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# *Ora et Guberna*. The Economic Impact of the Rule of St. Benedict in Medieval England

Domenico Rossignoli, Federico Trombetta

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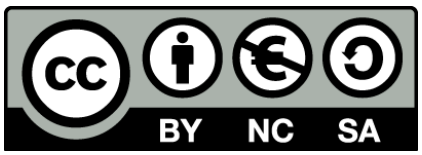


**DISEIS**
Dipartimento di Economia Internazionale, delle Istituzioni e dello Sviluppo
Università Cattolica del Sacro Cuore
Via Necchi 5
20123
Milano

# *Ora et Guberna.*
# *The Economic Impact of the Rule of St Benedict in Medieval England*

Domenico Rossignoli
DISEIS and CSCC, Università Cattolica del Sacro Cuore,
Largo Gemelli, 1 20123 Milano
domenico.rossignoli@unicatt.it

Federico Trombetta
DISEIS, Università Cattolica del Sacro Cuore,
Largo Gemelli, 1 20123 Milano
federico.trombetta@unicatt.it

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*Ora et Guberna.*

*The Economic Impact of the Rule of St Benedict in Medieval England*

We use historical data from the Domesday Book to investigate the impact of the landlord identity on economic performance, exploiting the land reshuffle that followed the Norman Conquest. We find that holdings whose lord became a Benedictine monastery experienced a higher growth rate in productive capacity than those with a new secular lord. This effect is mainly driven by holdings changing only the inferior level of the feudal structure and cannot be fully disentangled from the persistence of Benedictine overlordship during the Norman Conquest. We suggest that the governance structure of Benedictine monasteries may have played a role.

*Key words*: Institutions, Growth, Religion, Monasteries, Norman Conquest, Medieval England

*JEL*: N33 O43 Z12 D70

The Norman Conquest of England in 1066 is widely recognized as a pivotal moment in the country's history, with far-reaching effects across various aspects of its subsequent development. Amidst the political, social, and economic upheaval that ensued, did religious institutions play a role in affecting the economic outcome of the lands they controlled? In particular, did Benedictine monasteries, who controlled about one-sixth of the land in 1066 (Burton, 1994), perform differently from their secular counterparts, given their peculiar institutional and governance structure?

During the eleventh century, the feudal system in England operated through a hierarchical network of landowners. At the highest level were the "Overlords," who received their land directly from the King. This designation changed to "Tenant-in-Chief" after William's conquest.[1] They consisted of both secular and religious agents, who either subleased their land to different “lords” or acted themselves as “lords”, where by “lords” we define those exercising immediate control on the land at the lower level (note: they may or may not coincide with the respective Overlord / Tenant-in-Chief).

At every level of the feudal structure, landowners could be either “secular” or “religious” people. We classify all the entries in our dataset according to the following three types, both before and after the Norman

[1] Palmer (2010) defines them as “Overlord of the “man” in possession in 1066” and “Tenant-in-Chief of the estate, holding directly of the Crown” respectively.

Conquest: Benedictine, when the landlord is a Benedictine monastery; Other Ecclesiastic, when the landlord is a bishop, the canon of a cathedral church, a deacon or another non-monastic ecclesiastical figure; Secular, when the landlord is none of the above, mostly a nobleman or the King himself. We also identified a few non-Benedictine monasteries of Celtic tradition, that are excluded from our main analysis and only included in the direct comparison with Benedictine (see below) as they usually do not have two data points for their valuation.

In principle, religious landlords (Benedictine or Other Ecclesiastic) may have been either better or worse than secular landlords and other religious landlords, in terms of economic performance. They may have insisted more on education and human capital in general (Valencia Caicedo, 2019), while also being more conservative in the adoption of new technologies (Campbell, 2006). They may have had different ways of selecting their leaders, especially in the case of Benedictine monasteries (Knowles, 1963), but they may have been more oriented toward goals "orthogonal to the type of policies that benefit economic development" (Rubin, 2019). Nevertheless, they may have also promoted innovation (Mokyr, 1992), for example adding a religious meaning and motivation to manual labour (White, 1958).[2]

In this paper, we exploit the historical consequences of the Norman Conquest in medieval England to study the effect of different institutional arrangements, both religious and secular, on economic outcomes, in times of social and political turmoil. We use detailed fine-grained data from England around the time of the Norman Conquest (1066), exploiting institutional variation at a very local level. We compare the productivity of estates controlled by different types of landlords.

For holdings included in our sample, we are able to identify two levels of the feudal structure: the highest one, immediately below the King, and the lowest one, defined "lord" in both time periods.[3] Using for identification purposes the biggest change in land control in British history, that followed the Norman Conquest, and running our analysis at the lowest possible level of the feudal structure, i.e., "lords". we provide mixed evidence on the effect of holdings falling under the direct control of a religious lord: our analysis shows a positive and significant difference only in the case of Benedictine monasteries, and not for estates of Other Ecclesiastic lords. This effect however loses significance when we exclude holdings whose superior level of

[2] We are grateful to Joel Mokyr for suggesting this reference.

[3] We typically use "lord" and "landlord" interchangeably.

the feudal structure does not change with the Conquest, typically remaining Benedictine. A heterogeneity analysis considering different levels of the feudal structure suggests that this effect is mainly driven by holdings whose Overlord was already Benedictine in 1066 and became a direct lord in 1086, suggesting that institutional persistence at the Overlord level cannot be fully disentangled from Benedictine identity. Finally, although most of the monasteries in our sample are Benedictine, a few of them belong to the distinct Celtic tradition. We provide suggestive evidence that Benedictines tend to perform better than monastic communities of Celtic tradition (i.e., not subject to Benedict's Rule). Benedictine monasteries had a unique governance structure, different from both secular and Other Ecclesiastic lords, having an elective office as head of the community and holding regular meetings through an assembly to discuss important matters.

Our dataset merges information from the Domesday Book (henceforth DDB),[4] the English Monastic Archive and a variety of other sources for geographic and historical controls. Our basic units of analysis are holdings.[5] As we have information on the economic performance of these holdings (in terms of their productive capacity) and the landlord's name, we can compare the productivity of land controlled by secular landlords with that of the land controlled by Benedictine monasteries and other types of landlords.

We focus on the subsample of holdings whose lord in 1066 was secular and whose lordship changed between 1066 and 1086 (moving to a new secular lord, or a religious one). Applying a difference-in-difference approach, we find that holdings controlled by religious rulers tend to perform better, but that the coefficient is not always statistically significant. Consequently, guided by the different institutional structure that differentiated Benedictine monasteries from the other religious rulers, we run the comparison for the two subgroups separately. In this way, we find that Benedictine holdings experienced a 20-year productive capacity growth rate that was between 5 and 12 percentage points higher than holdings controlled by secular landlords. This result is robust to the inclusion of time-invariant covariates interacted with time fixed-effects and to

[4] An extensive survey of productivity and land allocation of its reign, commissioned by William in 1086. More in the Historical Background section and in Appendix G.

[5] Most of these holdings are manors, *id est* the smallest administrative unit and the basic unit of inquest of the Domesday Book (Finn, 1963), but there are also dependencies and non-manorial units. Online Appendix E provides a detailed description on how units of analysis are defined. They are identified in the DDB dataset as 'Entries' through a unique Entries StructIdx code.

matching techniques, but not to the exclusion from the sample of holdings whose upper level of the feudal structure does not change with the Conquest (almost all of them having a Benedictine Overlord/Tenant-in-chief), or whose lordship attribution in 1066 is ambiguously defined (for example, "20 freemen"). This poses a threat to our identification strategy, as it is hard to assess the extent of a governance change in those holdings, and whether any change was strategic.

The performance of holdings controlled by Other Ecclesiastic landlords in 1086 is not statistically different from that of holdings controlled by secular landlords. This is a relevant result since both bishops and other non-monastic ecclesiastic landlords were religious rulers, sharing the same cultural and religious roots as Benedictine monasteries, but without the institutional constraints of the Benedict's Rule.

To shed some lights on the caveats mentioned above, we exploit information on identities and changes in the superior level of the feudal structure,[6] conducting a heterogeneity analysis showing that the "Benedictine" effect is driven by holdings whose monastic lord in 1086 was also the upper level of the feudal structure both in 1066 and in 1086. For these observations the credibility of the parallel trend assumption may be weaker: these holdings do not change the upper level of the feudal structure and the change in the lower level may be due to the strategic initiative of the higher level, rather than to the Conquest. To alleviate this concern, we first introduce in the regression a "Benedictine Overlord" fixed effect showing that, reassuringly, our results are fully robust. Second, we show that this subset of Benedictine holdings are better than those switching from a secular landlord to the Crown, having the Crown as the higher level of the feudal structure both in 1066 and in 1086: for the latter, the possibility of a strategic re-claim of the land was probably even stronger. One limitation of this test is that it does not allow us to separate a "Benedictine" effect from the effect of institutional persistence, as the King changes after Hastings.

The result we find in the least restrictive subsample may be due to several channels, but we argue that the organisational structure played an important role. To support our claim, we first provide several tests to consider and rule out alternative potential explanations (such as cultural heritage or direct monastic work). Second, we show that having as a new landlord a Benedictine monastery correlates with the number of ploughs and mills (whose importance has been recently highlighted by Mokyr et al. 2022). Hence, these holdings tend

[6] The one above the lord and directly below the King.

to be better in terms of agricultural capital, consistently with Knowles' (1963) idea of monasteries as "agricultural capitalists".[7] Third, using newly coded data from Knowles and Handcock (1971), we provide positive evidence suggesting that Benedictine monasteries were more productive landlords than monasteries of Celtic tradition.[8] They were also monks, but their Rule (as far as we know) is silent in terms of governance and organisation.

Overall, if we focus only on changes in lordship, Benedictine monasteries turn out be better landlords than their secular counterparts, but the effect is sometimes not statistically significant in the subsample where we include only holdings changing every level of the feudal structure, and it is hard to fully disentangle the effect of institutional persistence from Benedictine control. We argue that any positive effect of Benedictine control on economic outcome is not just due to monks being, in general, a better selected sample. Benedictine monasteries perform better also when compared to monastic communities of different tradition. Hence the result we find may be, at least partially, due to the unique governance structure of Benedictine monasteries, which was probably able to guarantee institutional persistence, through the difficulty in replacing abbots and their strong legitimisation, and to create incentives for a better decision-making process (through the selection method of the leader and the importance of the Chapter as an advisory council, as also pointed out by Inauen et al., 2010b), but we cannot test those channels directly.

Our paper makes two contributions. First, from an economic history perspective, our analysis finds some evidence of a Benedictine advantage in economic performance, suggesting that this is partially explained by the specific governance structure embodied in the Rule and by the institutional persistence of monasteries. In this sense, we are consistent with Roehl (1986), who stresses the importance of the "corporate character" of Benedictine monasteries. This insight extends beyond England in the 11th century: Grzymala-Busse (2020) highlights the role of the medieval Catholic Church as a "template for institutional innovation": although we cannot look at long term outcomes, our paper suggests that some institutional arrangements now widely adopted (way beyond the Catholic Church) may have already been important for economic performance when they were the exception rather than the norm. Analogously, Doucette and Møller (2021) highlight how the

[8] We are grateful to Sascha Becker for suggesting this comparison.

proximity to Cluniac monasteries facilitated the "imitation" of their institutional features by local political communities, promoting the emergence of self-governance within an age of collapse of state institutions. Again, our contribution particularly fits to the age of political transition we are observing. Second, in terms of the economics of religion, we contribute with a case study of the interaction between religious legitimacy, political power and economic outcomes, the importance of which has been suggested by Iyer (2016). We analyse the historical economic impact of religious institutions acting as economic and political players, stressing the importance of looking at the interaction between religious legitimacy and the specific governance structure of those institutions.

## RELATED LITERATURE

Some papers have looked at the impact of monasteries (or their suppression) on economic outcomes from a long-term perspective. Heldring et al. (2021) look at the impact of the dissolution of monasteries on the industrial revolution in England. They find that places strongly affected by their dissolution are associated positively with innovation and agricultural yields, industrialisation, and the number of gentries in a parish, and negatively with the share of labour force in agriculture. Our research question is different from theirs, and they look at a different time frame. Andersen et al. (2017) use county-level English data to show the long-term impact of Cistercian monasteries on cultural values and population growth. We use variation at a much finer level to test the contemporaneous impact of different institutional structures, looking at an earlier historical period. Differently from them, we find weak evidence of a larger population stock on Benedictine estates, and we show that there is a strong and positive effect on productive capacity, observable in the short term (less than 20 years). As the "work-ethic factor" takes time to develop, our results suggest that other mechanisms were at play, such as a different governance structure. We are also not the first to compare the outcomes of secular and ecclesiastical holdings, but other studies focus on much smaller and less representative samples (McDonald and Snooks, 1986) and do not have an identification strategy, or they look at a different period (Heldring et al., 2021). Results are very mixed. Heldring et al. (2021) note that monastic land was characterised by "inefficient types of customary tenures", pointing toward a lower productivity of ecclesiastical holdings. Campbell (1983) finds no significant differences between ecclesiastic and secular holdings, and Campbell (2006) points to two competing effects. On the one hand, "on conventual and collegiate estates inertia rather

than enterprise could all too easily rule" (p. 421). On the other hand, "such landlords were also in a uniquely privileged position to develop the management of their estates on a long-term sustainable basis" (p. 421).

In our work, we use the entire Domesday Book for an analysis of the economic effect of secular and religious landlords, and to suggest an identification strategy that controls for geographic proximity and economic determinants. A few other recent papers use data from the Domesday Book. Angelucci et al. (2017) look at the long-term effect of farm grants (*id est* self-governing municipalities) on political support for more inclusive institutions. They also use data from the Domesday Book, but they focus only on boroughs, while we look at rural holdings. Moreover, the Norman Conquest is the starting point for their long-term analysis, while we look at short term impact before and after that event. Delabastita and Maes (2023) use the whole Domesday Book to analyse the economic effects of the feudal structure of the society, modelled as a network, finding evidence of its importance. Wieland (2022) studies the effect of Viking settlements in Eastern England on economic outcomes, using data from the Domesday book as an outcome variable. We see those papers as complementary to ours, leading to a better quantitative understanding of institutions in medieval England and their economic role.

In terms of religion and economic history, we contribute to the literature by studying the political and economic role of the Catholic Church in the Middle Ages (Belloc et al., 2016; Richardson, 2005; Blaydes and Paik, 2016; Becker et al., 2021). Specifically, we look beyond the role of the Church as a "legitimising agent" (Greif and Rubin, 2015; Rubin, 2017), and we focus on its economic performance as a local landlord, compared to secular counterparts. Moreover, we highlight differences between religious rulers and suggest the importance of the internal organisation of religious institutions. Further, Doucette and Møller (2021) related the proximity to Benedictine monasteries of Cluniac tradition to the emergence of self-governance, at an age of collapse of state institutions, as they promoted religious autonomy from secular lords and lord-bishops. Our paper complements also these findings by suggesting the importance of Benedictine monasteries as elements of institutional persistence through political and social turmoil and transitions.

Finally, some papers in the management literature (Inauen et al., 2010a; Rost et al., 2010; Inauen et al., 2010b; Rost and Graetzer, 2014) looked at Benedictine monasteries, finding that their high survival rate may be due to their better governance structure (including the election of the abbot and the participation of their members to the decision-making process). Our findings are consistent with their analysis. In this paper we

consider a different comparison (Benedictines vs secular lords or other monastic orders) and a different time span, together with a much larger sample that allows us to use up-to-date econometric techniques.

## HISTORICAL BACKGROUND

### *The Norman Conquest and the Domesday Book*

In 1066 William, Duke of Normandy, invaded England, conquering it at the Battle of Hastings, and claiming to be the legitimate heir of the Anglo-Saxon King Edward.[9]

William's arrival was not good news for Benedictine monasteries: generally speaking, they were historically well aligned with the Anglo-Saxon monarchy (Knowles, 1963; Barlow, 1979) and "the initial effect of the Norman conquest was greatly to disturb the monasteries" (Barlow, 1979, p. 190). This evidence suggests they were not systematically favoured by the new king.

Having seized power, William replaced the Anglo-Saxon elite with his own noblemen in order to secure his position (Finn, 1963), redistributing their land mostly to Norman noblemen. Fleming (1991) and Thomas (2008) discuss the methods behind the redistribution, pointing out that it is hard to say what proportion of the assignment was due to each method. According to Thomas (2008, chapter 3), the four methods were the following. First, direct succession, *id est* William appointed a Norman landlord as the successor of a dispossessed Anglo-Saxon landlord. Second military protection: "in militarily sensitive regions, the King gave blocks of properties, sometimes entire counties such as Cheshire, to individual lords". Third, "in some areas, William lumped together all or most of the lands of minor landholders that were 'left over' after the redistribution of major estates and gave them to a single Norman lord". Finally, "Norman nobles, particularly sheriffs, also simply grabbed new lands".

Obviously, the redistribution process that started after the Conquest was not limited to the highest level of the feudal structure, but it kicked off a further process of "subinfeudation" at lower levels of the hierarchy (Barlow, 1999, p. 92): Tenant-in-chiefs received the land from the king and then they could grant it to their

[9] Interestingly, the Domesday Book collected data for 1086 as well as for 1066, *id est* the last moment in time when King Edward was alive, precisely for this reason.

people, defined as "lords", in exchange for feudal services, or keep it (in this case, the lord and the Tenant-in-chief coincide). Given the complexity of the Domesday book, lordship attribution is not always unambiguous.[10]

Twenty years after the Conquest, William commissioned a complete survey of the land ownership under his reign. The result is known as the Domesday Book, "because its decisions, like those of the last judgement, are unalterable".[11] Several scholars, both in humanities and in economics (Darby, 1977; McDonald and Snooks, 1987; McDonald, 1997) have looked in detail at the content of the Domesday Book and at the way in which the data were gathered. The objective of this intense data collection ordered by William is still debated, but according to McDonald and Snooks (1986) it was a combination of two elements: an assessment of the ability to pay taxes and a clarification of the feudal structure of the kingdom. William dispatched royal commissioners throughout his kingdom, and the data they gathered (a holding's "value to its owner", *id est* our measure of productive capacity, in 1066 and 1086, name of its landlord in 1066, when King Edward was alive, and in 1086 and so on and so on) were then verified in open court (McDonald and Snooks, 1987). Valuations of holdings were collected in pounds and shillings which, at the time, existed only as units of accountancy (Finn, 1963). Overall, the Domesday Book seems to provide a reliable measure of land "value" and tax assessment (McDonald and Snooks, 1986), and its data are suitable for cliometrics analysis (McDonald and Snooks, 1987).

