the entire network.

Figure 8a depicts the specific geography of the network of William de Warenne, a leading loyalist, denoting rebel and loyal barons within his family network (in black and white respectively). Figure 8b depicts the network of Eustace de Vesci, a leading rebel. Both figures indicate that baronial families were closely intertwined and that there were no obvious geographical patterns to either a baron’s family network or his choice of allegiance. To construct our independent variable of interest – the non-appropriable resources of the rebels in the baron’s network – we add all the castles that each rebel baron in the network holds, weighted by the inverse of his network distance to the baron.

²⁸Answering his own question about the importance of family relationships under feudalism, Painter (1961b, 219) concluded that “family alliances thus formed played a part, at times, an important part, in English feudal politics.”

Figure 7: The Family Network of the Elite by Allegiance in 1215



The complete network of elites by allegiance in 1215. Filled circles are barons in our dataset. Small gray circles are family members (wives, siblings, children).

Figure 8: The family networks of selected barons



(a) The family network of William de Warenne, a leading loyal baron. (b) The family network of Eustace de Vesci, one of the rebel leadership.

4.4 *The Effect of Non-Appropriable Resources on Opposing John*

We have a cross-section of all barons alive in 1215. To construct our binary dependent variable, Opposed John in 1215, we assign a value of one if the baron is in the list of those who actively

rebelled and zero otherwise. The 95 inactive barons are included in the sample and assigned a zero. We use this variable in all the reported regressions in the main text. For robustness, we reconstruct Opposed John in 1215 by assigning a value of one if the baron is in the list of active rebels, and zero if he is in the list of active loyalists. This drops the inactive barons from the sample.

We estimate regressions of the following form:

$$\text{Opposed John in 1215}_i = \alpha + \beta(\text{Castles in Rebel Network})_i + \mathbf{X}_i\boldsymbol{\Omega} + \gamma_c + \epsilon_i, \quad (1)$$

where our proxy for the network-specific rebel non-appropriable resources is the number of castles held by all the rebel barons in baron i 's family network.

Vector $\mathbf{X}_i$ includes a vector of baron and barony-level characteristics. Table 1 reports our preferred specifications where we sequentially introduce a host of baron characteristics, geographical and economic characteristics and county-level fixed effects. Baron characteristics include indicators for whether they had personal grievances against King John and whether a baron was already in public opposition to John by January 1215. Geographical controls include average ruggedness, soil quality, and whether a barony was coastal, had a river, or had a Roman road passing through it. Economic controls are the total number of markets and fairs in a barony and that baron's assessed knight's fee.

Conventional approaches to clustering standard errors may be unreliable in a network setting (Leung, 2023). We therefore follow Naidu et al. (2021) and implement a fast-greedy community detection algorithm that uses the structure of our network to estimate natural clusters. We report standard errors clustered by the network neighborhood in square brackets alongside robust standard errors.

Consistent with our theory, we find that the number of castles belonging to the rebels in the baron's family network is robustly associated with opposing King John in 1215. To gauge magnitudes we report beta coefficients. A one standard deviation increase in the number of castles among rebels in a baron's family network is associated with a 10 percentage point (about 33%) increase in the probability of the baron joining the Magna Carta rebellion (column 5).

In Appendix Table A10, we show that our results are robust when we drop (i) the top 5, 10,

Table 1: Who Joins the Rebel Coalition? The Role of non-appropriable Resources: Castles

	Opposed John in 1215				
	(1)	(2)	(3)	(4)	(5)
Castles in Rebel Network	0.0689*** (0.0216) [0.0242]	0.0539*** (0.0197) [0.0182]	0.0420** (0.0210) [0.0214]	0.0387* (0.0217) [0.0195]	0.0611** (0.0282) [0.0273]
β Coefficient	0.24	0.19	0.15	0.14	0.22
Personal Grievances		0.553*** (0.0795) [0.0801]	0.506*** (0.0849) [0.0788]	0.463*** (0.0878) [0.0735]	0.441*** (0.0969) [0.0855]
Constant	0.209*** (0.0383) [0.0437]	0.134*** (0.0355) [0.0311]	0.153 (0.114) [0.118]	0.145 (0.118) [0.121]	0.138 (0.141) [0.146]
Baron Controls			✓	✓	✓
Geographical Controls			✓	✓	✓
Economic Controls				✓	✓
Military Experience				✓	✓
County FE					✓
Observations	186	186	185	185	185
Adjusted R^2	0.055	0.256	0.327	0.332	0.335

Table Notes: This table studies the relationship between non-appropriable resources and personal grievances on the probability of rebellion. The dependent variable equals one if the baron was in rebellion against John by the end of June 1215 (56 barons; Appendix B). Castles in Rebel Network is the number of potential rebel castles in a baron’s network, each weighted by the inverse of network distance. Personal Grievances equals one if the baron was indebted to John, the subject of rumors about John and his wife, had given hostages to John, or had been fined by John. In columns (3)-(5), we include the following baron controls: whether a baron was in public opposition by January 1215, the number of castles in their barony, and the number of baronies the baron held land in. Columns (3)-(5) include geographical controls, and columns (4)-(5) economic controls at the barony level. Geographical controls include average ruggedness, average soil quality, the presence of any Roman roads, any coastline, and any rivers. Economic controls include the number of markets, and the knight’s fee. In columns (4)-(5) we also control for military experience. We include county-level fixed effects in column (5). Robust standard errors are in parentheses and robust standard errors clustered at the fast-greedy community level are reported in square brackets. There are 89 clusters. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

15, and 20 barons as measured by the number of knights they owed the king; (ii) the earls; (iii) the barons with multiple baronies; and (iv) barons who had refused to serve with John in Poitou in 1214.²⁹ The result also holds when the family network is restricted to kin within 12 or 10 links rather than 16, using the unweighted count of rebel kin castles (Appendix Table A14).

Family Networks Do family networks have a direct role? Indeed, Appendix Table A8 suggests that there is a strong relationship between various network measures and the probability of joining the Magna Carta rebellion. Barons who have a closer network distance to the king were more loyal as were barons who had higher measures of network centrality (both degree and

²⁹Nor is the result driven by crusading. Barons who had been on crusade were no more likely to rebel once personal grievances are controlled, and adding crusading to our main specification leaves the coefficient on Castles in Rebel Network unchanged (Appendix Table A3).

eigenvector centrality). Loyal barons also were, as expected, more connected to one another and rebellious barons also shared greater network connections (Appendix Table A8). To account for this alternative set of explanations, in Appendix Table A12, we control sequentially for each of these measures of network connectivity. Our preferred proxy for rebel non-appropriable resources, Castles in Rebel Network, remains reasonably robust. Non-appropriable resources played a role in the Magna Carta rebellion that was independent of simple family networks.

Baronial Wealth We can now investigate an important potential omitted variable: baronial wealth and resources. The main concern is whether castles are simply a proxy for general wealth and resources. As discussed above, wealth was a precondition for owning and possessing a castle but the correlation between the two was modest. We address this concern directly in Table 2, which adds to our preferred specification (Table 1, column 5) each of the baron’s own wealth measures in turn. These are independent measures that capture different aspects of a baron’s wealth. For example, the information we have from Domesday Book, from the assessments of knights fees owed in 1166 or estimates of baronial income around 1200, provides several good proxies for landed wealth. Other measures such as markets and fairs, the urban wealth of nearby towns, market access and distance to the urban system provide good indicators of commercial wealth.

The coefficient on Castles in Rebel Network is between 0.048 and 0.061 when each measure is added, and 0.041 to 0.049 when they enter jointly (Appendix Table A26). Of the baron’s own wealth measures, only the Domesday value of his honour is associated with rebellion (0.038, $p = 0.03$); controlling for it, the castle coefficient is 0.048 ($p = 0.09$). Finally, the baron’s market access to the medieval urban system does not affect the coefficient on Castles in Rebel Network (Appendix F).

4.5 *Testing the Mechanism*

In our framework a resource is non-appropriable when the king cannot seize it from a baron who rebels. Baronial castles protected nearby land and were offensive bases from which raids and attacks could be launched.

If castles made a rebel’s land defensible, a baron should have been more willing to join the rebellion when the land of his rebel kin lay within reach of a rebel castle. For every rebel kinsman

Table 2: Castles in the Rebel Network, Controlling for the Baron’s Own Wealth

Baron’s own wealth measure added	Castles in Rebel Network	Baronial wealth measure	N	Adj. R^2
None (Table 1, column 5)	0.0611** (0.0282) [0.0273]	—	185	0.335
Domesday 1086 honour value (log)	0.0483* (0.0281) [0.0278]	0.0379** (0.0173) [0.0207]	185	0.354
Domesday 1086 watermills (number)	0.0582** (0.0286) [0.0278]	0.0011 (0.0017) [0.0018]	185	0.333
Cartae 1168–72 fees (log)	0.0614** (0.0282) [0.0279]	-0.0142 (0.0172) [0.0187]	185	0.333
Cartae 1190–1210 fees (log)	0.0613** (0.0283) [0.0278]	-0.0100 (0.0173) [0.0190]	185	0.332
Income c. 1200 (log)	0.0609** (0.0283) [0.0275]	-0.0598 (0.0534) [0.0608]	185	0.335
Urban wealth within 10 km, 1334 (log)	0.0554* (0.0287) [0.0272]	0.0197 (0.0133) [0.0124]	185	0.339
Market access to the urban system (log)	0.0609** (0.0284) [0.0278]	-0.1011 (0.1571) [0.1429]	185	0.333
Travel cost to nearest town	0.0610** (0.0283) [0.0274]	-0.0111 (0.0715) [0.0605]	185	0.330
Distance to nearest town (km)	0.0589** (0.0279) [0.0263]	-0.0064* (0.0035) [0.0031]	185	0.347

Table Notes: Each row adds the baron’s own wealth measure(s) named in the first column to the specification of Table 1, column (5): Castles in Rebel Network, personal grievances, baron, geographical, economic and military controls, and county fixed effects. The dependent variable is Opposed John in 1215. Domesday 1086 honour value, the Cartae fees of 1168–72 and 1190–1210, and income c. 1200 are the baron’s own holdings; watermills are the number of mills recorded on his Domesday holdings in 1086. Urban wealth is the 1334 lay-subsidy wealth of towns within 10 km of the baron’s caputs; market access to the urban system follows Donaldson and Hornbeck (2016) as implemented by Jedwab et al. (2024) (Appendix F); travel cost and distance are to the nearest of the 89 main towns from any of the baron’s caputs. Robust standard errors are in parentheses and standard errors clustered at the fast-greedy community level (89 clusters) in square brackets; stars refer to the robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

we divide his ancestral 1086 holdings into those within a given distance of his own castle or of another rebel’s castle (labeled protected) and the rest (labeled unprotected). We then construct

a measure similar to that for Castles in Rebel Network, using the value of the protected land held by each rebel in the baron’s network.

Table 3 reports the results. The protected land of rebel kin predicts rebellion. Consistent with the logic of our argument and the model, we observe the largest coefficient for lands very close to rebel castles (i.e. within 5km). The coefficient remains meaningful and statistically significant as we move out to 10, 20 and 50km, about a day’s ride.³⁰ But as we extend out the radius, the relationship disappears as predicted.³¹

Table 3: The Land of Rebel Kin, Protected and Unprotected

Rebel kin’s 1086 land, protected if within	Opposed John in 1215				
	5 km	10 km	20 km	50 km	150 km
	(1)	(2)	(3)	(4)	(5)
Protected (near a rebel castle)	0.291* (0.177) [0.192]	0.255* (0.144) [0.144]	0.215** (0.098) [0.085]	0.194** (0.084) [0.088]	0.055 (0.041) [0.051]
Unprotected	−0.073 (0.067) [0.074]	−0.107 (0.080) [0.080]	−0.130 (0.082) [0.071]	−0.169* (0.098) [0.107]	−0.040 (0.082) [0.104]
Protected – unprotected	0.364 (0.238)	0.363* (0.220)	0.344** (0.176)	0.362** (0.178)	0.095 (0.112)
Barons (rebels)	186 (56)	186 (56)	186 (56)	186 (56)	186 (56)
Full controls, county FE	✓	✓	✓	✓	✓

Table Notes: Linear probability models of opposing John in 1215 (in rebellion by the end of June 1215), with the full controls of Table 1, column (5), and county fixed effects. A rebel kinsman’s 1086 holding is protected if it lies within 5, 10, 20, 50 or 150 km of his own castle or of a castle held by another rebel, excluding castles held by the baron himself; his other holdings are unprotected. Each regressor is the inverse hyperbolic sine of the sum, over the baron’s rebel kin, of the 1086 value (in pounds) of their protected or unprotected holdings, each kinsman weighted by the inverse of his network distance to the baron. Every regression also controls for the inverse hyperbolic sine of the baron’s own protected and unprotected holdings (zero where he has no located holdings) and for the number of his rebel kin with located holdings, weighted in the same way. Holdings are those of baronies linked to a Domesday honour with grades A, B or C (Table A28). Robust standard errors in parentheses; standard errors clustered on fast-greedy communities in square brackets. Stars refer to the robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

4.6 Instrumenting Non-Appropriable Resources

We have shown our results are likely not contaminated by baronial wealth but there is another potential source of endogeneity that it is important to address: whether the distribution of castles in 1215 reflected preexisting political disputes between John and his barons.

³⁰This is consistent with the discussions of historians. Barber (1992, 278) says that castles easily controlled land within an 8-10 mile radius. Bachrach (1983, 557) suggests that knights could easily sally out from a castle within a 30km radius.

³¹The same pattern holds when each holding is weighted by the soil suitability of its land (GAEZ wheat suitability) rather than by its 1086 value: protected kin land predicts rebellion within 5, 10 and 20 km ($p = 0.07$ – 0.10), unprotected kin land does not, and the relationship fades at larger radii. The difference between protected and unprotected land is less precisely estimated ($p = 0.11$ – 0.14 within 20 km). See Appendix Table A23.

Table 4: Who Joins the Rebel Coalition? IV Analysis

<i>Panel A: Second Stage</i>				
	(1)	Opposed John in 1215		(4)
	(2)	(3)		
Castles in Rebel Network	0.0401* (0.0210) [0.0209]	0.0613** (0.0247) [0.0254]	0.0368* (0.0206) [0.0198]	0.0597** (0.0242) [0.0255]
AR Confidence Intervals	[.0054, .0747]	[.0206, .1022]	[.0026, .0706]	[.0196, .0994]
+ Ancestral royal favor	0.0381* (0.0210) [0.0201]	0.0591** (0.0255) [0.0253]	0.0343* (0.0204) [0.0187]	0.0572** (0.0249) [0.0252]
+ Ancestral shrievalty	0.0365* (0.0221) [0.0214]	0.0548** (0.0266) [0.0259]	0.0335 (0.0217) [0.0202]	0.0538** (0.0259) [0.0258]
Constant	0.117 (0.114) [0.113]	0.116 (0.123) [0.130]	0.117 (0.114) [0.113]	0.115 (0.123) [0.131]
Baron Controls	✓	✓	✓	✓
Geography Controls	✓	✓	✓	✓
Economic Controls	✓	✓	✓	✓
County FE		✓		✓
Observations	186	186	186	186
Adjusted R^2	0.325	0.331	0.325	0.331
<i>Panel B: First Stage</i>				
Father's Castles Network	0.0522*** (0.00155) [0.00195]	0.0530*** (0.00204) [0.00231]		
Grandfather's Castles Network			0.819*** (0.0248) [0.0325]	0.822*** (0.0315) [0.0375]
Baron Controls	✓	✓	✓	✓
Geography Controls	✓	✓	✓	✓
Economic Controls	✓	✓	✓	✓
County FE		✓		✓
Observations	186	186	186	186
Effective F-statistics	1126.4	677.2	1090.2	683.5

Table Notes: We instrument for Castles in Rebel Network by the rebel castles in the family network of each baron's father and grandfather, with rebels defined as in Table 1. The controls are the same as in Table 1. The row "+ Ancestral royal favor" re-estimates the second stage adding an indicator for whether the baron's family supplied one of the leading lay witnesses to the charters of Henry II or Richard I (Appendix Table A17, Panel A). The row "+ Ancestral shrievalty" instead adds an indicator for whether a member of the baron's family was sheriff of an English county under Henry II or Richard I (Appendix Table A17, Panel B). We also report Anderson-Rubin confidence intervals (90%). Robust standard errors are in parentheses and robust standard errors clustered at the fast-greedy community level are reported in square brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The distribution of castles was largely determined by factors such as strategic geography and the presence of past fortification. However, in some cases, the king may have influenced which barons were allowed to build, fortify or maintain their own baronial castles. This concern can be addressed with an instrumental variable approach.

We instrument the non-appropriable resources of the rebels in each baron's family network

by the non-appropriable resources of the ancestors of these rebels. Specifically, we calculate the number of castles owned by the father or grandfather of each rebel in the baron’s family network, and use this to instrument for our main proxy Castles in Rebel Network. While the distribution of baronial castles in 1215 might have been affected by personal relationships between John and his barons, the distribution of castles in the previous generation or two was unlikely to have been affected by these factors.³²

The exclusion restriction requires the distribution of castles in the previous generation to only affect the loyalty of barons through its effects on the distribution of castles in 1215. We believe this restriction is plausible for the following reasons.

First, historians argue that disputes within the Angevin royal family outweigh long-standing dynastic ties. Their rebelliousness and quarrelsomeness are sufficiently well known that they have been the subject of a Broadway play and a Hollywood film, *The Lion in Winter* (1968). Historians, however, note that “the rivalries between Henry and his sons, and of the latter among themselves, provide a noteworthy example of an historical reality that was even more virulent than the fictionalized version” (Bachrach, 1984, 111). Therefore, barons with personal ties to Henry II or Richard I were not necessarily loyal to John and vice-versa.³³ Moreover, for a feudal baron to rebel was not necessarily viewed as “treason” as it would be in later centuries.³⁴ For example, during the 1173 rebellion against Henry II, Roger Bigod (later 2nd Earl of Norfolk) was loyal to the crown. However, in 1215 he was among the leading baronial rebels. We see the same pattern with Humphrey III de Bohun who was loyal but whose son, Henry de Bohun (1st Earl of Hereford) rebelled against John. In contrast, William I de Ferrers, 3rd Earl of Derby was a rebel leader in 1173. His son, William II de Ferrers, 4th Earl of Derby was a loyalist for King John.

Second, we provide quantitative evidence consistent with this claim. In Appendix Table A16, we show that this pattern is representative of the small number of known 1173 rebels and their descendants. We also examine the descents of the six families whose castles Henry II destroyed in 1155 or after the revolt of 1173–74 and who had an heir among the barons of 1215. Of these,

³²Appendix Figure A9 sets out the instrument, and the main threat to the exclusion restriction, as a causal graph; Appendix G tests that threat directly.

³³The family of Robert Fitzwalter, for example, rose to prominence and to possession of Baynard Castle through loyal service to Henry I and Henry II.

³⁴There was a qualified feudal right to rebellion. See Ullman (1961) and Cuttler (1981).

three rebelled and three stayed loyal (Appendix Table A18). Nor did allegiance run in families more generally. The side a patriline took in the Anarchy or in 1173–74 is unrelated to its side in 1215, close kin often took opposite sides, and the heirs of the rebels of 1215 were no more likely than those of the loyalists to rebel in 1264 (Appendix Table A19).

Third, we provide two pieces of additional evidence on royal favor, the most obvious channel through which ancestral castles might affect rebellion other than through the castles of 1215. The king granted castles, custodies, and heiresses to those he favored, so favored families should have held more castles in the previous generations; and if a family’s standing with the crown persisted down the line, ancestral castles would carry that standing into 1215. We measure favor under Henry II and Richard I in two independent ways.

The first is presence at court, i.e. whether the baron’s family supplied one of the leading lay witnesses to the royal charters of Henry II or Richard I (Vincent, 2007; Heiser, 1989). The second is office, i.e. whether a member of his family was sheriff of an English county under Henry II or Richard I, from the Public Record Office’s *List of Sheriffs* (1898). Appendix B describes how both measures are constructed. Thirty-three barons belong to a family that supplied a leading witness, and thirty-four to one that held a shrievalty.

Both measures behave as expected. Favored families held more castles. Barons from families that held a shrievalty held 0.97 castles in 1215, against 0.38 for other barons, and the instrument is about twice as large for them. Families that supplied leading witnesses show the same pattern, but less strongly. However, neither measure predicts the side a baron took in 1215. Of the families that supplied a leading witness, 14 rebelled and 11 stayed loyal. Of those that held a shrievalty, 12 rebelled and 12 stayed loyal. Neither indicator predicts rebellion once the full controls are included (Appendix Table A17). Royal favor did not pass down as loyalty to the crown. Adding either indicator to the IV specification leaves the coefficient on Castles in Rebel Network unchanged (Table 4).

Panel B reports the first stage. Following Olea and Pflueger (2013), we report Effective F-statistics, which are recommended as best practice by Andrews et al. (2019). We also report Anderson-Rubin confidence intervals. Overall, this analysis confirms our OLS results. Non-appropriable resources of the rebels in a baron’s family network strongly predict joining the

rebellion and supporting Magna Carta.

Another related concern is that the castle-holdings of the potential rebels' fathers and grandfathers might be correlated with hereditary *military capability*. The families that built and held castles in the eleventh and twelfth centuries may have been militarily formidable families, and if a martial disposition passed from father to son it could raise the probability of rebellion through a channel other than the coalition's non-appropriable resources.

We can address this concern empirically by reconstructing the patriline of every baronial family back to the Conquest. We then code for each generation, whether the family was militarily prominent in each of the four major episodes of armed conflict before John's reign—the Conquest and its consolidation, the wars of Henry I, the Anarchy, and the reign of Henry II (including the great revolt of 1173–74). This enables us to build a baron-level index of hereditary military prominence, described in full in Appendix G.

Hereditary military prominence was present on both sides of the conflict in 1215.³⁵ At the same time the measure is moderately correlated with the ancestral-castle instruments (correlation coefficients of 0.24–0.33). This suggests that it indeed captures what we want it to capture. But when we add it as a control to the instrumental-variables specifications the coefficient on Castles in Rebel Network is essentially unchanged.

All in all, the evidence we have considered suggests that the exclusion restriction is plausible in this setting. Nor is the instrument correlated with the geographical variables that might provide another path from ancestral castles to rebellion (Appendix Table A38). Ruggedness, coastal and river access, Roman roads and travel cost to London are each unrelated to it. The one exception is soil quality, and that association disappears once we add county fixed effects; taken together, the six variables are jointly insignificant in every specification ($p \geq 0.25$). Like any measure of baronial standing, the instrument is correlated with a family's wealth. We address this channel in Table 2, where controlling for the baron's own wealth leaves the castle coefficient essentially unchanged. Controlling directly for ancestral wealth in the instrumental-variables specification—the Domesday value of the baron's honour in 1086 and its knight fees in the Cartae

³⁵If anything it is the *loyalists* who descend from the more martial families: their mean prominence index is 1.06 against 0.88 for the rebels. There are no systematic hereditary patterns of rebellion. For example, even descent from a line that had at some point fought *against* the reigning king—for Robert Curthose, for the Empress Matilda—is as common among the loyalists as among the rebels (52 percent of coded families on each side).

of 1166, measured in the generations from which the instruments are built—leaves the estimate essentially unchanged (0.053 against 0.061 with county fixed effects; Appendix Table A36).

Finally, one might be concerned about regional heterogeneity. Many of the rebel barons were northern and the northern baronage was militarized by the Scottish frontier. If exposure to the border drove both ancestral castle-building and rebellion, this might violate the exclusion restriction. Reassuringly, adding an indicator for lying within 100 kilometers of either frontier leaves the estimate unchanged (Table A39).³⁶

5 The Cementing of Magna Carta

Our model explains both the formation of the rebel coalition and the decision to offer and agree to Magna Carta. It also provides an explanation of why it broke down in the summer of 1215. In June 1215 the balance between the two coalitions meant that John could not be confident of victory, and he conceded. Over the summer the parameters shifted, since the pope annulled the charter and therefore bolstered John’s side, inducing him to recruit mercenaries from the continent. By late August it was in his interest to fight. In the language of the model, a shock to γ moved the game into the region in which the king prefers war to a peaceful settlement (Section 3.2).

Consistent with our model, the ensuing war was a war of sieges (Appendix E.6), and the rebel coalition survived it because its resources were castles that the king could not easily take, not land that he could seize. John then died in 1216 and the charter was reissued in 1216 and 1217 because the rebel coalition remained intact.

We now turn to events in Henry III’s reign. John was succeeded by his son Henry III, a minor. Peace was eventually obtained in 1217 at the Treaty of Lambeth when a revised version of Magna Carta was reissued. This was the price of peace demanded by the barons who had rebelled. In 1225, the king of France invaded Henry III’s remaining French territories. To obtain support from the barons, many of whom felt that Henry III’s government was infringing on their rights, Henry reissued Magna Carta. In return he was granted a sum of taxation. This process then recurred at several critical junctures during the 13th century.

³⁶Appendix I reports bands at 50, 100 and 150 kilometers, for the Scottish border alone and for either frontier.

To empirically study how Magna Carta finally became established over the course of several decades, we collected information on baronial opposition to Henry in 1258, after which Henry conceded the Provisions of Oxford, and in 1264, at the height of the Second Barons' War.³⁷

5.1 *The Second Barons' War*

Henry's reign was plagued by renewed disagreements with his barons. While Henry was less abusive towards his barons than John, he faced similar constraints. There was a limited pool of rents to be distributed. His decision to bring to England his in-laws from Savoy, and later his half-siblings from Poitou, the Lusignans, was deeply unpopular among the barons as they were seen to "suck up far too much from a diminishing pool of royal patronage" (Carpenter, 2020, 415). Henry also built ambitiously, spending large amounts on Westminster Abbey. And he needed to finance war in France. He taxed the Jewish community extremely heavily through "tallages" (Koyama, 2010; Mundill, 2010).

Henry faced complaints from his barons from the 1230s onwards. As early as 1237, his barons presented him with "the Paper Constitution" which complained that he was violating the terms of Magna Carta (Carpenter, 2020, 455). In general, he was able to conciliate leading opponents of his policy by redistributing positions and offices to them. Simon de Montfort, earl of Leicester, fell out with Henry in the 1240s but was reconciled by being made the king's Lieutenant in the Duchy of Aquitaine. By the late 1250s, however, discontent had spread. Henry asked repeatedly for additional taxation but the barons refused him.

Foreign policy failures, including defeats in Wales, and a failed attempt to make his brother king of Sicily, were negative shocks to Henry's rule, i.e. $\gamma < 0$. In 1258 the barons, led by de Montfort, charged Henry with violating the terms of Magna Carta and sought to impose further restrictions on his authority. Militarily, however, the coalition formed by the rebel barons was not powerful enough to enforce its authority. A failed attempt to have King Louis IX of France mediate brought about open conflict between Henry and the baronial coalition led by de Montfort, known as the Second Barons' War (1264–1267).

To study the crises of the 1250s and 1260s, we extend our initial dataset to include the

³⁷In Appendix D.3 we provide evidence from the witnessing of royal charters that the rebel barons of 1215 were reintegrated into Henry's government.

universe of barons active in the 13th century. In 1258 a baronial opposition forced Henry III to agree to the Provisions of Oxford. Henry’s eventual rejection of these provisions precipitated the Second Barons’ War (1264–1267). We collect information on the allegiance of the barons during the war itself (as allegiances changed between these two events). Of the 180 barons in our 1264 sample, 14 rebelled against Henry and 25 supported him.

To construct our main explanatory variable of interest, we use the number of castles as our measure of a baron’s non-appropriable resources. There is no information available on the distribution of baronial castles circa 1250. Therefore, our main proxy for the non-appropriable resources of the rebels in a baron’s network is the total number of castles of the fathers of those rebels. Our estimation equations and control variables are the same as in Equation 1.

We present this analysis in Table 5. We find a strong relationship between our measures of non-appropriable resources of the rebels in a baron’s network and the probability of that baron opposing Henry III in either 1258 or 1264. This relationship is robust to economic, geographic, and baron-level controls. It does weaken considerably when we control for a baron’s network distance to the leader of the rebellion, Simon de Montfort. This is consistent with historians’ accounts that the Second Barons’ War was unlike the First because of the strong leadership of Simon de Montfort.

Following the death of de Montfort in battle, Prince Edward (who emerged as the effective ruler of the kingdom) brought remaining rebel barons back into the fold with the Statute of Marlborough in 1267, which reconfirmed the rights proclaimed in Magna Carta. Once he became king in 1272, Edward I regularly used Parliament in order to govern (Butt, 1989, 89). His parliament of 1295 became a model for subsequent parliaments. After 1297, Magna Carta became ingrained into the laws of the land.

5.2 *External validity: why England and not France?*

France offers a natural test of external validity because on the eve of Magna Carta it resembled England in almost every respect.