The manorial economy that prevailed in Western Europe, as well as in England, in the 10$^{th}$ and 11$^{th}$ centuries was essentially based on private contracts between landlords and peasants. As North and Thomas (1971) note, "the absence of an effective central political authority made the provision of protection purely a local matter". In such a system, the most efficient way for the King to enforce political power lay in granting large estates "to be organised as petty kingdoms" (North and Thomas, 1973, p. 32). In exchange for protection, peasants provided some fixed labour to the landlord, through a form of serfdom that was alternative and different from pure slavery: Landlords (of all types) were the supreme local authority of the estate, monopolising the use of force to administer justice and secure protection for all the people living there (North and Thomas, 1973). According to Postan (1973, p. 82) "manors functioned as a local police authority". However, while the

[10] Some holdings are shared between multiple lords, and the lordship of others is unclear (i.e. "20 freemen"). There are also dependencies of manors and non-manorial units, in which case the degree of autonomy of the local lord is unclear.

[11] Richard Fitz Nigel (treasurer of Henry II), Dialogus de Scaccario, cited in Roffe (2000, p. 5).

governance of Benedictine houses was constrained by the rule, secular lords did not face such a constraint, neither in their selection process nor in the obligation to listen to an "advisory board".

Finally, the third type of landowners we identify in the DDB are Other Ecclesiastic, who mostly consisted of bishops. They enjoyed a powerful religious legitimacy, but they were typically free from the constraints of the Rule.

*Benedictine monasteries and their governance*

The Benedictine order was (and still is) composed of a set of monasteries who are committed to following the Rule written by Benedict of Nursia in the early Middle Ages (Knowles, 1963). They quickly became the most important monastic order in Europe, at least until the Cistercian reform in the XII century. They arrived in England in 597 AD and grew rapidly, acquiring control of several holdings. Importantly, the management of those holdings was highly centralised and was kept controlled by the monastic community until the XII century (Knowles, 1963).

According to the provision of Benedict's Rule, each individual monastery was an autonomous entity run by an abbot (there was no "head of the order"): therefore, common membership of the same order was granted by adherence to the Rule (Dell'Omo, 2011).

Even though the main purpose of the Rule was ascetic, it contains detailed instructions for the community of monks (prayer times, kitchen duties…). Its importance for the efficiency of monastic life has been noted by scholars of management science (Rost and Graetzer, 2014; Ehrmann et al., 2013; Rost, 2017). The Rule prescribes that the head of a monastery is an elective office (elected for life by the community of monks, although with some interference from the King) and that he has an obligation to consult with the community in the "Chapter", whose organization had elements of modern Parliaments. We provide further details in Online Appendix G.

*Celtic monasteries*

Although most of the monasteries in our sample are Benedictine, a few of them belong to a different tradition: the Celtic one. According to Dell'Omo (2011), both traditions where present at the same time on English soil, although eventually virtually every monastery became Benedictine. As the name suggests, the

Celtic monastic tradition developed in Ireland during its Christianisation. According to Dell'Omo (2011), this monastic tradition has important differences with respect to the "Benedictine" one in terms of liturgy and calendar, clothing and architecture. We do not know the exact content of the Rules that were followed in individual Celtic monasteries, but something can be learned from the most ancient and most famous one: the Rule of St. Columbanus: it is completely silent about on how an abbot should be chosen; there is no mention of elections nor of monastic Chapters and their advisory roles.

*DATA*

We assembled an original dataset by gathering information from a variety of different sources, as outlined in Table E1 (Appendix), creating a dataset consisting of more than 9,000 observations at the level of holdings.[12] The main source of information is the Domesday Book, henceforth DDB,[13] from which we take the name of the lord of the holding in 1066, during the reign of King Edward (i.e *before* the Norman Conquest), and the name of the lord in 1086, at the time the DDB was compiled during the reign of King William. As carefully studied in Delabastita and Maes (2023), the feudal structure described in the DDB is complex and exhibits multiple levels. For every holding, in our data we can identify two levels of the feudal structure: the highest one, immediately below the King (defined Overlord in 1066 and Tenant-in-Chief in 1086), and the lowest one, defined "lord" in both time periods. We run our analysis at the lord level, to attribute performance to whoever was managing the land. More specifically, by "lord" or "landlord" in this analysis we mean what Palmer (2008) codes as "Lord 66" and "Lord 86" respectively, i.e., "lord of the estate in 1066, in receipt of the profits of the holding" (for Lord 66) and "the immediate lord of the peasantry, either the Tenant-in-Chief himself or a tenant to whom he had granted the estate" (for Lord 86). This implies that, when we define whether an estate changed its landlord or remained with the same one, we look at the "lord" name only. Overlords and Tenant-in-Chiefs, the top levels of the feudal structure,[14] may or may not coincide with the Lord and may or may not change after

[12] The actual number of observations in the analysis depends on sparse missing data within each individual variable.

[13] The Domesday Book has been digitised by Palmer and colleagues and a downloadable version is freely available at the Hydra repository of the University of Hull. Please see http://www.domesdaybook.net/ and https://hydra.hull.ac.uk/resources/hull:domesdayDisplaySet.

[14] The similarities between the Norman and the Anglo-Saxon feudal structures are debated. However, there may have been some continuity (Roffe 2007).

the Conquest. The King himself appears both as Overlord/Tenant-in-Chief and as lord. To keep track of the full structure without losing many observations, we use the "lord 66" name (if available) to replace missing Overlords' names. The DDB reports 48 different landlord names referring to a monastery in 1066 (before the Conquest) and 80 in 1086 (after the Conquest).[15] To identify whether the landlord is a Benedictine monastery, we matched landlord names, as recorded in the DDB, with the names of Benedictine houses retrieved from the English Monastic Archive (D'Avray, 2015). Through the investigation of landlord names, we also identified holdings held by Catholic bishops and other non-monastic ecclesiastical landlords.

Note that the structure of the DDB is very complex and entails both holdings shared by multiple landlords and holdings spanning different locations.[16] Therefore, we needed to devise a rule to obtain a unique observational unit for our analysis, whose details are shown in Online Appendix E. Since our focus is on holdings, we decided to collapse multiple observations based on the largest value attributed to a single landlord in the holding. The DDB reports this value for both 1066 and 1086. When this information is not available, or in the event of ties, we assign the land to the landlord who has not changed between 1066 and 1086, we then prioritise secular landlords over other ecclesiastic landlords over monasteries in 1086, and the opposite in 1066; in the event of further ties, we assign a random number to rows and pick the landlord with the lowest random number attached. We keep the "randomised" holdings in the sample, showing robustness checks for their exclusion in Online Appendix D (Tables D5-D9).

In attributing landlords to holdings, we assign a missing value to a landlord whose name, for year 1086, is a general expression such as "one Englishman", "two thanes", or the like, rather than an actual name. Although we include these holdings in our dataset, unambiguously attribute their "type", and attach to them all the relevant control variables, we did not compute a landlord-specific identifier for such items. Hence, we coded those cases as "ambiguous landlords *1086*" and excluded them from the sample in the main analysis, performing robustness checks, as shown in Appendix D.

[15] In our analysis, we use 31 and 43 monasteries as we had to restrict the sample to observations where the outcome variable is available for both 1066 and 1086.

[16] In this case, when attributing the control variables, we usually take the average across locations.

We always exclude from the sample holdings codified as boroughs to get a homogeneous sample of rural holdings. We excluded from the sample about 0.4 percent of holdings that were attributed to Benedictine nuns, to obtain a homogeneous "treatment" group solely composed of male Benedictine monasteries.[17] We further excluded from our sample 90 observations (about 0.5 percent of total "raw" observations) that we classify as outliers, whose value is larger than 4, *id est* larger than the 99$^{th}$ percentile in the distribution of "raw" observations.

A few monastic houses were created toward the end of our observation range (for example Shrewsbury or Durham). We exclude these holdings from the main specification, as it is hard to attribute the change in performance between 1066 and 1086 to their ownership. Once again, their inclusion does not affect the results, as shown in Online Appendix D.

Figures 1a and 1b provide a graphical representation of the geographical distribution of holdings by type of landlord before (1066) and after (1086) the Conquest.

[Figure 1 about here.]

*Outcome variable*

As explained above, some of the information in DDB is available at two points in time: the first refers to the last moment before the Norman Conquest, thus we label it 1066; the second refers to the time the DDB was written, after the Conquest, thus we label it 1086.[18] Exploiting this feature, we obtain from the DDB the main outcome variable of our analysis, *id est* the holding's "value" in 1066 and 1086, from which we calculate the overall growth rate.[19] Historians have widely debated the actual meaning of the information on "values"

[17] Only 2 of these houses would be relevant for our difference in difference analysis and account for only 8 observations. Excluding also female secular landlords would only marginally change our estimated coefficients. The inclusion of Benedictine nunneries would slightly reduce the magnitude of the "Benedictine" coefficient. P-values would still be below 0.1 in most of the specifications and 0.109 in the main one.

[18] The original dataset sometimes codes as "Value 1066" entries that are not precisely dated but refer to an "unspecified date before 1086". In our analysis, we assign those observations to 1066. Adding a fixed effect for those ambiguous cases only marginally reduces the magnitude of the coefficients, as shown in Table C4.

[19] The actual growth rate is computed as $Growthrate = log(Value1086 + 1) - log(Value1066 + 1)$.

recorded in the DDB (McDonald and Snooks, 1986; Roffe, 2000). We interpret them as measures of income or productivity, similarly to Delabastita and Maes (2023),[20] as these data have been shown to be highly consistent with all the related variables reported in the DDB (McDonald and Snooks, 1987) as well as when compared to subsequent historical surveys of some regions of England (Wareham, 2000). Roffe (2007, p.241), instead, interprets them as cash payments from the tenants to the owner, hence excluding other forms of payments.

To study additional economic and social mechanisms we also include information about the estate's total population, as recorded in the DDB. This information is available only at one point in time and only for a limited subsample, therefore it cannot be used to fully replicate our main analysis. Population is calculated as the sum of all categories of people living on the estate, as recorded in the DDB, namely: villagers, smallholders, freemen, cottagers, slaves, burgesses, and cases listed as "other population". Furthermore, we include information about the presence of mills and ploughs as recorded in the DDB.

*Controls*

The most important difference between holdings likely depends on their geographical location. The digitised version of the DDB includes important geographical information related to each entry: Ordinance Survey Grid positions, that we converted into Latitude and Longitude; County and Hundred (local district). Using this information, we can also match our holdings with data on various features that may influence the outcome. As summarised in Table E1, we group those controls in three sets: geography (latitude, terrain quality and so on), history (distance to roman road, Viking influence and so on) and market access (distance to boroughs, fairs and so on). A detailed description of all the controls is in Online Appendix E.

## *EMPIRICAL STRATEGY*

The objective of this paper is to study the role of religious institutions (in general) and Benedictine monasteries (in particular) and their economic impact on the land they controlled, in times of great social and political turmoil. The main explanatory variable is a dummy equal to 1 if a holding was controlled by a religious

[20] Differently from them, we do not divide "values" by the number of non-slave of workers as this information is available for only one point in time.

landlord; the outcome variable is the holding's value in 1066 and 1086, as a measure of the change in productive capacity. Clearly, the relationship between these two variables is likely to be spurious for many reasons. Monasteries (and hence their estates) tended to be located in the southern part of England, and in the most ancient settled areas (Postan, 1973). Moreover, monasteries or bishops may have been granted systematically better (or worse) holdings. Indeed, historical evidence shows that some of the most strenuous opponents William faced after he landed in England were Benedictine monasteries, since most of the monks were part of the Anglo-Saxon aristocracy (Knowles, 1963). Furthermore, monasteries remained active both before and after the Conquest, while the secular aristocracy was almost entirely replaced. To isolate the effect of the institutional structure, we employ two different strategies. The first uses the post-1066 change in control of holdings formerly owned Anglo-Saxon lords as a historical caesura, comparing holdings whose direct lord changed from secular to one of the several types of owners (secular, religious, Benedictine, "Other Ecclesiastic") between 1066 and 1086. The second consists in the application of a matching estimation technique to focus on the most similar holdings, outlined in Online Appendix B. Furthermore, we exploit the geographical information contained in our dataset, that allows us to compare holdings of different ownerships located in the same small administrative area, controlling for a wide range of geographic and economic factors. This analysis is reported in Online Appendix A.

*Changes in direct management and difference-in-difference estimation*

Following the Battle of Hastings and the Norman Conquest, many holdings belonging to Anglo-Saxon landlords were re-assigned by King William and by its Tenants-in-Chiefs. Some were assigned to new secular lords, others to monasteries and still others to non-monastic religious lords. Of course, land could change ownership also for other reasons in the same period. In this specification, we focus on the sub-sample of holdings owned by Anglo-Saxon lords that changed their lord after the Norman Conquest, using those that ended up under the control of religious lords (and then by Benedictine monasteries and by "Other ecclesiastic" in separate models) as the "treatment group" and the rest as the "control group".

[Figure 2 about here.]

Since lordship in every holding within this sample has changed, we can disentangle the effect of a change in direct control from the effect of being controlled by a religious ruler.

Using the panel structure of the dataset, we estimate a difference-in-difference (DID) specification, comparing pre- and post-Conquest (log of) value for holdings moving from an Anglo-Saxon secular landlord to a religious ruler and holdings moving from an Anglo-Saxon secular landlord to a Norman landlord.[21] In practice, we estimate

$$\mathrm{Y}_{i,t} = \tau_t + \mu_i + \varphi Religious_{i,t} + \lambda' \boldsymbol{x}_{i,t} + \in_{i,t} \quad (1)$$

where $Y_{i,t}$ is the (log of) the annual value of holding $i$ at time $t$, $\tau_t$ is the time fixed effect, $\mu_i$ is the holding fixed effect, $Religious_{i,t}$ is a dummy for holdings controlled by Benedictine monasteries or other religious landlords and $x_{i,t}$ is a vector of time varying and time invariant controls interacted with the time fixed effect. Under the assumptions of parallel trends and that nothing else happens at the same time which affects the treatment and control group in a different way, $\varphi$ captures the causal effect of being controlled by a religious landlord on our measure of land productive capacity. A similar model is used to compare separately holdings whose new landlord was a Benedictine monastery or an "Other ecclesiastic" with those whose new landlord was secular. $Religious_{i,t}$ is replaced by $Benedictine_{i,t}$ or by $OthEccl_{i,t}$ respectively, and holdings ending up with the other religious landlord type are excluded from the sample. Standard errors are clustered at the "Lord 1086" level, but all our results are robust to different clustering strategies, as shown in Online Appendix A.

*Threats to identification*

Given that we are using historical data and we have only two time periods, unfortunately we cannot test the parallel trend assumption directly. As explained above we are not aware of any historical evidence that reports King William systematically favouring religious landlords, and especially monasteries, when he re-assigned land. Looking at the balance tests that we summarise in Figures A1, A2 and A3, reported in Online

[21] We do not have information about the exact origin of all the 1066 and 1086 landlords. We assume that those in control before the Conquest were much more likely to be Anglo-Saxon, and those appearing after the Conquest were much more likely to be Normans.

Appendix A, we note that most of the observables are not statistically different between the treatment (however this is defined) and control groups. Table 2 displays the coefficients and p-values of the balance tests for Benedictine and Other Ecclesiastic. In both cases most of the control variables are balanced. Among those that are different, those related to agricultural productivity and pasture suitability, if anything, work 'against' estates owned by religious landlords; some others (latitude, but also distance to roman settlements, roman roads, Anglo-Saxon settlements, and London) arise from the well-known tendency of monasteries to be in Southern England. This is clearly due to pre-existing historical reasons (as pointed out above, Fleming (1985) shows a difference in ecclesiastic landholding above and below "Viking Street"), that are time invariant and hence unlikely to induce a systematic bias in the coefficient. New monasteries spread all over England starting from Canterbury, maintaining cultural and religious ties with Rome and the continental European application of the Rule of St Benedict. Distance to markets is also lower in all the treatment groups. To deal with those unbalances, we interact all the controls with the time dummy, adding them to the estimation. Finally, the levels of the holdings' values pre-Conquest are never statistically different between groups.

While the re-assignment procedure was clearly not random, however, it is possible that the King could have chosen not to re-assign holdings with a higher growth prospect to his allies. Historians seem to agree that the main reasons driving the land reshuffle were internal and external security, something that was already a concern in Anglo-Saxon times (Fleming, 1985). On top of that, the King could have assigned those high-prospect estates directly to himself. We do not find conclusive evidence in support of this case, as a comparison between the King's and secular landlords' holdings, summarised in Table A5, shows a figure that is most of the time negative (or close to zero) and just once weakly positive. This noisy outcome provides no conclusive evidence supporting the claim of a systematic pattern in William's land reassignment to himself. Furthermore, if we look at the holdings whose Tenant-in-Chiefs were the most important followers of the King, we do not observe a stable pattern, especially in terms of agricultural productivity (graphic summaries of these tests are reported in the online Appendix, see Figures from A4 to A8). Overall, the data are consistent with the idea that William conducted the re-assignment without discriminating in favour of religious rulers, as the land they end up controlling was very similar, on average, to the land in control of secular landlords.