Like in England, the French monarch was also feudal and there was an armed aristocracy who possessed numerous castles in their own right. And yet no comparable national charter emerged in France. By our theory (Corollary 2), we can attribute this divergence to differences

Table 5: Predicting Opposition to Henry III in the 1250s and 1260s

	Supported the Provisions of Oxford in 1258			
	(1)	(2)	(3)	(4)
Father's Castles in Rebel Network	0.0354*** (0.00868)	0.0272** (0.0102)	0.0274*** (0.00938)	0.00447 (0.00734)
Network Distance De Montfort				-0.0072*** (0.00257)
Constant	0.0111 (0.0120)	-0.159** (0.0605)	-0.231*** (0.0726)	0.00748 (0.106)
Geography Controls		✓	✓	✓
Baron controls		✓	✓	✓
Economic Controls		—	✓	✓
Observations	159	159	159	159
Adjusted R^2	0.0296	0.113	0.125	0.199
	Rebelled Against Henry III in 1264			
	(5)	(6)	(7)	(8)
Father's Castles in Rebel Network	0.0172*** (0.0050)	0.0158*** (0.0058)	0.0153*** (0.0055)	-0.00247 (0.0046)
Network Distance De Montfort				-0.00860*** (0.00285)
Constant	0.0245 (0.0173)	-0.00607 (0.0428)	-0.0377 (0.0494)	0.276** (0.109)
Geography Controls		✓	✓	✓
Baron controls		✓	✓	✓
Economic Controls		—	✓	✓
Observations	180	180	180	180
Adjusted R^2	0.0192	0.0217	0.0147	0.118

Table Notes: This table studies the relationship between the distribution of castles held by the fathers of rebel kin and the probability of joining Simon de Montfort's opposition to Henry in 1258 and 1264. Father's castles in Rebel Network is the number of potential rebel castles in a baron's father's network. Columns (1) and (5) report the bivariate relationship. Columns (2) and (6) add baron controls (number of baronies, a family member in rebellion in the First Barons' War) and geography controls; columns (3) and (7) add economic controls (knight's fees, markets and fairs). Columns (4) and (8) include controls for network distance to the leader of the rebellion, Simon de Montfort. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors clustered at the fast-greedy community level are reported. The road, river and coast indicators use an exact 10 km rule, as in the other tables.

in the power of the king and in the distribution of power within the nobility.

The Norman settlement had left England a broad stratum of dispersed, broadly comparable barons, none of whom could rival the crown. In contrast, the French king faced quasi-sovereign territorial princes—the counts of Flanders, Champagne, and Toulouse, the dukes of Burgundy, Brittany, and Aquitaine—whose power dwarfed that of ordinary barons and often of the king himself.

This contrast is visible in the data. In England, as we have seen, baronial castles were relatively widely distributed among the barons. The highest number of castles, among our 186 barons, belonged to William Marshal, who held nine castles, most of them in Wales and the

March. But this was exceptional as only three barons held more than three. This was quite different in France. In a single province, Poitou, castle lordship consolidated from some fifty castellan families into four great houses, and by 1214 the viscount of Thouars alone held thirteen castellanies and this number was not uncommon for the more powerful French lords.

We find a similar pattern when we look at military resources more generally. In the muster of Philip Augustus's army at Bouvines in 1214, the two largest lordly contingents supplied nearly two-thirds of all the magnate knights present, and single princes each fielded about a quarter of what the entire royal domain could raise (Appendix J reconstructs the muster in detail; see Table A40). This is a different level of concentration from anything we find in England. A strong crown facing a broad baronage of comparable lords could reach a general, coalition-backed charter. In contrast, what we observe in France is only bilateral or provincial-level bargains. The result was a landscape of provincial estates rather than a single national assembly.

What about other parts of the world? Appendix J also discusses Hungary and two non-feudal societies: Song China and the Abbasid Middle East. These were bureaucratic polities which had far more centralized systems of military recruitment. As such even when levels of extraction from the ruler were much higher, we do not see developments like Magna Carta.

6 Conclusion

This article provides the first formal and empirical study of Magna Carta, a critical landmark in the historical development of inclusive institutions. We model Magna Carta as an optimal contract between the king and his barons and we ask how such a contract could have emerged from a feudal environment in which military power was decentralized. Specifically, we uncover conditions under which a rebel coalition of barons is likely to form and propose a new, inclusive, power-sharing agreement to the king, and the conditions under which the king will likely accept these conditions.

Scholars have often speculated about the origins of Magna Carta. In particular, they have asked why, despite John later reneging on it, it lasted (in slightly modified form) and became integrated into English law. They have also explored how it differed from other agreements made between feudal monarchs and their nobility.

Our analysis suggests that Magna Carta depended on a fairly narrow set of conditions. It required the conjunction of both a highly oppressive monarch and a fairly egalitarian baronial elite. While it was important that there was no obvious alternative king waiting in the wings (John had no close relatives apart from very young children), above all else Magna Carta required the formation of a rebel coalition with non-appropriable resources that are just sufficiently large to induce the rebel leader to threaten war against the king. The rebel leaders were not especially powerful barons. Had the rebellion been led by powerful barons, the latter would have required even larger non-appropriable resources, in order to induce them to give up their already privileged position for a more inclusive, equitable power-sharing agreement such as Magna Carta. Thus, the coalition’s non-appropriable resources might not have been sufficient for them, in which case they would have aborted the rebellion.

We provide evidence using a newly constructed dataset of English barons and baronies and other data on the distribution of wealth among the barons and the fiscal exactions of the king. Our findings show that prior to Magna Carta, there was unprecedented fiscal extraction by the king and a comparatively even distribution of wealth and power among the English barons. At the micro-level, we show that while idiosyncratic personal factors that generated grievances against King John increased the probability that a baron becomes a rebel, the non-appropriable resources of the rebel coalition also greatly influenced this decision. Together this novel quantitative evidence supports the qualitative arguments of prior scholars that constraints on the rulers and ultimate rise of representative institutions were a product of European feudalism.

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Online Appendix

A Historical Background

This appendix collects supplementary historical detail supporting the streamlined background in the main text. Table A1 gives a full chronology of the events surrounding Magna Carta, of which Figure 3 in the main text is a condensed version.

Table A1: A detailed timeline of the events surrounding Magna Carta, 1199–1297.

Year	Date	Event
1199		John becomes king.
1204		Loss of Normandy to Philip Augustus.
1212		Abortive baronial rebellion.
1214	February	Expedition to Poitou.
	27 June	Battle of Bouvines. Philip Augustus defeats Allied army. Spells the failure of John's attempts to retake his French lands.
1215	Easter	Barons rebel. Beginning of the First Barons' War (1215–1217)
	27 May	John asks Stephen Langton to arrange a truce.
	15 June	John accedes to Magna Carta.
	Late August	John fails to meet the barons at Oxford.
	24 August	Pope annuls Magna Carta.
1216	May	Prince Louis of France invades.
1216	October	John dies at Newark castle, succeeded by Henry III.
1216	12 November	Magna Carta reissued in Henry III's name.
1217	20 May	Second Battle of Lincoln, Prince Louis and rebel barons defeated.
1217		Treaty of Lambeth.
1217	11 September	Reissuing of Magna Carta.
1225		Reissuing of Magna Carta.
1258		The Provisions of Oxford.
1264–1267		Second Barons' War between the baronial coalition led by Simon de Montfort and the royal coalition led by King Henry III and Prince Edward.
1267		The Statute of Marlborough. Confirms Magna Carta and the Charter of the Forest.
1297		The Confirmatio Cartarum (Confirmation of Charters). Edward I reissued the 1225 version of Magna Carta in exchange for a tax and to prevent baronial unrest.

B Data Appendix

B.1 Main Sources

We compile a unique dataset on the universe of barons alive in 1215 and the characteristics of their baronies. In this section we describe our main sources of data.

Sanders’s Baron-Barony Data: Sanders (1960) provides the known population of barons and their respective baronies from 1066 to 1327, yielding a total of 2,714 owners over 210 baronies during the entire period, including baronies in the king’s possession. The data details each individual owner’s tenure and the percentage of the barony owned in the case of ownership split. Of the 280 barons who were alive during the reign of King John (r. 1199–1216), our main sample comprises the 186 barons active in 1215.

WikiTree Network Data: WikiTree.com is an online repository of genealogical data. We rely on its “Early English Feudal Baronies” category. The genealogical data is based on Sanders (1960), Keats-Rohan (2002), Cokayne (2000), and Burke (1883), in addition to numerous other one-off sources. Our data is similarly sourced to that used by Cummins (2017). The “Early English Feudal Baronies” WikiTree project is largely spearheaded by Andrew Lancaster, a historian of medieval genealogy (2007; 2009; 2010; 2019; 2020). We hand match our barons collected from Sanders (1960) to their respective WikiTree entry, allowing us to map out the elite kinship network during John’s reign.

Oxford Dictionary of National Biography: The Oxford Dictionary of National Biography (ODNB) contains 54,000 biographies of major British figures from prehistorical times until the present day. It is a standard reference work that was first published in 1885. The version we used is the updated or new edition, published in 2004, which was drawn from the contributions of over 10,000 historians. Each entry is by a recognized expert in the field and draws on the full range of existing primary and secondary sources. For this reason, the ODNB is recognized as a major resource for historians. However, it has not yet been used systematically to study broader trends in political and economic life. This is largely because the information contained within each biography has not been stored in a way that facilitates the use of empirical tools such as regression analysis.

We rely on the ODNB, supplemented with other sources described in Appendix B, to gather personal and political characteristics about each baron alive during John’s reign. Most importantly, we gather information on their political allegiance to John during the Magna Carta crisis: rebel, loyalist, or inactive.

B.2 Main Dependent and Explanatory Variables

In this section we describe our main explanatory variables and important control variables.

Political Allegiance: Our main variable of interest is the political allegiance of a baron. A baron could either have been a rebel, a loyalist, or inactive. Of the 186 barons alive in 1215, 56 were in rebellion by the end of June 1215, 35 were loyal, and 95 were inactive. Figure 5a in the main text depicts this data.

We code the allegiance of every baron from the primary and secondary authorities. We read Holt (1961) in full for the northern barons, and checked every baron against Painter (1949)’s account of the crisis, Carpenter (2015), the biographies and itineraries of the Magna Carta Project (magnacartaresearch.org) and the Victoria County History. Each baron’s coding carries a dated piece of evidence and its source. Our main measure codes a baron as a rebel if he was in arms against John by the end of June 1215, when the charter was sealed at Runnymede, and as a loyalist if he was then on the king’s side. Fifteen barons changed sides during the war of 1215–17: eight joined the rebels only after June 1215 (seven of them from the king’s side), five rebels submitted and later rebelled again, and two rebels went over to the king. Castles held through a wardship or in custody are assigned to whoever controlled them in mid-1215. The coding agrees with the papal excommunication of December 1215: of the 27 barons in our sample named in Innocent III’s letter of 16 December 1215 or in the sentence of his commissioners (Roger of Wendover, 1849, II, 354–6), 26 are coded as rebels by June 1215. Appendix Table A9 reports our main estimates when rebels are all barons who rebelled at any point in 1215–17, when four rebels whose date of joining is not recorded are added, and when the switchers are dropped.

Personal Grievances: Historians have long argued that personal grievances against King John were of paramount importance. Holt (1961), for instance, writes that the “chief motives

behind the rebellion are to be found elsewhere, in litigation in which royal influence told against them, in office which was refused them, in disseisins and monetary penalties inflicted on them, and in speculative proffers and costly compositions which led them deep into debt, sometimes to the verge of disinheritance or to a degrading dependence on the whim of the King” (Holt, 1961, 18). Figure A5 depicts the geographical distribution of these personal grievances.

Number of Castles: As noted in the main text, for our main explanatory variable, we collect data on all baronial castles in early 13th century England from Brown (1959). While there were around 1000 archaeological sites of castles or other similar fortifications dating from the Norman period, many of these castles were not extant around 1215, either because they had been demolished or had fallen into disrepair (Liddiard, 2012, 18). Therefore, we rely on Brown (1959) who compiled a list of all royal and baronial castles attested to in the documentary evidence between 1154 and 1216 and who they belonged to. According to his calculations in 1216, there were 93 royal castles and 179 baronial castles. We geolocated all of these castles and assigned them to the barons in our main dataset based on the information that Brown provided.

To investigate whether the distribution of castles was associated with observables, in Table A2 we report the relationship between the geographical characteristics of a barony and the number of castles in a barony. Without county fixed effects, castles were more common in coastal baronies, along Roman roads and in rugged country (columns 1–4). The association with ruggedness is unsurprising, as the lands along England’s western and northern frontiers with Wales and Scotland were more rugged than the lowlands, and coasts and roads were the routes along which castles were built to control movement. Once we include county fixed effects, no geographical variable predicts castle-holding (Table A2, column 5).

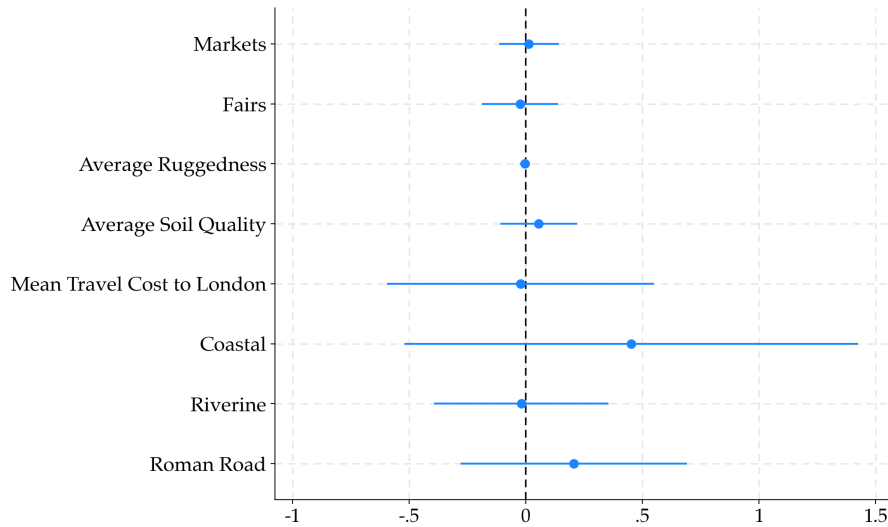
Instrument and Royal Favor Our instrument for Castles in Rebel Network is the number of castles held by the father or grandfather of each rebel in a baron’s family network (Section 4.6). To examine whether ancestral castles carry royal favor into 1215, we measure favor under Henry II and Richard I in two independent ways. The first is presence at court. The witnesses to a royal charter were the men in the king’s company when it was issued (Maitland, 1893). We take the leading witnesses to the royal charters of each reign: the 116 men who attest at least 15 of Henry II’s charters, 80 of them laymen (Vincent, 2007), and the leading witnesses to

Table A2: Determinants of Baronial Castles

	Number of Castles				
	(1)	(2)	(3)	(4)	(5)
Coastal	0.616** (0.284)	0.532* (0.286)	0.529* (0.295)	0.558* (0.308)	0.484 (0.346)
Riverine	0.258* (0.151)	0.286* (0.151)	0.276 (0.173)	0.258 (0.166)	-0.0223 (0.180)
Roman Road	0.333* (0.191)	0.410** (0.191)	0.404** (0.201)	0.430** (0.217)	0.214 (0.196)
Average Ruggedness		0.00679* (0.00353)	0.00695** (0.00351)	0.00941** (0.00457)	-0.00231 (0.0076)
Markets and Fairs			0.00919 (0.0449)	0.00593 (0.0463)	0.0233 (0.0496)
Mean Travel Cost to London				-0.0651 (0.0619)	-0.0103 (0.264)
County FE					✓
Constant	-0.0661 (0.192)	-0.305 (0.225)	-0.321 (0.212)	-0.214 (0.182)	0.0858 (0.554)
Observations	186	186	186	186	186
Adjusted R^2	0.0646	0.0763	0.0714	0.0736	0.2602

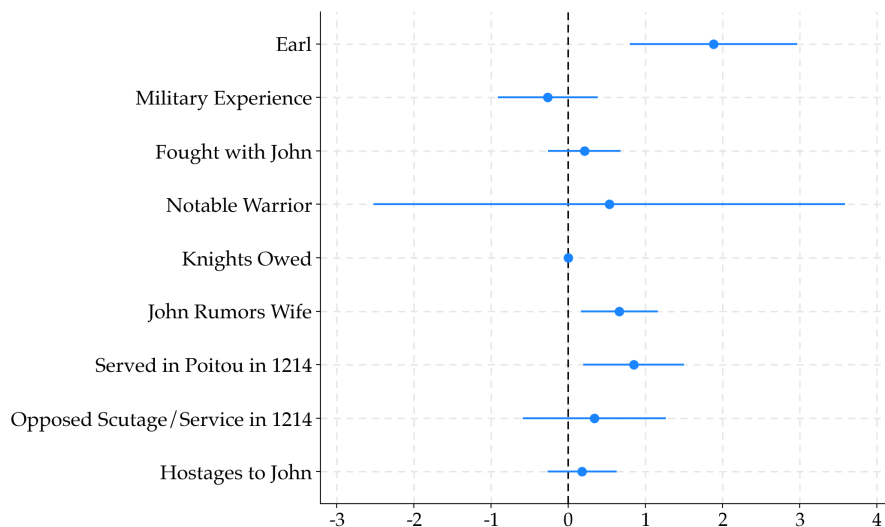
Table notes: This table reports the correlates of baronial castles at the barony-level. OLS of the number of castles a baron held in 1215 (90 castles, 51 holders) on the characteristics of his baronies, for the 186 barons of the 1215 cohort. Without county fixed effects, coastal location, Roman roads and ruggedness are positively associated with castle-holding; with county fixed effects (column 5) no variable is. We report robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure A1: Locational Determinants of Baronial Castles



Determinants of baronial castles. Coefficient plot based on a regression of number of castles on geographical variables inclusive of county fixed effects. Standard errors clustered at the county-level.

Figure A2: Personal Determinants of Baronial Castles



Determinants of baronial castles. Coefficient plot based on a regression of number of castles on personal characteristics. Robust standard errors.

Richard I's charters in each period of the reign, as tabulated by Heiser (1989). The second is office. The sheriff was the crown's principal agent in each county, and the shrievalty was in the king's gift. We digitize the Public Record Office's *List of Sheriffs for England and Wales* (1898) for 1154–1199, which gives 479 appointments in 39 counties and 297 distinct sheriffs, excluding deputies and the palatinates of Durham and Chester. We match both the lay witnesses and the sheriffs to the barons of 1215 by hand through the patriline: the baron himself, his father, grandfather, brother or uncle, or another member of his paternal line. Thirty-three barons belong to a family that supplied a leading witness, and thirty-four to a family that held a shrievalty. Appendix Table A17 reports both measures against allegiance in 1215.

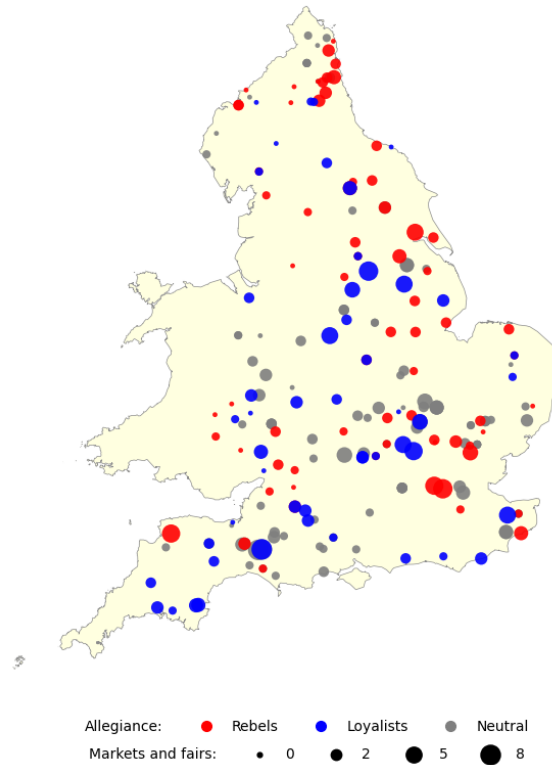
B.3 Markets and Fairs

Markets refer to weekly markets. Fairs were held on a yearly basis. The late 12th and early 13th centuries were a period of commercialization and economic growth (Miller, 1971; Britnell, 1981). Almost one third of all new towns founded in the medieval period were established in the fifty years between 1180 and 1230 (Masschaele, 2010, 156). An important study of the institutions of medieval fairs is Edwards and Ogilvie (2012).

A large number of markets and fairs were also established, many based on the wool trade that flourished between England and Flanders. We use data on the location and foundation date of markets and fairs in medieval England from Britnell (2009) and Letters et al. (2003). Letters et al. (2003) provides data on the locations of English markets and annual fairs, sourced directly from the English charter rolls.

Appendix Figure A3 maps the markets and fairs of each barony by the allegiance of its baron in 1215. On average, barons loyal to John had more markets and fairs in their baronies than the rebels (3.8 against 2.4; $p = 0.02$).

Figure A3: Markets and Fairs by Barony and Allegiance in 1215



Each point is the caput of a barony held by a baron of the 1215 cohort, colored by his allegiance at the end of June 1215 and sized by the barony's number of markets and fairs. Data sources: see the text.

According to Britnell, the decision to grant a market was typically a response to underlying patterns of economic activity and trade. He notes that royal charters sometimes simply codified markets that existed already (Britnell, 1978, 184). He finds no evidence that the decision to grant a market was motivated by the desire to create monopoly power.

The license to grant a market or a fair was given by the king in exchange for a fee. Once a market was licensed, however, the revenues associated with the market would go to the local lord. If the market was in the royal demesne, this would be the king. In the lands of a baron, it would go to that baron.

Kings were naturally concerned to enforce their right to license markets. This was a source of revenue. But a license once granted was seldom revoked. Roughly 75 % of markets founded in Northern England before 1199 remained as market towns after 1500 (Britnell, 1996, 54).

There were two types of revenue associated with markets and fairs: tolls and dues paid by the buyers and sellers and the fees of administering justice. These institutions were becoming more formalized over time; according to Britnell (1978, 192): “Later twelfth-century developments in administration brought new possibilities for judicial profits to the holders of markets”. As discussed by Edwards and Ogilvie (2012), medieval markets and fairs flourished because local officials had incentive to provide what was seen as a relatively even playing field for commercial disputes.

We use markets and fairs as a measure of the commercial wealth of a barony, not as a non-appropriable resource. Their revenues went to the lord, but like his land they lay within reach of the king’s forces. The baron’s own markets and fairs enter every specification as a control (Appendix E).

Additional Control Variables

Age of the baron in 1215 and Attainment Year: We collect data on the age of each baron in 1215 and the year they attained their barony. This is motivated by the suggestion that if a baron attained his barony, likely from his deceased father, during the reign of King John, he may have found it difficult and costly to acquire his full ownership rights. According to feudal custom, upon death of the vassal the land returns to the liege. Strapped for finances, the king utilized this fact to hold the baron’s inheritance hostage for a price. Sanders (1960) reports the year the baron attained full possession over his land. Also, using the WikiTree data, we can determine the baron’s birth year, and thus his age in 1215.

Opposition to Scutage in 1214: Barons were expected to provide military service to the king in periods of war. By John’s reign, however, that obligation could be fulfilled by a monetary

payment, scutage. Many of the barons who rebelled against King John in 1215 had refused to pay scutage for John's campaign in Poitou in 1214. This variable thus sheds light on nascent formation of a coalition to resist King John, as "there is no better witness to rebellious instincts than rebellion itself" (Holt, 1961, 19).

Travel Costs to London and Location on the Transport Network: Travel cost to London represents the ability of the king or his men to visit a given baron/barony. Travel cost to London is calculated for every barony using least cost travel path distance. In calculating least cost travel path, we assume the traveler from London can travel along the Roman roads and/or navigable rivers.

Prior Military Experience: We code whether a baron was mentioned as serving in armed conflict in their biography. We include conflicts in France, Ireland, Scotland or on Crusade. Military experience simply means that a baron served on campaign. It did not necessarily correspond to that baron's perceived military worth or ability.

Crusaders Because service on crusade is one component of military experience, we also code crusading separately. We match the barons of 1215 and their families to the two standard lists of English crusaders, Dansey (1850) and Siedschlag (1939). A baron is coded as a crusader himself if he appears on the Third or Fourth Crusade and was old enough to have taken part; his family is coded as crusading if any member of it appears on a crusade before 1215. Fourteen barons were crusaders themselves: 7 of the 56 rebels, 5 of the 35 loyalists and 2 of the 95 inactive barons. Table A3 shows that crusading does not predict rebellion once personal grievances are controlled, and that adding it leaves the coefficient on Castles in Rebel Network unchanged.

Network Measures: The network data allows us to construct measures of connectivity, centrality, and influence. For all barons, we calculate the minimum distance to the rebel and loyalist groups, which provide a sense for how close a baron was with the members of both coalitions. Also, for all barons, we calculate a measure of network influence, an individual's eigenvector centrality. Eigenvector centrality is a measure of network centrality that accounts for a node's number of connections as well as their quality. A baron with a high score is connected to many barons who themselves have high scores.

Table A3: Crusading and Opposition to King John in 1215

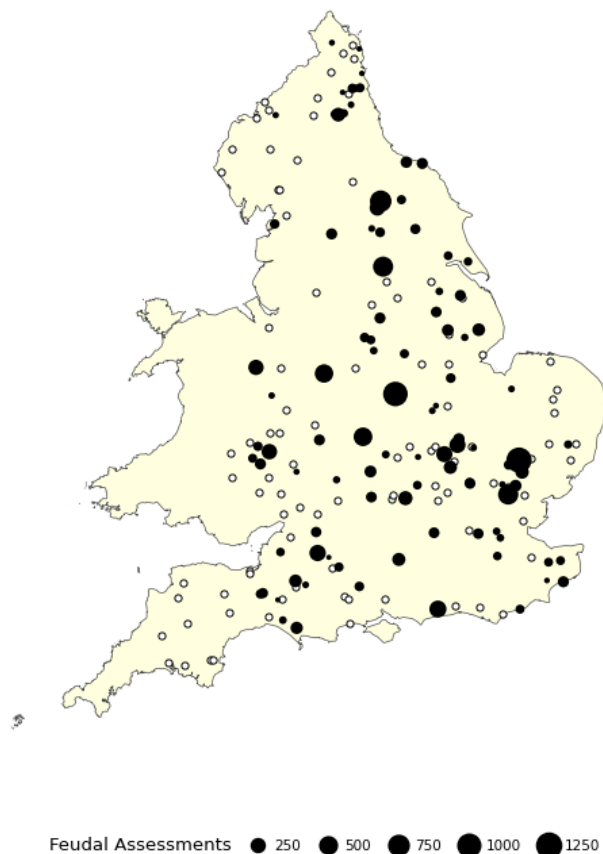
	Opposed John in 1215					
	(1)	(2)	(3)	(4)	(5)	(6)
Castles in Rebel Network			0.039* (0.022) [0.019]	0.059** (0.028) [0.027]	0.067** (0.029) [0.027]	0.062** (0.029) [0.029]
Crusader before 1215 (the baron himself)	0.215 (0.139) [0.116]	0.101 (0.103) [0.091]	-0.094 (0.114) [0.113]	-0.110 (0.138) [0.141]	-0.018 (0.150) [0.157]	
Crusader before 1215 (any member of his family)						-0.017 (0.076) [0.086]
Personal grievances		0.570*** (0.082) [0.085]	0.460*** (0.088) [0.074]	0.436*** (0.099) [0.088]	0.486*** (0.096) [0.087]	0.444*** (0.099) [0.088]
Full controls of Table 1			✓	✓	excl. military	✓
County FE				✓	✓	✓
Barons (rebels)	186 (56)	186 (56)	185 (56)	185 (56)	185 (56)	185 (56)

Table Notes: Linear probability models of opposing John in 1215 (in rebellion by the end of June 1215). A baron is a crusader himself if he appears in Dansey (1850) or Siedschlag (1939) on the Third or Fourth Crusade and was old enough to have served; his family crusaded if any member of it appears on a crusade before 1215. Columns (3)–(6) add the full controls of Table 1, column (4); columns (4)–(6) add county fixed effects, as in column (5) of that table. Column (5) omits the two military-experience controls, since crusade service is one of their components. Robust standard errors in parentheses; standard errors clustered on fast-greedy communities in square brackets. Stars refer to the robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Geographic Controls: We also create a number of economic geography variables such as whether a barony is situated on a road, river, or coast. These are important proxies for the trade connectivity of a barony. Finally, we measure the terrain ruggedness of a barony using Nunn and Puga (2012). To measure the agricultural productivity of the barony, we use the Food and Agriculture Organization (FAO)’s Global Agro-Ecological Zones (GAEZ) data on wheat suitability under rain-fed irrigation and low capital intensity (Fischer et al., 2002). We calculate a barony’s wheat suitability using a 10km buffer around the barony caput.

Knights Fees: Under the feudal system operational in 12th and early 13th century England, barons were categorized according to the number of knights they could provide to the king. The land that a baron was assessed on included both the land he owned directly and the land he provided to his knights, followers, and peasants. We view this as a measure of economic power (as it did not correspond with the actual military forces at the disposal of the barons). We collect the reported magnitude of knights’ fees owed to the king. The data collected in the ODNB is supplemented with Keefe (1983). We depict this data in Figure A4.

Figure A4: Knights Fees Assessed.



Data source: see text.

B.4 Personal Grievances Against King John

As discussed in the main text, many contemporary chroniclers, notably Ralph of Coggeshall, Roger of Wendover, and Matthew Paris, emphasized the importance of the personal grievances that many of the rebels had against King John.

Historians have, to varying degrees, endorsed the importance of some of these factors. For example, Geoffrey de Mandeville, Earl of Essex, had had to pay John 20,000 marks to marry Isabel of Gloucester. Lloyd (1972, 263) notes “[i]t may have delighted him to gain possession by marriage of most of that broad shire, but the reckoning had followed with a vengeance. The revenue from the territory proved quite inadequate to meet the terms of repayment. He did not

even repay the first installment”.

John was accused of seducing Robert Fitzwalter’s daughter and Eustace de Vesci’s wife and some historians such as Barratt (2018, 259) view these as credible motivations for their antipathy to the king. Other historians dismiss them as ex post rationalizations of their disloyalty by scurrilous medieval chroniclers.

In Table A7 we regress individually and then collectively the separate types of grievances that individual barons had with King John. Overall, they robustly predict joining the rebellion against him. This is in line with what historians have long argued. Nonetheless, personal grievances alone are not solid grounds for rebellion. Otherwise, many of the individual barons would have rebelled before 1215. Each aggrieved baron had a personal motive to oppose John but on their own they faced the “paradox of rebellion”: it was not in their interests to act given the diffused nature of the benefits resulting from their action and the concentrated costs and risks involved. The formation of a rebel coalition was the critical factor that made the rebellion in 1215 possible as indicated by the results we report in the main paper.

Table A13 re-estimates our main specification excluding the barons who had personal grievances against King John. We drop them one grievance at a time: first the barons who had given John hostages, then those in debt to him, then those touched by the rumors about John and their wives, and finally those he had fined. Without fixed effects, the coefficient on *Castles in Rebel Network* is 0.034–0.040 ($p = 0.10$ – 0.15). With county fixed effects it is 0.044–0.054 through the first three steps ($p = 0.09$ – 0.14). Dropping the fined barons removes only six further barons, since most had already been dropped for another grievance, but four of them were rebels; on the remaining 154 barons (31 rebels) the coefficient is 0.036 ($p = 0.27$). The effect is nonetheless of the same size relative to the rate of rebellion. Once every aggrieved baron is dropped, only 20 percent of the remaining barons rebelled, against 30 percent in the full sample, while the spread of *Castles in Rebel Network* is unchanged (standard deviation 1.6 in both). A one-standard-deviation increase raises the probability of rebellion by 6–7 percentage points in the last column, about 30 percent of the baseline rate, close to the one-third implied by Table 1. What is lost when the aggrieved barons are dropped is precision rather than magnitude: only 31 rebels remain.

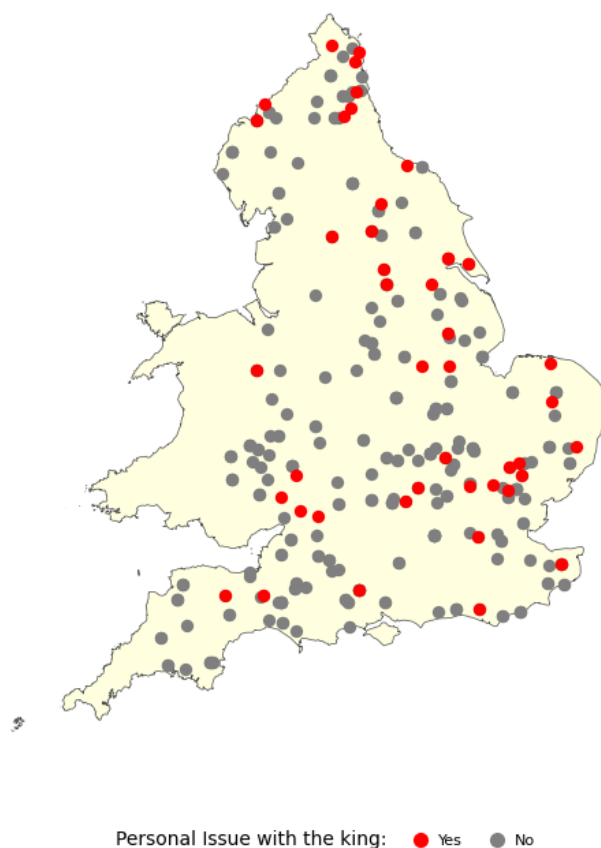


Figure A5: The distribution of personal grievances against John in 1215

(A grievance is any of hostages given, debt to the king, a fine imposed by John, or rumors concerning the baron's wife.)

C Rebellions against Henry III in 1258 and 1264

Baronial Allegiances in 1258 and 1264: Using the Sanders (1960) baron-barony data described above, we collect information about the 159 English barons alive and active in 1258 and the 194 barons in 1264. Using the Oxford Dictionary of National Biography (ODNB), we collect information on the allegiance of a given baron during the Revolution of 1258 and the Second Barons' War, both of which were waged against King Henry III. As with our analysis for King John, we classify barons as rebels, loyalists, or neutral.

Royal Charter Witness Lists: When a charter was issued by the king, it was formally witnessed by bishops and barons in the king’s vicinity. This fact allows us to gain insight into who was in the company of the king, and thus welcomed to the king’s court (Maitland, 1893; Huscroft, 2001). Using the royal charter witness list for the years 1227 to 1239, we count the number of charters witnessed by barons who were alive in 1215 and lived into Henry III’s reign. The witness lists for the royal charters during this period are given by Morris (2001). Furthermore, using the network data from WikiTree described above, we determine the identities of the sons of the 1215-era barons and count their frequency of witnessing charters.

Other Variables: Our main variable of interest and control variables are calculated following the same processes detailed above. As in our main analysis, we focus on castles as our proxy for a baron’s non-appropriable resources; markets and fairs enter as a measure of the baron’s commercial wealth. The core difference, given that the time period of study is nearly 50 years after our main analysis, is the time periods used in variable construction. Lacking the distribution of castles in the 1250s and 1260s, we rely solely on matching barons to the 1215 distribution (from Brown (2004)) through their fathers and grandfathers. For markets & fairs, we use the spatial distribution that existed in 1208 and in 1233.

All other variables associated with a baron’s territorial barony (e.g., ruggedness, travel cost to London, etc.) are the same as above.

D Summary Statistics and Additional Econometric Results

We report our summary statistics in Table A4. Table A5 reports balance on observables for three groups: inactive barons ($n = 95$, col. 1); loyal barons ($n = 35$, col. 2); and rebel barons ($n = 56$, col. 3). In general, as one would expect there are differences between inactive barons and both loyalists and rebels. The main differences between active rebels and active loyalists, however, are personal grievances against the king and other good relations with the king. Otherwise, loyalist barons had somewhat more markets and fairs than rebels and were located in lands with slightly better soil quality.

Table A6 reports balance on the wealth measures described in Appendix E.1. Two points stand out. First, rebels and loyalists do not differ significantly on any wealth measure (final difference column, all $p > 0.16$): the two active groups are balanced on wealth, as the identification argument requires. Second, the significant rebels-versus-others gaps for Domesday value, urban wealth and watermill numbers are driven by the inactive barons, who were on average smaller and—being minor barons—less well covered by the Domesday and fiscal sources; the raw levels below are therefore coverage-distorted and should be read with the per-measure coverage in the final column in mind.

D.1 Additional Empirical Results

In this section, we provide a series of additional empirical results in support of Lemma 1.3.

First, we establish that our main results are not driven by a specific subset of barons. In Table A10, we show that our results are robust when we drop (i) the top 5, 10, 15, and 20 barons as measured by the number of knights they owed the king; (ii) the earls; (iii) the barons with multiple baronies; and (iv) barons who had refused to serve with John in Poitou in 1214. The results in columns (1)-(6) suggest that the factors we identify were not specific to larger or more powerful barons. The results in column (7) suggest that they were not driven by a subset of barons with a track record of opposing King John.

Table A15 ranks the top 10 barons (excluding the king) by how central they are to the entire network of barons using their eigenvector centrality. We find that the main rebel leaders were not among the most central barons.

Table A4: Summary Statistics

	N Observations	Mean	SD	Min	Max
Opposed to John in 1215	186	0.30	0.46	0	1
Supported John in 1215	186	0.19	0.39	0	1
Inactive in 1215	186	0.51	0.50	0	1
Earl	186	0.10	0.30	0	1
N. Baronies	186	1.17	0.56	1	5
Hostages to John	186	0.07	0.26	0	1
In debt to John	186	0.06	0.24	0	1
Fined by John	185	0.06	0.24	0	1
Rumors About Wife	186	0.01	0.10	0	1
In Public Opposition by Jan 1215	185	0.04	0.20	0	1
Opposed Scutage/Service in 1214	186	0.03	0.18	0	1
Served in Poitou in 1214	186	0.16	0.37	0	1
Held lands in Normandy	186	0.13	0.34	0	1
Number of Castles	186	0.48	1.09	0	9
Military Experience	185	0.15	0.35	0	1
Notable Warrior	185	0.03	0.16	0	1
Knights Owed	186	79.53	180.35	0	1536
Average Ruggedness	186	25.88	21.67	0	100
Average Soil Quality	186	4.40	2.30	0	20.24
Mean Travel Cost to London	186	2.84	1.68	0	7.53
Coastal	186	0.22	0.42	0	1
Riverine	186	0.45	0.50	0	1
Roman Road	186	0.90	0.30	0	1
Markets and Fairs	186	2.43	2.21	0	11
Domesday 1086 Honour Value (£)	70	362.31	562.50	12.56	2635.13
Cartae 1166 Knight Fees	111	181.06	275.12	1.00	1634.94
Cartae 1168–1172 Fees	103	178.61	278.97	1.00	1607.91
Cartae 1190–1210 Fees	108	169.18	259.50	1.00	1536.00
Urban Wealth of Nearby Towns (£)	41	1070.37	2354.87	144.00	11341.00
Watermills 1086 (number)	69	34.52	48.63	1	270
Market Access (log)	186	11.23	0.38	10.63	13.34

Table Notes: This table reports summary statistics for our main covariates. We exclude all baronies controlled by the king. The final seven rows summarize the wealth measures used in Table 2 and Appendix E; each landed, fiscal, or commercial measure is computed over the baronies for which its source records a value, so the number of observations varies by source, while market access is defined for every barony. Number of Castles is the number of castles held in 1215 (90 castles, including the six held in wardship or custody by barons in our sample; the maximum is 9, William Marshal); coast, river and road are defined by an exact 10 km distance.

Table A5: Balance Table

Variable	(1) Mean Inactive	(2) Mean Loyalist	(3) Mean Rebels	(4) Rebels vs Others	(5) Rebels vs Loyalists
In debt to John	0.011	0.000	0.179	(0.001)***	(0.001)***
Fined by John	0.011	0.029	0.161	(0.005)***	(0.025)**
Rumors About Wife	0.000	0.000	0.036	(0.154)	(0.158)
Hostages to John	0.021	0.057	0.161	(0.013)**	(0.107)
Good Relations with John	0.032	0.382	0.089	(0.472)	(0.002)***
Fought with John	0.053	0.412	0.393	(0.001)***	(0.861)
Network Distance to the King	10.516	9.857	11.393	(0.402)	(0.297)
Average Soil Quality	4.168	5.264	4.258	(0.577)	(0.087)*
Average Ruggedness	24.331	31.277	25.137	(0.759)	(0.191)
Coastal	0.147	0.314	0.286	(0.183)	(0.776)
Riverine	0.379	0.600	0.464	(0.747)	(0.210)
Roman Road	0.905	0.829	0.929	(0.326)	(0.175)
Markets and Fairs	1.958	3.800	2.375	(0.817)	(0.018)**
Underage or Female in 1215	0.105	0.029	0.018	(0.029)**	(0.751)
Earl	0.011	0.229	0.161	(0.093)*	(0.439)
Number of Baronies	1.042	1.345	1.218	(0.272)	(0.356)
Mean Travel Cost to London	2.572	2.992	3.191	(0.066)*	(0.559)
Number of Castles	0.063	1.343	0.661	(0.117)	(0.050)**
Knights Owed	55.484	87.327	115.434	(0.185)	(0.536)
Barony Attained After 1199	0.547	0.686	0.482	(0.202)	(0.054)*
Notable Warrior	0.000	0.088	0.036	(0.660)	(0.344)
N. Baronies	1.042	1.400	1.250	(0.237)	(0.315)
Barony Attained After 1204	0.379	0.371	0.357	(0.798)	(0.892)
Age	39.571	41.970	41.000	(0.898)	(0.785)
Observations	95	35	56	186	91

Table Notes: This table reports balance on observables across three categories of barons: inactive (col. 1); loyalist (col. 2) and rebels (col. 3). In column 4 we compare rebels to all other barons. In column 5 we compare rebels to active loyalists. p -values are from OLS of each variable on a rebel indicator with robust standard errors.

Table A6: Balance on the wealth measures, by 1215 allegiance.

Wealth measure	Mean Inactive	Mean Loyalist	Mean Rebels	Rebels vs Others	Rebels vs Loyalists	Coverage (of 186)
Domesday 1086 honour value (£)	10.3	358.2	211.5	(0.092)*	(0.243)	70
Cartae 1166 knight fees	65.7	147.9	155.0	(0.145)	(0.912)	111
Cartae 1168–1172 fees	54.7	139.1	148.8	(0.116)	(0.879)	103
Cartae 1190–1210 fees	60.0	135.2	139.9	(0.163)	(0.938)	108
Urban wealth of nearby towns (£)	63.2	165.9	572.7	(0.092)*	(0.161)	41
Domesday 1086 watermills (number)	1.3	32.3	20.1	(0.060)*	(0.268)	70
Observations	95	35	56	186	91	

Table Notes: p -values in parentheses from Welch two-sample t -tests. “Coverage” is the number of barons for whom the source records the measure; the remaining barons are zero-imputed, so the inactive-group means in particular understate true wealth. The 1200 baronial incomes of Painter (1943) are not included: the source names only about a dozen barons, too few for a baron-level comparison. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A7: Personal Grievances and Opposition to King John in 1215

	Opposed John in 1215					
	(1)	(2)	(3)	(4)	(5)	(6)
Hostages to John	0.421*** (0.133)					
In debt to John		0.646*** (0.0933)				
John Rumors Wife			0.707*** (0.0338)			
Fined by John				0.550*** (0.122)		
Personal Grievances					0.580*** (0.0803)	0.528*** (0.0932)
Constant	0.272*** (0.0340)	0.263*** (0.0335)	0.293*** (0.0338)	0.269*** (0.0337)	0.201*** (0.0325)	0.0787 (0.0792)
Geography Controls	—	—	—	—	—	—
Economic Controls	—	—	—	—	—	—
County Fixed Effects						✓
Observations	186	186	186	186	186	186
Adjusted R^2	0.050	0.106	0.020	0.075	0.223	0.262

Table Notes: Columns (1)–(5) are bivariate regressions and column (6) adds only county fixed effects. Personal Grievances is an indicator for any of four grievances—in debt to John, rumors about the baron’s wife, hostages given to John, or fined by John—the definition used in every other table; column (4) adds the fine on its own (Fined by John is unrecorded for one baron and is coded zero, as in the aggregate). This table reports the correlation between various personal grievances and the decision to rebel against King John in 1215. We report robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A8: Network Connections and Opposition to King John in 1215

	Opposed John in 1215					
	(1)	(2)	(3)	(4)	(5)	(6)
Network Distance to King	0.00305 (0.00363)					
Min Distance (Loyalists)		-0.00463** (0.00230)				
Min Distance (Rebels)			-0.0185*** (0.00141)			
Degree Centrality				0.00196 (0.00539)		
Betweenness Centrality					-4.02e-08 (7.57e-07)	
Eigenvector Centrality						-3.729*** (0.709)
Constant	0.269*** (0.0494)	0.419*** (0.0567)	0.590*** (0.0488)	0.331*** (0.0570)	0.347*** (0.0410)	0.352*** (0.0395)
Adjusted R^2	-0.002	0.017	0.368	-0.006	-0.007	-0.000
Observations	186	150	150	150	150	150

To investigate the characteristics of the rebels further, we look at the three rebel leaders, Saer de Quincy, Robert Fitzwalter, and Eustace de Vesci and at the barons who were known to be in public opposition to John by January 1215. Overall, these barons were not particularly central to the network (de Quincy was the most central with a ranking of 13, but de Vesci’s ranking

Table A9: Main estimates under alternative codings of allegiance

	Table 1	Table 4		Table A28: Both – Loyalist	
	col. (5)	col. (2)	col. (4)	col. (1)	col. (2)
Rebel by June 1215 (main)	0.0611**	0.0613**	0.0597**	0.108*	0.042**
56 rebels, N = 185	(0.0282)	(0.0247)	(0.0242)	(0.065)	(0.018)
+ rebels with undated joining	0.0450	0.0450*	0.0447*	0.055	0.030
60 rebels, N = 185	(0.0289)	(0.0256)	(0.0248)	(0.065)	(0.019)
Rebel at any point, 1215–17	0.0346*	0.0362*	0.0354*	0.081	0.026
68 rebels, N = 185	(0.0204)	(0.0185)	(0.0184)	(0.078)	(0.022)
Main, switchers dropped	0.0506*	0.0510**	0.0458*	0.127*	0.052***
49 rebels, N = 170	(0.0286)	(0.0243)	(0.0239)	(0.071)	(0.018)

Table Notes: Each row re-estimates the main specifications with a different coding of who was a rebel; the outcome, Castles in Rebel Network, the instruments, the public-opposition control and the loyalist and rebel-side castles of Table A28 all use the same coding. The first row, “Rebel by June 1215”, is the main coding used throughout the paper. The second row adds four barons who rebelled but whose date of joining is not recorded. The third row codes as a rebel every baron who rebelled at any point in 1215–17, and as a loyalist only those loyal in June 1215 who never rebelled. The fourth row drops the fifteen barons who changed sides. Table 1 column (5) and Table 4 columns (2) and (4) use the 185–186 barons of those tables (fewer when switchers are dropped); Table A28 column (1) weights holdings by their 1086 value and column (2) by soil suitability. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A10: Who Joins the Rebel Coalition? Robustness to Dropping Selected Barons

	Opposed John in 1215						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Castles in Rebel Network	0.0638**	0.0645**	0.0595**	0.0617**	0.0473**	0.0374	0.0456**
	(0.0278)	(0.0279)	(0.0278)	(0.0282)	(0.0235)	(0.0233)	(0.0219)
	[0.0246]	[0.0245]	[0.0247]	[0.0248]	[0.0146]	[0.0197]	[0.0215]
Personal Grievances	0.484***	0.492***	0.500***	0.475***	0.489***	0.456***	0.500***
	(0.0940)	(0.0982)	(0.105)	(0.105)	(0.0944)	(0.101)	(0.0933)
	[0.0869]	[0.0899]	[0.0980]	[0.0988]	[0.0851]	[0.0972]	[0.0832]
Constant	0.143	0.151	0.180	0.210	0.200	0.330**	0.162
	(0.149)	(0.151)	(0.157)	(0.159)	(0.141)	(0.158)	(0.128)
	[0.162]	[0.163]	[0.169]	[0.169]	[0.137]	[0.175]	[0.130]
Dropping	Top 5	Top 10	Top 15	Top 20	Earls	Multiple	Refused
	Knights Fee	Knights Fee	Knights Fee	Knights Fee		Baronies	to Serve
Adjusted R^2	0.306	0.296	0.297	0.295	0.300	0.305	0.326
Observations	183	180	176	173	167	164	168

Table A11: Table notes: This table replicates the main specification in Table 1 sequentially dropping the barons with the highest knights fees (cols. (1)–(4)); the earls (col. 5), barons with multiple baronies (col. 6), and those barons who refused to serve in Poitou in 1214 (col. 7). Robust standard errors are in parentheses and robust standard errors clustered at the fast-greedy community level are reported in square brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Castles in Rebel Network is the number of castles held by rebel kin in 1215, each weighted by the inverse of network distance. Columns (1)–(4) include county fixed effects; columns (5)–(7) do not. Personal Grievances equals one if the baron was indebted to John, the subject of rumors about John and his wife, had given hostages to John, or had been fined by John.

was 65).³⁸ Overall, the early rebels were less central than the average baron. Nor were the

³⁸According to Painter (1961c, 239) writing of the de Quincy family “their feudal power was never sufficient to place them in the top rank of the English baronage”. Eustace de Vesci, we are told, “was a second-ranker, for all his notoriety” (Lloyd, 1972, 261).

Table A12: Who Joins the Rebel Coalition? Robustness to Controlling for the Network

	Opposed John in 1215				
	(1)	(2)	(3)	(4)	(5)
Castles in Rebel Network	0.0734** (0.0302) [0.0278]	0.0839** (0.0349) [0.0316]	0.0802** (0.0393) [0.0353]	0.0644* (0.0345) [0.0353]	0.0719** (0.0299) [0.0292]
Personal Grievances	0.470*** (0.0954) [0.0884]	0.485*** (0.0956) [0.0865]	0.484*** (0.104) [0.0987]	0.482*** (0.104) [0.0982]	0.484*** (0.0957) [0.0864]
Network Measure	0.00409 (0.00384) [0.00307]	-0.00644 (0.00713) [0.00632]	0.00234 (0.00350) [0.00305]	-1.05e-07 (8.70e-07) [8.82e-07]	-3.717* (1.947) [2.081]
Constant	0.0970 (0.158)	0.181 (0.142)	0.118 (0.201)	0.179 (0.171)	0.152 (0.143)
Baron Controls	✓	✓	✓	✓	✓
Geography Controls	✓	✓	✓	✓	✓
Economic Controls	✓	✓	✓	✓	✓
County FE	✓	✓	✓	✓	✓
Network Measure	Ego Distance to King	Degree Centrality	Min Distance to Loyalist	Betweenness Centrality	Eigenvector Centrality
Adjusted R^2	0.321	0.321	0.298	0.296	0.322
Observations	185	185	150	150	185

Table Notes: Castles in Rebel Network is the number of potential rebel castles in a baron’s network. In all columns, we include baron controls, geography controls, economic controls, and county fixed effects as described in Table 1. Robust standard errors are in parentheses and robust standard errors clustered at the fast-greedy community level are reported in square brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Castles in Rebel Network is the number of castles held by rebel kin in 1215, each weighted by the inverse of network distance. Degree and eigenvector centrality are set to zero for the barons outside the family graph; the distance and betweenness measures are undefined for them, so columns (3)-(4) use the 150 barons in the graph. Personal Grievances equals one if the baron was indebted to John, the subject of rumors about John and his wife, had given hostages to John, or had been fined by John.

rebel leaders ranked especially highly in economic terms as measured by the number of markets and fairs (with the exception of Geoffrey de Mandeville, Earl of Essex). This is consistent with Lemma 2: an important feature of the 1215 rebellion was that it was not led by a close rival to King John. This distinguishes it from earlier or later rebellions in English history such as the revolt of the Young King (1173/74), John’s own rebellion against Richard (1192/94), Simon de Montfort’s rebellions against Henry III (1258-1265), Henry Bolingbroke’s rebellion against Richard II (1399) or Richard of York’s rebellion against Henry VI (1459/1460). As Holt (1961, 1) observed: “Hitherto, if civil wars had been fought for any positive end, they had been fought on behalf of an individual, a Robert Curthose or a young King Henry, or in the interests of the participants in seeking land, office, and power. Now a civil war was being fought for a cause, a programme, not for one individual or even several, but for a document, a simple piece of

Table A13: Testing Lemma 1.3: Coalitional Analysis Dropping Barons with Grievances Against King John

	(1)	(2)	Opposed John in 1215		
	All barons		(3)	(4)	(5)
		gave hostages	Dropping barons who ... + were in debt	+ rumors	+ were fined
<i>Panel A: Baseline controls</i>					
Castles in Rebel Network	0.0367 (0.0238) [0.0232]	0.0342 (0.0238) [0.0232]	0.0347 (0.0241) [0.0199]	0.0393 (0.0240) [0.0195]	0.0396* (0.0241) [0.0203]
Adjusted R^2	0.208	0.178	0.146	0.145	0.153
<i>Panel B: Baseline controls and county fixed effects</i>					
Castles in Rebel Network	0.0522* (0.0305) [0.0309]	0.0439 (0.0297) [0.0323]	0.0524 (0.0322) [0.0333]	0.0538* (0.0324) [0.0334]	0.0358 (0.0322) [0.0335]
Adjusted R^2	0.220	0.198	0.146	0.133	0.136
Observations	185	173	162	160	154
Barons opposed to John	56	47	37	35	31

Table Notes: This table re-estimates the main specification of Table 1, dropping barons with personal grievances against King John cumulatively. Column (1) uses all barons. Column (2) drops the barons who had given John hostages; column (3) also drops those in debt to John; column (4) also drops those who were the subject of rumors about John and their wives; and column (5) also drops those whom John had fined, leaving only barons with none of the four grievances. Baseline controls are those of Table 1, column (5), except personal grievances: ruggedness, soil quality, coast, river and road, public opposition by January 1215, own castles, number of baronies, knights owed, markets and fairs, and military ability and experience. Panel B adds county fixed effects. Castles in Rebel Network is the number of castles held by rebel kin in 1215, each weighted by the inverse of network distance. Robust standard errors are in parentheses and standard errors clustered at the fast-greedy community level in square brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

parchment”.³⁹

D.2 The Rebellion of 1173 and the Allegiance of Rebel Descendants

As we discuss in the main text, there were no hereditary patterns of loyalty or disloyalty to the throne in Angevin England. The Norman monarchy was a strong one by feudal standards and all barons were nominally loyal to the king in normal times. Feudal rebellions, however, were common. Unlike those lower down the feudal hierarchy, barons had both the de facto power and a tacitly understood de facto right to rebel if they believed they were being treated unfairly. Following a rebellion, the king might punish the rebels but they were not treated like traitors as was the case in the late Middle Ages: they were not executed, their hereditary lands were usually left untouched and their heirs were allowed to inherit.

This is why we believe the distribution of baron castles in the previous generation or two

³⁹In 1215, there was no single baron with more than 9 castles. In contrast, John of Gaunt (father of Henry Bolingbroke) possessed 30 castles during the reign of Richard II (Pounds, 1990, 137).

Table A14: Who Joins the Rebel Coalition? Unweighted Network, Robustness by Network Size

	Opposed John in 1215					
	(1)	(2)	(3)	(4)	(5)	(6)
Castles in Rebel Network	0.0085*** (0.0026) [0.0034]	0.0081** (0.0033) [0.0032]	0.0095*** (0.0036) [0.0048]	0.0099** (0.0045) [0.0043]	0.0129*** (0.0049) [0.0063]	0.0126** (0.0063) [0.0060]
Personal Grievances		0.480*** (0.095) [0.087]		0.484*** (0.097) [0.090]		0.486*** (0.098) [0.091]
Constant	0.211*** (0.038) [0.044]	0.151 (0.143) [0.145]	0.235*** (0.038) [0.046]	0.175 (0.149) [0.152]	0.237*** (0.037) [0.045]	0.167 (0.152) [0.155]
Baron Controls		✓		✓		✓
Geographical Controls		✓		✓		✓
Economic Controls		✓		✓		✓
County FE		✓		✓		✓
Network Connections	16		12		10	
Observations	186	185	186	185	186	185
Adjusted R^2	0.053	0.320	0.033	0.312	0.034	0.309

Table Notes: This table studies the relationship between non-appropriable resources and personal grievances on the probability of rebellion when varying the size of the family network. The main explanatory variable is the number of rebel castles in a baron’s network. Castles in Rebel Network is the number of castles held in 1215 by rebel kin within 16, 12 or 10 links of the baron in the family network, unweighted by network distance. Baron controls include whether a baron was in public opposition by January 1215 and the number of baronies the baron held land in. Geographical controls include average ruggedness, average soil quality, the presence of any Roman roads, any coastline, and any rivers. Economic controls include the number of markets and fairs, the baron’s knights fee, and the number of castles. Robust standard errors are in parentheses and robust standard errors clustered at the fast-greedy community level are reported in square brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Personal Grievances equals one if the baron was indebted to John, the subject of rumors about John and his wife, had given hostages to John, or had been fined by John.

generations of baronial leaders should be orthogonal to the distribution of castles among rebels and barons in 1215. The reasons for a baron to rebel were specific to the situation they faced in the reign of King John. They did not represent some long-lasting hereditary set of grievances.