Although some of the changes in the identity of those controlling the land are probably direct or indirect consequences of the re-assignment procedure put in place by William, we can only observe whether the direct

lord of the estate is the same in 1066 and 1086 or not. We do not have full information about the reasons behind this change, and sometimes lordship changes without modifications in the name of the Overlord/Tenant-in-Chief. In those cases, the higher level of the feudal structure remains unchanged, while the inferior one changes. This may be a consequence of William's re-assignment, if the lord of 1066 was dispossessed because of his Anglo-Saxon loyalty, or a strategic choice of the Overlord/Tenant-in-Chief. In the latter case, this could be a violation of the parallel trend assumption. Moreover, holdings experiencing this type of lordship change had typically a Benedictine Overlord/Tenant-in-Chief, as very few secular Overlords remained in place in 1086. Furthermore, when the attribution of the 1066 lordship is unclear it is particularly challenging to assess whether a change in governance has happened. We deal with this in four ways. (i) We run our Diff-in-Diff excluding from the sample holdings whose lordship in 1066 is ambiguously attributed. The effect is statistically significant only in the first column, hence it is not fully robust to this more restrictive sample, but it remains significant if, instead of removing observations with an ambiguous lord in 1066, we add a fixed effect interacted with time. (ii) We perform a heterogeneity analysis interacting our main "treatment" dummy with a dummy equal to 1 if the Lord in 1086 is different from the one in 1066 but it coincides with the Overlord in 1066 and with the Tenant-in-chief in 1086. This analysis shows that the positive effect of Benedictine control is mostly driven by those estates. (iii) To alleviate concerns about the parallel trend assumption we show that the main result is robust to the introduction of a dummy equal to 1 if the Overlord (pre-determined at the time of the treatment) is a Benedictine monastery, interacted with time FE. (iv) We show that those specific monastic holdings driving the result are better than those experiencing a similar pattern in ownership change, i.e., those whose 1086 landlord becomes the Crown, which was also the Overlord and the Tenant-in-chief, but not the 1066 landlord. This last result is robust to the exclusion of holdings whose lord in 1066 was ambiguously defined, although it is driven by very few observations in this restricted sample, but it does not allow to disentangle the "Benedictine effect" from the fact they do not change across the Conquest (while the person holding the Crown changes).

Another potential threat to the identification may come from a differential effect in the tax treatment of the land. On this respect, Pratt (2013) shows that exemptions were granted on individual cases and on both ecclesiastical and secular land (p. 19) in Anglo-Saxon times. In Norman times, instead, it seems that all the demesne land of Tenant-in-Chiefs, both secular and ecclesiastical, was exempt (p. 2). We use this fact as a

robustness check, showing that our results are still true in the subsample of "demesne only" land, hence on observations where tax treatment was the same irrespective of the type of landlord.[22] Finally, we are not aware of other events that systematically affected one of the two groups of holdings.[23]

## *RESULTS*

### *Change of landlord types and DID estimation*

#### Religious versus secular landlords

Table 2 describes in detail the sample we use for our main research strategy (our Difference-in-Difference analysis), showing group-specific summary statistics, while statistics for the full sample are shown in Table 1. As mentioned, we keep only estates that were held by secular landlords in 1066 and whose owner changed between 1066 and 1086. In this case, we are exploiting the panel structure of our dataset, and the outcome variable is the log of value in 1066 and 1086. Therefore, we can interpret the result as the differential effect on the productive capacity growth rate calculated over 20 years induced by Religious or Benedictine control. As most of the control variables are time-invariant, we add them to the specification after multiplying them by the time fixed effect. From Table 2 it emerges that "Benedictine" holdings tend to have a positive growth rate of 6% over 20 years (implying an average yearly growth rate of 0.3%), "secular" holdings have a negative growth rate of 5.8% over the same period and "Other ecclesiastic" holdings experience a small 1.6% decrease.

[Table 1 about here.]

[Table 2 about here.]

[22] It is important, however, to keep in mind that Palmer (2008) codes as "demesne" holdings where the lord coincides with the Tenant-in-Chief. We do not have information on further sub-divisions with each estate.

[23] A few Viking raids are known to have hit the North-Western part of England around 1070, but the potential detrimental effects of these events are already captured by the geographical control variables we include in our models. Furthermore, we control explicitly for the area of land that ended up under direct Danish control in Anglo-Saxon times.

The results of model (1) are reported in Panel A of Table 3. We report only the estimated values for $\varphi$. As we are considering a difference in logs, this coefficient can be interpreted as a difference in growth rate expressed in percentage points.

[Table 3 about here.]

All the coefficients are positive, although not all the specifications are significant, suggesting the existence of heterogeneous effects that need to be explored. Therefore, guided by the important institutional differences described above, we divide the analysis of religious properties into two groups: holdings controlled by Benedictine monasteries and those controlled by non-monastic figures, such as bishops, deacons, and canons. The formers are constrained by the Rule of St Benedict, with its institutional structure. The latter are not.

Different religious landlords

In this section we estimate the same model described in equation (1) comparing Benedictine monasteries and Other ecclesiastical landlords with secular rulers in separate estimations.

Panel B of Table 3 reports the results of the comparison between holdings whose new landlord was a Benedictine monastery and those whose new landlord was a secular landlord. The estimates are broadly consistent across all the columns: holdings that end up being controlled by Benedictine monasteries experience a 20-year productive capacity growth rate that is between 5 and 12 percentage points higher, depending on the specification. As shown in Table A10, results are similar if we use the doubly robust Difference-in-difference estimator proposed by Sant'Anna and Zhao (2020).

In Panel C of Table 3 we report the estimates of the same model, but here the "treatment" dummy is equal to one when the land owned by an Anglo-Saxon nobleman in 1066 is controlled by a Other Ecclesiastic landlord in 1086. Interestingly, we find no statistically significant difference, meaning that changing landlord and being controlled by an "Other ecclesiastic" landlord does not lead to a statistically significant change in productive capacity growth rate. The dimension of the coefficients is about one third of those associated with monasteries, but the difference between the two is not statistically significant.

Results in Table 3, Panel B, are robust to a wide range of checks (e.g., different levels of clustering, exclusion of "randomized" holdings etc.), as discussed in the Online Appendix. They are not, however, fully robust to a few sample restrictions. In particular, the coefficient is smaller and remains statistically significant only in the baseline specifications if we exclude holdings that change lord but not Overlord/Tenant-in-Chief, or holdings whose lord in 1066 is "ambiguous" (Tables D10 and D12, Online Appendix D. Those groups partially overlap). If instead we add an "ambiguous lord 1066 fixed effect" interacted with time the Benedictine coefficient remains significant (Table D11, Online Appendix D). In all those cases, the number of "Benedictine" observations is reduced by roughly one third. Taken together, those restrictions seem to suggest that the effect we find is mostly driven by holdings that do not change Overlord/Tenant-in-Chief and whose lordship attribution is partially unclear. As in this case the credibility of the identification strategy is lower, we explore these heterogeneities in greater details.

*Heterogeneity across Overlordship*

In this section, we explore the heterogeneity of the Benedictine effect across different levels of the feudal structure. More in details, we define the dummy variable "Stable OL/TC" equal to 1 for those holdings where the landlord in 1086 is the same as the Tenant-in-Chief in 1086 and the same as the Overlord in 1066, but different from the landlord in 1066. Importantly, for this variable (and for this section) we consider the stability of the institution of the Crown, rather than of the actual person who hold it. This is necessary because otherwise holdings with "Stable OL/TC" would be almost only Benedictine. Hence, holdings whose Overlord was King Edward and whose lord and Tenant-in-Chief was King William are coded as 1. Extending this notion to the "lord" level changes the definition of the sample we are using, as holdings whose landlord was King Edward in 1066 and King William in 1087 would now be considered "stable", and hence excluded. To show what happens when we consider the "Stable OL/TC" variable irrespective of changes in the definition of the sample, we present our results in Table 4 in two panels. In Panel A we add "Stable OL/TC" using the same sample as in the analysis above. In Panel B we exclude from the sample holdings whose landlord was Edward in 1066 and William in 1086. Results remain very similar. In Table 4 we perform the usual diff-in-diff analysis, but we add "Stable OL/TC" interacted with the time dummy, with the $Benedictine_{i,t}$ dummy and with all the controls. From this analysis, we can learn two lessons. First, the "Benedictine" effect is stronger among holdings whose

lord is secular in 1066 and end up being controlled by a landlord (and Tenant-in-Chief) in 1086, which was already the Overlord in 1066. Second, the "Benedictine effect" among holdings where Stable OL/TC is equal to 0 is always positive although it loses significance once we introduce the usual set of controls. Hence, the overall effect we find in Table 3, Panel B, is driven mainly by holdings with a secular lord and a Benedictine overlord in 1066, that end up being controlled (both at lord and TC level) by the same Benedictine house in 1086. For this subgroup, the parallel trend assumption is questionable: the highest level of the feudal structure remains the same before and after the Conquest, hence the change in the lower layer may be due to its strategic initiative rather than to the Conquest. To alleviate this concern, we perform two more tests, whose results are shown below in Tables 5 and 6.

[Table 4 about here.]

Table 5 shows that our main results, presented in Table 3, Panel B, hold when we add to all regressions a time-invariant dummy equal to 1 if the Overlord is a Benedictine Monastery of any gender interacted with the time dummy. This alleviates the concern described above, as we are now conditioning on the monastic identity of the upper level of the feudal structure as defined before the Conquest. As shown, "Benedictine" coefficients are a bit smaller, but they maintain their statistical significance.

[Table 5 about here.]

Table 6 shows a comparison, within "constant Overlordship", between holdings whose landlords are secular in 1066 (excluding those already controlled by the King) and that end up in Benedictine or royal hands in 1086, both at lord and TC level.[24] This is done to partially address the concern that the effect captured by the interaction term in Table 4 is driven by the possibility to strategically choose which holdings to control in 1086. This possibility may have occurred for estates whose Overlord/Tenant-in-Chief has always been the same monastery, while it surely was present for estates whose Overlord/Tenant-in-Chief was the Crown. Despite this, the coefficient of $Benedictine_{i,t}$ is positive, significant most of the columns and fairly sizeable, although the sample size is fairly small. Furthermore, this result is robust, in most of the models, to the sample

[24] Results are similar to the case of Stable OL/TC=1 from Table 4, as almost all those observations belonged to the Crown.

restriction that excludes lords ambiguously defined in 1066, where the main coefficient of Table 3 loses significance. It has to be pointed out, however, that this result is driven by very few observations.

This analysis presents several limitations: the sample size is quite small; the identity of the Overlord could correlate with the outcome through unobservable confounders and of course the person holding the Crown changes between 1066 and 1086. Figure A9 in Appendix A shows the balance between "treated" and "control" observations in this further subsample. They tend to be different on many dimensions, but it is reassuring to note that the outcome variable measured in 1066 is smaller for the treatment than for the control group, hence they were not better *ex ante*.

[Table 6 about here.]

*Other mechanisms*

Overall, our analysis so far highlights that, among religious landlords, only monasteries outperform their secular counterparts, at least in the less restrictive subsample. Furthermore, the effect is driven by those estates with a monastic Overlord that ended up under direct monastic control. In this section, we try to shed light on what additional mechanism might explain the over-performance of monasteries we find in the least restrictive subsample. As discussed in Section 2, there are a few possible reasons that have been highlighted by historians. However, we are able to rule out those that are not related to the institutional structure of the Rule. More specifically, we control for the historical presence of Roman settlements in the area and for a wide range of other geographic characteristics. Hence, the effect we find is not due to those elements (the importance of which has been stressed, for example by Postan, 1973). The availability of cheap labour as a channel for prosperity, stressed by Ekelund et al. (1996), plays no role here, as *conversi* were not yet present in the period we are observing. We also show that geographical proximity to a monastery (as a proxy for its "hard work ethic" suggested by Andersen et al. 2017) has no effect on economic growth. Furthermore, older monasteries do not overperform more recent ones (as a proxy for human capital) and Benedictines perform better than holdings that did not change their lord between 1066 and 1086 (hence it is not just a matter of stability in lordship). Finally, excluding holdings close to their Benedictine lord or focusing only on holdings whose lord is also their Tenant-in-Chief in 1086 does not change our baseline result, hence ruling out the possibility that it is explained by the monks working directly on their land or by a different fiscal treatment. All those tests are discussed in detail in the Online Appendix F.

Table 7 explores whether holdings with a Benedictine landlord in 1086 are different from holdings with secular landlords in 1086 in terms of population, ploughs, and mills. We use the same sample as in (1), but in this case we cannot estimate a difference-in-difference because the outcome variable is measured in 1086 only (and only for a subset of observations). Consequently, we run an Ordinary Least Squares regression with hundred fixed effects, like the exercise we describe in the Online Appendix A. Given that the dependent variable is, at least partly, an outcome of who oversaw the land, we are not truly testing a "mechanism" here. Moreover, since we do not know the level of those outcome variables in 1066, it is impossible to know whether this result is due to pre-existing conditions or not. Despite this, Table 7 shows that on average Benedictine holdings in 1086 had a larger population, number of ploughs and mills. We believe these results, and the latter, although based on a limited sample, are consistent with previous historical evidence, especially White (1958) and Knowles (1963) idea of monasteries as "agricultural capitalists" (Knowles, 1963, p.441). Furthermore, mills have been proven important determinants of growth in human capital and industrialisation (Mokyr et al., 2022). As shown in Panels B and C, results are broadly robust to controlling for "Stable OL/TC" (both without changing the subsample (Panel B) and excluding holdings where the King is the landlord in 1066 and 1086 (Panel C)). Even in case of mills, the coefficient is positive and the p-value smaller than 0.13.

[Table 7 about here.]

Having ruled out all the channels that are not related to the institutional structure and the way leaders were chosen; we try to provide a more direct test of the institutional mechanism. One way to do so, is to compare the performance of Benedictine-controlled holdings with those belonging to different monastic orders. Unfortunately, there was not much variation at the time of the Norman Conquest. However, Knowles and Handcock (1971, p. 356) lists a few non-Benedictine houses active in England around 1066 that belonged to the Celtic monastic tradition.[25] We were able to find some of them in our dataset, coding their holdings.

[25] The precise history of those houses is complicated. Knowles and Handcock (1971) clarify that their list includes houses "thought to have existed until after 1066" and including both Celtic monasteries and "Clas", i.e. communities of canons living under an abbot. Some of them became parochial soon after the Norman Conquest, other were re-founded as Benedictine monasteries and so on. Given the restriction in our dataset, we code as "Celtic" all the houses mentioned as

Unfortunately, for the vast majority, "values" are available only for 1086, hence we cannot use panel data methods. Therefore, we run a simple cross section where we compare them to holdings of Benedictine monasteries in 1086. To avoid losing any observation and given the fact that missing values for "Holding value (1066)" is not an issue in this specification, we use all the available observation with non-missing values recorded in 1086, including holdings that do not change landlord. We obtain a sample of 892 Benedictine holdings and 24 "Celtic" holdings. Given the small number of "control" observations, we decided not to include geographic fixed effects. Results are described in Table 8. They are noisy because of the very small sample, but Benedictine holdings outperform those belonging to Celtic monasteries both in the basic and in the full specification. Despite being weakened by the limitations in the available data, we interpret this result as suggesting that Benedictine monasteries tend to perform better than non-Benedictine monasteries, hence in some sense "controlling for" everything that makes monks a selected sample, especially their specific organisational structure, driven by the attention that Benedict's Rule places on internal governance. Finally, note from panel B that our results do not change much if we also control for a dummy variable equal to 1 if the Overlord and the Tenant-in-Chief do not change.[26] The p-value of column (5) panel B is 0.135.

[Table 8 about here.]

*DISCUSSION AND CONCLUSION*

Our results show that, conditional on a change in lordship between 1066 and 1086, holdings held by a secular lord in 1066 that end up being controlled by Benedictine monasteries perform significantly better than those that end up in the hands of a (different) secular lord. This result is robust to alternative standard errors, matching techniques and sampling definitions. However, it is not fully robust to different ways of dealing with ambiguous lordship attribution in 1066 and is driven by holdings whose Overlord was already Benedictine in 1066 and also remains as Tenant-in-Chief in 1086. As this choice can be strategic and the extent to which the

such in Knowles and Handcock (1971) that we could find in our data, even when they are described as "canons" in the DDB.

[26] We control for this one, rather than for the full "Stable OL/TC" (which is 1 only if, on top of having the same Overlord and TIC, the landlord in 1066 is different from the Overlord) because the latter would always be 0 for "Celtic" observations.

actual governance changed in these holdings is unclear, we compare these holdings with those whose Overlord was the Crown and that end up under direct control of King William in 1086 (without having King Edward as lord in 1066). Even in this case, where in a sense we condition to the (realised) strategic choice, Benedictines perform better, although we cannot separate Benedictine control from the absence of institutional change. Finally, we provide suggestive evidence showing that Benedictines tend to perform better than monastic communities of Celtic tradition.

Taken together, these results suggest that, in the most restrictive sample where we consider only holdings changing both levels of the feudal structure, Benedictine governance has a positive causal effect on productive capacity only in the baseline specification, although in more demanding specifications, statistical significance is mostly lost.. A very robust correlation exists in a less demanding sample, where we cannot fully disentangle Benedictine control from a higher probability of institutional persistence in the upper level of the feudal structure. By comparing Benedictine holdings with those of Celtic traditions, our results also suggest that the institutional structure of Benedictine monasteries could have played a role.

This could have mattered in two ways. First, in protecting the institutional stability (and overlordship) in a period of great turmoil. Replacing a living abbot was not an easy task, as the position of elected abbots was legitimised by the Rule, and they had to interact with the Chapter. In fact, as stressed by Knowles (1963), the "normannization" of monastic houses took longer than for bishops or secular landlords. In many cases, William had to wait for the death of an abbot, before being able to impose one of his choices, as in the case, for example, of the Abbey of Bury St Edmunds, which turns out as the major contributor to the group of Benedictine holdings driving the result. Second, better selected or better advised abbots may have been able to make better choices. Even conditional on possible strategic selections, Benedictines perform better than the King, and they perform better than Celtic monasteries. As discussed, the decision-making power of an abbot was relevant and may have been translated into better economic outcomes, or choices leading to those (for instance in terms of technology, agricultural organisation, etc.).