To lend support to this claim in Table A16, we tabulate the allegiances of the descendants of the baronial rebel leaders in the rebellion of 1173 against Henry II. Unfortunately, the sources likely do not record all of the barons whose loyalty in that rebellion was suspect. Henry’s biographer writes: “The chroniclers give the impression of a much wider revolt than can actually be identified” (Warren, 1973, 123). Nonetheless, the pattern that we observe from the small number of barons known to have led the rebellion indicates that patterns of loyalty or disloyalty were personal and not hereditary. The direct descendants of William de Ferrers, 3rd Earl of Derby and Hugh of Cyfeiliog, 5th Earl of Chester were loyal to King John in 1215. William

Table A15: The Characteristics of the Rebel Leadership

Baron	Network Rank	Opposed John in 1215	Castles	Markets & Fairs
<i>Panel A</i>				
William Longespee	1		0	6
Richard I de Chilham	2		1	6
William IV de Warenne	3		6	1
Roger II Bigod	4	✓	1	0
William I Marshal	5		9	1
Henry Fitzcount	6		1	8
William I Briwerre	7		3	11
William I de Beauchamp	8	✓	1	2
Richard Briwerre	9		0	9
Roger II Bertram	10	✓	1	2
Average	0.00286	30%	2.3	4.6
Early Rebels & Rebel Leaders				
<i>Panel B</i>				
Saer de Quincy	13	✓	0	2
Richard de Clare	14	✓	3	5
Geoffrey de Mandeville	21	✓	2	6
Peter de Brus	29	✓	1	2
William de Mowbray	39	✓	0	1
Richard de Percy	40	✓	1	4
Robert Fitzwalter	44	✓	0	0
Eustace de Vesci	65	✓	1	3
Roger de Cressy	67	✓	0	1
Richard de Montfichet	80	✓	0	3
Roger de Montbegon	115	✓	1	1
Robert de Grelley	119	✓	2	0
Average	0.000003	100%	0.917	2.33
Average for all barons	0.0013	30%	0.484	2.43

Table Notes: Panel A lists the top 10 barons in 1215 after the king by their network centrality as measured by eigenvector centrality. While 3/10 eventually joined the rebellion, none of the rebel leaders were among these elite barons. Panel B lists the early rebels who were in opposition to John by January 1215 as well as the three main rebel leaders (in bold). As measured by their network connectivity, number of castles and number of markets and fairs, these rebels were drawn from the middle ranks of the baronage. They were less central to the network than the average baron. They held more castles than the average baron (0.92 against 0.48) but far fewer than the ten most central barons (2.3), and a similar number of markets and fairs (2.3 against 2.4). Castles are the number of castles held in 1215. Data sources: see main text and Appendix B.

Marshal was a rebel in 1173 but would be a leading loyalist for John. His son, however, joined the rebellion.

Table A19 tests the absence of hereditary allegiance more broadly. First, among the rebels and loyalists of 1215 whose patriline's side is recorded, the side the family took in the Anarchy, or in the reign of Henry II including the revolt of 1173–74, is unrelated to the side it took in

Table A16: Barons who Rebelled Against Henry II in 1173 and their allegiance in 1215

Rebel Baron 1173	Direct Descendants in 1215	Allegiance in 1215
William de Ferrers 3rd Earl of Derby	William de Ferrers 4th Earl of Derby	Loyal
Hugh Bigod 1st Earl of Norfolk	Hugh Bigod 3rd Earl of Norfolk	Rebel
Hugh of Cyfeiliog 5th Earl of Chester	Ranulf de Blondville 6th Earl of Chester	Loyal
Robert de Beaumont 3rd Earl of Leicester	None	
Rebel in 1173	Allegiance in 1215	Allegiance of Son
William Marshal	Loyal	Rebel

1215 ($p = 0.71$ and $p = 0.54$). Families that had fought for Matilda—the side of John’s own grandmother—were no more loyal to John than those that had fought for Stephen. Second, close relatives often took opposite sides in 1215: of the 13 pairs of active barons within two links of each other in the family network (fathers and sons, brothers, spouses), 5 were on opposite sides, 38 percent, against 48 percent if sides were unrelated to kinship. Third, allegiance did not pass to the next generation: in the Second Barons’ War of 1264 the heirs of the rebel families of 1215 rebelled at much the same rate as the heirs of the loyal families (40 and 43 percent, $p = 1.00$). In 1258, with only eleven such barons, the difference (83 against 40 percent) is not significant ($p = 0.24$).

D.3 Royal Charters After 1215

In the main text we note that the reissuing of Magna Carta in the decades after 1215 can be obtained as an equilibrium outcome of the same game M played by a new draw of rebels and loyalists.

The Magna Carta rebels were not punished or excluded from offices in Henry’s reign. Many of them even remained prominent at court. As evidence of this, we collect data on all surviving witness lists. Historians argue that the composition of witness lists for royal charters reveals who was in high favor with the king and had status at court (Westervelt, 2008). Henry III was

Table A17: Royal favor and shrievalty under Henry II and Richard I, and allegiance in 1215

	Families		Share who rebelled		<i>p</i>
	Rebels	Loyalists	In group	Others	
<i>Panel A: The baron's family among the king's leading lay witnesses</i>					
Leading witness under Henry II (1154–89)	10	6	0.62	0.61	1.00
Leading witness under Richard I (1189–99)	5	7	0.42	0.65	0.20
Either reign	14	11	0.56	0.64	0.63
Either reign, an ancestor or kinsman (not the baron himself)	13	8	0.62	0.61	1.00
Either reign, including collateral branches and inherited honours	15	13	0.54	0.65	0.35
Rebellion on favor (either reign), full controls	0.096 (<i>p</i> = 0.32); with county fixed effects 0.095 (<i>p</i> = 0.38)				
<i>Panel B: The baron's family held a shrievalty</i>					
Sheriff under Henry II (1154–88)	9	6	0.60	0.62	1.00
Sheriff under Richard I (1189–99)	8	9	0.47	0.65	0.27
Either reign	12	12	0.50	0.66	0.22
Either reign, an ancestor or kinsman (not the baron himself)	10	8	0.56	0.63	0.60
Either reign, including the mother's and wife's families	22	18	0.55	0.67	0.28
Rebellion on shrievalty (either reign), full controls	0.078 (<i>p</i> = 0.34); with county fixed effects 0.121 (<i>p</i> = 0.21)				

Table Notes: Active barons of 1215 (56 rebels by the end of June 1215, 35 loyalists). Panel A: a family is favored if it supplied one of the leading lay witnesses to the king's charters under Henry II or under Richard I (the latter from Heiser's tabulation). Panel B: a family held a shrievalty if one of its members was appointed sheriff of an English county in 1154–99, from the Public Record Office's *List of Sheriffs* (1898); deputies and the palatinates of Durham and Chester are excluded. In both panels families are matched to the 1215 baron by patriline: the baron himself, his father, grandfather, brother or uncle, or another member of his paternal line; the last row of each panel adds matches outside the patriline. p from Fisher's exact test. The regressions are linear probability models of rebellion on the either-reign indicator with the full controls of Table 1, column (5). Favored families that rebelled: Geoffrey II de Say; Geoffrey de Mandeville; Gilbert fitz Reinfrid; Giles de Braose; Henry de Bohun; Nicholas I de Stuteville; Robert Fitzwalter; Roger II Bigod; Roger de Cressy; Saer de Quincy; Walter III de Dunstanville; William II Malet; William II de Forz; William III de Lanvaley. Favored families that stayed loyal: Fulk II Paynel; Hugh I de Balliol; John I Marshal; Ranulf III de Blondeville; Thomas Basset; Walter II de Lacy; Warin fitz Gerold; William I Briwerre; William I Marshal; William IV d'Aubigny; William Longespee. Sheriffs' families that rebelled: Eustace de Vesci; Geoffrey de Mandeville; Gilbert fitz Reinfrid; Giles de Braose; Henry II d'Oilly; John fitz Robert; Nicholas I de Stuteville; Robert I de Vere; Robert I fitz Pain; Robert Mauduit; William I de Beauchamp; William III d'Aubigny. Sheriffs' families that stayed loyal: Henry Fitzcount; John I Marshal; Matthew fitz Herbert; Robert II de Vaux; Thomas Basset; Walter II de Beauchamp; Walter II de Clifford; William I Briwerre; William I Marshal; William II de Ferrers; William Longespee; William de Redvers.

declared of full age in 1227, and we have surviving witness lists for the period between 1227 and 1239. While some of the barons who had been involved in 1215 had died by this point (but were not executed), many were still alive. Of these, Henry relied more on barons who had been loyal to his father. He used them to witness 55% of royal charters witnessed by a Magna Carta-era baron. But he also did not fully exclude those barons who had rebelled against his father. They were involved in witnessing nearly 20% of charters witnessed by a Magna Carta-era baron (Figure A6a). We obtain similar numbers when we include the children of Magna Carta-era barons

Table A18: Castles destroyed by Henry II, and the holders’ heirs in 1215

Castle	Destroyed	Holder	Heir among the barons of 1215	Side in 1215
<i>After Henry II’s accession, 1155</i>				
Cleobury	1155	Hugh de Mortimer	Hugh II de Mortimer	Loyal
<i>After the revolt of 1173–74</i>				
Brackley	1173	Robert, earl of Leicester	– (no male heir in 1215)	–
Mountferrant	1173	Fossard	– (no 1215 descendant)	–
Huntingdon	1174	Earl of Huntingdon	David, earl of Huntingdon	Rebel
Weston Turville	1174	Turville	– (no 1215 descendant)	–
Allington	1175	Allington	– (no 1215 descendant)	–
Duffield	1175	William de Ferrers, earl of Derby	William II de Ferrers	Loyal
Framlingham	1175	Hugh Bigod, earl of Norfolk	Roger II Bigod	Rebel
Tutbury	1175	William de Ferrers, earl of Derby	William II de Ferrers	Loyal
Bungay	1176	Hugh Bigod, earl of Norfolk	Roger II Bigod	Rebel
Dudley	1176	Gervase Paganel	Fulk II Paynel (related branch)	Loyal
Grobby	1176	Robert, earl of Leicester	– (no male heir in 1215)	–
Kirkby Malzeard	1176	Roger de Mowbray	William de Mowbray	Rebel
Leicester	1176	Robert, earl of Leicester	– (no male heir in 1215)	–
Thirsk	1176	Roger de Mowbray	William de Mowbray	Rebel
Families with an heir among the barons of 1215: 6; rebelled in 1215: 3; stayed loyal: 3				

Table Notes: Baronial castles recorded as destroyed or demolished in 1154–56 and 1173–77 in Cappelen and Hariri’s digitization of Brown (1959)’s census of English castles (ownership spells 1154–1216). Not listed: 4 church castles destroyed in 1155 and 5 royal or episcopal castles destroyed in 1173–77. Brown’s census largely omits the short-lived castles of Stephen’s reign, so the 1155 destructions are understated. Holders are matched to the 1215 barons through their paternal line; Dudley’s Paganel were a branch of the Paynel family. The earldom of Leicester had no male heir in 1215. Bungay’s holder is not recorded in the digitization; it was a Bigod castle.

(Figure A6b).

D.4 Family Networks

As discussed in the main text, family networks played a critical role in early 13th century England. Historians concur that family networks played a role in the formation of the rebel and loyal coalitions in the lead-up to Magna Carta and specifically that “[f]amily allegiances in a closely interrelated aristocracy extended the ranks of the malcontents” (Lloyd, 1972, 263).

We manually constructed each baron’s family network using the WikiTree data described in Appendix B. That is, for every baron, we identify the other barons that are within 16 network connections, where connections are direct blood ties. We call the barons within 16 connections of the target baron the target baron’s family network.

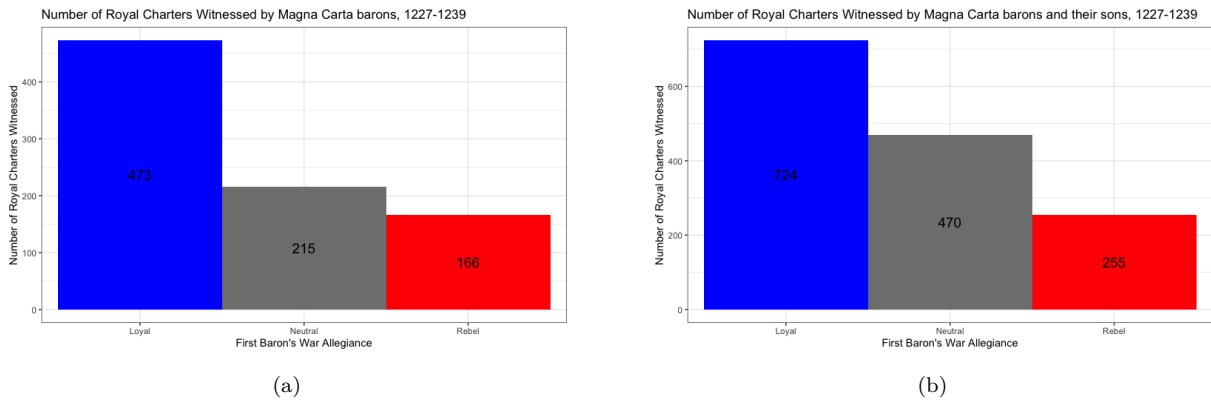
We divide the baron’s family network by allegiance (rebel, loyalist, and inactive), and construct the total number of resources within the family network by allegiance. The resources we are interested in are the number of castles (the baron’s non-appropriable resources) and the number

Table A19: Was allegiance hereditary? Earlier conflicts, close kin, and the next generation

<i>Panel A: the patriline's side in earlier conflicts, by the baron's side in 1215</i>			
	Rebels	Loyalists	<i>p</i>
<i>The Anarchy, 1135–54 (n = 32)</i>			0.71
Matilda (the Angevin side)	10	7	
Stephen	5	3	
Switched sides	3	4	
<i>Henry II's reign, incl. the revolt of 1173–74 (n = 42)</i>			0.54
With the king	19	16	
With the rebels of 1173–74	3	1	
Switched sides	1	2	
<i>Panel B: pairs of active 1215 barons, by distance in the family network</i>			
	Pairs	Opposite sides	Share
Related within 1–2 links (parent, child, sibling, spouse)	13	5	0.38
Related within 3 links	32	7	0.22
Related within 4 links	38	18	0.47
Related within 5 links	74	34	0.46
Share expected if sides were unrelated to kinship			0.48
<i>Panel C: the next generation, by the family's side in 1215</i>			
	Active barons	Rebelled	Share
<i>Revolution of 1258 (Fisher $p = 0.24$)</i>			
Family rebelled in 1215	6	5	0.83
Family loyal in 1215	5	2	0.40
<i>Second Barons' War, 1264 (Fisher $p = 1.00$)</i>			
Family rebelled in 1215	15	6	0.40
Family loyal in 1215	7	3	0.43

Table Notes: Panel A: the side taken by the baron's patriline in each episode (hereditary military prominence data, Appendix G), for the rebels (in rebellion by the end of June 1215) and loyalists of 1215 whose patriline is side-coded; p from a χ^2 test. Descent from a line that ever backed a challenger to the king is reported in Table A34. In the Anarchy, Matilda's was the Angevin side, the side of John's own grandmother. Panel B: pairs of active 1215 barons (rebels and loyalists) linked in the family network used to build Castles in Rebel Network, by the number of links between them; the last row is the share of rebel–loyalist pairs among all pairs of active barons. Panel C: barons active in 1258 and 1264 whose family was involved in 1215, from the Henry III baron data (Table 5); p from Fisher's exact test.

Figure A6: Evidence from Royal Witness Lists



The number of royal charters witnessed by Magna Carta-era barons and their children (by allegiance) in the early reign of Henry III.

of markets and fairs (a measure of commercial wealth) within a baron's family network.

For an illustrative example, we can consider Nicholas I de Stuteville. He was a rebel against John in 1215, but not a rebel leader. The baronial network is a fairly dense one, so he has 94 other barons within 16 connections of himself. 29 of them rebelled in 1215, 19 of them remained loyal, and 46 were inactive. One of those rebels in his family network was Eustace de Vesci, who was 2 connections away from him. On the loyal side, William Marshal, the Earl of Pembroke and loyalist leader, was 12 connections away. Within his family network, Stuteville had 17 rebel castles and 21 loyalist castles, and 80 rebel-associated markets and 89 loyalist-associated markets.

Figure A7 depicts the entire elite network in 1215. Large red circles denote the barons in our dataset. Small circles denote their family members.

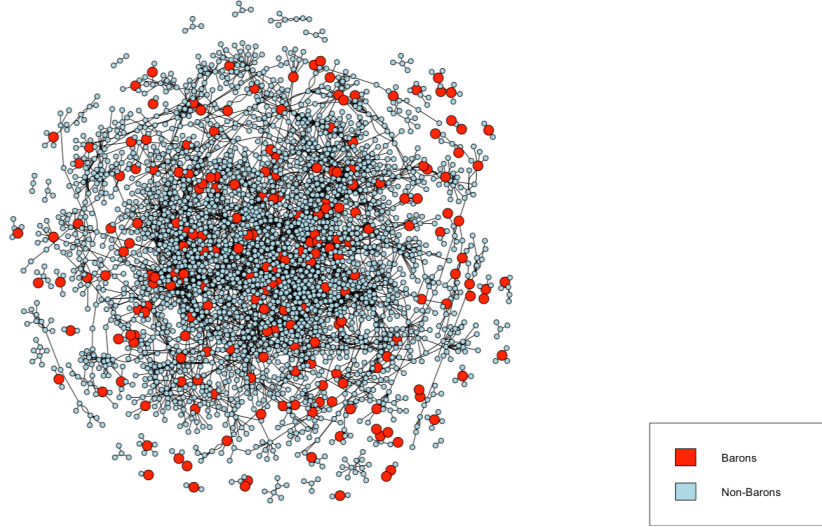


Figure A7: The Elite Network in 1215. Data source: see main text and Appendix.

In Table A8 we simply explore the relationship between various measures of network centrality and opposition to King John in 1215. As expected, barons who were closely connected to the king (column 1) or highly central to the network (columns (4)-(6)) were less likely to join the rebellion. Barons more closely related to other loyalists were likely to stay loyal (column (2)); barons more closely related to other rebels were more likely to rebel (column 3).

We also demonstrate that our results are robust when we vary the size of the network. In our main analysis we allow family networks to include up to 16 degrees of connectivity. In Table A14

we use the unweighted count of castles held by rebel kin and restrict the family network to kin within 16, 12 and 10 links. The coefficient is significant at the 5 percent level in every column, with and without controls. Per standard deviation of the measure, the effect with full controls is 0.105 at 16 links, 0.095 at 12 links and 0.090 at 10 links, close to the 0.10 of the inverse-distance measure in Table 1.

D.4.1 Castles of close kin

Table A20: Castles Held by Rebel Kin Within Five Links

Also controlled	Opposed John in 1215		
	(1) —	(2) Loyal kin castles	(3) Number of kin
Rebel kin castles, within five links	0.102** (0.046) [0.041] 186	0.129*** (0.047) [0.048] 186	0.146* (0.074) [0.081] 186
Barons			
Full controls, county FE	✓	✓	✓

Table Notes: Linear probability models of opposing John in 1215, with the full controls of Table 1, column (5), including county fixed effects. The regressor is the number of castles held in 1215 by rebel kin within five links of the family network, equally weighted. Coefficients and standard errors are for one standard deviation. Allegiance and position placebos are in Table A22. Robust standard errors in parentheses; standard errors clustered on fast-greedy communities in square brackets (89 clusters; barons with no community form one group). Stars refer to the robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Summed over the whole family network, as in Table 1, the castles of rebel kin are close to a count of how many kin a baron has: the correlation between the two is 0.98. Once that count is controlled the whole-network measure loses its effect (Table A21, row 1/ d), so the whole-network measure cannot by itself tell the castles of rebel kin from the number of kin. The correlation falls as the reach shortens, from 0.99 at 13 or 16 links to 0.81 at five and 0.54 at three. Among close kin the two can therefore be separated.

Table A21 reports the estimates at each reach. At five links the measure predicts rebellion (0.080 per standard deviation without fixed effects, 0.102 with them, both $p < 0.05$), and the estimate rises when the number of kin is controlled (0.125 and 0.146; $p = 0.03$ and 0.05). At three links the measure is positive but small and noisy; at seven or more it again moves with the number of kin, and the estimate controlling for the count is unstable. Table A22 shows that the five-link estimate survives using only high-confidence castles, counting Bedford as Beauchamp's,

and clustering on network communities; dropping the earls leaves it positive (0.080 and 0.084, $p = 0.06$ and 0.10). Restricted to rebels and loyalists (91 barons) it is positive but imprecise alone and larger once the number of kin is controlled. Reshuffling which kin were rebels gives placebo p -values of 0.020 to 0.079 with county fixed effects, including 0.030 when the number of kin is controlled; reshuffling network positions gives 0.001 to 0.042.

The test has limited power. With the number of kin controlled, the robust standard error is 0.057–0.074 per standard deviation, so the smallest effect we could detect with 80 percent power at the 5 percent level is about 0.16–0.21 per standard deviation, larger than the estimates themselves. We read the five-link result as a stable, moderate effect that the sample cannot fully separate from the number of close kin.

Table A21: Castles of rebel kin, by how far the kin reach

Kin within (links)	Barons > 0	$r(\text{number of kin})$	Alone		+ number of kin	
			No FE	County FE	No FE	County FE
3	24	0.54	0.017 (0.036)	0.033 (0.042)	0.036 (0.037)	0.045 (0.045)
5	58	0.81	0.080** (0.037)	0.102** (0.046)	0.125** (0.057)	0.146* (0.074)
7	71	0.88	0.052 (0.039)	0.080* (0.043)	0.069 (0.066)	0.072 (0.081)
9	78	0.96	0.060* (0.036)	0.085** (0.042)	0.013 (0.109)	-0.082 (0.127)
13	84	0.99	0.070** (0.035)	0.106** (0.044)	0.025 (0.221)	-0.084 (0.290)
16	85	0.99	0.066** (0.033)	0.101** (0.042)	-0.507 (0.335)	-0.683** (0.343)
1/ d , whole graph (Table 1)	85	0.98	0.065* (0.036)	0.104** (0.046)	-0.051 (0.137)	-0.053 (0.179)
1/ d^2 , whole graph	85	0.71	0.007 (0.033)	0.044 (0.043)	-0.019 (0.037)	-0.001 (0.049)
$e^{-0.5d}$, whole graph	85	0.83	0.033 (0.039)	0.062 (0.051)	0.033 (0.058)	0.039 (0.075)

Table Notes: Each cell is one linear probability model of opposing John in 1215 with the full controls (186 barons). The regressor is the number of castles held in 1215 by rebel kin within the stated number of links, equally weighted, or over the whole graph with the stated distance weights; coefficients and robust standard errors are for one standard deviation. “+ number of kin” also controls for the number of kin within the same reach, weighted in the same way. $r(\text{number of kin})$: the correlation of the measure with that count. Barons > 0: barons with at least one castle among rebel kin within the reach. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

D.4.2 The land of rebel kin, weighted by soil suitability

Table A23 re-estimates Table 3 with each 1086 holding weighted by the GAEZ wheat suitability of its land rather than by its 1086 value. Across holdings the two weights are almost uncorrelated

Table A22: Castles of rebel kin within five links: robustness and placebo networks

<i>Panel A: robustness</i>					
	Alone		+ number of kin		Barons
	No FE	County FE	No FE	County FE	
Five links (Table A20)	0.080** (0.037)	0.102** (0.046)	0.125** (0.057)	0.146* (0.074)	186
High-confidence castles only (86)	0.089** (0.038)	0.112** (0.047)	0.135** (0.057)	0.158** (0.074)	186
Bedford counted as Beauchamp's	0.079** (0.037)	0.102** (0.046)	0.127** (0.058)	0.152** (0.076)	186
Rebels and loyalists only	0.052 (0.038)	0.094 (0.079)	0.173*** (0.060)	0.266** (0.132)	91
Earls dropped	0.080* (0.042)	0.084* (0.051)	0.132** (0.060)	0.172** (0.069)	168
Community-clustered standard errors	0.080*** (0.029)		0.125** (0.056)		186
<i>Panel B: placebo networks (county FE)</i>					
	Estimate	Placebo mean	[5th, 95th percentile]	Placebo p	
Allegiance reshuffled					
Alone	0.102	0.036	[-0.016, 0.100]	0.046	
+ loyal kin castles	0.129	0.030	[-0.043, 0.114]	0.020	
+ number of kin	0.146	-0.011	[-0.127, 0.112]	0.030	
+ both	0.124	-0.009	[-0.124, 0.111]	0.079	
Network position reshuffled					
Alone	0.102	0.000	[-0.053, 0.056]	0.001	
+ loyal kin castles	0.129	0.000	[-0.065, 0.073]	0.001	
+ number of kin	0.146	0.000	[-0.090, 0.095]	0.009	
+ both	0.124	0.001	[-0.097, 0.104]	0.042	

Table Notes: Rebel kin castles within five links, per standard deviation, full controls; robust standard errors in parentheses except in the last row of Panel A (fast-greedy communities; no FE version only). High-confidence castles only: the 80 of the 84 castles whose attribution is high-confidence, plus the six castles held in wardship or custody by barons in the sample (86) (own castles also on that list). Bedford: coded royal by Brown; the row counts it as William de Beauchamp's, who held it as hereditary constable in 1215 (Painter, 1949, p. 71 n. 4). Panel B: 2,000 draws; allegiance reshuffles which kin were rebels or loyalists and rebuilds the measures; position reshuffles the measures across barons. The placebo p is the share of draws at least as large in absolute value as the estimate. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

($r = 0.01$), so this version measures how much of the kin's land lay within reach of a rebel castle rather than how valuable it was. The pattern is the same: protected kin land predicts rebellion within 5, 10 and 20 km, unprotected kin land does not, and the relationship fades at 50 and 150 km. The estimates are less precise than with the 1086 value, and the difference between protected and unprotected land is not statistically significant ($p = 0.11$ – 0.14 within 20 km).

Table A23: The Land of Rebel Kin, Protected and Unprotected, Weighted by Soil Suitability

Rebel kin's land, protected if within	Opposed John in 1215				
	5 km	10 km	20 km	50 km	150 km
	(1)	(2)	(3)	(4)	(5)
Protected (near a rebel castle)	0.072* (0.043) [0.044]	0.066* (0.037) [0.036]	0.057* (0.031) [0.031]	0.033 (0.034) [0.041]	0.012 (0.012) [0.015]
Unprotected	-0.033 (0.029) [0.030]	-0.037 (0.030) [0.029]	-0.035 (0.030) [0.030]	-0.017 (0.040) [0.050]	0.007 (0.024) [0.028]
Protected – unprotected	0.105 (0.072)	0.103 (0.065)	0.092 (0.060)	0.050 (0.073)	0.005 (0.030)
Barons (rebels)	186 (56)	186 (56)	186 (56)	186 (56)	186 (56)
Full controls, county FE	✓	✓	✓	✓	✓

Table Notes: As Table 3, except that each located 1086 holding is weighted by the GAEZ wheat suitability of its cell (one holding on a no-data cell takes the mean of its neighbors) rather than by its 1086 value. Each regressor is the inverse hyperbolic sine of the sum, over the baron's rebel kin, of the soil suitability of their protected or unprotected holdings, each kinsman weighted by the inverse of his network distance to the baron; the baron's own protected and unprotected holdings are weighted in the same way. Linear probability models with the full controls of Table 1, column (5), and county fixed effects. Robust standard errors in parentheses; standard errors clustered on fast-greedy communities in square brackets. Stars refer to the robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

E Wealth versus Non-Appropriability

An important question is whether our castle measure proxies for general wealth and status rather than for non-appropriability. This appendix collects the evidence that distinguishes the two. The organizing idea is that wealth and non-appropriability, though correlated (wealth is a precondition for building and garrisoning a castle), are distinct: wealth is what the king could appropriate, whereas a castle is what made resources defensible against appropriation. The empirical implications are that (i) the castle coefficient should survive controls for wealth, measured in whatever way; (ii) measures of appropriable wealth should not positively predict rebellion; and (iii) where the appropriable and non-appropriable components of the same asset can be separated, only the latter should matter.

E.1 Construction of the wealth measures

Each wealth measure is built at the baron level and enters our regressions as the baron's *own* wealth, alongside Castles in Rebel Network. Where a source does not record a given barony we set the measure to zero, the same convention throughout; the coverage of each source is noted below and summarized in Table A24, and Table A27 reports every result on the covered barons

alone as well.

Domesday 1086 honour value: We match each barony in Sanders (1960) to its constituent Domesday manors in Palmer’s electronic edition of Domesday Book and sum the recorded 1086 annual values (in pounds) to a baron-level honour value. The measure is available for 70 of the 186 barons—the honours whose Domesday antecedents can be traced—and zero-imputed for the remainder.

Cartae Baronum and the scutage assessments: The 1166 Cartae Baronum return of knights’ fees is the assessment we also use as the “Knights owed” control; we enter it here as a wealth measure and add, from the pipe-roll scutage assessments, two later sub-period series spanning 1168–72 and 1190–1210. Together these record the assessed feudal and fiscal capacity of a barony at three dates. Coverage is 111, 103, and 108 baronies respectively.

Urban wealth of nearby towns: As a distinct, commercial measure we digitize Alan Dyer’s ranking lists of English medieval towns (Dyer, 2000, in the *Cambridge Urban History of Britain*, vol. 1), take the 1334 lay-subsidy assessment (in pounds) of each ranked town, geolocate the towns, and assign to each barony the summed taxable size of the ranked towns within 10 km of its caput. Barons could not tax these boroughs—they paid the crown directly—so the measure proxies the commercial development of a baron’s neighborhood rather than his own receipts. It is available for the 41 baronies with a ranked town nearby.

Table A24: Coverage of the wealth measures

Measure	Source	Covered (of 186)
Domesday 1086 honour value	Domesday Book (Palmer) $\times$ Sanders (1960)	70
Cartae 1166 knight fees	Cartae Baronum 1166	111
Cartae 1168–72 fees	Pipe-roll scutage assessments	103
Cartae 1190–1210 fees	Pipe-roll scutage assessments	108
Urban wealth of nearby towns	Dyer (2000); 1334 lay subsidy	41

Table Notes: “Covered” is the number of the 186 barons for whom the source records the measure; the remainder are zero-imputed.