This paper sheds a new light on the active role of the Catholic Church as a big landlord and a local political player in the aftermath of the Norman Conquest and assesses the economic results of "early democratic" institutional arrangements within the Catholic Church in the Middle Ages. Some of those practices have sometimes been adopted as a model by secular institutions (Stasavage, 2020; Grzymala-Busse, 2020).

Moreover, we focus on the development of countryside areas, which are considerably less studied than cities and villages (Becker et al., 2021). Further research is needed to understand the persistence of this effect and its long-term consequences, up to the period of Henry VIII's dissolution of the monasteries. Moreover, it would be interesting to compare a larger sample of different monastic orders and their performance as landlords. This would entail a substantial effort of data collection, as many of the other monastic orders appeared later in history.

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Table 1: Summary statistics

| | Mean | SD | Min | Max | Obs |
|---|---|---|---|---|---|
| *Lord Types* | | | | | |
| Benedictine (1066) | 0.055 | 0.229 | 0.000 | 1.000 | 9592 |
| Benedictine (1086) | 0.062 | 0.241 | 0.000 | 1.000 | 9592 |
| Oth. Ecclesiastic (1066) | 0.060 | 0.237 | 0.000 | 1.000 | 9592 |
| Oth. Ecclesiastic (1086) | 0.063 | 0.243 | 0.000 | 1.000 | 9592 |
| *Outcome variables* | | | | | |
| Holdings' income, 1066 (log) | 1.264 | 0.829 | 0.000 | 5.707 | 9592 |
| Holdings' income, 1086 (log) | 1.224 | 0.890 | 0.000 | 5.362 | 9592 |
| Population (1086) | 15.844 | 25.951 | 0.000 | 1145.000 | 9587 |
| Mills (1086) | 1.418 | 1.105 | 0.000 | 13.500 | 2479 |
| Ploughs (1086) | 4.887 | 7.016 | 0.000 | 173.000 | 9542 |
| *Geography* | | | | | |
| Latitude | 52.317 | 0.846 | 50.502 | 54.611 | 9592 |
| Longitude | -0.637 | 1.147 | -4.074 | 1.742 | 9592 |
| Latitude×Longitude | -33.445 | 60.136 | -205.757 | 91.468 | 9592 |
| Terrain altitude (median) | 118.248 | 317.317 | -1.000 | 2488.000 | 9592 |
| Crop yield, cereals, value | 4.052 | 1.390 | 0.000 | 7.615 | 9592 |
| Ruggedness | 14.951 | 20.040 | 0.000 | 208.646 | 9592 |
| Agricultural suitability | 1.214 | 7.371 | -1.000 | 177.000 | 9592 |
| Pasture suitability | 463.935 | 5452.047 | 0.000 | 1.45e+05 | 9592 |
| Animal husbandry suitability | 42.508 | 279.932 | 0.188 | 2157.214 | 9592 |
| Dist. mining site | 61.004 | 36.460 | 0.349 | 174.420 | 9592 |
| Holdings size (log) | 1.465 | 0.960 | 0.000 | 7.222 | 9592 |
| *History* | | | | | |
| Dist. Roman settl. | 4.273 | 3.043 | 0.000 | 26.995 | 9592 |
| Dist. Roman roads | 5.967 | 5.228 | 0.002 | 34.965 | 9592 |
| Dist. Anglo-Saxon settl. | 21.453 | 17.242 | 0.119 | 111.724 | 9592 |
| Viking influence in 10th century | 0.513 | 0.500 | 0.000 | 1.000 | 9592 |
| *Market* | | | | | |
| Dist. rivers | 38.319 | 32.948 | 0.007 | 233.059 | 9592 |
| Dist. coast | 41.283 | 28.294 | 0.001 | 103.833 | 9592 |
| Dist. London | 138.004 | 75.514 | 1.375 | 370.910 | 9592 |
| Dist. borough | 36.609 | 23.924 | 0.000 | 118.619 | 9592 |
| Dist. market | 19.061 | 12.115 | 0.070 | 81.227 | 9592 |

*Notes*. The table includes all available observations with holding values in both 1066 and 1086, excluding estates held by Female monastic houses and outliers (*id est* estates recording growth rate larger than 4).

Table 2: Summary statistics (subsample) by groups

| Lordship changes to: | Secular | | Oth. Eccl. | | Benedictine | | Differences | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD | diff | t-stat | diff | t-stat |
| *Outcome variables* | | | | | | | | | | |
| Holdings' income, 1066 (log) | 1.227 | 0.798 | 1.351 | 0.941 | 1.461 | 0.925 | 0.234 | (1.25) | 0.124 | (1.10) |
| Holdings' income, 1086 (log) | 1.169 | 0.853 | 1.336 | 1.029 | 1.519 | 0.914 | 0.350** | (2.11) | 0.167 | (1.32) |
| *Geography* | | | | | | | | | | |
| Latitude | 52.363 | 0.867 | 52.397 | 0.757 | 51.941 | 0.569 | -0.422*** | (-3.71) | 0.033 | (0.27) |
| Longitude | -0.630 | 1.165 | -0.262 | 1.065 | -0.334 | 1.068 | 0.296 | (1.03) | 0.368 | (1.59) |
| Latitude*Longitude | -33.126 | 61.109 | -13.753 | 55.677 | -17.292 | 55.590 | 15.834 | (1.05) | 19.374 | (1.59) |
| Terrain altitude (median) | 121.020 | 323.002 | 87.168 | 247.668 | 115.575 | 329.193 | -5.445 | (-0.15) | -33.852 | (-1.51) |
| Crop yield, cereals, value | 4.068 | 1.386 | 4.089 | 1.442 | 4.125 | 1.317 | 0.057 | (0.29) | 0.021 | (0.12) |
| Ruggedness | 15.335 | 20.616 | 9.884 | 10.298 | 11.966 | 15.995 | -3.369 | (-1.50) | -5.452*** | (-5.89) |
| Agricultural suitability | 1.363 | 8.406 | 0.722 | 1.895 | 0.616 | 0.867 | -0.747*** | (-3.07) | -0.641** | (-2.21) |
| Pasture suitability | 562.003 | 6156.054 | 170.513 | 1877.896 | 24.949 | 222.902 | -537.054*** | (-3.56) | -391.490* | (-1.83) |
| Animal husbandry suit. | 44.742 | 284.696 | 24.974 | 220.537 | 40.635 | 291.577 | -4.107 | (-0.13) | -19.768 | (-0.86) |
| Dist. mining site | 62.025 | 37.627 | 68.107 | 37.508 | 61.802 | 31.622 | -0.223 | (-0.03) | 6.082 | (0.78) |
| Holdings size (log) | 1.422 | 0.921 | 1.544 | 1.098 | 1.563 | 0.994 | 0.141 | (1.06) | 0.122 | (1.13) |
| *History* | | | | | | | | | | |
| Dist. Roman settl. | 4.381 | 3.079 | 4.427 | 3.042 | 3.780 | 2.309 | -0.601*** | (-3.02) | 0.045 | (0.16) |
| Dist. Roman roads | 6.079 | 5.349 | 6.356 | 4.508 | 5.355 | 4.310 | -0.724 | (-1.62) | 0.277 | (0.57) |
| Dist. Anglo-Saxon settl. | 22.151 | 17.609 | 17.038 | 9.976 | 14.890 | 8.492 | -7.261*** | (-6.32) | -5.113*** | (-4.94) |
| Viking influence in 10th c. | 0.537 | 0.499 | 0.623 | 0.486 | 0.506 | 0.502 | -0.031 | (-0.25) | 0.086 | (1.17) |
| *Market* | | | | | | | | | | |
| Dist. rivers | 39.917 | 33.530 | 42.285 | 36.373 | 42.237 | 30.220 | 2.319 | (0.38) | 2.367 | (0.28) |
| Dist. coast | 40.169 | 28.294 | 37.849 | 27.495 | 40.476 | 25.919 | 0.308 | (0.10) | -2.320 | (-0.50) |
| Dist. London | 142.935 | 76.666 | 131.553 | 71.747 | 100.829 | 43.825 | -42.105*** | (6.67) | -11.381 | (-0.96) |
| Dist. borough | 37.666 | 24.156 | 37.884 | 25.455 | 34.604 | 19.278 | -3.062 | (-1.12) | 0.218 | (0.03) |
| Dist. market | 19.663 | 12.403 | 16.483 | 10.138 | 15.409 | 7.517 | -4.254*** | (-4.36) | -3.180** | (-2.67) |
| Observations | 7151 | | 244 | | 160 | | 7311 | | 7395 | |

*Notes.* Summary statistics by treatment group. The t-stats for differences are computed by clustering standard errors at landlord level (1086).
$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table 3: Holding value: Different religious leaders religious vs secular landlord

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Panel A | | | | | |
| Religious | 0.072** | 0.030 | 0.026 | 0.052 | 0.026 |
| | (0.032) | (0.024) | (0.022) | (0.032) | (0.023) |
| Obs | 15110 | 15110 | 15110 | 15110 | 15110 |
| Panel B: | | | | | |
| Benedictine | 0.117*** | 0.062*** | 0.053** | 0.087*** | 0.058** |
| | (0.033) | (0.024) | (0.025) | (0.033) | (0.022) |
| Obs | 14622 | 14622 | 14622 | 14622 | 14622 |
| Panel C: | | | | | |
| Oth. Eccl. | 0.043 | 0.012 | 0.009 | 0.028 | 0.006 |
| | (0.047) | (0.036) | (0.031) | (0.046) | (0.033) |
| Obs | 14790 | 14790 | 14790 | 14790 | 14790 |
| Common to both panels: | | | | | |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each panel includes 7151 holdings and 404 Religious holdings (Panel A); 160 Benedictine holdings (Panel B) and 244 Oth. Eccl. Holdings (Panel C). Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as: estates with "Other ecclesiastic" lords in 1086 (Panel B); estates with Benedictine lords in 1086 (Panel C).

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10th century.

$* p < 0.10$ $** p < 0.05$ $*** p < 0.01$

Table 4: Holding value: Benedictine vs secular landlord, heterogeneity analysis

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Panel A | | | | | |
| Benedictine | 0.069** | 0.025 | 0.018 | 0.036 | 0.025 |
| | (0.029) | (0.027) | (0.028) | (0.029) | (0.028) |
| Benedictine*Stable OL/TC | 0.255*** | 0.348*** | 0.321*** | 0.337** | 0.319*** |
| | (0.056) | (0.055) | (0.039) | (0.141) | (0.079) |
| Obs | 14622 | 14622 | 14622 | 14622 | 14622 |
| Panel B | | | | | |
| Benedictine | 0.072** | 0.028 | 0.022 | 0.040 | 0.030 |
| | (0.030) | (0.026) | (0.027) | (0.029) | (0.027) |
| Benedictine*Stable OL/TC | 0.252*** | 0.344*** | 0.316*** | 0.333** | 0.314*** |
| | (0.056) | (0.056) | (0.039) | (0.143) | (0.078) |
| Obs | 14436 | 14436 | 14436 | 14436 | 14436 |
| Common to both panels: | | | | | |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[1] | No | No | Yes | No | Yes |
| History*time ctrls[1] | No | No | No | Yes | Yes |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 7151 (Panel A) and 7058 (Panel B) secular holdings and 160 Benedictine holdings (both Panels). Panel A reports main results; Panel B excludes observations in which the Crown holds the same estate as lord in both 1066 and 1086. Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4)., as well as estates with "Other ecclesiastic" lords in 1086.

[1] Geography, Market, and History control variables are the same as listed in the note to Table 3. All control variables are also interacted with Stable OL/TC.

$* p < 0.10$ $** p < 0.05$ $*** p < 0.01$

Table 5: Holding value: Benedictine vs secular landlord, adding Benedictine Overlord dummy

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.095*** | 0.056** | 0.050** | 0.071*** | 0.055** |
| | (0.024) | (0.022) | (0.024) | (0.026) | (0.022) |
| Benedictine OL*time | 0.102*** | 0.030 | 0.012 | 0.080*** | 0.011 |
| | (0.025) | (0.024) | (0.022) | (0.025) | (0.023) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[1] | No | No | Yes | No | Yes |
| History*time ctrls[1] | No | No | No | Yes | Yes |
| Obs. | 14622 | 14622 | 14622 | 14622 | 14622 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 7151 secular holdings and 160 Benedictine holdings. Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4).as well as estates with "Other ecclesiastic" lords in 1086.

[1] Geography, Market, and History control variables are the same as listed in the note to Table 3.

$* p < 0.10$ $** p < 0.05$ $*** p < 0.01$

Table 6: Holding value: Benedictine vs royal landlord, Stable OL/TC holdings subsample

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.328*** | 0.378*** | 0.325*** | 0.405** | 0.161 |
| | (0.072) | (0.135) | (0.079) | (0.176) | (0.169) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[1] | No | No | Yes | No | Yes |
| History*time ctrls[1] | No | No | No | Yes | Yes |
| Obs. | 126 | 126 | 126 | 126 | 126 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 26 secular holdings and 37 Benedictine holdings. The sample includes only holdings whose Tenant-in-Chief in 1086 is the same as the landlord in 1086 and was Overlord in 1066, but not the landlord in 1066. Furthermore, we include only holdings where the Overlord/Tenant-in-chief was either the King or a Benedictine monastery. Dependent variable: log of value. Standard errors are robust but not clustered due to limited number of landlord (1086) included in the sample. We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4). as well as estates with "Other ecclesiastic" lords in 1086.

[1] Geography, Market, and History control variables are the same as listed in the note to Table 3.

$* p < 0.10$ $** p < 0.05$ $*** p < 0.01$

Table 7: Alternative outcomes, Benedictines vs secular landlords

| Panel A | Population | Ploughs | Mills |
|---|---|---|---|
| Benedictine (1086) | 3.260* | 0.788* | 0.300* |
| | (1.926) | (0.458) | (0.177) |
| Obs | 7308 | 7282 | 1823 |
| Panel B | Population | Ploughs | Mills |
| Benedictine (1086) | 3.610* | 0.889* | 0.288 |
| | (2.013) | (0.471) | (0.187) |
| Obs | 7308 | 7282 | 1823 |
| Panel C | Population | Ploughs | Mills |
| Benedictine (1086) | 3.788* | 1.014** | 0.287 |
| | (2.027) | (0.474) | (0.190) |
| Obs | 7215 | 7189 | 1770 |
| Common to both panels: | | | |
| Hundred FE | *Yes* | *Yes* | *Yes* |
| *Included controls* | | | |
| Geography[1] | *Yes* | *Yes* | *Yes* |
| Market[1] | *Yes* | *Yes* | *Yes* |
| History[1] | *Yes* | *Yes* | *Yes* |

*Notes.* OLS, cross-section. The number of observations is different due to limited availability of alternative dependent variables. Panel A reports main results; Panel B include a control variable for 'stability' in Overlordship, i.e. Overlord in 1066 is also Tenant-in-Chief in 1086. Panel C excludes observations in which the King holds the same estate in both 1066 and 1086. Col (1) includes 7148 (Panel A and B) and 7055 (Panel C) secular and 160 Benedictine holdings (all Panels); col (2) includes 7123 (Panel A and B) and 7030 (Panel C) secular and 159 Benedictine holdings (all Panels); col (3) includes 1780 (Panel A and B) and 1727 (Panel C) secular and 43 Benedictine holdings (all Panels). Dependent variables as indicated in columns' headings. Standard errors clustered at lord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings with "Other ecclesiastic" lords in 1086.

[1] Geography, Market, and History control variables are the same as listed in the note to Table 3.

$* p < 0.10$, $** p < 0.05$, $*** p < 0.01$

Table 8: Holding value, Benedictines vs Celtic monastic landlords

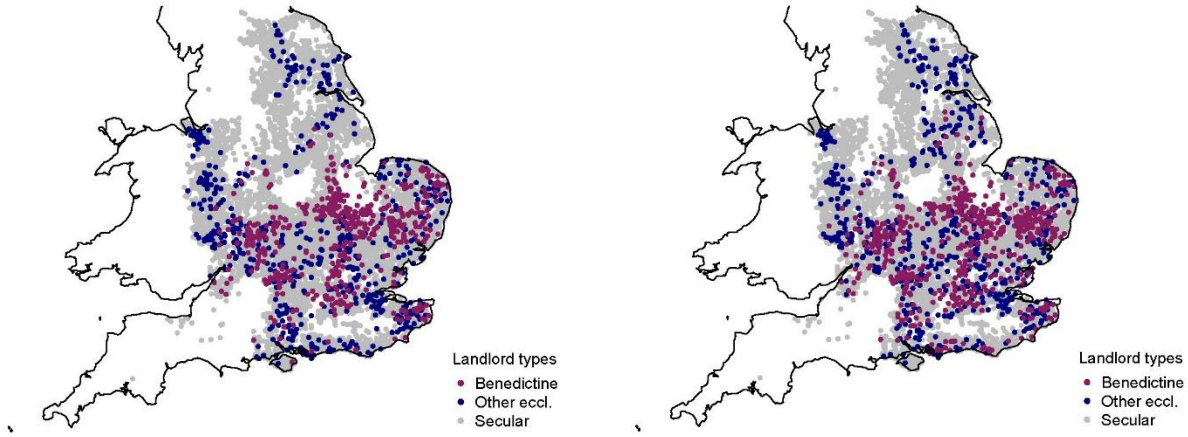
| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Panel A | | | | | |
| Benedictine (1086) | 0.749*** | 0.193 | -0.269 | 0.693*** | 0.334** |
| | (0.168) | (0.143) | (0.485) | (0.170) | (0.156) |
| Panel B | | | | | |
| Benedictine (1086) | 0.754*** | 0.163 | -0.264 | 0.744*** | 0.254 |
| | (0.178) | (0.139) | (0.491) | (0.177) | (0.169) |
| Common to both panels: | | | | | |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[1] | No | No | Yes | No | Yes |
| History*time ctrls[1] | No | No | No | Yes | Yes |
| Obs. | 916 | 916 | 916 | 916 | 916 |

*Notes:* OLS, cross-section based on 1086 outcomes. The sample includes 892 Benedictine holdings and 24 Celtic monasteries' holdings, independently of their status in 1066. Panel A reports main results; Panel B also controls for stability in Overlordship, i.e. Overlord in 1066 is also Tenant-in-Chief in 1086, in all the columns. Dependent variable: log of value measured in 1086 only. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4). In this models we add stability (*id est* having the same landlord in both 1066 and 1086) as a control in columns (2) and (5).

[1] Geography, Market, and History control variables are the same as listed in the note to Table 3.

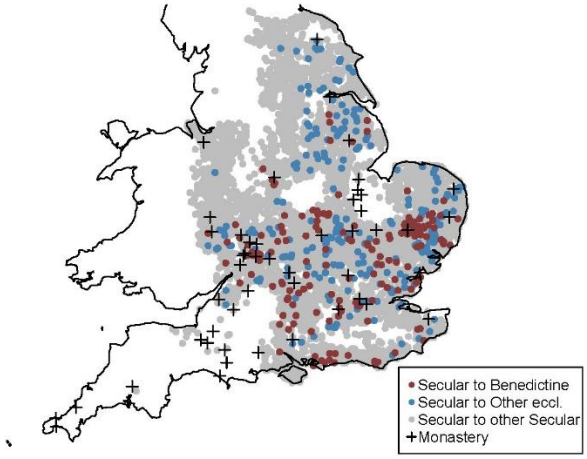
$*p < 0.10$, $** p < 0.05$, $*** p < 0.01$

Figure 1: Lord types in England before and after the Conquest




(a) 1066 (b) 1086

Figure 2: Change in lord types




*Notes*: Holdings whose lord changed between 1066 and 1086. Grey dots represent holdings switching from a secular lord to another secular lord (presumably, from an Anglo-Saxon to a Norman nobleman), blue dots represent those switching from a secular lord to an "Other ecclesiastic" and maroon dots represent those switching from a secular lord to a monastery. Black crosses represent monasteries. The map excludes holdings with missing information on value and outliers.

# ONLINE APPENDIX

Ora et Guberna.

The Economic Impact of the Rule of St Benedict

in Medieval England

## A Additional tables and figures

### A.1 Cross-section with geographic fixed effects

This section includes a third empirical strategy we can use, taking advantage of the detailed geographical information included in our dataset. Since we know the geographic location of every estate, we are able to collect a number of controls related to geographic conditions, history and market access. Moreover, we exploit information on the administrative structure of the Norman kingdom to include dummies for each county or each hundred. In practice, we estimate by OLS the following specification:

$$Y_{i,\mathrm{g}} = \gamma_g + \delta \mathrm{Religious}_{i,g} + \beta' \boldsymbol{x}_{i,g} + \epsilon_{i,g} \quad \text{(A.1)}$$

where $Y_{i,g}$ is the growth rate of value over 20 years for holding $i$ located in the geographic unit $g$, $\gamma_g$ are geographic (county or hundred) dummies, $Religious_{i,g}$ is a dummy equal to one if holding $i$ was controlled by a religious landlord in 1066 and $\mathbf{x}_{i,g}$ is the vector of holding-varying controls mentioned above. The coefficient of interest is $\delta$ and, in the most demanding specification, we are comparing monastic and secular estates located within small administrative units. We also use a similar specification to compare Benedictine holdings (hence the dummy is $Benedict_{i,g}$) and secular holdings, excluding those controlled by "Other ecclesiastic" in 1066. Finally, the specification we use to compare "other ecclesiastic" and secular lords is exactly the same, with $Benedict_{i,g}$ replaced by $OthEcclesiastic_{i,g}$ and monastic holdings excluded. Note that the sample is different from the one used in the main body of the paper, since here i) we do not limit our attention to holdings that switched landlord and ii) we look at their ownership in 1066, rather than at their change between 1066 and 1086, as we want to focus on the long term effect of Benedictines. The combination of this feature with the holding-specific controls we collected should address most of the endogeneity concerns that arise from purely geographic considerations. It remains possible, however, that monasteries or bishops managed to systematically select the best land (in terms of unobservable characteristics we are not accounting for) within each hundred. Moreover, the Norman Conquest affected the land controlled by non-monastic landlords to a disproportionate extent, due to the almost complete annihilation of the Anglo-Saxon elite. Section 4.1 attempts to address these concerns.

Table A1 summarises the results when we estimate (A.1). We first present the model without controls, then add these separately. Column (5) is the most demanding estimation, with the whole set of controls.

Table A1: Growth rate of holding value: religious and secular landlords compared

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Religious (1066) | 0.047*** | 0.051*** | 0.046** | 0.048*** | 0.051*** |
| | (0.018) | (0.019) | (0.018) | (0.018) | (0.019) |
| Hundred FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography[1] | No | Yes | No | No | Yes |
| Market access[2] | No | No | Yes | No | Yes |
| History[3] | No | No | No | Yes | Yes |
| Obs | 8078 | 8078 | 8078 | 8078 | 8078 |

*Notes.* OLS, cross-section. Dependent variable: value growth rate. Standard errors clustered at landlord level (1066). We exclude holdings whose lord (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4).

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines, holding's value in 1066 and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.

$*\ p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

As the outcome variable is the growth rate, these estimates suggest that between 1066 and 1086, holdings controlled by a religious ruler in 1066 experienced a growth rate that was between 4.7 and 5.4 percentage points higher than in holdings controlled by a secular ruler. In tables A2, A3 and A4 we perform the same analysis for Benedictine monasteries and Other ecclesiastical landlords separately we find a positive and significant coefficient in most of the specifications.

Table A2: Growth rate of manor income: Benedictine and secular landlords compared, excl. Bishops

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine (1066) | 0.048** | 0.051*** | 0.047** | 0.049** | 0.052*** |
| | (0.021) | (0.020) | (0.022) | (0.021) | (0.020) |
| Hundred FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography[1] | No | Yes | No | No | Yes |
| Market access[2] | No | No | Yes | No | Yes |
| History[3] | No | No | No | Yes | Yes |
| Obs | 7512 | 7512 | 7512 | 7512 | 7512 |

*Notes.* OLS, cross-section. Dependent variable: value growth rate. Standard errors clustered at landlord level (1066). We exclude holdings whose lord (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines, holding's value in 1066 and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.

$* p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A3: Growth rate of manor income: Benedictine and secular landlords compared, county FE

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine (1066) | 0.074*** | 0.080*** | 0.071** | 0.074*** | 0.080*** |
| | (0.027) | (0.024) | (0.028) | (0.027) | (0.024) |
| County FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography[1] | No | Yes | No | No | Yes |
| Market access[2] | No | No | Yes | No | Yes |
| History[3] | No | No | No | Yes | Yes |
| Obs | 7512 | 7512 | 7512 | 7512 | 7512 |

*Notes.* OLS, cross-section. Dependent variable: value growth rate. Standard errors clustered at landlord level (1066). We exclude holdings whose lord (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines, holding's value in 1066 and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.

$* p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A4: Growth rate of holding value: "other ecclesiastic" and secular landlords compared, excluding Benedictine monasteries

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Oth. Eccl. (1066) | 0.048* | 0.051* | 0.045* | 0.049* | 0.051* |
| | (0.027) | (0.028) | (0.027) | (0.026) | (0.028) |
| Hundred FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography[1] | No | Yes | No | No | Yes |
| Market access[2] | No | No | Yes | No | Yes |
| History[3] | No | No | No | Yes | Yes |
| Obs | 7546 | 7546 | 7546 | 7546 | 7546 |

*Notes.* Dependent variable: value growth rate. Standard errors clustered at landlord level (1066). This implies dropping all the landlords with only one holding. We exclude holdings whose lord (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by Benedictine monasteries in 1086.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines, holding's value in 1066 and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.

$* p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

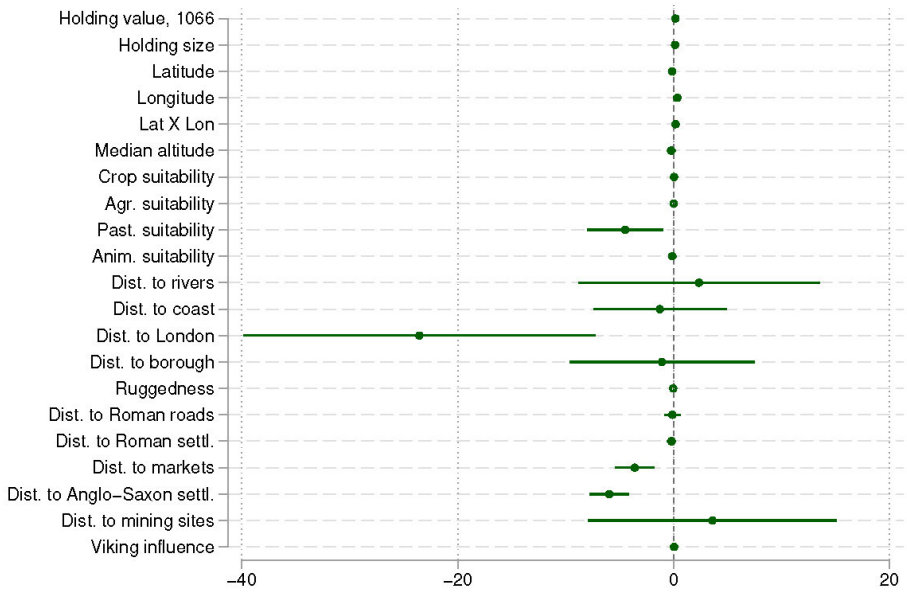
## A.2 Difference in difference model: robustness checks

This section contains the balance tests for all the "treatment" dummies we consider. Furthermore, Figures A4 to A8 summarizes balance tests related to holdings assigned to five prominent landlords who were among the fellow warriors of William during his military campaign to conquer England. Finally, Tables A6 estimates the same model as in table 5 excluding holdings assigned to the King.

### A.2.1 Balance tests

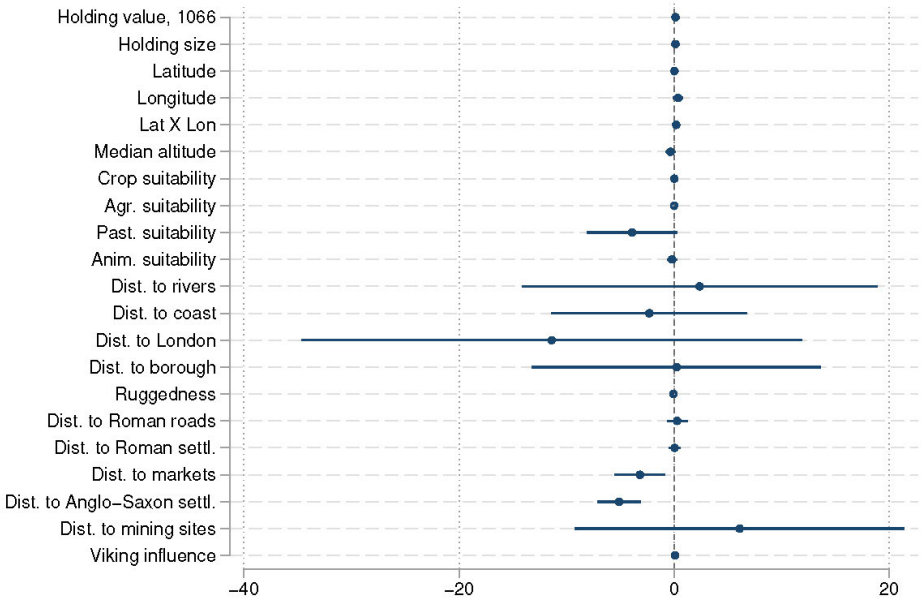
Figures A1, A2 and A3 perform balance tests for the control variables with respect to Religious, Benedictine and Other Ecclesiastical holdings respectively. Secular holdings are always the baseline. We use the same sample as in the main Difference-in-Difference specification.

Figure A1: Balance tests for Religious, 1086 (DID subsample)



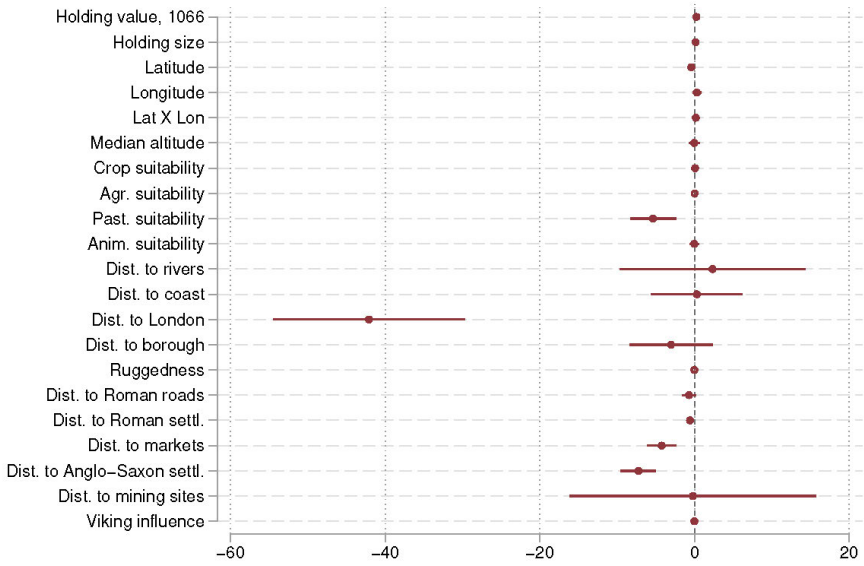

*Notes*: Regression of the dependent variable stated in each row on Religious (1086) dummy. Sample limited to secular holdings in 1066 that switched owner, excluding outliers, ambiguous lords (1086), female and non-Benedictine monasteries and Benedictine monasteries created after 1076. Distances and value are all in logs. Standard errors clustered at landlord level (1086). Coefficients of Lat×Lon, Ruggedness, Median altitude, Agr., Past. and Anim. suitability have been re-scaled to ease graphical readability.

Figure A2: Balance tests for Benedictine, 1086 (DID subsample)




*Notes*: Regression of the dependent variable stated in each row on Benedictine (1086) dummy. Sample limited to secular holdings in 1066 that switched owner, excluding "other ecclesiastic", outliers, ambiguous lords (1086), female and non-Benedictine monasteries and Benedictine monasteries created after 1076. Distances and value are all in logs. Standard errors clustered at landlord level (1086). Coefficients of Lat×Lon, Ruggedness, Median altitude, Agr., Past. and Anim. suitability have been re-scaled to ease graphical readability.

Figure A3: Balance tests for "Other ecclesiastic", 1086 (DID subsample)

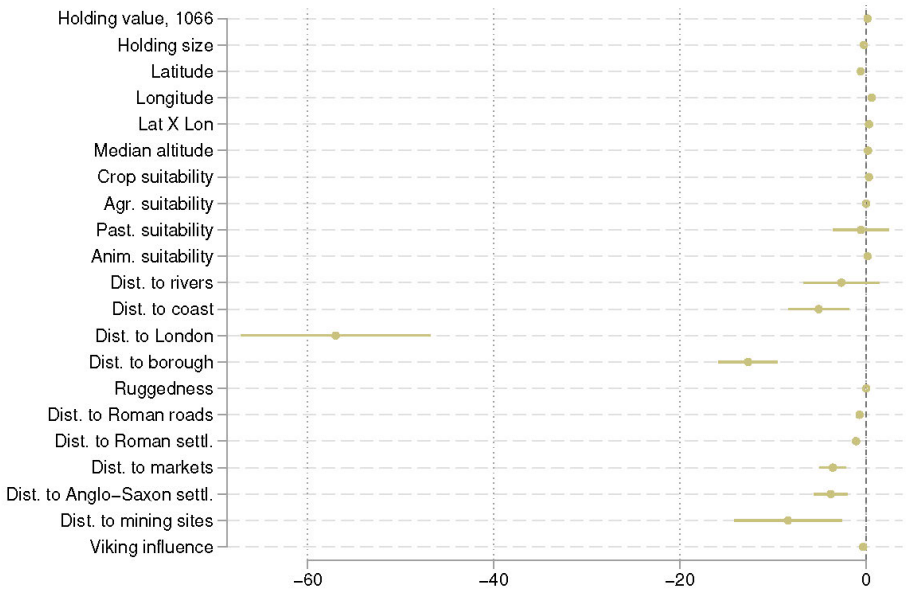



*Notes*: Regression of the dependent variable stated in each row on "Other ecclesiastic" (1086) dummy. Sample limited to secular holdings in 1066 that switched owner, excluding outliers, ambiguous lords (1086) and monasteries. Distances and value are all in logs. Standard errors clustered at landlord level (1086). Coefficients of Lat×Lon, Ruggedness, Median altitude, Agr., Past. and Anim. suitability have been re-scaled to ease graphical readability.

### A.2.2 Test for big Tenant-in-Chiefs

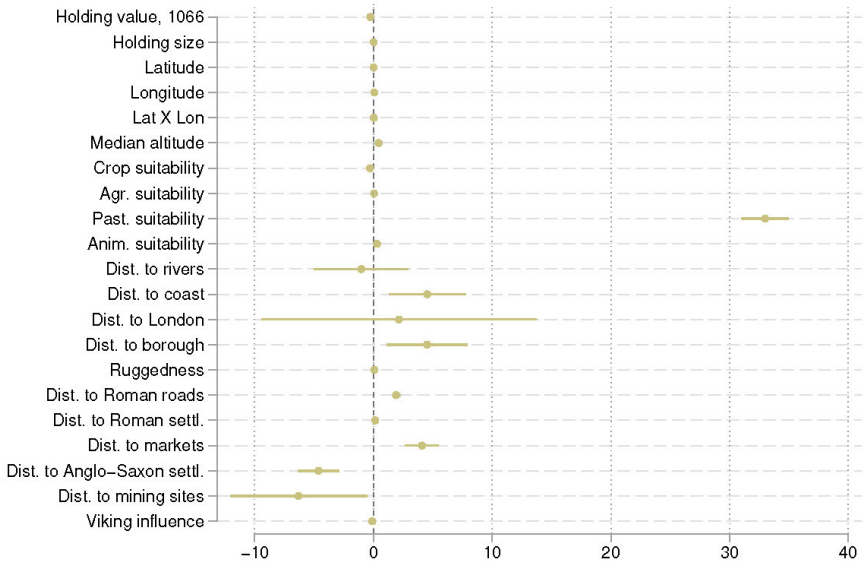
Figures A4, A5, A6, A7 and A8 compares holdings belonging to five big Tenant-in-Chiefs with all other holdings. We run this analysis at the Tenant-in-Chief level.