E.2 Wealth as a precondition for castle-holding

Before turning to rebellion, we address a prior question: did wealth predict who held a castle at all? It should have. Castles were expensive to build and more expensive to keep up, and Painter

(1961a, 127) attributes the decline in their number over the twelfth century largely to the cost of maintenance. A baron with no resources could not have sustained a stronghold.

Table A25 confirms this. Each row regresses a baron’s own castle count on his own (log) wealth, adding county fixed effects and then geography. Every measure of the baron’s *own* landed and fiscal wealth is positively and significantly associated with castle-holding in the full specification, and the number of Domesday watermills, the measure closest to manorial capital, is the most closely correlated with it (0.010 per mill, $p < 0.01$; $r = 0.39$). The two *locational* measures behave differently, as they should: the urban wealth of nearby towns is insignificant on its own and becomes significant only once county fixed effects are added (0.073, $p = 0.045$; 0.066, $p = 0.084$ with geography), and market access carries no association at all. Neither describes what a baron owned; both describe where his caput happened to sit.

Two features of this table matter for what follows. First, wealth was indeed a precondition for possessing a castle, and we do not claim otherwise. Second, the table bounds how much work that precondition can do. The raw correlations between wealth and the castle count run from 0.14 to 0.39, so wealth accounts for a small share of the variation in castle-holding. A precondition is not a proxy. It is precisely because the two are distinct in this way that the test below is informative: if Castles in Rebel Network merely picked up the wealth of the baron himself—wealthy barons having wealthy, castle-holding kin—then adding his own wealth would absorb the castle coefficient.

E.3 The baron’s own wealth, measured seven ways

Table A26 reproduces Table 2 of the main text and adds, in Panel B, the measures entered jointly. The castle coefficient is 0.049 with the landed and fiscal measures together and 0.041 when the urban measures are added.

Table A27 adds the baron’s own wealth to our preferred specification (Table 1, column 5), one measure at a time. Four measures capture his landed and fiscal wealth between 1086 and 1210: the Domesday honour value and the three Cartae series. The other two are commercial and locational: the taxable size (1334 lay subsidy) of the ranked towns within 10 km of his caput—boroughs he could not tax, which paid the crown directly—and his market access to the medieval urban system (Appendix F).

Table A25: Wealth is a precondition for castle-holding at the baron level.

Period	Wealth measure	Bivariate	+County FE	+Geography	$r(\text{count})$	$r(\text{any})$
1086	Domesday 1086 honour value (log)	0.152*** (0.044)	0.132*** (0.046)	0.132*** (0.042)	0.36	0.28
1166	Cartae 1166 knight fees (log)	0.064 (0.039)	0.104** (0.043)	0.106** (0.042)	0.14	0.08
1168–72	Cartae 1168–1172 (log)	0.071* (0.040)	0.110** (0.044)	0.105** (0.041)	0.16	0.09
1190–1210	Cartae 1190–1210 (log)	0.066* (0.040)	0.102** (0.043)	0.101** (0.041)	0.14	0.09
1334	Urban wealth of nearby towns (log)	0.017 (0.027)	0.073** (0.037)	0.066* (0.038)	0.04	0.11
1086	Domesday 1086 watermills (number)	0.012*** (0.003)	0.009*** (0.003)	0.010*** (0.003)	0.39	0.31
–	Market access, whole urban system (log)	0.080 (0.211)	0.483 (0.360)	0.279 (0.373)	0.03	-0.02

Table Notes: The dependent variable is the baron’s number of castles; each row enters one wealth measure (in logs, except the number of watermills). Columns 3–5 add county fixed effects and then geography controls (ruggedness, soil suitability, coast/river/road access). The final two columns report the raw Pearson correlation of the wealth measure with the castle count and with an indicator for holding any castle. Each wealth measure is zero-imputed where the source does not cover the baron. $N = 186$; heteroskedasticity-robust (HC1) standard errors in parentheses. The castle count is the number of castles held in 1215 (90 castles, 51 holders). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Across all barons, with each measure set to zero where its source is silent, the castle coefficient lies between 0.048 and 0.065, against 0.061 with no wealth control. It is significant at the 5 percent level in every row except two: with the Domesday honour value it is 0.048 ($p = 0.09$), and with the urban wealth of nearby towns 0.055 ($p = 0.054$). Of the baron’s own wealth measures, only the Domesday honour value is associated with his rebellion (0.038, $p = 0.03$), and it is the measure most correlated with the castle measure ($r = 0.49$). None of the other measures approaches significance ($p \geq 0.14$).

Zero-imputation does not drive these results. The right-hand columns of Table A27 restrict each regression to the barons whose source records them. The baron’s own wealth is insignificant in every covered row ($p \geq 0.70$). On these samples, however, the castle coefficient is small and imprecise (-0.004 to 0.037), and it is equally so *before* any wealth measure is added (-0.004 to 0.016). Samples of 69 to 111 barons do not reproduce the castle coefficient of the full specification,

Table A26: Castles in the Rebel Network, Controlling for the Baron’s Own Wealth: Each Measure Alone and Jointly

Baron’s own wealth measure added	Castles in Rebel Network	Baronial wealth measure	N	Adj. R^2
<i>Panel A: one measure at a time</i>				
None (Table 1, column 5)	0.0611** (0.0282) [0.0273]	—	185	0.335
Domesday 1086 honour value (log)	0.0483* (0.0281) [0.0278]	0.0379** (0.0173) [0.0207]	185	0.354
Cartae 1168–72 fees (log)	0.0614** (0.0282) [0.0279]	-0.0142 (0.0172) [0.0187]	185	0.333
Cartae 1190–1210 fees (log)	0.0613** (0.0283) [0.0278]	-0.0100 (0.0173) [0.0190]	185	0.332
Income c. 1200 (log)	0.0609** (0.0283) [0.0275]	-0.0598 (0.0534) [0.0608]	185	0.335
Urban wealth within 10 km, 1334 (log)	0.0554* (0.0287) [0.0272]	0.0197 (0.0133) [0.0124]	185	0.339
Market access to the urban system (log)	0.0609** (0.0284) [0.0278]	-0.1011 (0.1571) [0.1429]	185	0.333
Travel cost to nearest town	0.0610** (0.0283) [0.0274]	-0.0111 (0.0715) [0.0605]	185	0.330
Distance to nearest town (km)	0.0589** (0.0279) [0.0263]	-0.0064* (0.0035) [0.0031]	185	0.347
<i>Panel B: measures entered jointly</i>				
Landed and fiscal wealth together (Domesday, both Cartae sub-periods)	0.0489* (0.0283) [0.0285]	see notes	185	0.347
Landed, fiscal and urban together (adds urban wealth, market access, distance to town)	0.0408 (0.0287) [0.0271]	see notes	185	0.363

Table Notes: Each row adds the baron’s own wealth measure(s) named in the first column to the specification of Table 1, column (5): Castles in Rebel Network, personal grievances, baron, geographical, economic and military controls, and county fixed effects, with listwise deletion. The dependent variable is Opposed John in 1215. Domesday 1086 honour value, the Cartae fees of 1168–72 and 1190–1210, and income c. 1200 are the baron’s own holdings (logs; zero where the baron has no recorded holding; income c. 1200 is non-zero for only two barons). Urban wealth is the 1334 lay-subsidy wealth of towns within 10 km of the baron’s caputs; market access to the urban system follows Donaldson and Hornbeck (2016) as implemented by Jedwab et al. (2024) (Appendix F); travel cost and distance are to the nearest of the 89 main towns from any of the baron’s caputs. Knight fees in the Cartae of 1166, markets and fairs, and the baron’s own castles are omitted as rows because they are already controls in every row. Panel A reproduces Table 2. In Panel B the own-wealth coefficients are not shown individually: Domesday honour value is 0.037 (0.018) and 0.038 (0.017), distance to the nearest town is -0.0061 (0.0039) in the second row, and no other measure has $p < 0.10$. Robust standard errors are in parentheses and standard errors clustered at the fast-greedy community level (89 clusters, the 22 unassigned barons forming one) in square brackets; stars for statistical significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

but adding the baron’s own wealth to them changes nothing. The urban measure has no covered sample in this sense: a barony with no ranked town within 10 km has a genuine zero, and the 41 barons with such a town are too few to estimate the full specification with county fixed effects.

Table A27: Castles in the rebel network, controlling for the baron’s own wealth, on the full and on the covered samples.

Period	Own wealth measure added	All barons (zero-imputed)			Barons the source covers			
		Castles in Rebel Network	Own wealth	N	Castles in Rebel Network (no wealth)	Castles in Rebel Network	Own wealth	N
–	None (Table 1, column 5)	0.0611** (0.0282) [0.0273]		185				
1086	Domesday 1086 honour value (log)	0.0483* (0.0281) [0.0278]	0.0379** (0.0173) [0.0207]	185	0.0157 (0.0756) [0.0717]	0.0367 (0.1126) [0.1107]	–0.0479 (0.1459) [0.1338]	69
1166	Cartae 1166 knight fees (log) ^a	0.0646** (0.0287) [0.0289]	–0.0033 (0.0148) [0.0162]	185	0.0015 (0.0449) [0.0416]	–0.0020 (0.0445) [0.0415]	0.0135 (0.0425) [0.0450]	111
1168–72	Cartae 1168–72 fees (log)	0.0614** (0.0282) [0.0279]	–0.0142 (0.0172) [0.0187]	185	–0.0039 (0.0528) [0.0484]	0.0012 (0.0543) [0.0521]	–0.0217 (0.0582) [0.0569]	103
1190–1210	Cartae 1190–1210 fees (log)	0.0613** (0.0283) [0.0278]	–0.0100 (0.0173) [0.0190]	185	–0.0033 (0.0489) [0.0452]	–0.0043 (0.0484) [0.0459]	0.0074 (0.0531) [0.0558]	108
1334	Urban wealth of nearby towns (log) ^b	0.0554* (0.0287) [0.0272]	0.0197 (0.0133) [0.0124]	185	–	–	–	–
–	Market access to the urban system (log) ^c	0.0609** (0.0284) [0.0278]	–0.1011 (0.1571) [0.1429]	185	–	–	–	–

Table Notes: Each row adds the baron’s *own* wealth, measured one way, to the preferred specification of Table 1, column 5 (Castles in Rebel Network, personal grievances, geography, public opposition by January 1215, own castles, number of baronies, knights owed, markets and fairs, military ability and experience, county fixed effects). Columns 3–5 use all barons, with the measure set to zero where the source does not record the barony; columns 6–9 restrict to the barons the source records, reporting the castle coefficient on that sample without and then with the wealth measure. Heteroskedasticity-robust standard errors in parentheses; standard errors clustered on fast-greedy network communities in brackets (the barons assigned to no community form one cluster). Listwise deletion, as in Table 1, drops the one baron with no record of public opposition, so the Domesday sample is 69 rather than 70. ^a The 1166 return is also the source of the “knights owed” control; this row replaces that control with the log of the 1166 return, so it is not entered twice. ^b A barony with no ranked town within 10 km has a genuine zero rather than a missing value, so there is no covered sample to restrict to; the 41 barons with a ranked town nearby are too few to estimate the specification with county fixed effects (adjusted $R^2 = 0.999$), and we do not report that column. ^c Market access is strictly positive for every barony, so there are no imputed zeros; Bairoch travel costs, $\sigma = 1$ (Table A33 reports the other parameterizations). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (robust standard errors).

Two remarks. First, we treat markets and fairs as wealth, not as a non-appropriable resource; the baron’s own markets and fairs are among the controls of every specification. Second, the

baron's *own* castles, knights owed, and markets and fairs do not significantly predict his rebellion in the preferred specification (Table 1, column 5: -0.030 , $p = 0.43$; 0.0002 , $p = 0.34$; -0.029 , $p = 0.11$). The signal lies in the castle holdings of the rebel network, as the collective-action mechanism requires, not in the baron's individual wealth.

On the 41 barons with a ranked town within 10 km of a caput, with the controls of Figure 6, the urban wealth of nearby towns does not predict rebellion either (0.349 per standard deviation of its log, $p = 0.33$).

E.4 Appropriability as distance from a stronghold: the barons' own holdings

Appropriability, in our framework, is not an intrinsic property of land but a function of its distance from a defensible stronghold: the same acre is non-appropriable at the castle gate and appropriable twenty kilometers away. We test this on the lands the barons actually held. Section E.4.1 describes how each baron's 1086 holdings are located. Section E.4.2 reports the test of Table A28: holdings near the castles of loyalists. Section E.4.3 reports a second design, which interacts the exposure of a baron's own holdings to royal castles with the castles of his rebel kin, and its placebo. Section E.4.4 reports the earlier test on soil quality by distance from the caput.

E.4.1 Locating the 1086 holdings

Matching baronies to Domesday: We link each 1215 barony in Sanders (1960) to the Domesday tenant-in-chief, or the part of his fee, from which it descends, and take that holder's entries in the Hull electronic edition of Domesday Book (Palmer, 2010). This matching extends the one behind our Domesday honour value (Appendix E.1). Every link carries a grade:

- A Sanders names the 1086 holder and he corresponds to a single entry in the Domesday database;
- B the link is secure but needs a choice: between namesakes (by region), or of the part of a fee that formed the barony;
- C the descent runs through a forfeiture and regrant, or through a sub-tenancy, so that the 1086 honour is attached to the place rather than inherited;
- P the barony was created after 1086 and is linked through its named component manors;

D no usable link (dropped).

The 84 new rows are graded A 24, B 9, C 22, P 17 and D 12. Every filter was re-applied independently, and the row counts and 1086 values reproduce for all 84. The 13 rows first graded B were coded a second time, blind, and checked against the *Victoria County History*; four were moved to C. The C and P rows have not had this second coding, which is one reason they enter only the wider samples.

Locating the holdings: Each link’s filter selects its holdings in the database, and each holding is located from its Ordnance Survey grid reference: 10,730 of 12,243 holdings (88 percent), in 141 baronies. Holdings are spread out. In 69 of these baronies the median holding lies 36 km from its caput, and only 65 percent of an honour’s value lies within 50 km of it. In 404 entries the same value appears on several holder rows (0.8 percent of all value); we leave these as recorded.

Continuity to 1215: A 1086 honour is a good guide to a 1215 barony only if the barony still centered on it. We therefore keep an honour only if one of its 1086 holdings lies within 5 km of the 1215 caput: 130 of the 137 cohort honours pass. We locate each caput from the Domesday grid reference of the caput or the Ordnance Survey reference of its castle (for two baronies with no caput, from the value-weighted center of the 1086 fee). Three caputs remain uncertain (Ashby, Ashfield and the lordship of Westmorland).

Samples: Table A28 uses links graded A, B and C, 136 barons. Table A29 also reports the most secure links, graded A and B (114 barons), and the widest sample, which adds grade P (144 barons).

E.4.2 Holdings near loyalist castles

In the model the king recovers what rebels hold by assembling a coalition of loyalists, so land within reach of a loyalist’s castle is land that coalition could seize if its holder rebelled. We call a baron’s 1086 holding *threatened* if it lies within 10 km of a castle held in 1215 by another baron who stayed loyal, and *protected* if it lies within 10 km of a rebel-side castle: another rebel’s, or the baron’s own, which would be a rebel castle if he joined. Allegiance enters only through the other barons’ castles. Table A28 splits the 1086 value of each baron’s holdings into four classes (threatened only, protected only, both, and neither) and enters all four with the full

Table A28: Which Castles Matter? The Barons' Own Holdings

<i>The baron's own 1086 holdings within 10 km, by the castles nearby</i>		
	Opposed John in 1215	
	(1)	(2)
Holdings weighted by	1086 value	soil suitability
Near a loyalist castle only	-0.058* (0.030) [0.031]	-0.017* (0.009) [0.009]
Near a rebel-side castle only	-0.004 (0.029) [0.030]	-0.000 (0.009) [0.009]
Both – Loyalist	0.108* (0.065) [0.065]	0.042** (0.018) [0.016]
Barons	136	136
Full controls, county FE	✓	✓

Table Notes: Linear probability models of opposing John in 1215, with the full controls of Table 1, column (5), including county fixed effects. Each baron's 1086 holdings are those of the Domesday honours from which his baronies descend (Sanders, 1960). A holding is near a castle if it lies within 10 km of it. Loyalist castles are those of other barons who were loyal to John in June 1215; rebel-side castles are those of other barons who were in rebellion by the end of June 1215 and the baron's own, whichever side he took. In column (1) each regressor is the inverse hyperbolic sine of the 1086 value (in pounds) of the baron's holdings in that class; in column (2) it is the inverse hyperbolic sine of the sum, over the same holdings, of the GAEZ low-input rain-fed wheat suitability of the cell in which each holding lies (the layer of the aggregate soil control). Across holdings, suitability is uncorrelated with 1086 value ($r = 0.01$). Both columns use the barons whose barony can be linked to a Domesday honour by descent: links graded A and B (descent most secure) and regrants and sub-tenancies (grade C). Baronies created after 1086 and linked only through their named component manors (grade P) are excluded. Holdings near neither kind of castle are included in every regression but not shown. "Both – Loyalist" is the difference between the coefficients on holdings near both kinds of castle and near a loyalist castle only. Robust standard errors in parentheses; standard errors clustered on fast-greedy communities in square brackets (70 clusters). Stars refer to the robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

controls and county fixed effects. Value near a loyalist castle and no rebel-side castle is negatively associated with rebellion (-0.058 , $p = 0.053$), and value near both kinds of castle exceeds it by 0.108 ($p = 0.096$). Table A29 reports the threatened-only and both coefficients in three samples of linked honours, at other radii and with royal castles counted as threats. With county fixed effects the threatened-only coefficient is -0.045 to -0.058 at 10 km and shrinks toward zero at 25 and 50 km (-0.010 to -0.027); without them it is -0.026 to -0.029 at 10 km and insignificant. With county fixed effects it disappears when holdings near royal castles also count as threatened (-0.011 to 0.007). Royal castles were garrisoned for the king, so if the mechanism were the king's reach this is the variant one would expect to work best. It does not, which suggests that what matters is proximity to the castles of loyal *barons*. We read Table A28 as a pattern consistent with the mechanism, and not as a test that excludes the alternatives.

Table A29: Holdings near loyalist castles: radius and royal castles

Links used	(1) A, B	(2) A, B, C	(3) A, B, C, P
<i>Without county fixed effects</i>			
10 km (Table A28)			
Near a loyalist castle only	-0.027 (0.023)	-0.029 (0.023)	-0.026 (0.022)
Near both kinds of castle	0.076 (0.061)	0.067 (0.050)	0.062 (0.052)
25 km			
Near a loyalist castle only	0.003 (0.021)	-0.005 (0.020)	-0.008 (0.019)
Near both kinds of castle	0.017 (0.027)	0.009 (0.020)	0.017 (0.019)
50 km			
Near a loyalist castle only	0.014 (0.019)	0.001 (0.018)	-0.002 (0.018)
Near both kinds of castle	-0.018 (0.030)	-0.007 (0.022)	-0.003 (0.020)
10 km, royal castles also count as threats			
Near a loyalist castle only	-0.004 (0.031)	-0.017 (0.029)	-0.010 (0.026)
Near both kinds of castle	0.011 (0.059)	0.014 (0.050)	0.006 (0.050)
<i>With county fixed effects</i>			
10 km (Table A28)			
Near a loyalist castle only	-0.055 (0.036)	-0.058* (0.030)	-0.045 (0.029)
Near both kinds of castle	0.061 (0.071)	0.050 (0.052)	0.067 (0.054)
25 km			
Near a loyalist castle only	-0.020 (0.040)	-0.013 (0.030)	-0.010 (0.028)
Near both kinds of castle	0.006 (0.037)	0.004 (0.027)	0.018 (0.025)
50 km			
Near a loyalist castle only	-0.027 (0.033)	-0.027 (0.027)	-0.016 (0.026)
Near both kinds of castle	0.040 (0.056)	0.015 (0.035)	0.019 (0.031)
10 km, royal castles also count as threats			
Near a loyalist castle only	0.007 (0.060)	-0.011 (0.044)	0.007 (0.038)
Near both kinds of castle	0.015 (0.069)	0.010 (0.054)	0.025 (0.055)

Table Notes: Linear probability models of opposing John in 1215 with the full controls, with and without county fixed effects. The specification is that of Table A28, column (1): the inverse hyperbolic sine of the 1086 value of the baron's holdings in four classes—near a loyalist castle only, near both a loyalist and a rebel-side castle, near a rebel-side castle only, and near neither—where loyalist castles are the 1215 castles of other barons who stayed loyal and rebel-side castles those of other barons who rebelled and the baron's own. The last two classes are in the regressions but not shown. Columns differ in the Sanders–Domesday links used: grades A and B (114 barons), A, B and C (136, the sample of Table A28), and A, B, C and P (144). In the last block of each panel a holding within 10 km of a royal castle standing in 1215 also counts as threatened. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

E.4.3 Exposure of the baron's own holdings and the castles of his rebel kin

A baron whose own land lies within reach of the king should need more help to rebel, and so respond more to the castles of his rebel kin. We call a 1086 holding *seizable* if it lies within 25 km of a royal castle standing in 1215 and more than 25 km from every 1215 castle of the barony's holders, and measure a baron's exposure as the seizable share of his 1086 value. T1 interacts exposure with rebel kin castles (the measure of Table 1, standardized); T2 enters the seizable and total 1086 wealth of rebel kin within five links. We use 25 km; 15 and 40 km are robustness checks.

Table A30 reports the results. The T1 interaction has the predicted positive sign in every sample and every variant: 0.343 with county fixed effects in the sample of links graded A and B ($p = 0.039$), 0.192 ($p = 0.25$) and 0.199 ($p = 0.18$) in the wider ones. But the placebo that reshuffles which kin were rebels reproduces it almost exactly: its mean is 0.324, 0.197 and 0.189, and the centered p -values are 0.66, 0.88 and 0.78. The positive interaction is therefore produced by the way the variables are built, not by allegiance, and it is no evidence for the mechanism. The larger and more significant interactions at 15 and 40 km should be read the same way: the placebo was run only for the 25 km radius, and nothing suggests the construction behaves differently at the others. T2 is null in every sample, and its estimates are close to their placebo means.

E.4.4 Soil quality by distance from the caput

Before the holdings could be located, we tested the same idea on soil quality. For every Sanders caput we construct ring (donut) means of agro-climatic wheat suitability at 0–10 km (within a garrison's reach), 10–25 km, and 25–50 km (the same measure, out of reach), and replace the aggregate soil control of Table 1 with them. The inner and outer rings are far from collinear (correlation 0.47 across caputs). Table A31 reports the result. Soil quality near the caput does not predict rebellion, alone or interacted with the baron's own castle-holding. Soil quality 25–50 km away does: it is negatively and significantly associated with rebellion in every column (-0.324 , -0.296 and -0.273). That is the sign one would expect if good land beyond a garrison's reach is what a rebel stands to lose. But we did not predict it, and it rests on a single soil measure.

Table A30: Exposure of the baron's own holdings and the castles of his rebel kin

Links used	(1) A, B	(2) A, B, C	(3) A, B, C, P
<i>T1: exposure $\times$ rebel kin castles (per SD), the interaction</i>			
25 km	0.314** (0.158)	0.207 (0.141)	0.210* (0.123)
15 km	0.393** (0.154)	0.391*** (0.144)	0.341** (0.139)
40 km	0.545*** (0.181)	0.444*** (0.167)	0.385*** (0.124)
25 km, all honours	0.309** (0.154)	0.190 (0.137)	0.197 (0.120)
25 km, shares by number of holdings	0.357** (0.149)	0.221 (0.141)	0.249** (0.118)
Placebo mean, 25 km row	0.287	0.195	0.188
Placebo p (centered)	0.610	0.736	0.396
25 km, county FE	0.343** (0.166)	0.192 (0.166)	0.199 (0.148)
15 km, county FE	0.375* (0.197)	0.344* (0.193)	0.348** (0.172)
40 km, county FE	0.618*** (0.131)	0.471*** (0.161)	0.435*** (0.126)
25 km, all honours, county FE	0.331* (0.171)	0.179 (0.167)	0.185 (0.149)
25 km, shares by number of holdings, county FE	0.381** (0.156)	0.218 (0.167)	0.244 (0.150)
Placebo mean, 25 km row, county FE	0.324	0.197	0.189
Placebo p (centered), county FE	0.663	0.876	0.783
Barons, 25 km row	114	136	144
<i>T2: rebel kin's seizable 1086 wealth, given their total (five links)</i>			
25 km	-0.067 (0.083)	-0.060 (0.084)	-0.039 (0.045)
15 km	-0.031 (0.052)	-0.021 (0.052)	-0.031 (0.042)
40 km	-0.005 (0.097)	-0.011 (0.099)	-0.028 (0.038)
25 km, all honours	-0.041 (0.082)	-0.027 (0.084)	-0.037 (0.045)
25 km, shares by number of holdings	-0.051 (0.093)	-0.042 (0.096)	-0.020 (0.076)
Placebo mean, 25 km row	-0.076	-0.046	-0.023
Placebo p (centered)	0.960	0.918	0.808
25 km, county FE	-0.019 (0.087)	-0.014 (0.087)	-0.024 (0.047)
15 km, county FE	-0.000 (0.053)	0.004 (0.053)	-0.015 (0.044)
40 km, county FE	-0.019 (0.104)	-0.018 (0.106)	-0.040 (0.037)
25 km, all honours, county FE	0.015 (0.087)	0.038 (0.086)	-0.018 (0.046)
25 km, shares by number of holdings, county FE	-0.003 (0.103)	0.005 (0.106)	0.000 (0.083)
Placebo mean, 25 km row, county FE	-0.068	-0.042	-0.022
Placebo p (centered), county FE	0.679	0.779	0.964
Barons, 25 km row	186	186	186

Table Notes: Linear probability models of opposing John in 1215 with the full controls. A 1086 holding is *seizable* if it lies within R km of a royal castle standing in 1215 and more than R km from every 1215 castle of the barony's holders; a baron's exposure is the seizable share of his 1086 value. T1 interacts exposure with rebel kin castles (the network measure of Table 1, standardized) and also enters both main effects and the baron's own asinh 1086 value. T2 enters rebel kin's seizable and total 1086 wealth within five links (all 186 barons). Placebo: 2,000 draws that reshuffle which kin were rebels, for the 25 km row; centered p . The placebo means show that the positive interaction in T1 is produced by the construction of the variables, not by allegiance. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

With the rings in place of the aggregate soil control, the castles-in-rebel-network coefficient is 0.053 ($p = 0.058$), against 0.064 ($p = 0.024$) in the same sample with the aggregate control.

Replacing agro-climatic suitability with a contemporary measure, the assessed 1086 value of the Domesday holdings within 10 km of the caput and 10–50 km beyond, gives a different pattern. Here it is *nearby* value that is negatively associated with rebellion: -0.168 ($p = 0.012$) without the castle measure, and -0.144 ($p = 0.037$) with it; on the 160 barons with Domesday holdings in the rings, -0.168 ($p = 0.024$) and -0.140 ($p = 0.072$). Value 10–50 km away is unrelated to rebellion. The castle coefficient is 0.050 ($p = 0.079$). The two measures of land therefore disagree about where the negative association lies, and we do not treat either as evidence for the mechanism. Both show that the castle coefficient does not stand in for the quality or value of the land around a baron’s caput.

Table A31: Land quality decomposed by distance from the caput.

	Rings alone	Ring $\times$ castle	Rings + castle
Soil, 0–10 km (protected reach)	0.037 (0.054)	0.043 (0.061)	0.041 (0.053)
Soil, 25–50 km (out of reach)	-0.324^{**} (0.127)	-0.296^{**} (0.129)	-0.273^{**} (0.131)
Soil (0–10 km) $\times$ own castle		-0.028 (0.074)	
Castles in rebel network			0.053* (0.028)
Standard controls, county FE	✓	✓	✓
Observations	186	186	186

Table Notes: Ring means of GAEZ low-input rain-fed wheat suitability (scaled 0–10) in donuts around the caput; full standard controls (aggregate soil control replaced by the ring components) and county fixed effects; standard errors clustered by baron. Castles in Rebel Network is the number of castles held by rebel kin in 1215, each weighted by the inverse of network distance; own castle-holding is from the same 1215 castle list; the ring means are taken from the GAEZ v3 raster (the layer of the aggregate soil control), which cover all 186 barons. With the aggregate soil control in place of the rings, the castle coefficient in the same sample is 0.064 (0.028). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

E.5 Watermills as an appropriable asset

Domesday watermills are fixed capital whose renders were itemized manor by manor and could be farmed or confiscated without destroying the asset. Table A32 adds the number of watermills the baron held in 1086 to our preferred specification (Table 1, column 5). The number of mills

he held does not predict his rebellion (0.0011, $p = 0.50$, across all barons; -0.0005 , $p = 0.87$, on the Domesday-covered barons), and with it the castle coefficient is essentially unchanged (0.058, against 0.061). On the Domesday-covered barons neither the castle coefficient nor the watermill count is significant, with or without the watermills.

Table A32: Domesday 1086 watermills: the baron’s own holdings.

	All barons		Domesday-covered barons	
	(1)	(2)	(3)	(4)
Castles in Rebel Network	0.0611** (0.0282) [0.0273]	0.0582** (0.0286) [0.0278]	0.0157 (0.0756) [0.0717]	0.0194 (0.0808) [0.0697]
Own watermill count		0.0011 (0.0017) [0.0018]		-0.0005 (0.0031) [0.0036]
Observations	185	185	69	69
Adjusted R^2	0.335	0.333	0.098	0.066

Table Notes: The specification is that of Table 1, column 5 (full controls and county fixed effects), adding the number of the baron’s own Domesday 1086 watermills (columns 2 and 4). Columns 1–2 use all barons, with zero watermills where Domesday does not record the barony; columns 3–4 restrict to the barons whose Domesday holdings are traced. Heteroskedasticity-robust standard errors in parentheses; standard errors clustered on fast-greedy network communities in brackets.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (robust standard errors).

In Domesday, mills are part of the manor, so the watermill count belongs with the landed wealth measures rather than at the appropriable extreme.

E.6 Warfare in the First Barons’ War was fought over castles

The preceding subsections separate castles from wealth. A complementary question is why castles, specifically, are the non-appropriable resource in our model: they were the decisive military asset of the period, the object over which warfare was actually waged. The civil war that broke out when John repudiated Magna Carta—the First Barons’ War of 1215–17—makes this concrete. We code the 60 recorded military engagements of that war by type. Only three were pitched battles. Twenty-eight were formal sieges, and a further twenty-six were other actions at castles—surrenders, captures, and slightings—so that 54 of the 60 engagements (90 percent) were fought at a castle (Figure A8). Control of the realm turned on control of its castles, not on victory in open battle. This is exactly what our framework requires: a castle was the resource a baron could defend and hold against the king, so the military contest was a contest over castles.

It is on this basis that we take the number of castles as the proxy for a baron’s non-appropriable resources.

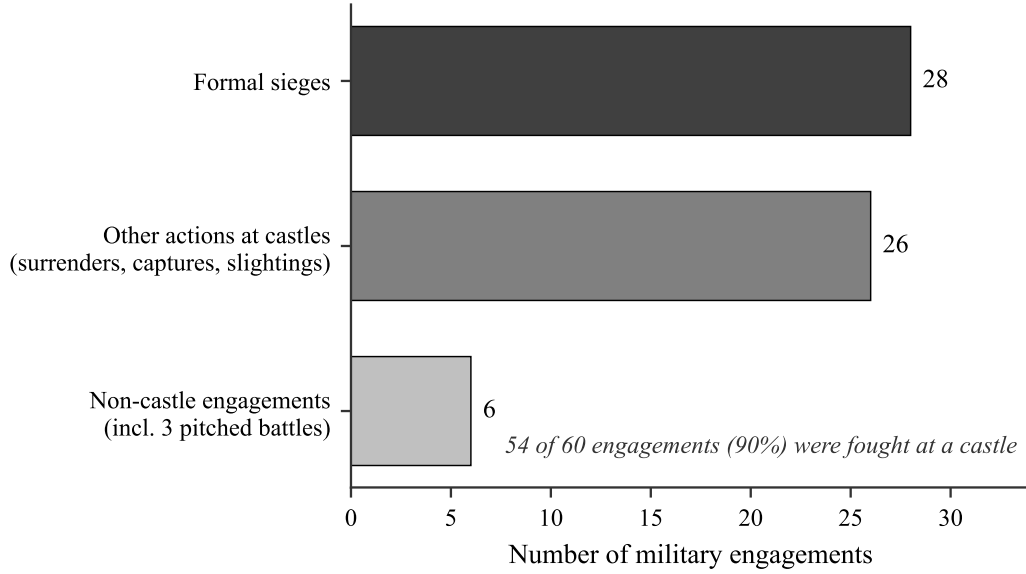


Figure A8: Military engagements of the First Barons’ War (1215–17), by type. Of the 60 recorded engagements, 54 (90 percent) were fought at a castle—28 formal sieges and 26 other actions at castles (surrenders, captures, slightings)—while only 6 were non-castle engagements, of which just 3 were pitched battles. Engagements coded from narrative accounts of the war.

F Market Access as a Wealth Measure

A further wealth measure complements the six of Appendix E: the *market access* of a baron’s caput. The measure follows the market-access approach of Donaldson and Hornbeck (2016); specifically, we follow its implementation for medieval Europe in Jedwab et al. (2024). For each baron we compute

$$MA_i = \sum_j \frac{\text{pop}_j}{\tau_{ij}^\sigma},$$

summing over the medieval urban system—the ranked English towns of Dyer (2000), sized by the 1377 poll tax, together with the Scottish towns from Bairoch—where τ_{ij} is the least-cost travel cost from the caput to town j . Travel costs are computed over a 10 km friction grid that assigns each cell the cheapest medieval transport technology available there—Roman roads, medieval trade routes, navigable rivers, and coastal sea lanes, with overland portage as the

outside option—exactly as in Jedwab et al. (2024). The measure enters our regressions at the baron level, as the baron’s own market access.

Market access is a particularly demanding test for two reasons. First, unlike the sparser landed and fiscal sources, it is continuous and strictly positive for every barony—access to the urban system is never exactly zero—so there are no imputed zeros and the coverage concerns discussed above do not arise. Second, it has strong face validity: the barony with the greatest market access is that of William Hardel, mayor of London and one of the twenty-five sureties of the Charter, while the lowest values fall to the far-northern and Welsh-march baronies remote from the towns.

Table A33 adds the baron’s own market access to our preferred specification (Table 1, column 5). Market access carries no independent association with rebellion (insignificant in every row, $p \geq 0.44$), while the castle coefficient is unchanged at 0.059–0.061 (all $p < 0.05$), against 0.061 with no market-access control. This holds across all four standard travel-cost parameterizations and under both a low ($\sigma = 1$) and a high ($\sigma = 3.8$) distance-decay elasticity, and it is likewise unchanged when towns are sized by their pre-plague (Bairoch 1300) populations rather than the 1377 poll tax (castle coefficient 0.059–0.061, market access $p \geq 0.39$). Commercial access to the urban system, like landed wealth, fiscal wealth, and manorial capital, does not account for the association between the castles of a baron’s rebel network and his rebellion.

Table A33: Market access as a wealth measure: the baron's own market access.

Travel cost	σ	Castles in Rebel Network	Own log market access	N	Adj. R^2
Bairoch	1	0.0609** (0.0284) [0.0278]	-0.1011 (0.1571) [0.1429]	185	0.333
Bairoch	3.8	0.0607** (0.0287) [0.0277]	0.0023 (0.0138) [0.0129]	185	0.330
Boerner-Pryor-McCormick	1	0.0610** (0.0283) [0.0272]	0.1318 (0.2709) [0.2118]	185	0.332
Boerner-Pryor-McCormick	3.8	0.0588** (0.0288) [0.0274]	0.0151 (0.0194) [0.0165]	185	0.333
Masschaele	1	0.0610** (0.0283) [0.0273]	0.0496 (0.1851) [0.1507]	185	0.331
Masschaele	3.8	0.0593** (0.0287) [0.0275]	0.0101 (0.0148) [0.0134]	185	0.333
Campbell-Galloway-Murphy	1	0.0608** (0.0282) [0.0272]	0.0704 (0.1378) [0.1164]	185	0.332
Campbell-Galloway-Murphy	3.8	0.0593** (0.0287) [0.0275]	0.0085 (0.0123) [0.0113]	185	0.333

Table Notes: Each row adds the baron's own log market access, $MA_i = \sum_j \text{pop}_j / \tau_{ij}^\sigma$, over the medieval urban system, to the specification of Table 1, column 5 (full controls and county fixed effects), under four travel-cost parameterizations (Bairoch; Boerner-Pryor-McCormick; Masschaele; Campbell-Galloway-Murphy) and two distance-decay elasticities ($\sigma = 1$, $\sigma = 3.8$). Towns are sized by the 1377 poll tax (English) and Bairoch 1300 populations (Scottish). Heteroskedasticity-robust standard errors in parentheses; standard errors clustered on fast-greedy network communities in brackets.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (robust standard errors).

G Hereditary Military Prominence

G.1 Motivation

The instrumental-variables strategy in the main text instruments the castles of the potential rebels in a baron's family network with the castles held by their fathers and by their grandfathers. The exclusion restriction requires that ancestral castle-holding affect a baron's decision to rebel in 1215 only through the non-appropriable resources available to the rebel coalition, and not through any other channel. The most serious candidate for such a channel is the possibility that

military strength was a heritable family characteristic. The families that built and acquired castles in the eleventh and twelfth centuries may have been militarily formidable families, and if martial capability, or a martial disposition, was transmitted from father to son, then the castles of a baron’s ancestors could be correlated with an unobserved family trait that itself raises the probability of rebellion. If that were the case, the instruments would be invalid. Figure A9 sets out this threat as a causal graph.

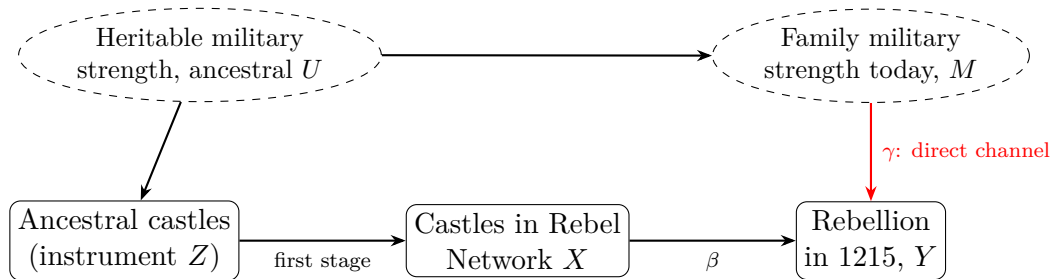


Figure A9: The exclusion-restriction threat as a causal graph. Solid boxes are observed; dashed ellipses are latent. The IV exploits the path $Z \rightarrow X \rightarrow Y$. The threat is the back-door path $Z \leftarrow U \rightarrow M \rightarrow Y$: ancestral castles Z are a legacy of ancestral military strength U , which is inherited as the family’s present-day strength M . The exclusion restriction fails only if M raises rebellion *directly* (the red arrow $\gamma \neq 0$) and Z proxies M ($\text{Cov}(Z, M) \neq 0$); this appendix targets the red arrow.

Our response is to make the allegedly unobserved characteristic observable and to examine the channel directly. If military capability was transmitted within families, it should be visible in the historical record: the militarily prominent families of Norman and Angevin England are precisely the families whose deeds the chronicles, and the modern biographical literature built upon them, record in detail. This appendix describes the construction of a baron-level measure of hereditary military prominence for the full regression sample, presents its distribution across the allegiance groups of 1215, reports its correlation with castle-holding and with the instruments themselves, and explains how the measure enters the revised empirical analysis.

G.2 Construction of the measure

Ancestral lines: For each of the 186 barons in the regression sample we reconstruct the patriline—the baron’s father, his father’s father, and so on—as far back as the generation of the Norman Conquest, where the sources permit. We code descent along the biological male line, including illegitimate links, for two reasons: a heritable characteristic is transmitted through biological descent rather than through the legal succession to a barony, and the instruments are

constructed from the castles of the biological father and grandfather, so the measure must follow the same line. For 33 families the succession to the honour departs from the male line at some point within our window—through an heiress, a regrant, or an illegitimate link—and we flag these families so that the coding can be repeated on the succession line as a robustness exercise. Genealogies are reconstructed from WikiTree and cross-checked against the Oxford Dictionary of National Biography (ODNB) and the standard genealogical references. Five barons have no reconstructable patriline and enter the data with all cells missing.

Episodes: We code each ancestral generation against the four major episodes of armed conflict between the Conquest and the accession of King John: (i) the Conquest and its consolidation, 1066–71; (ii) the wars of Henry I, including the conflict with Robert Curthose that culminated at Tinchebrai in 1106; (iii) the civil war of Stephen’s reign (the Anarchy), 1135–54; and (iv) the reign of Henry II, including the great revolt of 1173–74. A person is assigned to an episode if he was an adult during any part of it, and the baron himself (generation zero) is included for episodes that fell within his own adult lifetime before 1189.

Cell-level coding: The unit of coding is the person-by-episode cell; there are 676 such cells. A cell is coded *prominent* (equal to one) when the sources document the person’s own military participation or leadership in the fighting of that episode—commanding or serving in a battle or siege, holding or taking a castle in the conflict, or raising and leading a contingent. Documented non-participation is coded zero. Where no record of any kind survives, the cell is coded missing rather than zero, so that silence in the sources is never treated as evidence of military insignificance; 258 of the 676 cells are missing on this rule. Where the sources permit, we additionally code the *side* on which the person fought: for the king, for a challenger to the king (Curthose against Henry I; the Empress Matilda during the Anarchy; the rebels of 1173–74), or switching between them. Where the patriline ancestor of a generation was a minor or absent and a brother or uncle in the male line carried the family’s military role in the episode, the cell reflects that agnatic head, and the source field records this explicitly. Every cell carries a source citation and a confidence grade.⁴⁰

⁴⁰The coding draws on the ODNB, chronicle-based standard narratives, and the established county and family histories.

Baron-level variables: The family’s value for an episode is the maximum over the patriline persons alive in that episode. From the episode values we construct: (i) four episode indicators; (ii) a *hereditary military prominence index*, the number of episodes (zero to four) in which the family was prominent, computed over non-missing episodes and set to missing when all four episodes are missing; (iii) a variant of the index that treats missing episodes as zeros; (iv) a two-generation variant restricted to the father and grandfather generations, which are the generations from which the instruments are constructed; and (v) an indicator for whether the patriline *ever backed a challenger* to the reigning king, equal to one if any side-coded cell records service for Curthose, for Matilda, or with the rebels of 1173–74, missing for barons with no side-coded cells, and again carried in both missing-aware and zero-filled variants.

G.3 *Hereditary military prominence and allegiance in 1215*

Table A34 presents the measure by the allegiance of the barons in 1215. Three features of the table are directly relevant to the exclusion restriction. First, hereditary military prominence is present on both sides of the conflict, and the loyalist barons are on average *more* prominent than the rebels: the mean index is 1.06 among loyalists against 0.88 among rebels (1.00 against 0.79 when missing episodes are treated as zeros). Second, the loyalist advantage holds episode by episode and is largest in the two episodes nearest to 1215: among families with an observed record, 57 percent of loyalist families were prominent in the Anarchy against 44 percent of rebel families, and 39 percent of loyalist families were prominent under Henry II against 24 percent of rebel families. Only for the Conquest generation, five generations before 1215 and the episode from which most baronial families of any standing descend, do the rebel families show a higher share. Third, even a family history of fighting *against* the reigning king does not predict rebellion: among barons whose ancestors’ sides are recorded, 52 percent of loyalists and 52 percent of rebels alike descend from a line that at some point backed Curthose, Matilda, or the rebels of 1173–74. Whatever military capability or disposition traveled down these families’ lines, it did not sort barons into the rebel coalition of 1215.

Table A34: Hereditary military prominence of the 1215 baronage, by allegiance

	Rebels	Loyalists	Neutrals
Barons in the regression sample	56	35	95
with at least one episode observed	50	33	35
<i>Hereditary military prominence index (0–4)</i>			
Mean among observed patriline	0.88	1.06	0.34
Mean treating unobserved episodes as zero (all barons)	0.79	1.00	0.13
Prominent in father/grandfather generations (n)	18	13	5
<i>Prominent, by episode (share of observed patriline, %)</i>			
Conquest, 1066–71	52	36	57
Henry I’s wars (incl. Curthose)	18	32	19
The Anarchy, 1135–54	44	57	40
Henry II’s reign (incl. 1173–74 revolt)	24	39	3
<i>Patriline ever backed a challenger to the king</i>			
Share among side-coded patriline (%)	52	52	15
(counts)	16/31	12/23	2/13

Table Notes: One observation per baron in the 186-baron regression sample; allegiance in 1215 is the baron-level classification used in the main analysis: rebels were in rebellion by the end of June 1215, loyalists were loyal to John in June 1215, and the remaining barons are neutral. The index counts the episodes (of four) in which the baron’s patriline was militarily prominent; a family with no surviving record for an episode is coded missing, not zero, and “observed” rows condition on at least one non-missing episode. “Backed a challenger” means that the patriline fought for Curthose against Henry I, for Matilda during the Anarchy, or with the rebels of 1173–74. Episode-level denominators vary because observability varies by episode.

G.4 Correlation with castle-holding and with the instruments

For the measure to discipline the exclusion restriction, it must be related to the variables whose exogeneity is in question; a measure of family military quality that was uncorrelated with castle-holding could not carry a test of this concern. Table A35 therefore reports the correlation of the prominence measures with the baron’s own castles in 1215, with the two ancestral-castle instruments, and with the assessed knight’s fee.

Three facts emerge. First, hereditary military prominence is positively and moderately correlated with castle-holding: the index correlates at 0.26 with a baron’s own castles in 1215 (0.34 in the zero-filled variant), and families higher on the index held more castles: families scoring zero or one held about half a castle on average in 1215, families scoring two to four between one and two. This confirms the premise of the concern: castle-holding and family military prominence are indeed related attributes of the same great families. Second, the prominence of the father

and grandfather generations—the generations from which the instruments are built—correlates at 0.30 to 0.33 with the instruments themselves. The instruments are therefore genuinely related to the family characteristic at issue, and the tests described below are informative rather than vacuous. Third, the component of the measure that most directly encodes an inherited disposition to oppose the king—descent from a line that backed a challenger—is uncorrelated with the instruments: the correlations are -0.19 and -0.14 and statistically indistinguishable from zero. At the same time, correlations of 0.3 imply that castle-holding and military prominence share roughly ten percent of their variance, so the castle measures are far from being a proxy for family military quality.

Table A35: Correlation of hereditary military prominence with castle-holding and with the instruments

	Prominence index		Two-generation prominence	Challenger-backing
	missing-aware	zero-filled		
Castles held by the baron in 1215	0.26** (118)	0.34** (186)	0.26** (104)	0.19 (67)
Instrument: father-generation castles	0.24* (81)	0.22* (86)	0.30** (75)	-0.19 (53)
Instrument: grandfather-generation castles	0.27* (81)	0.25* (86)	0.33** (75)	-0.14 (53)
Assessed knight's fee	0.24* (118)	0.27** (186)	0.12 (104)	0.13 (67)

Table Notes: Pearson correlation coefficients; the number of barons over which each correlation is computed is in parentheses. “Two-generation prominence” is the indicator for prominence in the father or grandfather generation; “challenger-backing” is the missing-aware indicator for descent from a line that backed a challenger to the king. Sample sizes vary because the missing-aware measures are defined only for barons with observed cells and because the instruments are defined for the subsample used in the instrumental-variables analysis. The instruments are the castles held by the fathers (respectively grandfathers) of the potential rebels in a baron’s family network, as in the main instrumental-variables tables. The assessed knight’s fee is the measure of economic capacity described in Appendix B. Spearman rank correlations are similar in magnitude and identical in sign. Castles are those of the 1215 castle map used in the main analysis. * $p < 0.05$, ** $p < 0.01$.

G.5 Use in the empirical analysis

We incorporate the measure into the identification analysis in three ways. First, as a balance test: we examine whether the instruments are related to hereditary military prominence conditional on the baseline controls, which is the direct analogue, for this particular confounder, of the balance exercises reported for the other pre-determined characteristics. Second, as a control: we re-estimate the instrumental-variables specifications including the prominence index (and,

separately, the challenger-backing indicator) as regressors. If the effect we attribute to ancestral castles in fact operated through inherited military capability, including the direct measure of that capability should attenuate the castle coefficients; stability of the coefficients indicates the opposite. Third, we complement the controlled specifications with a formal sensitivity analysis following Cinelli and Hazlett (2020), which asks how strong an unobserved confounder would have to be—in terms of the share of residual variation it explains in *both* castle-holding and rebellion—to overturn the result.

The balance test does not come out as one might have hoped. The instruments are strongly related to hereditary military prominence, and remain so after conditioning on the baseline controls and on ancestral wealth. This is what one would expect if castles and martial standing descend together along the same patriline, and we read it as confirming that the measure captures the family trait at issue rather than noise—which is what makes the exercises that follow informative. The one component unrelated to the instruments is descent from a line that backed a challenger to the king, the component that most directly encodes an inherited disposition to oppose the crown. The identification argument accordingly rests not on balance but on the absence of a direct effect: conditional on the 1215 distribution of castles, hereditary prominence does not predict rebellion, and adding it to the instrumental-variables specifications leaves the castle coefficient essentially unchanged (father’s castles: 0.040 at baseline, 0.046 with prominence, 0.043 with prominence and wealth; $p = 0.056, 0.056$ and 0.074). If anything, the coefficient rises when prominence is controlled. These controlled estimates are reported in full in Table A36. The descriptive evidence of Table A34 points the same way: a characteristic more common among the king’s supporters than among his opponents is not a plausible confounding channel from ancestral castles to rebellion.

Table A36 reports the instrumental-variables estimates with direct controls for the family characteristics through which ancestral castles might affect rebellion other than through the castles of 1215: ancestral wealth, measured by the Domesday value of the baron’s honour in 1086 and by its knight fees in the Cartae of 1166 (the latter in the generations from which the instruments are built); hereditary military prominence; and ancestral royal favor. The controls enter one at a time and then together. With county fixed effects, as in our preferred specification,

the estimate with the father's castles as instrument is 0.061 at baseline, 0.061 with the Cartae fees, 0.053 with both wealth measures, 0.056 with prominence, 0.059 with royal favor and 0.052 with all of them ($p = 0.013, 0.013, 0.039, 0.051, 0.021$ and 0.084). None of the added controls predicts rebellion (all $p \geq 0.13$).

Table A36: Instrumental Variables with Controls for Ancestral Wealth, Prominence and Royal Favor

Instrument	Opposed John in 1215			
	Father's castles		Grandfather's castles	
County FE	(1)	(2)	(3)	(4)
Baseline (controls of Table 4)	0.0401*	0.0613**	0.0368*	0.0597**
	(0.0210)	(0.0247)	(0.0206)	(0.0242)
	[0.0209]	[0.0254]	[0.0198]	[0.0255]
+ Domesday 1086 honour value	0.0359	0.0532**	0.0321	0.0511**
	(0.0220)	(0.0256)	(0.0214)	(0.0250)
	[0.0216]	[0.0268]	[0.0201]	[0.0267]
+ Cartae 1166 knight fees	0.0399*	0.0613**	0.0364*	0.0588**
	(0.0209)	(0.0248)	(0.0203)	(0.0241)
	[0.0209]	[0.0259]	[0.0197]	[0.0257]
+ Domesday 1086 and Cartae 1166	0.0357	0.0529**	0.0316	0.0500**
	(0.0218)	(0.0257)	(0.0211)	(0.0248)
	[0.0218]	[0.0272]	[0.0202]	[0.0268]
+ hereditary military prominence	0.0457*	0.0562*	0.0420*	0.0543*
	(0.0239)	(0.0288)	(0.0234)	(0.0279)
	[0.0237]	[0.0297]	[0.0217]	[0.0290]
+ ancestral royal favor	0.0381*	0.0591**	0.0343*	0.0572**
	(0.0210)	(0.0255)	(0.0204)	(0.0249)
	[0.0201]	[0.0253]	[0.0187]	[0.0252]
+ all of the above	0.0411*	0.0515*	0.0364	0.0478*
	(0.0238)	(0.0297)	(0.0228)	(0.0283)
	[0.0234]	[0.0317]	[0.0208]	[0.0303]
Effective F (range across rows)	766–1126	419–677	747–1090	423–684

Table Notes: Two-stage least squares estimates of the coefficient on Castles in Rebel Network, instrumented as in Table 4, with the controls of that table. Each row adds the named controls. Domesday 1086 honour value is the log value of the baron's 1086 predecessor honour plus an indicator for Domesday coverage; Cartae 1166 knight fees are in logs; hereditary military prominence is the 0–4 index of Table A34 with missing episodes coded zero; ancestral royal favor indicates that the baron's family supplied one of the leading lay witnesses to the charters of Henry II or Richard I (Table A17). None of the added controls is significant ($p \geq 0.13$ throughout). Robust standard errors in parentheses; standard errors clustered on fast-greedy communities in square brackets. Stars refer to the robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A37 reports the sensitivity analysis. In the full-controls specification an unobserved confounder would have to explain 12.5 percent of the residual variance in both castle-holding and rebellion to drive the castle coefficient to zero, and 14.2 percent once county fixed effects are included.

Table A37: Sensitivity of the castle effect to an unobserved confounder

	Full controls	Full controls + county FE
Castle coefficient	+0.0411	+0.0543
Partial R^2 of castles with rebellion	0.018	0.023
Robustness value, $RV_{q=1}$	0.125	0.142

Notes: Sensitivity of the OLS castle coefficient to an unobserved confounder, following Cinelli and Hazlett (2020). $RV_{q=1}$ is the share of residual variance in both castle-holding and rebellion that a confounder must explain to drive the estimate to zero. Standard errors are clustered by baron. $N = 186$ throughout. The castle variable is Castles in Rebel Network, the number of castles held by rebel kin in 1215, each weighted by the inverse of network distance.

H The Castles Instrument and Geography

If the ancestral castles that make up our instrument had been built where geography favored rebellion, the instrument could affect rebellion through geography rather than through the castles of 1215. Table A38 regresses each instrument on the geographical characteristics of the baron's holdings: each variable on its own, all of them together, and all of them together with county fixed effects. Ruggedness, coastal and river access, Roman roads and travel cost to London are unrelated to either instrument. Soil quality is positively related to both, but only without fixed effects, and the six variables are jointly insignificant in every specification. Soil quality is among the controls in all our IV estimates.

Table A38: The Castles Instrument and Geography

	Fathers' Castles in Rebel Network			Grandfathers' Castles in Rebel Network		
	(1) Each alone	(2) Jointly	(3) Jointly	(4) Each alone	(5) Jointly	(6) Jointly
Average Ruggedness	-0.0024 (0.0945)	-0.0679 (0.1173)	-0.1338 (0.1397)	0.0003 (0.0062)	-0.0025 (0.0076)	-0.0072 (0.0090)
Average Soil Quality (GAEZ)	2.4031** (1.1109)	2.5625** (1.2500)	1.9603 (1.2951)	0.1617** (0.0773)	0.1683* (0.0860)	0.1271 (0.0855)
Coastal	6.2826 (5.1187)	3.5344 (5.5384)	1.6350 (7.0491)	0.3704 (0.3304)	0.2004 (0.3522)	0.0870 (0.4446)
Riverine	3.4418 (4.2546)	1.7629 (4.2441)	-3.5907 (6.1635)	0.2211 (0.2744)	0.1107 (0.2723)	-0.2934 (0.3977)
Roman Road	8.3221 (6.4430)	7.0852 (7.0545)	5.8609 (7.9819)	0.6335 (0.4045)	0.5654 (0.4495)	0.5376 (0.5116)
Mean Travel Cost to London	1.0471 (1.2560)	2.3792 (1.5856)	1.5078 (5.3489)	0.0516 (0.0801)	0.1282 (0.0996)	0.0799 (0.3371)
County FE			✓			✓
Joint test, p -value		0.25	0.54		0.29	0.44
R^2		0.061	0.322		0.062	0.326
Mean of dependent variable	23.42	23.42	23.42	1.52	1.52	1.52
Observations	186	186	186	186	186	186

Table Notes: The dependent variable is the instrument used in Table 4: the number of castles held by the fathers (columns 1–3) or grandfathers (columns 4–6) of the rebels in each baron's family network. Columns (1) and (4) report a separate bivariate regression for each variable. Columns (2), (3), (5) and (6) include all six variables together; columns (3) and (6) add county fixed effects. The joint test is an F -test that all six coefficients are zero. Robust standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

I Border Proximity and the Castles Instrument

The identifying variation behind the instrumental-variables estimates of Section 4.6 is partly regional. Decomposing the first-stage covariance baron by baron, within counties and net of the standard controls, six northern counties—Cumberland, Northumberland, Yorkshire, Lincolnshire, Lancashire and Westmorland—supply about 39 percent of it (37 percent with the grandfathers' castles as the instrument), and Northumberland (14 percent) and Yorkshire (13 percent) contribute more than any other county. The variation is not concentrated in a few men: the ten barons who carry the most weight supply 31 percent of it, and it takes 23 barons to reach half. Three of those ten held in the northern counties (Gilbert de Gant, Patrick of Dunbar and Hilary de Boullers); the others are Hamo II de Peche, Warin de Mountchesney, Hugh Pantolf, Godfrey de Louvain, David of Huntingdon, Roger II Bigod and William de Beauchamp.

The northern share invites an objection to the exclusion restriction. The northern baronage was militarized because of the Scottish border, and it rebelled in 1215 for reasons entangled with John's northern campaigns, the forest law and the conspiracy of 1212. If exposure to the frontier

drove both ancestral castle-building and the decision to rebel, then the instrument would fail precisely where it does much of its work.

We test this directly. For each baron we compute the great-circle distance from his caput to the nearest point on the Anglo-Scottish border and, separately, to the Welsh march; a baron holding several baronies is assigned the distance of his most exposed holding. Caput coordinates are available for all 186 barons in the sample. We then re-estimate the instrumental-variables specifications adding, in turn, an indicator for lying within 50, 100 or 150 kilometers of the Scottish border, the same three bands for either frontier, and the continuous log distance to Scotland.