Figure A4: Balance tests for Odo of Bayeux, 1086 (DID subsample)



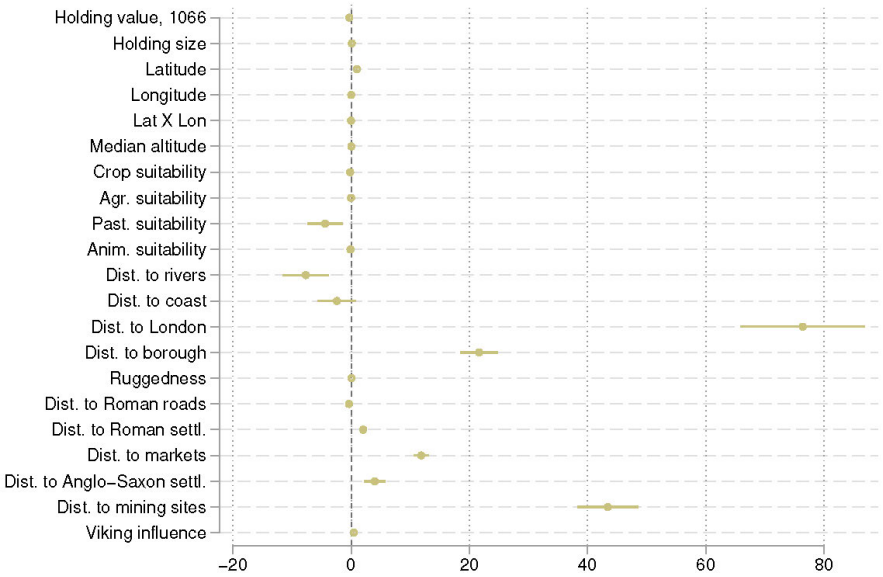

*Notes*: Regression of the dependent variable stated in each row on a dummy variable identifying holdings assigned to Odo of Bayeux. The sample excludes outliers and holdings controlled by an ambiguous lord in 1086. Distances and value are all in logs. Standard errors clustered at landlord level (1086). Coefficients of Lat×Lon, Ruggedness, Median altitude, Agr., Past. and Anim. suitability have been re-scaled to ease graphical readability.

Figure A5: Balance tests for Count Mortain, 1086 (DID subsample)



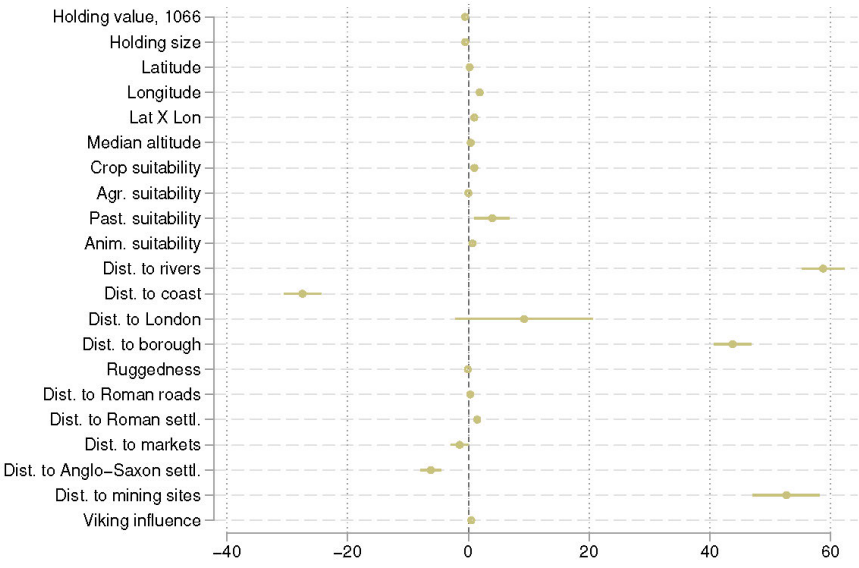

*Notes*: Regression of the dependent variable stated in each row on a dummy variable identifying holdings assigned to Count Mortain. The sample excludes outliers and holdings controlled by an ambiguous lord in 1086. Distances and value are all in logs. Standard errors clustered at landlord level (1086). Coefficients of Lat×Lon, Ruggedness, Median altitude, Agr., Past. and Anim. suitability have been re-scaled to ease graphical readability.

Figure A6: Balance tests for Count Alan, 1086 (DID subsample)



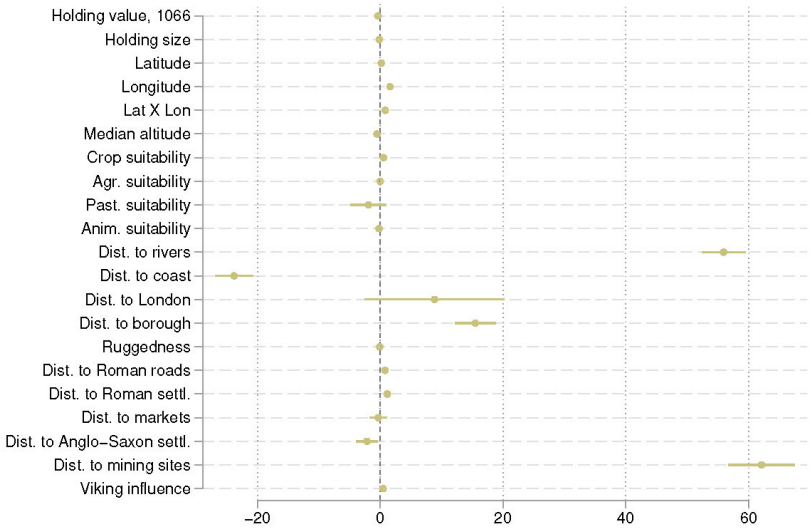

*Notes*: Regression of the dependent variable stated in each row on a dummy variable identifying holdings assigned to Count Alan. The sample excludes outliers and holdings controlled by an ambiguous lord in 1086. Distances and value are all in logs. Standard errors clustered at landlord level (1086). Coefficients of Lat×Lon, Ruggedness, Median altitude, Agr., Past. and Anim. suitability have been re-scaled to ease graphical readability

Figure A7: Balance tests for Roger Bigot, 1086 (DID subsample)




*Notes*: Regression of the dependent variable stated in each row on a dummy variable identifying holdings assigned to Roger Bigot. The sample excludes outliers and holdings controlled by an ambiguous lord in 1086. Distances and value are all in logs. Standard errors clustered at landlord level (1086). Coefficients of Lat×Lon, Ruggedness, Median altitude, Agr., Past. and Anim. suitability have been re-scaled to ease graphical readability.

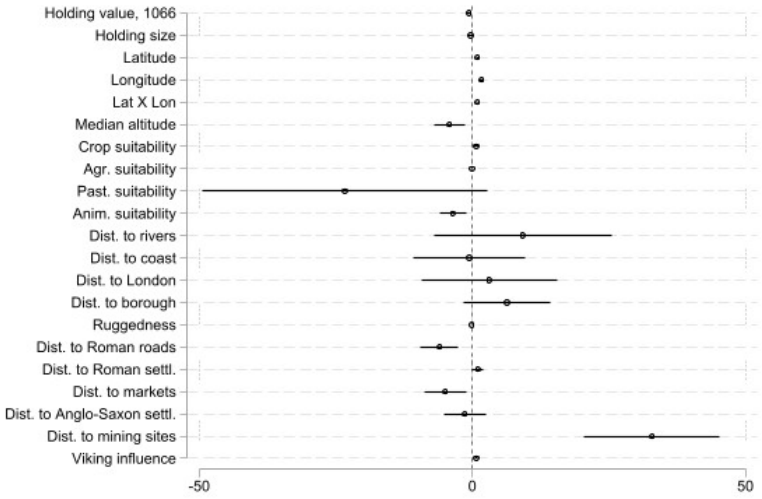
Figure A8: Balance tests for Robert Malet, 1086 (DID subsample)




*Notes*: Regression of the dependent variable stated in each row on a dummy variable identifying holdings assigned to Robert Malet. The sample excludes outliers and holdings controlled by an ambiguous lord in 1086. Distances and value are all in logs. Standard errors clustered at landlord level (1086). Coefficients of Lat×Lon, Ruggedness, Median altitude, Agr., Past. and Anim. suitability have been re-scaled to ease graphical readability.

### A.2.3 Balance test for 'constant' Overlords, comparing Benedictine and royal Tenant-in-Chiefs

Figure A9: Balance tests for Benedictine (subsample of 'constant' Overlords)




*Notes*: Regression of the dependent variable stated in each row on a dummy variable identifying holdings controlled by Benedictine in 1086. The sample excludes outliers and holdings controlled by an ambiguous lord in 1086. Distances and value are all in logs. Standard errors clustered at landlord level (1086). Coefficients of Lat×Lon, Ruggedness, Median altitude, Agr., Past. and Anim. suitability have been re-scaled to ease graphical readability.

### A.2.4 Additional tables

Table A5: Holding value: King vs secular landlords

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| King | -0.044*** | 0.002 | 0.013 | -0.039*** | 0.036* |
| | (0.011) | (0.018) | (0.016) | (0.013) | (0.021) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs. | 14302 | 14302 | 14302 | 14302 | 14302 |

*Notes*. Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 6637 secular and 514 holdings held by King William.

Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), and holdings controlled by Benedictine or Ecclesiastic landlords;

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.

$* p < 0.10 ** p < 0.05 *** p < 0.01$

Table A6: Holding value: Benedictine vs other landlords (excluding the King)

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.114*** | 0.068*** | 0.060** | 0.087*** | 0.066*** |
| | (0.033) | (0.024) | (0.024) | (0.033) | (0.022) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 13594 | 13594 | 13594 | 13594 | 13594 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 6637 secular holdings and 160 Benedictine holdings.

Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" or by the King in 1086;

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.

$* p < 0.10 ** p < 0.05 *** p < 0.01$

## A.3 DID: different clustering strategies

This section contains tables showing the robustness of the results in Table 5 to different clustering strategies (hundred level, county level and Conley standard errors).

Table A7: DID: Conley standard errors

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.117*** | 0.062*** | 0.053** | 0.087*** | 0.058*** |
| | (0.032) | (0.023) | (0.023) | (0.027) | (0.022) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 14622 | 14622 | 14622 | 14622 | 14622 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 7151 secular holdings and 160 Benedictine holdings. Dependent variable: log of value. Standard errors are calculated using Spatial HAC method. We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in $10^{th}$ century.

$* p < 0.10 ** p < 0.05 *** p < 0.01$

Table A8: DID: clustering at Hundred level

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.117*** | 0.062** | 0.053* | 0.087*** | 0.058** |
| | (0.031) | (0.029) | (0.029) | (0.030) | (0.029) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 14622 | 14622 | 14622 | 14622 | 14622 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 7151 secular holdings and 160 Benedictine holdings. Dependent variable: log of value. Standard errors clustered at hundred level. We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in $10^{th}$ century.

$* p < 0.10 ** p < 0.05 *** p < 0.01$

Table A9: DID: clustering at County level

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.117** | 0.062** | 0.053* | 0.087** | 0.058** |
| | (0.057) | (0.029) | (0.027) | (0.040) | (0.027) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 14622 | 14622 | 14622 | 14622 | 14622 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 7151 secular holdings and 160 Benedictine holdings.

Dependent variable: log of value. Standard errors clustered at county level. We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.

$* p < 0.10 ** p < 0.05 *** p < 0.01$

## A.4 DID: Doubly-Robust Estimator

In this section we estimate the main table of the paper using the doubly-robust Difference-indifference estimator proposed by Sant'Anna and Zhao (2020) as a way to estimate the ATT when the parallel trend assumption holds only conditional on covariates. Results are very consistent with the main table of the paper.

Table A10: Holding value: Benedictine vs secular landlord, Doubly-Robust Difference-in-Difference

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.117*** | 0.068*** | 0.070*** | 0.087*** | 0.062*** |
| | (0.033) | (0.019) | (0.026) | (0.029) | (0.020) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 14622 | 14622 | 14622 | 14622 | 14622 |

*Notes*. Doubly Robust Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 7151 secular holdings and 160 Benedictine holdings.
Dependent variable: log of value. Standard errors clustered at landlord level (1086). All models have been estimated implementing the doubly robust Difference-in-Difference estimator described in Sant'Anna and Zhao (2020), to adjust for conditional parallel trend violations. We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as estates with "Other ecclesiastic" owner in 1086.
[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines, holding's value in 1066 and (log of) size;
[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;
[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.
$* p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

# B Matching

## Coarsened Exact Matching (CEM)

Since we are dealing with historical observational data and not with a pure experimental dataset, we need to address the potential bias in the estimation of the (sample) Average Treatment Effect on the Treated (ATT) driven by potential non-random assignment to "treatment": in other words, the effect might be driven by unobservable variables we cannot control for. In the previous sections, we dealt with this issue by including a broad range of controls that sharply reduce the chances of such a bias still existing. However, since there are far fewer observations in the treatment than in the control group, we provide a further test for the robustness of our findings by applying a matching estimation technique.

Matching is a technique for pre-processing data to obtain a new dataset in which some heterogeneity is "sacrificed" to limit potential selection bias, by "matching" each treated observation to its most similar control. Matching can be performed through a variety of alternative methods. We adopt the Coarsened Exact Matching (CEM) procedure described in Iacus et al. (2012) and Blackwell et al. (2009). CEM enables the matching of treated and control groups by "coarsening" variables to obtain a few categories for each variable and by retaining in the sample only treated and control observations that are exactly matched within these categories. This procedure carries several benefits in comparison to alternative popular methods for matching, such as propensity score (King and Nielsen, 2016), by bounding ex-post imbalance, as well as any error in the estimate of the ATT, and by reducing model dependence (Iacus et al., 2012). Since CEM prunes observations to improve balance between the control and treated groups (id est retaining only observations in the common support area), alternative decisions about coarsening affect the size of the matched sample.[1] We provide two alternative matched samples to assess the robustness of our choice. First, in the "Approach A" version, we

[1] As Iacus et al. (2012) note, this decision is pivotal for any researcher and crucially depends on the knowledge of the data generation process.

condition matching on the full set of covariates, coarsening all variables following the Sturges' rule[2] except for holding size, which is categorised into two bins.[3] Second, we produce a more demanding "Approach B" version of the benchmark matching, in which holding size is categorised into three bins. For all these alternative matching approaches, we apply two statistical models to estimate the ATT controlling for the residual imbalance. The first model only controls for variables with the largest univariate residual imbalance (L1 larger than 0.01); the second model replicates our preferred model including the full set of covariates.

Table B1 shows the outcome of our analysis on the matched sample, based on two alternative matched samples and two alternative statistical models. The Table notes report the full list of control variables included in every model.

Table B1: Coarsened Exact Matching (CEM): Growth rate of value: Benedictine and secular holdings compared

| | CEM | | | | DID | |
|---|---|---|---|---|---|---|
| | Approach A | | Approach B | | Table 4, Panel B | |
| | (1) | (2) | (3) | (4) | Col. (1) | Col. (5) |
| coef.† | 0.285 | 0.285 | 0.288 | 0.288 | 0.117 | 0.058 |
| s.e | 0.097 | 0.070 | 0.092 | 0.073 | 0.033 | 0.022 |
| p-value | 0.004 | 0.000 | 0.002 | 0.000 | 0.000 | 0.010 |
| Control variables | Unbalanced[1] | All | Unbalanced[2] | All | All | |
| Treated (Benedictine) | 77 | 77 | 74 | 74 | 160 | 160 |
| Control (Secular) | 127 | 127 | 121 | 121 | 7151 | 7151 |
| L1 | 0.78 | | 0.83 | | 0.998 | |

*Notes.* Coarsened Exact Matching (CEM), based on the full set of covariates. All variables have been coarsened by Sturges' method, except for holding size. In the Benchmark matching model (Approach A), holding size has been coarsened into two equally sized bins; in the Expanded matching model (Approach B), holding size has been coarsened in three equally sized bins. Dependent variable: log of value. Standard errors clustered at landlord level (1086), excluding holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as "Other Ecclesiastic".

† The estimated coefficient (coef.) is sample Average Treatment Effect on the Treated (ATT) for the CEM model; Difference-in-Difference estimator for DID model.

[1] Variable with residual L1 larger than 0.01: Holding size (log), Ruggedness, Dist. to Roman settlements, Dist. to mines, Dist. to markets, Dist. to boroughs, Dist. to London, Dist. to Anglo-Saxon settlements.

[2] Variable with residual L1 larger than 0.01: Holding size (log), Dist. to Roman settlements, Dist. to mines, Ruggedness, Dist. to Anglo-Saxon settlements, Dist. to markets, Dist. to London, Dist. to boroughs.

[2] Assuming $k$ categories (bins) and $n$ observations, Sturges' rule defines the optimal number of bins as: $k = \lceil log_2 n \rceil + 1$.

[3] Sturges' rule assumes normality in the distribution, but this variable is very skewed, so the Sturges' rule would be inappropriate in this case.