Table A39 reports the results. Every specification includes county fixed effects, as in columns (2) and (4) of Table 4. The coefficient on Castles in Rebel Network is stable throughout. With the fathers' castles as the instrument it is 0.0613 without a border control and between 0.0588 and 0.0688 with one; with the grandfathers' castles, 0.0597 and between 0.0570 and 0.0661. The largest change, an increase of about 12 percent, comes from the indicator for lying within 50 kilometers of either frontier. Every estimate is significant at the five percent level ($p \leq 0.019$). The effective first-stage F -statistic ranges from 656.4 to 692.8 across the sixteen specifications, so the border controls do not weaken the first stage.

Border exposure is therefore not the channel carrying ancestral castles into rebellion. We note that the frontier of this period was a zone rather than a line—Cumbria in particular changed hands more than once—so these distances should be read as bands of exposure rather than as a precise cartography.

Table A39: The castles instrument, controlling for border proximity

Border control added	Fathers' castles		Grandfathers' castles	
	Estimate	First-stage F	Estimate	First-stage F
None (baseline)	0.0613** (0.0247)	677.2	0.0597** (0.0242)	683.5
Scottish ≤ 50 km	0.0663*** (0.0248)	657.3	0.0645*** (0.0241)	661.1
Scottish ≤ 100 km	0.0588** (0.0248)	659.7	0.0570** (0.0242)	669.1
Scottish ≤ 150 km	0.0628** (0.0250)	662.5	0.0611** (0.0245)	677.5
Any border ≤ 50 km	0.0688*** (0.0244)	680.8	0.0661*** (0.0237)	692.8
Any border ≤ 100 km	0.0611** (0.0249)	681.8	0.0581** (0.0244)	672.0
Any border ≤ 150 km	0.0625*** (0.0241)	661.5	0.0615*** (0.0233)	685.4
Log km to Scottish border	0.0615** (0.0248)	656.4	0.0598** (0.0243)	657.0

Table Notes: Two-stage least squares estimates of the coefficient on Castles in Rebel Network, instrumented by the castles of the fathers (columns 1–2) or grandfathers (columns 3–4) of the rebels in each baron’s family network. Each row adds the stated measure of border proximity to the standard control set and county fixed effects of Table 4; the first row reproduces columns (2) and (4) of that table. Distances are great-circle distances from a baron’s most exposed caput to the Anglo-Scottish border or, for the “any border” rows, to the nearer of that border and the Welsh march. $N = 186$ throughout. Columns 2 and 4 report the effective first-stage F -statistic. Heteroskedasticity-robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Castles in Rebel Network is the number of castles held by rebel kin in 1215, each weighted by the inverse of network distance.

J External Validity

The mechanism developed in the main text is specific to a *feudal* order: a polity in which military power is decentralized among autonomous lords who hold defensible, non-appropriable strongholds. This appendix asks what the account implies for polities that fall outside, or only partly within, that scope condition. It is useful to organize the comparison along two dimensions. The first is the basis of *military recruitment*: whether the ruler’s armed force is paid, professional, or servile—and so controlled from the center—or feudal, held by a landed baronage in its own right. The second is the structure of the *polity*: whether it is a centralized monarchy or a decentralized congeries of quasi-sovereign lordships. Figure A10 arranges the leading cases along these axes.

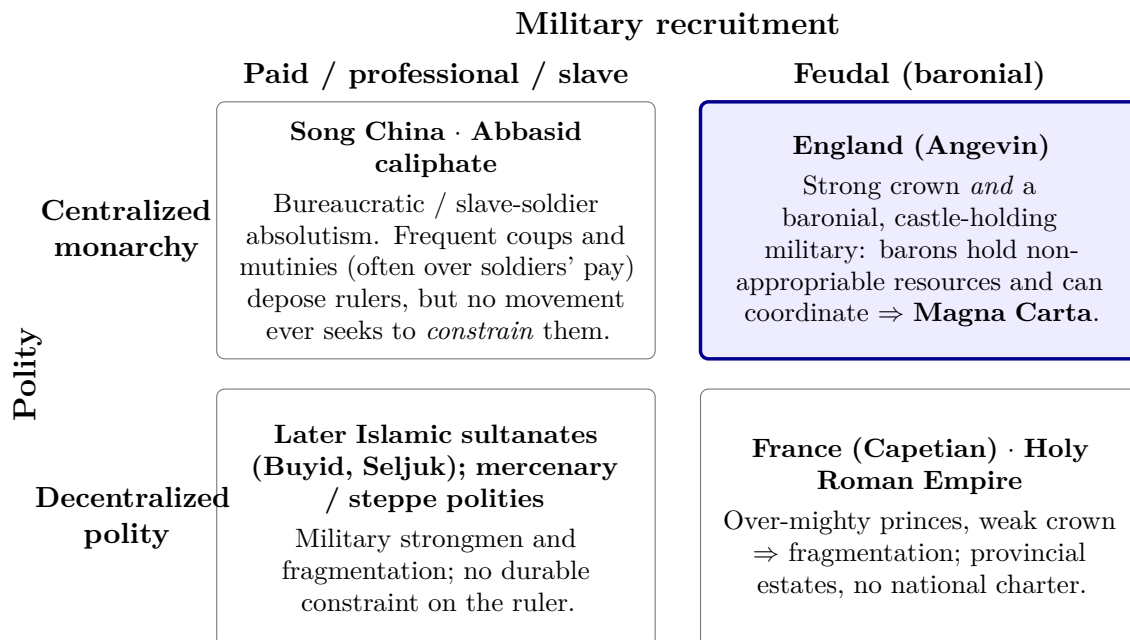


Figure A10: Military recruitment and polity structure. A Magna-Carta-type settlement requires the upper-right cell: a centralized crown (a single, worthwhile counterparty to bind) whose military is feudal and decentralized (barons hold non-appropriable castles and can coordinate). Song China and the Abbasid caliphate differ on the military axis; France differs on the polity axis.

Angevin England occupies the upper-right cell: a monarchy centralized enough to be a single counterparty worth binding, whose military nonetheless rested on an autonomous, castle-holding baronage able to coordinate against it. The other cases fail to produce such a settlement by differing on one axis or the other. We treat France at length, because it is the case most like England and therefore the most searching test of the mechanism, and then more briefly Song China and the Abbasid Middle East, which fail the scope condition on the military axis rather than the polity axis.

J.1 France

France differs from England not on the military axis—both kingdoms had feudal militaries—but on the structure of the polity, and it is the more searching comparison because the two were otherwise so alike. Three differences account for the divergence. First, the fiscal positions of the two crowns parted sharply after 1204. King John, having lost Normandy, was driven to finance its recovery from England alone, whereas the Capetian kings were the victors of that conflict and, later, of the Albigensian Crusade—with conquered lands and confiscated fiefs to distribute rather

than a shortfall to extract—and accumulated large surpluses in exactly these years (Baldwin, 1986; Barratt, 1999). Second, and most important, the distribution of resources among the nobility was far more unequal in France. The English baronage was, by the design of the Norman settlement, dispersed and broadly comparable in scale, with no lay baron rivaling the crown; the French crown faced quasi-sovereign territorial princes—the counts of Flanders, Champagne, and Toulouse, the dukes of Burgundy, Brittany, and Aquitaine—whose power dwarfed that of ordinary barons and often of the king himself (Dunbabin, 1985). In our model such inequality makes an equal-treatment charter unattractive to the greatest lords, who expect to lose by it, and so forecloses the broad coalition that a Magna Carta requires. Third, France was larger, more regionally and linguistically heterogeneous, and more deeply subinfeudated; bargaining between lords and their men was struck locally, and the institutional residue was a landscape of provincial estates rather than a single national assembly. This reading is consistent with recent comparative scholarship: Boucoyannis (2021) argues that durable representative institutions emerged where a strong ruler could compel his most powerful subjects into common obligations—which the English crown could do and the French crown, confronting over-mighty princes across a vast realm, could not. France thus sits in the lower-right cell of Figure A10: a feudal military, but a polity too decentralized and a nobility too unequal for a national charter to form.

J.1.1 The inequality of the two nobilities, quantified

The difference in the distribution of noble power between the two kingdoms can be documented from three independent bodies of evidence.

Castle shares. Computed from the published replication data of Cappelen and Hariri (2026b) (deposit: Cappelen and Hariri, 2026a), the crown’s share of castles over 1066–1300 averages 12.2 percent in England against 4.3 percent in France (20.6 against 7.8 percent including castles held by royal representatives), and the English share exceeds the French in every single year from 1066 to 1214, with a median ratio of 3.6 (Figure A11). The important point, however, is not the king’s share but the distribution of the remainder. In England the crown enforced a ceiling on baronial castle-holding: in our data the largest holder among the 186 barons of the 1215 cohort, William Marshal, possessed nine castles, most of them in Wales and the March; the mean holding was under half a castle; and the one magnate who accumulated on a continental

scale, William de Braose, was destroyed by John in 1208–10. In France no such ceiling operated. In the early twelfth century the king could not master even the castellans of his own domain: Abbot Suger’s life of Louis VI is in long stretches a chronicle of royal campaigns against Hugh of Crécy, Thomas of Marle lord of Coucy, Aymon Vaire-Vache of Bourbon, and William VI of Auvergne (Suger, 1992, chs. 7–8, 11, 15, 18). And where the Capetians did consolidate, the nobility consolidated faster: in Poitou, castle lordship passed from some fifty castellan families into the hands of four great houses—Thouars, Mauléon, Lusignan, and the l’Archevêques of Parthenay—which together came to hold nearly half of the province’s administrative castles; in 1214 the viscount of Thouars alone held thirteen castellanies, against the nine of the count’s own domain (Hajdu, 1978, 27, 34–35).

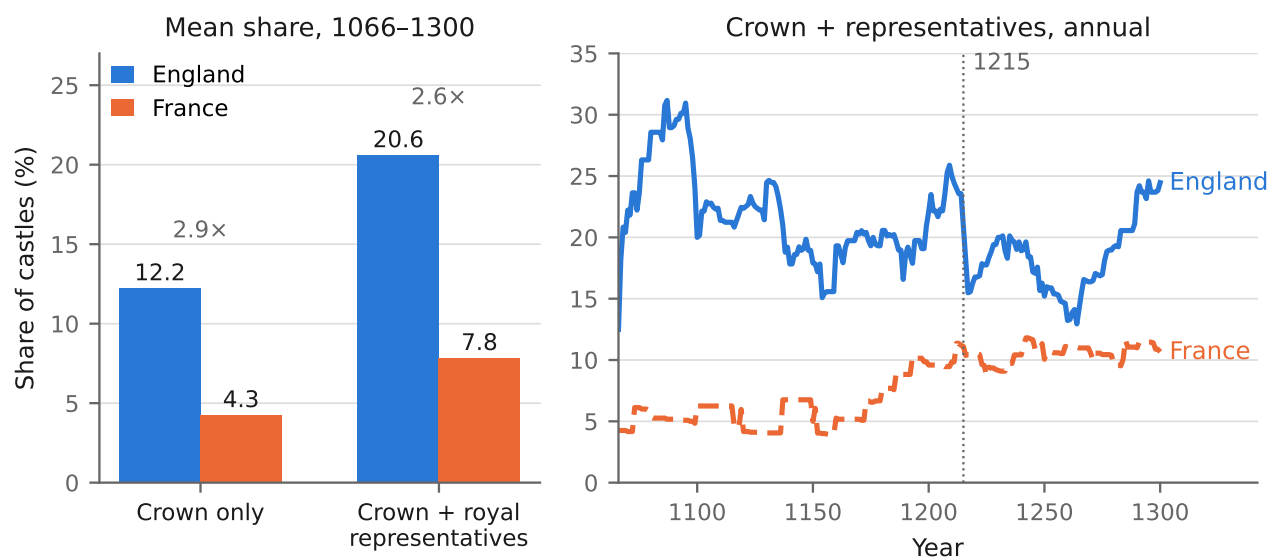


Figure A11: Royal castle shares in England and France, computed from the replication data of Cappelen and Hariri (2026b) (deposit: Cappelen and Hariri, 2026a). Left: mean shares over 1066–1300. Right: annual share including royal representatives, with 1215 marked. France’s rise after 1204 partly reflects the absorption of Philip Augustus’s conquests into the “France” territory of the underlying historical map; sampling-weighted variants are within one percentage point of the series shown.

Knight service. The muster of Philip Augustus’s army at Bouvines in 1214, reconstructed by Baldwin (1986, App. E, 450–53) from the royal inventory (Register C) and the estimates of Verbruggen (1977, 224–26), records the royal domain furnishing some 763 knights and the lords from outside the domain a further 560 (Table A40). The duke of Burgundy and the Champagne contingent each brought about 180 knights—each roughly a quarter of what the entire royal

domain could field. The two largest lordly contingents together supplied 64 percent of all magnate knights in the army, and the distribution collapses below them, from 180 knights at rank two to 40 at rank three. By contrast, the two largest English fee-holders account for less than a fifth of the 1215 cohort's assessed knight service, and the largest for about a tenth. These are top shares among recorded contingents, not an inequality index: the muster records only the lords present, and the lords absent from it—the count of Flanders and the count of Boulogne fought in the opposing coalition—were the greatest of all, so the comparison understates the French concentration.

Table A40: Knight service on Philip Augustus's side at Bouvines (1214)

	Knights	Share (%) of	
		domanial host	whole army
<i>The king's own mobilization</i>			
Royal domain (Register C inventory)	763	100.0	57.7
largest lay contingents therein:			
Gaucher, count of Saint-Pol	30	3.9	2.3
Jean, count of Beaumont	20	2.6	1.5
<i>Great lords from outside the royal domain (estimates)</i>			
Eudes, duke of Burgundy	180	23.6	13.6
Champagne (under Henri, count of Grandpré)	180	23.6	13.6
Robert, count of Dreux	40	5.2	3.0
Pierre, count of Auxerre	30	3.9	2.3
Henri, count of Bar-le-Duc	30	3.9	2.3
Raoul, count of Soissons	30	3.9	2.3
Adam, <i>vicomte</i> of Melun	25	3.3	1.9
Arnaud, count of Guines	20	2.6	1.5
Individually named knights	25	3.3	1.9
<i>Subtotal, outside contingents</i>	560	73.4	42.3
Entire army	1,323	—	100.0

Table Notes: Baldwin (1986, App. E, 450–53). Register C (*Scripta de feodis*, nos. 415–16) is the crown's inventory of the royal domain's contingents, drawn up preparatory to the battle; the outside-domain contingents are the estimates of Verbruggen (1977, 224–26) as tabulated by Baldwin. "Individually named knights" aggregates Guillaume des Barres (10), Michel de Harnes (5), Hugues de Malaunoi (5), and one further estimated contingent of 5. The count of Ponthieu carries no separate contingent (his entry reads "see below"): his following appears among the itemized Ponthieu and Artois contingents of Register C, within the domanial total. The counts of Flanders and Boulogne fought in the opposing coalition alongside Otto IV and the English expeditionary force; Brittany, Toulouse, and Plantagenet Aquitaine sent no contingent.

The battle's coalition structure itself. The most powerful prince of northern France did not

fight for his king at Bouvines but against him, in alliance with the Emperor and with English subsidies. That a great French fief-holder could take the field against his own sovereign in a foreign coalition is itself a summary statistic of a kind: it measures a degree of baronial independence for which Angevin England offers no analogue, and it joins the two halves of our comparison, since the English exactions that financed the coalition are the same exactions that drove John’s barons to Runnymede the following year.

J.2 Hungary and the Golden Bull of 1222

The Golden Bull of 1222, granted by Andrew II seven years after Runnymede, is the usual near-contemporary comparator to Magna Carta, and is often read as a natural parallel to it (e.g. Fukuyama, 2011, 326). There were important differences, as the leading historian of medieval Hungary insists—in “origin and character” the two privileges “were . . . as far from each other as were the kingdoms of the Árpádians and the Angevins” (Engel, 2001, 95)—and we do not present them as a common constitutional process. The coalitional model nonetheless applies to the case, and it accounts both for the early resemblance to England and for the later divergence.

A coalition of the English kind: Like Magna Carta, the Golden Bull was granted by a king faced with a coalition of his nobles. Fukuyama (2011, 378) suggests that the Hungarian charter “was driven by a rather different set of social actors” than the English one; the specialist literature points the other way. The coalition was broad and mixed, much as in England in 1215. Its clauses spoke for the middling nobility, the *servientes*, but the rising itself was “most probably orchestrated by several of the leading aristocratic families” (Rady, 2000, 40)—a few great lords at its head and a broad body of lesser nobles behind them. The abuses it answered were in large part those of the magnates whom Andrew’s own grants had raised, rather than of the king alone; with that adjustment, the lemmas and corollaries of our model describe how the coalition formed and came to impose limits on both royal and noble power.

Divergence over time: The difference from England lies not in 1222 itself but in what followed. In England the broad settlement of Magna Carta became self-reinforcing; in Hungary constitutionalism weakened over the later Middle Ages. Our model locates the difference in the distribution of non-appropriable resources within the nobility, and a single shock changed

Hungary’s position on that axis. Before the Mongol invasion of 1241, stone castles “were almost entirely unknown” in Hungary (Rady, 2000, 50); to defend the kingdom after it, Béla IV and his successors promoted castle-building, and the great majority of the new castles were private. By 1300 “only 30 of the 166 castles in existence were royally owned” (Rady, 2000, 50), and the building had gathered defensible power into a few hands, producing the provincial “little kings” (*kiskirályok*) who broke the realm into lordships. The nobility that emerged was far more unequal and oligarchic than the one that had won the charter.

What the model says: Such a nobility had little interest in enforcing, or building upon, a charter obtained by a broad coalition: the Golden Bull’s resistance clause, which licensed the nobility to oppose the king, “was hardly ever invoked” in the medieval centuries (Engel, 2001, 94). Fukuyama (2011) reads the Hungarian outcome as one in which the noble estate grew too strong for the monarchy; our model adds the variable that reading leaves implicit—how evenly non-appropriable resources were held *among* the nobles. On that axis Hungary moved over time from resembling England, where castles were dispersed across a broad baronage, to resembling France, where they were concentrated in a few over-mighty lords: England-like in the early thirteenth century, France-like by the fourteenth.

Two limits attach to the case. Hungary leaves no source like the English record of baronies and their castles, so we cannot identify individual lords and their holdings or run the coalitional analysis of Section 4; the treatment is comparative and qualitative. And the fine-grained castle counts are thin for the twelfth and early thirteenth centuries, so we rest the argument on the well-documented concentration after 1241 rather than on precise earlier levels.

J.3 Song China

Song China (960–1279) is the sharpest case of a highly extractive state that generated no constitutional constraint on the ruler, and it is instructive precisely because it inverts the European pattern. The Song polity was not feudal but *bureaucratic*. After the militarized disorder of the late Tang and the Five Dynasties, the Song founders deliberately subordinated the military to civilian control: regional military governors were stripped of their commands, armies were rotated and administered from the center, and office was increasingly filled through the civil-service examinations rather than by hereditary right (Kuhn, 2009; Lorge, 2015). The

governing elite was thus a body of salaried, examination-recruited scholar-officials with no independent military base, standing over a military with no autonomous landed aristocracy behind it. There was no baronial class holding non-appropriable resources; the raw material of our mechanism was absent.

It might be objected that the Song state was far more extractive than King John: at its peak it raised on the order of a tenth of output in revenue, several times John's share (Stasavage, 2020). But the comparison of tax *levels* is the wrong comparison. What made John's exactions destabilizing was not their magnitude but their character: they were a sharp departure from the customary baronial benchmark; they were levied arbitrarily and unequally at the king's discretion; and they were widely seen as serving the king's private cause—the recovery of his lost continental patrimony—rather than the common benefit of the realm. Song taxation had none of these features. It was the settled, expected level; it was assessed systematically by a sophisticated fiscal administration that by the late eleventh century drew most of its revenue from commercial and indirect taxes rather than arbitrary levies on a landed elite (Liu, 2015; Glahn, 2016); and it funded a recognizable program of public goods—frontier defense, canals, granaries and famine relief, and a vast civil administration. A high but regularized and publicly directed fiscal take does not generate the grievance that an equal-treatment charter answers. Song China was thus *more* taxing yet *less* “extractive” in the sense our model requires.

J.4 The Abbasid Middle East

The early Abbasid state was, like Song China, a centralized bureaucratic empire that deliberately prevented the local fusion of powers on which a feudal baronage depends. Describing the reorganization that followed the transfer of the capital to Iraq, Crone (1980, 62) records that “the bureaucracy was hugely expanded, fiscal and military governorships began to be separated, and an elaborate espionage system was set up to facilitate central control.” From the ninth century the caliphs went further, building their armies out of imported slave soldiers—the *ghilman*, later the *mamluks*—a caste with no hereditary landholding, no castles, and no roots in the society they policed; the *iqta* through which such troops were later supported was a revocable assignment of

tax revenue, not a heritable, defensible fief (Crone, 1980; Kennedy, 2001).⁴¹

The result was a military that could unmake rulers but could not constrain them. The Abbasid centuries were exceptionally turbulent—replete with revolts, and with coups and mutinies, often over soldiers’ pay, that deposed and killed caliphs—yet at no point did any movement seek to *limit* the ruler’s authority through an institution or a charter. Crone locates the reason in the character of the servile army, which she contrasts directly with a feudal one:

The combination of cultural dissociation and personal dependence ... obliterated the soldier’s public personality. Legally and psychologically aliens do not belong, and mercenaries do not usually have strong views on public issues in the polity which recruits them ... [I]t was a feature which sharply differentiated a servile army from a feudal one. The barons were no aliens, but members of their own polity who subscribed ... to its political values ... free men participating in a public culture: their code of private fidelity and chivalry became itself a public one. The mamluks by contrast ... were not supposed to think, but to ride horses; they were designed to be not a military elite, but military automata. (Crone, 1980, 79–80)

Because the slave soldier had no “public personality,” and thus no stake in the polity or membership in it, he could depose a caliph but could not enter the durable, collective bargaining relationship out of which, in feudal Europe, a charter such as Magna Carta emerged. This is the divergence developed comparatively by Chaney and Blaydes (2013), who trace the greater durability and constraint of medieval European monarchs to their reliance on a landed feudal aristocracy, and its absence in the Islamic world to reliance on slave soldiers.

K On the non-appropriability of resources

In the model, each baron i has a fixed amount of resources e_i , a fixed portion n_i of which is appropriable (and, therefore, $e_i - n_i$ non-appropriable). But what determines whether a resource is appropriable or non-appropriable in the first place?

Here we provide explicit structural content to n_i by specifying some function $n_i \equiv f(\mathbf{z}_i)$ that

⁴¹We considered whether any Islamic polity possessed a landed aristocracy of the European type. Crone (1980, 76) observes that pre-Islamic Iran had known a tradition of local kinglets holding their thrones as vassals of the king of kings, but that “Sasanid measures of centralization on the one hand, and the nature of the Arab conquest on the other, had combined to eradicate this tradition from the central Iranian provinces”; it survived only along the Central Asian frontier (e.g. the Bukharkhuda of Bukhara). No comparable class existed in the Islamic heartlands.

maps baron i 's characteristics $\mathbf{z}_i$ onto values of n_i .⁴² But before doing so, note that whatever $\mathbf{z}$ are, they are exogenous to the game: the Magna Carta game does not affect the value of $\mathbf{z}$. To put it another way, there will always be deep determinants that are unaffected and pre-determined in the game. Specifying $f(\mathbf{z}_i)$ therefore leaves all results unchanged. The only notational difference is that the non-appropriable resources of the rebel coalition, currently $\mathcal{E}_R \equiv \sum_{i \in R_T} (e_i - n_i)$, would become $\mathcal{E}_R \equiv \sum_{i \in R_T} (e_i - f(\mathbf{z}_i))$. Since Lemmas 1.1–1.3 establish threshold values for $\mathcal{E}$ without specifying what enters it, and none of the results mention n_i directly, Theorems 1 and 2 and Corollary 2 are unaffected.

So what are deep determinants of n_i ? The current literature offers some answers. Mayshar et al. (2022) contend that resources that are more observable or easily monitored by any ruler are easier to appropriate — a point linked to James Scott's notion of 'legibility', which can itself be determined by geography (example of the Nile delta). Desierto et al. (2026) contend that salt resources that are more dispersed, i.e. those extracted from brine springs and coastal waters, are harder to monitor and therefore non-appropriable by any ruler. Some resources are inherently more defensible due to rugged terrain and dense forests (Fernández-Villaverde et al., 2023), or due to preexisting military technologies — castles being the prime example (Desierto and Koyama, 2025). Note, however, that neither geography nor military technology is endogenous to, or an outcome of, the establishment of Magna Carta.

We can therefore specify how n_i is determined, given some preexisting inputs, geographical traits and military technology.

Let $e_i \equiv g(\mathbf{x}_i) - h(\mathbf{x}_i; c\theta)$, where $\mathbf{x} = \{x_j\} = x_1, x_2, \dots$ is a vector of inputs (land, labor, capital), $g(\mathbf{x}_i)$ is the gross resources produced from those inputs, and $h(\mathbf{x}_i; c\theta)$ is the total cost of using them. c is an indicator variable equal to one whenever ownership of inputs is in contention and therefore needs to be protected from seizure, as when i is rebelling against the king or withdrawing from his coalition, and parameter θ gets activated when there is need for such protection. θ could be some geographical feature, e.g. ruggedness of terrain in which $\mathbf{x}$ are located, that makes them easier to defend or hide, or some military technology that is advantageous to i .

⁴²As the king k also has resources e_k , a portion n_k of which is appropriable, an analogous function $n_k \equiv f(\mathbf{z}_k)$ can be adopted. This is not very relevant, however, as n_k plays no active role in the model.

Function g maps inputs to gross resources, with $\partial g/\partial x_j > 0$ for all j . Function h is the total cost function, covering ordinary production costs and, when $c = 1$, the additional cost of protecting inputs from seizure. The marginal cost of input x_j is $MC_j \equiv \partial h/\partial x_j$. As some inputs may be easier to protect/hide than others (e.g. rugged land vs exposed land, land within vs outside a castle, armed vs unarmed laborers), then θ has differential effects on the marginal costs of inputs: $\frac{\partial MC_1}{\partial \theta} \neq \frac{\partial MC_2}{\partial \theta} \neq \dots$.

Let θ capture the difficulty of protection, then all costs are non-decreasing in θ when $c = 1$. If x_1 is relatively harder to protect than x_2 , then $\frac{\partial MC_1}{\partial \theta} > \frac{\partial MC_2}{\partial \theta}$.

It is straightforward to show that e_i when $c = 1$ (denoted as $e_{i|c=1}$) is less than e_i when $c = 0$ (denoted as $e_{i|c=0}$). The difference, $e_{i|c=0} - e_{i|c=1}$, is what i cannot keep during periods of contestation and therefore what is appropriated by the contesting party (e.g. king's coalition during rebellion). The remainder is what i keeps and is therefore non-appropriable.

In other words, $n_i = e_{i|c=0} - e_{i|c=1} = f(\mathbf{z}_i)$, where $\mathbf{z}_i = (\mathbf{x}_i, \theta)$.

Proof. Let $g(\mathbf{x})$ denote the gross resources produced from inputs $\mathbf{x}$, with $\partial g/\partial x_j > 0$ for all j , and let $h(\mathbf{x}; c\theta)$ be the total cost of deploying inputs, covering both ordinary production costs and, when $c = 1$, the additional costs of protecting inputs from seizure. Net resources are $e_i = g(\mathbf{x}) - h(\mathbf{x}; c\theta)$. Baron i chooses $\mathbf{x}$ to maximize e_i ; let $\mathbf{x}^*(\theta)$ denote the optimizer when $c = 1$.

By the envelope theorem:

$$\frac{d e_{i|c=1}}{d \theta} = -\frac{\partial h}{\partial \theta}(\mathbf{x}^*(\theta); \theta).$$

Since all marginal costs are non-decreasing in θ (i.e. $\partial h/\partial \theta \geq 0$), we have $d e_{i|c=1}/d \theta \leq 0$. At $\theta = 0$, protection imposes no costs regardless of c , so $e_{i|c=1}|_{\theta=0} = e_{i|c=0}$. Since $e_{i|c=1}$ is non-increasing in θ and equals $e_{i|c=0}$ at $\theta = 0$, it follows that $e_{i|c=1} \leq e_{i|c=0}$ for all $\theta \geq 0$. ■

The comparative statics of $\mathbf{x}^*$ follow from the first-order conditions $\partial g/\partial x_j = MC_j(\mathbf{x}^*, \theta)$ for all j . Differentiating implicitly with respect to θ :

$$\frac{\partial x_j^*}{\partial \theta} = -\frac{\partial MC_j/\partial \theta}{\partial^2 g/\partial x_j^2 - \partial^2 h/\partial x_j^2}.$$

With g concave ($\partial^2 g/\partial x_j^2 < 0$) and h convex in $\mathbf{x}$ ($\partial^2 h/\partial x_j^2 > 0$), the denominator is negative. Since $\partial MC_j/\partial \theta \geq 0$ by assumption, the numerator is non-negative, so $\partial x_j^*/\partial \theta \leq 0$: when

protection becomes more difficult, the baron optimally reduces use of every input.

Illustration (Cobb-Douglas). Suppose $g(\mathbf{x}) = A \prod_j x_j^{\alpha_j}$ with $\sum_j \alpha_j = 1$, and the total cost function is $h(\mathbf{x}; c\theta) = \sum_j (p_j + c\theta_j)x_j$, where $p_j > 0$ is the ordinary production cost of input j and $\theta_j > 0$ captures the additional cost of protecting it from seizure when $c = 1$ (e.g. ruggedness of the land, proximity to a castle, or the defensibility of armed retainers). Baron i has wealth W , so the budget constraint is $h(\mathbf{x}; c\theta) \leq W$.

Standard cost-minimization yields $x_j^* = \alpha_j W / (p_j + c\theta_j)$, and therefore:

$$e_{i|c=0} = AW \prod_j \left(\frac{\alpha_j}{p_j} \right)^{\alpha_j}, \quad e_{i|c=1} = AW \prod_j \left(\frac{\alpha_j}{p_j + \theta_j} \right)^{\alpha_j}.$$

Since $p_j + \theta_j > p_j$ for all j , it follows immediately that $e_{i|c=1} < e_{i|c=0}$. The appropriable portion is:

$$n_i = AW \left[\prod_j \left(\frac{\alpha_j}{p_j} \right)^{\alpha_j} - \prod_j \left(\frac{\alpha_j}{p_j + \theta_j} \right)^{\alpha_j} \right] > 0,$$

which is increasing in each θ_j : higher protection difficulty means more resources can be seized. Conversely, n_i is decreasing in α_j/p_j : inputs that are cheap relative to their output share are easier for the baron to maintain even under contestation, reducing the fraction that is appropriable. Thus $n_i = e_{i|c=0} - e_{i|c=1}$ is itself a function of $\mathbf{z}$ — the vector of inputs and characteristics θ — confirming the specification $n_i \equiv f(\mathbf{z})$ posited above, with $f(\mathbf{z})$ now given explicit structural content via g and h .

What we have shown is that the appropriable/non-appropriable split need not be taken as a primitive of the environment: it can be pushed one level deeper, to a fixed set of inputs together with the geographical traits and military technology that determine how costly those inputs are to protect. Two conclusions follow. First, the results are robust to endogenizing the split rather than assuming it: specifying some function $n_i \equiv f(\mathbf{z})$ leaves all of our results unchanged. Lemmas 1.1–1.3 establish threshold values for $\mathcal{E}$ without reference to what constitutes it; Theorems 1 and 2 and Corollary 2 follow from those thresholds and are equally unaffected. Lemma 1.3, which underlies our empirical strategy, is unchanged as well: a baron is more likely to be in the rebel coalition the larger the non-appropriable resources of the latter, however those resources are determined. Second, the derivation disciplines the empirical work rather than leaving the choice

of proxy to intuition. In terms of the deeper determinant θ , this can be restated as: a baron is more likely to rebel the lower the difficulty of protecting the rebel coalition's resources — i.e., the easier it is for the coalition to shield its inputs from seizure. Empirically, the natural proxy for this ease of protection remains castle ownership, castles being precisely the military technology that renders resources defensible.

L Proofs

In this section we provide the formal proofs. We begin by implementing the backward induction process to prove the three parts of Lemma 1.

L.1 Proof of Lemma 1.1

We first construct the king's payoff from accepting the proposal, i.e. $V^k(\alpha_k = 1, \mu_p = 1, \{(K_t, R_t)\})$. Since no fighting occurs, then no costs of fighting are incurred. However, each rebel has taken from the king his non-appropriable resources at the moment of joining the rebel coalition, and every subsequent time period until T . These resources, however, are restored after the proposal is implemented, i.e. at $T + 1$ onwards. Thus, at $t = 1$, the resources of the realm are equal to the resources of the king and each baron, less the non-appropriable resources of the rebel coalition at $t = 1$. At $t = 2$, it is equal to the resources of the king and each baron, less the non-appropriable resources of the rebel coalition at $t = 2$, which may have grown if the 2nd baron drawn joined the rebel coalition. Thus, let subscripts $t = 1, 2, \dots, T$ denote the order by which baron-followers are drawn, and let $\mathbb{1}_{R_t}$ indicate membership in the rebel coalition at t . Then the value of the cumulative resources of the realm from the periods 1 to T , undiscounted to simplify the notation, is $E_{\alpha_k=1} = (e_k + \sum_{i \in N} e_i)T - (e_p - n_p)T - (e_1 - n_1)\mathbb{1}_{R_1} - \left((e_1 - n_1)\mathbb{1}_{R_1} + (e_2 - n_2)\mathbb{1}_{R_2}\right) - \left((e_1 - n_1)\mathbb{1}_{R_1} + (e_2 - n_2)\mathbb{1}_{R_2} + (e_3 - n_3)\mathbb{1}_{R_3}\right) - \dots - \left((e_1 - n_1)\mathbb{1}_{R_1} + \dots + (e_T - n_T)\mathbb{1}_{R_T}\right)$. This can be succinctly written as:

$$E_{\alpha_k=1} = (e_k + \sum_{i \in N} e_i)T - \sum_{i \in R_1} (e_i - n_i) - \sum_{i \in R_2} (e_i - n_i) - \dots - \sum_{i \in R_T} (e_i - n_i). \quad (2)$$

With some abuse of notation, denote also as $E_{\alpha_k=1}$ the present discounted value of (2), of which the king gets share σ_{k_0} .

Now from $T + 1$ onwards, there is no more rebellion and non-appropriable resources are back in the realm. Therefore at every time period from $T + 1$ onwards, the resources of the realm are $e_k + \sum_{i \in N} e_i$. Denote the present discounted value of this stream of resources as E , of which the king gets the proposed share $\sigma_{k'} < \sigma_{k_0}$. Thus, the king's expected payoff from accepting the proposal is

$$V^k(\alpha_k = 1, \cdot) = \sigma_{k_0} E_{\alpha_k=1} + \sigma_{k'} E. \quad (3)$$

On the other hand, recall the king's expected payoff from rejecting the proposal (and therefore fighting with the rebels at T): $V^k(\alpha_k = 0, \mu_p = 1, \{(K_t, R_t)\})$. In this case, costs of fighting are incurred at T . Rebels' non-appropriable resources have also been removed from the realm at each time period $t = 1, 2, \dots, T$. Thus, the present value of the cumulative resources of the realm from $t = 1$ to T is $E_{\alpha_k=1}$ minus the (discounted) cost of fighting of the loyalists at T , that is, $E_{\alpha_k=0} = E_{\alpha_k=1} - \beta \sum_{i \in K_T} c_i$, of which the king gets share σ_{k_0} , and where $\beta \in (0, 1)$ is a discount factor.

The present value of the cumulative resources of the realm from $T + 1$ onwards is still E , of which, with probability $(1 - \rho_T)$, the king gets share σ_{k_0} and, with probability ρ_T , he gets share $\sigma_{k'}$. Thus, the king's expected payoff from $T + 1$ onwards is $(\sigma_{k_0} - \rho_T(\sigma_{k_0} - \sigma_{k'}))E$. His expected payoff from rejecting the proposal is thus

$$V^k(\alpha_k = 0, \cdot) = \sigma_{k_0} (E_{\alpha_k=1} - \beta \sum_{i \in K_T} c_i) + (\sigma_{k_0} - \rho_T(\sigma_{k_0} - \sigma_{k'}))E. \quad (4)$$

Comparing (3) and (4), the first term of (3) is greater than the first term of (4), and the difference is larger when the loyalists' cost of fighting $\sum_{i \in K_T} c_i$ is large. From the second terms of (3) and (4), we have $\rho_T(\sigma_{k_0} - \sigma_{k'}) \leq (\sigma_{k_0} - \sigma_{k'})$, which implies that the second term of (3) is no larger than the second term of (4), but that (absolute) difference is smaller as $\rho_T \rightarrow 1$.

In turn, ρ_T depends on the relative fighting capacities of the rebels and the loyalists. In particular, $\rho_T = \Pr[\gamma \leq F_{R_T} - F_{K_T}]$. Now since $F_{R_T} = \sum_{i \in R_T} (e_i - n_i) - \sum_{i \in R_T} c_i$ and $F_{K_T} = \sum_{i \in K_T} e_i - \sum_{i \in K_T} c_i$, ρ_T is closer to one the larger are $\sum_{i \in R_T} (e_i - n_i)$ and $\sum_{i \in K_T} c_i$, and the smaller are $\sum_{i \in K_T} e_i$ and $\sum_{i \in R_T} c_i$. Thus, given γ , the king will accept a proposal that decreases his share from σ_{k_0} to $\sigma_{k'}$ if $\sum_{i \in R_T} (e_i - n_i)$ and $\sum_{i \in K_T} c_i$ are sufficiently large and $\sum_{i \in K_T} e_i$ and $\sum_{i \in R_T} c_i$ are sufficiently small.

More formally, denote as $\mathcal{E}_R \equiv \sum_{i \in R_T} (e_i - n_i)$ the one-period non-appropriable resources of the full coalition of rebels, and $\mathcal{K}_R \equiv \sum_{i \in R_T} c_i$ its cost of fighting. Similarly, let $\mathcal{E}_L \equiv \sum_{i \in K_T} e_i$ be the one-period resources of the full coalition of loyalists, and $\mathcal{K}_L \equiv \sum_{i \in K_T} c_i$ its cost of fighting.

Consider, thus, the king's threshold: a collection of (minimum) values $\{\underline{\mathcal{E}}_R^k, \underline{\mathcal{K}}_L^k\} \equiv \{\mathcal{E}_R, \mathcal{K}_L\}$ and (maximum) values $\{\bar{\mathcal{E}}_L^k, \bar{\mathcal{K}}_R^k\} \equiv \{\mathcal{E}_L, \mathcal{K}_R\}$ such that, given γ , σ_k , and $\sigma_{k'}$, $V^k(\alpha_k = 1, \cdot) = V^k(\alpha_k = 0, \cdot)$. That is, at the king's threshold, equation (3) is equal to (4), which (just) induces the king to accept the proposal. It thus follows that the king also accepts the proposal beyond the threshold. Thus, the king will accept proposal σ_p whenever $\mathcal{E}_R \geq \underline{\mathcal{E}}_R^k$, $\mathcal{K}_L \geq \underline{\mathcal{K}}_L^k$, $\mathcal{E}_L \leq \bar{\mathcal{E}}_L^k$, and $\mathcal{K}_R \leq \bar{\mathcal{K}}_R^k$, and reject it otherwise.

L.2 Proof of Lemma 1.2

The rebel leader p 's expected payoff from proposing at T is $V^p(\alpha_k, \mu_p = 1, \{(K_t, R_t)\})$. If p proposes, his payoff would depend on whether the king accepts or rejects and, if he rejects, on the probability ρ_T that the rebels win in battle.

Suppose k accepts the proposal, then the present value of the cumulative resources of the realm from $t = 1, 2, \dots, T$ is $E_{\alpha_k=1}$, of which p gets share $\sigma_{i=p}$. From $T + 1$ onwards, p gets share $\frac{1-\sigma_{k'}}{N}$ of E . Thus, if k accepts the proposal, p 's payoff from proposing is $\sigma_{i=p}E_{\alpha_k=1} + \frac{1-\sigma_{k'}}{N}E$.

If k rejects the proposal, then fighting ensues and p 's expected payoff depends on ρ_T . If the rebels win, p gets $\sigma_{i=p}(E_{\alpha_k=1} - \beta \sum_{i \in R_T} c_i) + \left(\frac{1-\sigma_{k'}}{N}\right)E$. If they lose, the status quo persists, and p gets $\sigma_{i=p}(E_{\alpha_k=1} - \beta \sum_{i \in R_T} c_i) + \sigma_{i=p}E$. Then p 's expected payoff from fighting is $\sigma_{i=p}(E_{\alpha_k=1} - \beta \sum_{i \in R_T} c_i) + \left(\sigma_{i=p} + \rho_T \left(\frac{1-\sigma_{k'}}{N} - \sigma_{i=p}\right)\right)E$.

From the above, p 's expected payoff from proposing is thus

$$\begin{aligned} V^p(\alpha_k, \mu_p = 1, \cdot) &= \alpha_k \left[\sigma_{i=p}E_{\alpha_k=1} + \left(\frac{1-\sigma_{k'}}{N}\right)E \right] \\ &+ (1 - \alpha_k) \left[\sigma_{i=p}(E_{\alpha_k=1} - \beta \sum_{i \in R_T} c_i) + \left(\sigma_{i=p} + \rho_T \left(\frac{1-\sigma_{k'}}{N} - \sigma_{i=p}\right)\right)E \right]. \end{aligned} \quad (5)$$

In contrast, if p does not propose, then no fighting costs are incurred. Thus, at each $t = 1, 2, \dots, T$, p gets share $\sigma_{i=p}$ of the resources of the realm, and share σ' of the (non-appropriable) resources of the rebels at each t . Denote as E_R the present discounted value of the stream of rebels' non-appropriable resources $\left(\sum_{i \in R_1} (e_i - n_i) + \sum_{i \in R_2} (e_i - n_i) + \dots + \sum_{i \in R_T} (e_i - n_i) \right)$. In the

cumulative period from $T + 1$ onwards, p gets share $\sigma_{i=p}$ of E . Thus, p 's expected payoff from not proposing is

$$V^p(\alpha_k, \mu_p = 0, \cdot) = \sigma_{i=p}(E_{\alpha_k=1} + E) + \sigma' E_R. \quad (6)$$

To see whether proposing is the optimal action for p , subtract (6) from (5). The $E_{\alpha_k=1}$ terms cancel, leaving

$$D \equiv V^p(\alpha_k, \mu_p = 1, \cdot) - V^p(\alpha_k, \mu_p = 0, \cdot) = E \left(\frac{1 - \sigma_{k'}}{N} - \sigma_{i=p} \right) \left(\alpha_k + (1 - \alpha_k) \rho_T \right) - (1 - \alpha_k) \sigma_{i=p} \beta \sum_{i \in R_T} c_i - \sigma' E_R.$$

Note that while $E > E_R$, D is negative when the remaining terms are non-positive, in which case it would be better for p not to propose. Thus, for p to propose, it must be that, net of the (dominated) $\sigma' E_R$ term, the remaining terms are positive. We thus set them to zero and simplify to get

$$\left(\frac{1 - \sigma_{k'}}{N} - \sigma_{i=p} \right) \left(\alpha_k + (1 - \alpha_k) \rho_T \right) = (1 - \alpha_k) \sigma_{i=p} \beta \sum_{i \in R_T} c_i / E. \quad (7)$$

Note, then, that given the existing share $\sigma_{i=p}$ of the rebel leader – and provided $\sigma_{i=p} < \frac{1 - \sigma_{k'}}{N}$, i.e. that p stands to gain from the reform, which must hold whenever proposing is ever optimal for him – the LHS of (7) is more likely to be larger than the RHS the smaller $\mathcal{K}_R \equiv \sum_{i \in R_T} c_i$ is and the closer ρ_T is to one. In turn, recall that ρ_T is closer to one the larger are $\mathcal{E}_R \equiv \sum_{i \in R_T} (e_i - n_i)$ and $\mathcal{K}_L \equiv \sum_{i \in K_T} c_i$, and the smaller are $\mathcal{E}_L \equiv \sum_{i \in K_T} e_i$ and $\mathcal{K}_R \equiv \sum_{i \in R_T} c_i$.

Consider, then, rebel leader p 's threshold: a collection of (minimum) values $\{\underline{\mathcal{E}}_R^p, \underline{\mathcal{K}}_L^p\} \equiv \{\mathcal{E}_R, \mathcal{K}_L\}$ and (maximum) values $\{\bar{\mathcal{E}}_L^p, \bar{\mathcal{K}}_R^p\} \equiv \{\mathcal{E}_L, \mathcal{K}_R\}$ such that, given $\sigma_{i=p}$ and α_k , $V^p(\alpha_k, \mu_p = 1, \cdot) = V^p(\alpha_k, \mu_p = 0, \cdot)$. That is, at the threshold, equation (5) is equal to (6), which (just) induces rebel leader p to propose to the king. It follows that p also proposes beyond the threshold. Thus, p will propose σ_p to the king whenever $\mathcal{E}_R \geq \underline{\mathcal{E}}_R^p$, $\mathcal{K}_L \geq \underline{\mathcal{K}}_L^p$, $\mathcal{E}_L \leq \bar{\mathcal{E}}_L^p$, and $\mathcal{K}_R \leq \bar{\mathcal{K}}_R^p$, and not propose otherwise.

L.3 Proof of Lemma 1.3

The last baron drawn, i.e. the T^{th} baron-follower, chooses whether to join either of the existing coalitions R_{T-1} or K_{T-1} . If he joins R_{T-1} , he gets a share σ'' of the rebels' non-appropriable resources at each period in which he is in the rebel coalition, i.e. (only) at T . In addition, he

gets share $\sigma_{i=q_T}$ of the resources of the realm.

From $t = 1, 2, \dots, T - 1$, $q = T$ has not been drawn yet and so he does not get any share of the rebels' non-appropriable resources. He only gets $\sigma_{i=q_T}$ of the realm's resources. Thus, the payoffs from these periods are immaterial.

However, from $T + 1$ onwards, $q = T$ gets either $\sigma_{i=q_T}E$ or $(\frac{1-\sigma_{k'}}{N})E$, or a mix thereof (depending on ρ_T). That is, he gets $\sigma_{i=q_T}E + \rho_TE \left(\frac{1-\sigma_{k'}}{N} - \sigma_{i=q_T} \right)$, which increases in ρ_T if $(\frac{1-\sigma_{k'}}{N}) > \sigma_{i=q_T}$, and decreases otherwise. In turn, ρ_T is likely larger when the T^{th} baron is in R_T rather than in K_T – that is, he contributes his non-appropriable resources to the existing rebel coalition, and the existing fighting capacities are such that $F_{R_{T-1}} > F_{K_{T-1}}$. Thus, provided that the T^{th} baron-follower is not too powerful in the realm, i.e. $\sigma_{i=q_T}$ is small, such that he is able to get a better share when institutions change, his payoff from $T + 1$ onwards is likely larger if the fighting capacity of the existing rebel coalition is larger than that of the existing loyalist coalition and his own contribution to the former is large.

To complete the analysis, we compare the payoffs of the T^{th} baron at period T from joining R_{T-1} or K_{T-1} .

If $q = T$ joins R_{T-1} , he gets at T his share $\sigma_{i=q_T}$ of the resources of the realm, as well as share σ'' of the rebels' non-appropriable resources. Thus, he obtains (a): $\sigma_{i=q_T} \left(e_k + \sum_{i \in N} e_i - \sum_{i \in R_T} (e_i - n_i) \right) + \sigma'' \sum_{i \in R_T} (e_i - n_i)$. If $q = T$ joins K_{T-1} , he gets at T only (b): $\sigma_{i=q_T} \left(e_k + \sum_{i \in N} e_i - \sum_{i \in R_T} (e_i - n_i) \right)$. Thus (a)–(b) = $\sigma'' \mathcal{E}_R > 0$ whenever $\sigma'' > 0$, a difference that vanishes as the rebels' non-appropriable resources go to zero, and that does not depend on $\sigma_{i=q_T}$. If fighting ensues, we simply deduct the costs of fighting from (a) and (b) to get (c) $\sigma_{i=q_T} \left(e_k + \sum_{i \in N} e_i - \sum_{i \in R_T} (e_i - n_i) - \sum_{i \in K_T} c_i \right) + \sigma'' \sum_{i \in R_T} (e_i - n_i - c_i)$ and (d) $\sigma_{i=q_T} \left(e_k + \sum_{i \in N} e_i - \sum_{i \in R_T} (e_i - n_i - c_i) - \sum_{i \in K_T} c_i \right)$. Here (a)–(b) is unaffected by fighting costs alone; taking them into account, (c)–(d) = $\sigma'' \mathcal{E}_R - (\sigma_{i=q_T} + \sigma'') \mathcal{K}_R$, positive whenever $\sigma''(\mathcal{E}_R - \mathcal{K}_R) > \sigma_{i=q_T} \mathcal{K}_R$, and – unlike (a)–(b) – strictly decreasing in $\sigma_{i=q_T}$: the more powerful the baron, the smaller his own cost of fighting must be before it deters him from joining the rebels.

From the foregoing, it is evident that baron-follower $q = T$ with existing share $\sigma_{i=T}$ is more likely to join R_{T-1} than K_{T-1} if $\mathcal{E}_R \equiv \sum_{i \in R_T} (e_i - n_i)$ is large, $\mathcal{K}_R \equiv \sum_{i \in R_T} c_i$ small, $\mathcal{E}_L \equiv \sum_{i \in K_T} e_i$ small, and $\mathcal{K}_L \equiv \sum_{i \in K_T} c_i$ large.

More formally, for baron-follower $q = T$ whose share is $\sigma_{i=T}$, there is a threshold: a collection of (minimum) values $\{\underline{\mathcal{E}}_R^T, \underline{\mathcal{K}}_L^T\} \equiv \{\mathcal{E}_R, \mathcal{K}_L\}$ and (maximum) values $\{\bar{\mathcal{E}}_L^T, \bar{\mathcal{K}}_R^T\} \equiv \{\mathcal{E}_L, \mathcal{K}_R\}$ such that his expected payoff from joining R_{T-1} (constructed by taking the expectation of the expressions (a) and (c) over the probability of fighting $\mu_p(1 - \alpha_k)$) is just equal to his expected payoff from joining K_{T-1} (constructed similarly by taking the expectation of expressions (b) and (d) over the probability of fighting). It thus follows that he also joins R_{T-1} beyond the threshold.

A similar logic holds iteratively for every other baron-follower drawn until the first one at $t = 1$. The relevant time periods during which payoffs are compared are only from the time the baron is drawn until T . Thus, for the $(T - 1)^{th}$ baron drawn to play at $T - 1$, periods $T - 1$ and T matter, and so (a) becomes (a): $\sigma_{i=qT} \left((e_k + \sum_{i \in N} e_i)2 - \sum_{i \in R_{T-1}} (e_i - n_i) - \sum_{i \in R_T} (e_i - n_i) \right) + \sigma'' \left(\sum_{i \in R_{T-1}} (e_i - n_i) + \sum_{i \in R_T} (e_i - n_i) \right)$. As for the periods from $T + 1$ onwards, the payoffs are constructed similarly as for the T^{th} baron.

Thus, one can generalize for any baron-follower q . That is, for $q \in (T \subseteq N \setminus p)$ whose share is $\sigma_{i=q}$, there exists a collection of (minimum) values $\{\underline{\mathcal{E}}_R^q, \underline{\mathcal{K}}_L^q\} \equiv \{\mathcal{E}_R, \mathcal{K}_L\}$ and (maximum) values $\{\bar{\mathcal{E}}_L^q, \bar{\mathcal{K}}_R^q\} \equiv \{\mathcal{E}_L, \mathcal{K}_R\}$ such that q is in the rebel coalition whenever $\mathcal{E}_R \geq \underline{\mathcal{E}}_R^q$, $\mathcal{K}_L \geq \underline{\mathcal{K}}_L^q$, $\mathcal{E}_L \leq \bar{\mathcal{E}}_L^q$, and $\mathcal{K}_R \leq \bar{\mathcal{K}}_R^q$, and in the loyalist coalition otherwise.

L.4 Proof of Lemma 2

King. From (3) and (4), setting $V^k(\alpha_k = 1, \cdot) = V^k(\alpha_k = 0, \cdot)$ and simplifying gives the king's indifference condition in terms of ρ_T :

$$\rho_T^* = 1 - \frac{\sigma_{k_0} \beta \mathcal{K}_L}{(\sigma_{k_0} - \sigma_{k'})E}.$$

Writing $\varphi(\sigma_{k_0}) \equiv \sigma_{k_0}/(\sigma_{k_0} - \sigma_{k'})$, we have $\varphi'(\sigma_{k_0}) = -\sigma_{k'}/(\sigma_{k_0} - \sigma_{k'})^2 < 0$, so that $\rho_T^* = 1 - (\beta \mathcal{K}_L/E)\varphi(\sigma_{k_0})$ is strictly increasing in σ_{k_0} . Since $\rho_T = \Pr[\gamma \leq F_{R_T} - F_{K_T}]$ is strictly increasing in $\mathcal{E}_R$ holding $\mathcal{K}_L, \mathcal{E}_L, \mathcal{K}_R$ fixed (Section L.1), the value $\underline{\mathcal{E}}_R^k$ that solves $\rho_T(\underline{\mathcal{E}}_R^k; \mathcal{K}_L, \mathcal{E}_L, \mathcal{K}_R) = \rho_T^*(\sigma_{k_0})$ is itself strictly increasing in σ_{k_0} .

Rebel leader. Subtracting (6) from (5) at $\alpha_k = 0$, the $E_{\alpha_k=1}$ terms cancel and, dropping the (dominated) $\sigma' E_R$ term as in the surrounding text, p 's net gain from proposing is zero at

$$\rho_T^* = \frac{\sigma_{i=p} \beta \mathcal{K}_R/E}{\frac{1-\sigma_{k'}}{N} - \sigma_{i=p}}.$$

This is positive only if $\sigma_{i=p} < \frac{1-\sigma_{k'}}{N}$, i.e., only if p stands to gain a larger per-capita share from the reform than he currently holds – which must hold whenever proposing is ever optimal for p , since otherwise he would never want σ_p implemented regardless of $\mathcal{E}_R$ or $\mathcal{K}_R$. Writing $b \equiv \frac{1-\sigma_{k'}}{N}$ and $a \equiv \beta\mathcal{K}_R/E$, $\rho_T^* = a\sigma_{i=p}/(b - \sigma_{i=p})$, so $d\rho_T^*/d\sigma_{i=p} = ab/(b - \sigma_{i=p})^2 > 0$: ρ_T^* is strictly increasing in $\sigma_{i=p}$, and, by the same argument as for the king, so is $\underline{\mathcal{E}}_R^p$.

Baron-follower. Using the period- T comparison in Section L.3, (a)–(b) = $\sigma''\mathcal{E}_R$, which does not depend on $\sigma_{i=q}$, while the fighting-adjusted comparison gives (c)–(d) = $\sigma''\mathcal{E}_R - (\sigma_{i=q} + \sigma'')\mathcal{K}_R$, which is strictly decreasing in $\sigma_{i=q}$. Likewise, q 's continuation payoff from $T + 1$ onward is $\sigma_{i=q}E + \rho_T E \left(\frac{1-\sigma_{k'}}{N} - \sigma_{i=q} \right)$; joining R_{T-1} rather than K_{T-1} raises ρ_T from some ρ_T^K to $\rho_T^R > \rho_T^K$, so the resulting gain in continuation value is $(\rho_T^R - \rho_T^K)E \left(\frac{1-\sigma_{k'}}{N} - \sigma_{i=q} \right)$, also strictly decreasing in $\sigma_{i=q}$. Weighting the no-fighting and fighting branches by $1 - \mu_p(1 - \alpha_k)$ and $\mu_p(1 - \alpha_k)$, as in the threshold construction in Section L.3, q 's total expected net gain from joining R_{T-1} rather than K_{T-1} has derivative $-\mu_p(1 - \alpha_k) \left[\mathcal{K}_R + (\rho_T^R - \rho_T^K)E \right]$ with respect to $\sigma_{i=q}$, which is strictly negative whenever there is positive probability of fighting. Since this net gain is strictly increasing in $\mathcal{E}_R$ (Section L.3), the threshold $\underline{\mathcal{E}}_R^q$ at which it is zero must be strictly increasing in $\sigma_{i=q}$, exactly as for k and p .

Since, in each case, $\underline{\mathcal{E}}_R^j$ ($j = k, p, q$) is increasing in the respective player's power share, and $T_j = 1$ if and only if $\mathcal{E}_R \geq \underline{\mathcal{E}}_R^j$ (Lemma 1), it follows that, for a common realized $\mathcal{E}_R$, a player with a lower share of power in the realm is more likely to have his threshold met than one with a higher share.

L.5 Proof of Theorem 1

Lemma 1 serves as proof.

L.6 Proof of Theorem 2

The proof that $f_0(\Pi_0, \sigma_0)$ will change towards $f_m(\Pi_0, \sigma_p)$ when $T_p = 1$ for baron $p \in N$ drawn to be the rebel leader is in the text preceding Theorem 2. It remains to show that if p is the most powerful leader, then the change will also occur if the rebellion is led by any other, less powerful, baron.

Note that since up to $|N|$ barons can be drawn to be the rebel leader p , there are as many as

$|N|$ rebel leader thresholds. Among these, the most onerous would be the rebel leader threshold of the most powerful baron – the baron with the largest share. To see this, note in equation (7) that the larger $\sigma_{i=p}$ is, the smaller the LHS and the larger the RHS. Thus, to have the LHS equal to the RHS, ρ_T has to be closer to one. (In turn, for $\rho_T \rightarrow 1$, the larger $\mathcal{E}_R$ and $\mathcal{K}_L$ have to be, and the smaller $\mathcal{E}_L$ and $\mathcal{K}_R$ have to be.)

Thus, if the rebel leader threshold constructed with the largest value of $\sigma_{i=p}$ is met, then any other rebel leader threshold constructed with a smaller value of $\sigma_{i=p}$ is also met.

L.7 Proof of Corollary 1

Immediate from Lemma 2: since $\underline{\mathcal{E}}_R^q$ and $\underline{\mathcal{E}}_R^p$ are increasing in σ_q and σ_p respectively, a coalition drawn from the lower tail of the power distribution has thresholds no higher than that of its most powerful member, clearable by an $\mathcal{E}_R$ far below what a more powerful baron or leader would require.

L.8 Proof of Corollary 2

The proof of both parts is in the text just prior to the corollary.