The table shows that the estimated ATT is consistent across specifications and generally larger than the main specification of the Difference-in-Difference effect, reported in the last column for the reader's convenience, although it is relatively close in magnitude to the Benchmark specification of the Difference-in-Difference effect. It is worth stressing that matching results are obtained by comparing observations that are otherwise similar but differ only in treatment status: the estimated effect is therefore larger although inference may be limited. Overall, matching supports our previous findings, since all four estimated ATT are strongly statistically significant. Therefore, when restricting the analysis to similar observations, we find that being assigned to Benedictine monasteries impacts the holding's productivity within a range of 17 to 18 percentage points.

We also applied the same CEM technique to the case of holdings whose lordship changed to "Other Ecclesiastic". Table B2 summarises the results showing that once the sample is pre-processed through CEM, the estimated coefficient of the ATT in the case of "Other Ecclesiastic" landlords becomes negative and never statistically significant. This result strengthens our finding on the heterogeneity of religious leaders on holdings' performance, strongly highlighting that only Benedictine monasteries exert a distinctive positive effect within the context of alternative religious leader types.

Table B2: Coarsened Exact Matching (CEM): Growth rate of value: "other ecclesiastic" and secular holdings compared

| | CEM | | | | DID | |
|---|---|---|---|---|---|---|
| | Approach A | | Approach B | | Table 4, Panel C | |
| | (1) | (2) | (3) | (4) | Col. (1) | Col. (5) |
| coef.[†] | -0.100 | -0.100 | -0.104 | -0.105 | 0.043 | 0.006 |
| s.e | 0.051 | 0.051 | 0.053 | 0.052 | 0.047 | 0.033 |
| p-value | 0.054 | 0.052 | 0.050 | 0.046 | 0.368 | 0.848 |
| Control variables | Unbalanced[1] | All | Unbalanced[2] | All | All | |
| Treated (Oth. Eccl.) | 124 | 124 | 120 | 120 | 244 | 244 |
| Control (Secular) | 242 | 242 | 235 | 235 | 7151 | 7151 |
| L1 | 0.81 | | 0.79 | | 0.996 | |

*Notes:* Coarsened Exact Matching (CEM), based on the full set of covariates. All variables have been coarsened by Sturges' method, except for holding size. In Approach A matching model, holding size has been coarsened into two equally sized bins; in the Approach B matching model, holding size has been coarsened in three equally sized bins. Dependent variable: log of value. Standard errors clustered at landlord level (1086), excluding holdings controlled by an ambiguous lord in 1086 and outliers (*id est* estates recording growth rate larger than 4).

[†]The estimated coefficient (coef.) is sample Average Treatment Effect on the Treated (ATT) for the CEM model; Difference-in-Difference estimator for DID model.

[1]Variable with residual L1 larger than 0.01: Holding size (log), Dist. to Roman roads, Dist. to Roman settlements, Ruggedness, Dist. to markets, Dist. to mines, Dist. to Anglo-Saxon settlements.

[2] Variable with residual L1 larger than 0.01: Holding size (log), Dist. to Roman roads, Dist. to Roman settlements, Ruggedness, Dist. to markets, Dist. to Anglo-Saxon settlements.

## Nearest-Neighbour Matching (NNM)

An alternative matching approach, adopted in Heldring et al. (2020), is based on the Nearest-Neighbour Matching technique (NNM henceforth) which aims to minimise the Mahalanobis distance[4] between treated and control observations.[5] More specifically, the resulting subsample retains for every holding assigned to a Benedictine monastery only the most similar holding assigned to a secular landlord, thus restricting the analysis to 338 observations, in which the ratio between treated and controls is exactly 1. Although this procedure comes at the cost of sacrificing some precision in the estimated effect (due to the sharp reduction in the number of observations), it ensures "the most credible inference with the least bias" (Imbens and Wooldridge, 2009, p. 31). In fact, by restricting our analysis to only those estates that are similar with regard to the full set of our covariates, we can assume that treatment is as good as randomly assigned after conditioning on covariates. Once the matched sample has been obtained as explained above, the (sample) Average Treatment Effect on the Treated (ATT) can be calculated by estimating the mean difference in the outcome variable (the log of value in 1086) between Benedictine and non-Benedictine holdings. Results are shown in Table B3: it compares the estimated ATT after matching to the estimated coefficients of our main Difference-in-Difference OLS estimations, both excluding and including the full set of control variables. The coefficient is highly significant, at 1% level, and similar in size to the reported DID coefficients. The bottom rows present a summary of the balancing of all covariates in the matched and DID samples. Full balancing is achieved when the average standardised difference of covariates across treatment groups (*id est* comparing Benedictine and secular holdings) is equal to 0. Analogously, balancing is achieved when the variance ratio for the two groups is 1. As the Table shows, *after* matching has been implemented, these values are respectively -0.002 and 0.990, implying that our matching procedure achieves substantial balancing with regard to all observable characteristics of Benedictine and non-Benedictine holdings. This is reassuring for the precision of the estimated ATT and provides important confirmatory evidence of our main results.

[4] Mahalanobis distance, $D_{ij}$, allows us to compute the multidimensional distance between two points $i$ and $j$ in a multivariate space and is defined as: $D_{ij} = \sqrt{(\boldsymbol{X}_i - \boldsymbol{X}_j)' \boldsymbol{W}^{-1} (\boldsymbol{X}_i - \boldsymbol{X}_j)}$ where $!_i$ and $!_j$ are the vectors of covariate data and $"^{\#}$ is the variance-covariance matrix.

[5] As Iacus et al. (2012) note, Mahalanobis distance is part of a class of matching methods "which does not guarantee any level of imbalance reduction in any given data set; its properties only hold on average across samples and even then only by assuming a set of normally unverifiable assumptions about the data generation process". For this reason, we rely on CEM as our first choice while implement also NNM as a further robustness check.

Table B3: Nearest-Neighbour Matching (NNM): Growth rate of holding value: Benedictine and secular holdings compared

| | NNM | DID | |
|---|---|---|---|
| | | Table 4, Panel B | |
| | | Col. (1) | Col. (5) |
| coef.† | 0.132 | 0.117 | 0.058 |
| s.e.‡ | 0.065 | 0.033 | 0.022 |
| p-value | 0.042 | 0.000 | 0.010 |
| Treated | 160 | 160 | 160 |
| Control | 160 | 7151 | 7151 |
| *Balance tests* | Matched sample | DID sample | |
| Avg. standardised diff. of covariates | -0.002 | -0.028 | |
| Avg. variance ratio | 0.986 | 1.297 | |

*Notes.* Dependent variable: log of value. Standard errors clustered at landlord level (1086), excluding holdings whose lords (1086) were female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as "Other Ecclesiastic".
Nearest-Neighbour Matching with replacement based on Mahalanobis distance, conditioning on the full set of covariates: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines, (log of) size, distance (in km) to: rivers, coast, London, nearest borough, to Roman settlements, to Roman roads and to Anglo-Saxon settlements, and Viking influence in $10^{th}$ century.
† The estimated coefficient (coef.) is the sample Average Treatment Effect on the Treated (ATT) for the NNM model; Difference-in-Difference estimator for DID model.
‡ Standard errors are Abadie-Imbens robust standard errors for NNM (Abadie and Imbens, 2006); robust (clustered at lord 1086 level) for DID.

Similarly, Table B4 reports the outcome of the same matching exercise performed when we compare Other ecclesiastical holdings with secular holdings. Again, matching confirms the outcome of our main regression tests.

Table B4: Nearest-Neighbour Matching: Growth rate of holding value: test on the effect of Other ecclesiastical holdings

| | NNM | DID | |
|---|---|---|---|
| | | Table 4, Panel C | |
| | | Col. (1) | Col. (5) |
| coef.† | -0.340 | 0.043 | 0.006 |
| s.e.‡ | 0.255 | 0.047 | 0.033 |
| p-value | 0.183 | 0.368 | 0.848 |
| Treated | 160 | 244 | 244 |
| Control | 160 | 7151 | 7151 |
| *Balance tests* | Matched sample | DID sample | |
| Avg. standardised diff. of covariates | -0.001 | -0.022 | |
| Avg. variance ratio | 1.023 | 1.262 | |

*Notes.* Dependent variable: log of value. Standard errors clustered at landlord level (1086), excluding holdings whose lords (1086) were female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4)

Nearest-Neighbour Matching with replacement based on Mahalanobis distance, conditioning on the full set of covariates: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines, (log of) size, distance (in km) to: rivers, coast, London, nearest borough, to Roman settlements, to Roman roads and to Anglo-Saxon settlements, and Viking influence in $10^{th}$ century.

† The estimated coefficient (coef.) is the sample Average Treatment Effect on the Treated (ATT) for the NNM model; Difference-in-Difference estimator for DID model.

‡ Standard errors are Abadie-Imbens robust standard errors for NNM (Abadie and Imbens, 2006); robust (clustered at lord 1086 level) for DID.

#

# C Robustness to different coding

In this section we test the robustness of our results to different ways of coding the "treatment" variable. First, Table C1 restricts the sample to holdings where the landlord who controls them in 1086 is also a Tenant-in-Chief. This implies that we are excluding all those holdings that Tenants-in-Chief assigned to someone else (for example one of their knights). Despite the drop in the number of observations, results are significant in most of the specifications. Overall, we think this table provides positive evidence of the robustness of our results.

Table C1: DID: including only Tenant-in-Chiefs

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.158*** | 0.049 | 0.059* | 0.118*** | 0.060* |
| | (0.040) | (0.037) | (0.033) | (0.041) | (0.033) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 7042 | 7042 | 7042 | 7042 | 7042 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 3407 secular holdings and 114 Benedictine holdings.

Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086. The sample only includes landlords who were simultaneously serving as Tenant-In-Chief in their estates.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in $10^{th}$ century.

$* p < 0.10 ** p < 0.05 *** p < 0.01$

Secondly, Table C2 excludes holdings belonging to the Abbey of Canterbury from the sample. The reason for this is twofold. Firstly, Canterbury was traditionally the see of the most important bishop of the Church in England; secondly, in 1070 King William was able to impose one of his close advisers, Lanfranc, as archbishop and abbot there. Hence, he may have rewarded him directly with better holdings.

Table C2: DID: excluding holdings belonging to the Abbey of Canterbury

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.115*** | 0.059** | 0.051** | 0.085** | 0.056** |
| | (0.034) | (0.025) | (0.026) | (0.035) | (0.023) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 14614 | 14614 | 14614 | 14614 | 14614 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 7151 secular holdings and 156 Benedictine holdings. Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086; Moreover, we exclude holdings assigned to the Abbey of Canterbury.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.

$* p < 0.10 ** p < 0.05 *** p < 0.01$

Table C3: DID: excluding holdings belonging to the cathedral priories

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.113*** | 0.057** | 0.049* | 0.084** | 0.052** |
| | (0.035) | (0.026) | (0.028) | (0.036) | (0.025) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 14592 | 14592 | 14592 | 14592 | 14592 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 7151 secular holdings and 145 Benedictine holdings. Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086. Moreover, we exclude holdings assigned to cathedral priories (*id est* monasteries that were also the see of a Bishop, namely: Canterbury, Coventry, Ely, and Winchester since the Bishop held the priory until 1239).

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.

$* p < 0.10 ** p < 0.05 *** p < 0.01$

Further, as Knowles notes (p. 107 Knowles, 1963) there were four monastic cathedrals at the time of the Conquest. In the following Table C3 we have removed all the estates belonging to any of these monasteries from the sample. The results still hold.

Table C4 shows how the basic diff-in-diff changes when we introduce an "ambiguous Value 1066" fixed effect, interacted with time. It is a dummy equal to 1 if the coded "Value 1066" refers to "an intermediate date" or an "unspecified date before 1086" in the original dataset (id est, the variable Values is coded as "qr" or "was" rather than as "tre").

Table C4: DID: adding fixed effect for ambiguous "Value 1066"

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.097** | 0.053** | 0.043* | 0.073** | 0.050** |
| | (0.031) | (0.023) | (0.026) | (0.036) | (0.023) |
| Ambig. Value66*time | 0.196*** | 0.179*** | 0.154*** | 0.186*** | 0.167*** |
| | (0.015) | (0.011) | (0.012) | (0.013) | (0.011) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 14622 | 14622 | 14622 | 14622 | 14622 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 7151 secular holdings and 160 Benedictine holdings. Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.

$* p < 0.10 ** p < 0.05 *** p < 0.01$

# D Robustness to different sample definitions

In this section, we show our results' robustness to different ways of defining the sample. We will focus principally on the main DID specification, adding other tables when meaningful.

## D.1 Inclusion of ambiguous lords

In Tables D1 and D2 we estimate the main model including all the landlords for whom it was impossible to find a unique identifier, using two different clustering strategies. Results are substantially unaffected.

Table D1: DID: including also "ambiguous" landlords - clustering at hundred level

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.118*** | 0.064** | 0.055* | 0.089*** | 0.060** |
| | (0.031) | (0.029) | (0.029) | (0.030) | (0.029) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 14886 | 14886 | 14886 | 14886 | 14886 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 7283 secular holdings and 160 Benedictine holdings.

Dependent variable: log of value. Standard errors clustered at hundred level. We exclude holdings whose lords (1086) were female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086. Moreover, we exclude holdings assigned to "alien" priories (*id est* holdings assigned to monasteries that were physically located in Normandy).

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.

$* p < 0.10 ** p < 0.05 *** p < 0.01$

Table D2: DID: including also "ambiguous" landlords - Conley spatial s.e.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.118*** | 0.064*** | 0.055** | 0.089*** | 0.060*** |
| | (0.032) | (0.023) | (0.023) | (0.027) | (0.022) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 14886 | 14886 | 14886 | 14886 | 14886 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 7283 secular holdings and 160 Benedictine holdings. Dependent variable: log of value. Standard errors are calculated using Spatial HAC method. We exclude holdings whose lords (1086) were female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086. Moreover, we exclude holdings assigned to "alien" priories (*id est* holdings assigned to monasteries that were physically located in Normandy).

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10th century.

$* p < 0.10 ** p < 0.05 *** p < 0.01$

## D.2 Exclusion of "alien" priories

In table D3 we show that the results do not change if we exclude English dependencies of French monasteries from the treatment group.

Table D3: DID: excluding "alien" priories

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.132*** | 0.076*** | 0.068*** | 0.105** | 0.073*** |
| | (0.040) | (0.026) | (0.026) | (0.042) | (0.022) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 14504 | 14504 | 14504 | 14504 | 14504 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 7151 secular holdings and 101 Benedictine holdings. Dependent variable: log of value. Standard errors clustered at landlord level (1086). This implies dropping all the landlords with only one holding. We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086. Moreover, we exclude holdings assigned to "alien" priories (*id est* holdings assigned to monasteries that were physically located in Normandy).

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10th century.
$* p < 0.10 ** p < 0.05 *** p < 0.01$

## D.3 Inclusion of "late" monasteries

In Table D4 we show that the results do not change if we include in the sample monasteries created in the second half of our sample period.

Table D4: DID: including "late" monasteries

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.118*** | 0.069*** | 0.058** | 0.092*** | 0.063*** |
| | (0.032) | (0.023) | (0.024) | (0.032) | (0.022) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 14634 | 14634 | 14634 | 14634 | 14634 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 7151 secular holdings and 166 Benedictine holdings. Dependent variable: log of value. Standard errors clustered at landlord level (1086). This implies dropping all the landlords with only one holding. We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086.
[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;
[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;
[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10th century.
$* p < 0.10 ** p < 0.05 *** p < 0.01$

## D.4 Exclusion of randomly assigned holdings

In this Appendix, we show that our results are robust to the exclusion of all those holdings whose landlord has been assigned following the randomisation procedure detailed in Online Appendix E. The Benedictine coefficient is smaller but it maintains similar significance levels as in the sample where those holdings are included. The most notable exception is the case of table D7 where the coefficient alone loses significance even in column (1).

Table D5: Holding value: Benedictine vs secular landlord, excluding "randomized" holdings

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.088** | 0.048* | 0.043 | 0.067** | 0.046* |
| | (0.034) | (0.026) | (0.028) | (0.033) | (0.025) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 12396 | 12396 | 12396 | 12396 | 12396 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 6048 secular holdings and 150 Benedictine holdings. Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086. Holdings with randomly assigned lords are also excluded.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10th century.

$* p < 0.10 ** p < 0.05 *** p < 0.01$

Table D6: Holding value, "Other ecclesiastic" vs secular landlords, excluding "randomized" holdings

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Oth. Eccl. | 0.016 | -0.007 | -0.005 | 0.003 | -0.013 |
| | (0.041) | (0.033) | (0.030) | (0.040) | (0.031) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 12514 | 12514 | 12514 | 12514 | 12514 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 6048 secular holdings and 209 Other Ecclesiastic holdings. Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by Benedictine monasteries in 1086. Holdings with randomly assigned lords are also excluded.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10th century.

$* p < 0.10 ** p < 0.05 *** p < 0.01$

Table D7: Holding value: Benedictine vs secular landlord, heterogeneity analysis excl. "randomized"

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Panel A | | | | | |
| Benedictine | 0.035 | 0.005 | 0.002 | 0.014 | 0.005 |
| | (0.029) | (0.028) | (0.029) | (0.028) | (0.028) |
| Benedictine*Stable OL/TC | 0.329*** | 0.471*** | 0.397*** | 0.461*** | 0.370*** |
| | (0.057) | (0.072) | (0.043) | (0.119) | (0.090) |
| Obs | 12396 | 12396 | 12396 | 12396 | 12396 |
| Panel B | | | | | |
| Benedictine | 0.038 | 0.008 | 0.007 | 0.018 | 0.011 |
| | (0.029) | (0.027) | (0.027) | (0.028) | (0.027) |
| Benedictine*Stable OL/TC | 0.326*** | 0.468*** | 0.392*** | 0.457*** | 0.365*** |
| | (0.057) | (0.071) | (0.042) | (0.120) | (0.087) |
| Obs | 12244 | 12244 | 12244 | 12244 | 12244 |
| Common to both panels: | | | | | |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 6048 (Panel A) and 5972 (Panel B) secular holdings and 150 Benedictine holdings (both Panels). Panel A reports main results; Panel B excludes observations in which the Crown holds the same estate as lord in both 1066 and 1086. Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4)., as well as estates with "Other ecclesiastic" lords in 1086. Holdings with randomly assigned lords are also excluded.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.

$* p < 0.10 ** p < 0.05 *** p < 0.01$

Table D8: Holding value: Benedictine vs royal lord, Stable OL/TC holdings subsample, excl. "randomized"

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.370*** | 0.504*** | 0.385*** | 0.527*** | 0.213 |
| | (0.072) | (0.142) | (0.075) | (0.157) | (0.167) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs. | 116 | 116 | 116 | 116 | 116 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 24 secular holdings and 34 Benedictine holdings. The sample includes only holdings whose Tenant-in-Chief in 1086 is the same as the landlord in 1086 and was Overlord in 1066, but not the landlord in 1066. Furthermore, we include only holdings where the Overlord/Tenant-in-chief was either the King or a Benedictine monastery. Dependent variable: log of value. Standard errors are robust but not clustered due to limited number of landlord (1086) included in the sample. We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4). as well as estates with "Other ecclesiastic" lords in 1086. Holdings with randomly assigned lords are excluded.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.

$* p < 0.10$ $** p < 0.05$ $*** p < 0.01$

Table D9: Holding value, Benedictines vs Celtic monastic landlords, excl. "randomized"

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Panel A | | | | | |
| Benedictine (1086) | 0.711*** | 0.185 | -0.346 | 0.555*** | 0.308 |
| | (0.160) | (0.150) | (0.455) | (0.158) | (0.159) |
| Panel B | | | | | |
| Benedictine (1086) | 0.714*** | 0.149 | -0.344 | 0.604*** | 0.221 |
| | (0.171) | (0.146) | (0.460) | (0.164) | (0.176) |
| Common to both panels: | | | | | |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs. | 842 | 842 | 842 | 842 | 842 |

*Notes:* OLS, cross-section based on 1086 outcomes. The sample includes 818 Benedictine holdings and 24 Celtic monasteries' holdings, independently of their status in 1066. Panel A reports main results; Panel B also controls for stability in Overlordship, i.e. Overlord in 1066 is also Tenant-in-Chief in 1086, in all the columns. Dependent variable: log of value measured in 1086 only. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4). In these models we add stability (*id est* having the same landlord in both 1066 and 1086) as a control in columns (2) and (5). Holdings with randomly assigned lords are excluded.

Geography controls include geographic/agriculture related features, namely: stability, latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size; Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets; History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century. $* p < 0.10$ $** p < 0.05$ $*** p < 0.01$

## D.5 Exclusion of ambiguous lords in 1066

Table D10 shows what happens if we exclude holdings whose lordship attribution in 1066 was ambiguous, i.e. stated as a generic name (e.g. "20 freemen"). In those cases, the results remain statistically significant only in the baseline specification. Table D11 shows that the main coefficient remains significant if, instead of removing those observations, we add a fixed effect interacted with time.

Table D10: DID: excluding holdings with an ambiguous lord in 1066

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.082** | 0.030 | 0.016 | 0.043 | 0.025 |
| | (0.034) | (0.031) | (0.033) | (0.035) | (0.032) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 12610 | 12610 | 12610 | 12610 | 12610 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 6194 secular holdings and 111 Benedictine holdings. Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086. Furthermore, we exclude holdings whose lord was ambiguous in 1066.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in $10^{th}$ century.

$* p < 0.10 ** p < 0.05 *** p < 0.01$

Table D11: DID with "ambiguous lord 1066" fixed effect

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.105*** | 0.065*** | 0.056** | 0.079*** | 0.062*** |
| | (0.027) | (0.025) | (0.026) | (0.029) | (0.023) |
| Ambig. lord 66*time | 0.069*** | -0.020 | -0.024 | 0.050*** | -0.033* |
| | (0.017) | (0.017) | (0.020) | (0.017) | (0.020) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 14622 | 14622 | 14622 | 14622 | 14622 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 7151 secular holdings and 160 Benedictine holdings. Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in $10^{th}$ century.

$* p < 0.10 ** p < 0.05 *** p < 0.01$

## D.6 Exclusion of holdings not changing the superior level of the feudal hierarchy

Table D12 shows the results of the same model presented in the main text in Table 3, panel B, when we exclude holdings whose Overlord/Tenant-in-Chief did not change after the Conquest. Holdings whose Overlord/Tenant-In-Chief is the Crown are treated as changing the superior level of the feudal hierarchy and therefore are included in the sample.

Table D12: Holding value: Benedictine vs secular landlord excluding holdings not changing the superior level of the feudal hierarchy

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.071** | 0.027 | 0.019 | 0.038 | 0.027 |
| | (0.029) | (0.027) | (0.028) | (0.029) | (0.028) |
| Obs | 14218 | 14218 | 14218 | 14218 | 14218 |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each panel includes 6986 holdings and 123 Benedictine holdings. Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose Overlord/Tenant-In-Chief is the same in 1066 and 1086, holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as estates with "Other ecclesiastic" lords in 1086.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.

$* p < 0.10 ** p < 0.05 *** p < 0.01$

# E Technical note on dataset generation and cleaning

## E.1 Definition of observations

We only consider units for which geographical position is available ('Grid' is not missing). In attributing landlord to holdings, we assign missing value to landlord whose name is not a proper noun, rather a general expression such as "one Englishman" , "two thanes" , or the like. Although we include these holdings in our dataset, and we are able to attribute their "type" as described in Section II and to attach them all the relevant control variables, we did not compute a landlord unique identifier for such items, since we cannot discriminate whether they are uniquely attached to a single holding or if the same landlord were also governing other holdings.

## E.2 Solving potential duplicated entries

Due to the land reshuffle in 1066, some entries may appear as duplicated in the DDB original dataset, due to the following potential cases:

1. Single holdings (uniquely identified in the DDB dataset as 'Entries' through a unique Entries StructIdx code) assigned to a single Lord in 1066, split into more parts in 1086;
2. Single holdings (uniquely identified in the DDB dataset as 'Entries' through a unique Entries StructIdx code) assigned to a single Lord in 1066, split into more parts in 1086, with one or more part retained by the original Lord;
3. Holdings (uniquely identified in the DDB dataset as 'Entries' through a unique Entries StructIdx code) split into more parts in both 1066 and 1086.

We solve this potential problem of attribution as follows:

1. we assign the estate in 1086 to the largest owner in 1086, by considering the value of TRWowners _ Value86;
2. in case of ties in TRWowners _Value86, we pick the largest non-missing value in 1066 (TRE owners Value66);
3. in case of further ties in TRE owners Value66, we pick the row referring to the holding whose landlord has not changed;
4. in case of further ties, in case of conflicting landlord types we assign the holding according to this priority: Secular type, Bishop, Monasteries, first as measured in 1086 and then as measured in 1066 but in reversed order (i.e. giving priority to Benedictines, then other ecclesiastic and then secular);

5. in case of further ties relating to holding of same landlord type (for example entry 16762) we assign the landlord randomly, taking the lowest random number assigned to the row (random numbers are generated at the beginning of the process).

Please note that the above procedure applies to the attribution of landlords. Clearly this procedure introduces some noise in the lord attribution and related variables (e.g. counties and hundreds are identified as those associated with the entry that emerges at the end of the tie breaking process). However, we are still confident that this is the best feasible procedure to aggregate information at the holding level.

In this process, Celtic monasteries are grouped together with "secular" holdings in order to maximize the number of those observations in the tie breaking rule.

## E.3 Calculating georeferenced control variables

All available observations in the original DDB dataset are exported to a Geographic Information System software (QGIS and ArcGIS Pro) to calculate all geographical and distance variables. The values obtained for each variable are specific to each observation. Since entries may include multiple rows (see point 2 above), we collapse all geographical and distance variables by taking the average at the Entries level (the only exceptions are Distance to Mines, Distance to Anglo-Saxon Settl. and Viking Influence whose values are calculated directly on the basis of the "averaged location" of each entry). In case of Entries including holdings insisting on different places, those places are usually very close to each other and in most of the cases their reciprocal distance is smaller than the grid size of geographical variables.

## E.4 Holdings' size

In the original dataset, the "size" measure is associated with places, not with individual entries. It is possible that an entry insists on multiple places, or that a places is divided between multiple entries (or both). In order to find a reasonable proxy for the size, we decided to assign the full "size" of each places to all the entries that include that place, and then sum up the total size by entry. This implies some double-counting (if holdings A and B include place X of size 1, this place is counted twice, in each individual holding), but it provides us with an operationally simple way to proxy the overall size of our entries.

## E.5 Detailed description of control variables

In this section we provide a detailed description of all the control variables included in the analysis, by thematic group, as used in the paper.

### *Geography*

The most important difference between holdings is likely to depend on their geographical location. The digitised version of the DDB includes important geographical information related to each entry: Ordinance Survey Grid positions, that we converted into Latitude and Longitude; County and Hundred (local district), that we exploited to include geographical fixed effects in our analysis (see "Geographical fixed effect" section in Table 1).

Latitude and Longitude have been included to account for the uneven distribution of monastic estates throughout England. Further, following Becker et al. (2016), all our models include an interaction term between Latitude and Longitude.

Since all holdings in our dataset have been geolocated we can also match them with geographical information about the features of the terrain, that are likely to affect soil productivity and hence potential productivity. For this reason, we include the median altitude of terrain, retrieved from the GAEZ dataset at a very high resolution, which roughly corresponds to grid cells of about 10 km. Higher terrain is expected to be less productive hence median altitude is expected to be negatively correlated with value, as is the case in our sample.

Furthermore, since not all terrain may be equally fertile and suitable for farming, we include a measure of crop suitability, retrieved again from GAEZ. This database provides alternative measures of crop suitability: we decided to include suitability for growth of cereal crops for low input level rain-fed terrains, since we believe that this kind of index best approximates the actual conditions of farming around XI century and the same measure is used in Angelucci et al. (2017).

Moreover, we include an index for terrain ruggedness, as proposed by Nunn and Puga (2012). This index targets the potential detrimental effect on soil productivity (and hence on the value of the estate) caused by sharp differences in elevation within small areas. Finally, we include agriculture suitability, pastoralism suitability and sedentary animal husbandry suitability, retrieved from Beck and Sieber (2010). These three indices are constructed upon a high spatial resolution using raster cells of about 5km and provide indicators of the suitability of land for alternative use in primary economic activities. With the inclusion of these controls, we can account for *ex-ante* advantages in the holdings' productivity. All the geographic controls illustrated in this section have been included in our dataset by superimposing the original raster files onto our map of geolocalised holdings.

To add further precision to our estimates, we also collected data on mining activities in Roman times from Talbert (2000) and built a measure of distance to mines for all estates, since the presence of nearby mines could affect the overall holding's value.[6]

To account for further potentially omitted variables that are specific to individual holdings we include a measure of the size of the holding, retrieved from the DDB.[7]

### *History*

To account for potential heterogeneity in the historical roots of holdings we include two measures to control for proximity to ancient Roman settlements and the Roman road network.

[6] We thank an anonymous referee for this suggestion.

[7] To ensure comparability across holdings, we only keep observations of sizes that have been measured in "geld", as recorded in Palmer (2008). According to Palmer, this is the best proxy for the size of estates. Furthermore, we are only able to find a slightly noisy measure of size for holdings including places shared with other holdings.

To obtain the first measure, we calculated the geodesic distance from each holding to Roman rural settlements in Britain by relying on the geolocated information provided by Allen et al. (2018). This database provides geographical coordinates of rural placements of Roman Britain, identified through a vast range of archaeological sources. Areas of earlier settlement may benefit from higher levels of development.

The second measure is calculated as the geodesic distance to the nearest Roman road. We retrieved information and maps of the Roman road network in Britain from McCormick et al. (2010). All distances are expressed in kilometres.

Finally, we also account for further important historical legacies, namely the presence of early Anglo-Saxon settlements and the extent of previous Viking influence. Therefore, we collected data about previous Anglo-Saxon settlements as recorded by Hamerow (2012) and built a measure of distance from them for all estates; we also used information about Viking presence in 10th and 11th centuries as recorded by Ditchburn et al. (2007) to build a binomial variable for accounting for Viking influence.

### *Market access*

Our measure of productive capacity could be affected by better access to markets. To control for this feature, we included a set of (geodesic) distance measures. Firstly, we retrieved historical maps of Britain from the Barrington Atlas of the Greek and Roman World (Talbert, 2000) to calculate distances to rivers and coasts. Both distances approximate market access since waterways were an extremely important transportation network in the early Middle Ages. Further, distance to coast also approximates the strategic position of the holding and its possible vulnerability to Viking raids. Secondly, we include measures of distance to actual markets approximated by distance to the nearest borough (as identified in the DDB), to the Tower of London and to the closest fair or market, as recorded in Letters (2005). The latter dataset provides valuable information about the location of markets and fairs in early medieval England. Since the date of the first appearance of chartered markets might be uncertain, we consider all markets or fairs that were recorded before 1066, or that

were recorded within a time frame including 1066 or whose mint date was recorded in an analogous way.

## E.6 Variables' sources and detailed description

### Table E1: Variables description

| | Description | Source |
|---|---|---|
| Religious (1066) or (1086) | Dummy variable equal to 1 if the holding's lord is a Benedictine monastery or a non monastic ecclesiastical lord at the time of King Edward, id est *before* the Conquest (1066), or at the time of King William (1086) | Authors' coding based on DDB[1] and EMA[2] |
| Benedictine (1066) or (1086) | Dummy variable equal to 1 if the holding's lord is a Benedictine monastery at the time of King Edward, id est *before* the Conquest (1066), or at the time of King William (1086) | Authors' coding based on DDB[1] and EMA[2] |
| Oth. Eccl. (1066) or (1086) | Dummy variable equal to 1 if the holding's lord is a Bishop or the Canons of a cathedral church or another non-monastic ecclesiastical lord at the time of King Edward, i.e. *before* the Conquest (1066), or at the time of King William (1086) | Authors' coding based on DDB[1] |
| Other Monastic (1066) or (1086) | Dummy variable equal to 1 if the holding's lord is recorded as an early monastery by Knowles and Handcock (1971) at the time of King Edward, id est *before* the Conquest (1066), or at the time of King William (1086) | Authors' coding based on Knowles and Handcock (1971) and DDB[1] |
| *Outcome variables:* | | |
| *Cross-section* | | |
| Growth rate | Growth rate of holding's value between 1086 and 1066 | DDB[1] |
| Population (1086) | Number of households settled in the holding | DDB[1] |
| Mills (1086) | Number of mills recorded in the holding | DDB[1] |
| Ploughs (1086) | Number of ploughs in the holding | DDB[1] |
| *Outcome variables:* | | |
| *Diff-in-diff* | | |
| Holding's value$_t$ (log) | Natural log of 1+value to the lord of the holding at time *t* (either 1066 or 1086), as recorded in DDB | DDB[1] |
| *Geography* | | |
| Latitude | Latitude of the holding, decimal degrees | DDB[1] |
| Longitude | Longitude of the holding, decimal degrees | DDB[1] |
| Median altitude | Median altitude of terrain, resolution 5 arc-minutes | GAEZ[3] |
| Crop suitability | Index of cereals suitability for low input level rain-fed cereals, baseline period 1961-1990, resolution 5 arc-minutes | GAEZ[3] |
| Ruggedness | Index for rugged terrain, measured in hundreds of meters of elevation difference for grid points 30 arc-seconds apart. | Nunn and Puga (2012) |
| Agriculture suitability | Probability of occurrence of agriculture estimated through maximum entropy modelling, baseline period 1961-1991, resolution 2.5 arc minutes | Beck and Sieber (2010) |
| Pasture suitability | Probability of occurrence of pasture estimated through maximum entropy modelling, baseline period 1961-1991, resolution 2.5 arc minutes | Beck and Sieber (2010) |
| Animal suitability | Probability of occurrence of animal husbandry estimated through maximum entropy modelling, baseline period 1961-1991, resolution 2.5 arc minutes | Beck and Sieber (2010) |
| Distance to mines | Geodesic distance to nearest mine site | Authors' calculations based on BA[5] |
| Holding's value, 1066 (log) | Natural log of 1+value to the lord of the holding in 1066, as recorded in DDB | DDB[1] |
| Size (log) | Natural log of 1+holding's size as recorded in DDB | DDB[1] |
| *History* | | |
| Dist. Roman settl. | Geodesic distance to nearest Roman settlement, as identified in the Rural settlements of Roman Britain database | Authors' calculations based on ADS[4] |
| Dist. Roman roads | Geodesic distance to nearest Roman road | Authors'calculations based on Mc-Cormick et al. (2010) |
| Distance to Anglo-Saxon settl. | Geodesic distance to nearest Anglo-Saxon settlement, existing since 10$^{th}$ century or earlier, as coded by Hamerow (2012) | Authors' calculations based on Hamerow (2012) |
| Viking influence | Dummy variable equal to if the holding is within an area of known Viking influence as to 10$^{th}$ century | Authors' calculations based on Ditchburn et al. (2007) |
| *Market access* | | |
| Dist. rivers | Geodesic distance to nearest river | Authors' calculations based on BA[5] |
| Dist. coast | Geodesic distance to coastline | Authors' calculations based on BA[5] |
| Dist. London | Geodesic distance to the Tower of London (latitude 51.5048, longitude -0.0723) | Authors' calculations |
| Dist. borough | Geodesic distance to nearest borough, as defined in DDB | Authors calculations based on DDB |
| Dist. to markets | Geodesic distance to closest market or fair | Authors calculations based on Letters (2005) |

*Continues …*

Table 1: …*Continues*

| | Description | Source |
|---|---|---|
| *Geographic fixed effects* | | |
| County FE | Dummies that uniquely identify holdings w.r.t. their county | DDB[1] |
| Hundred FE | Dummies that uniquely identify holdings w.r.t. their local district, named Hundred, as reported in DDB | DDB[1] |
| *Other variables* | | |
| Dist. nearest monastery | Geodesic distance to any nearest Benedictine Monastery, regardless of whether it is a landlord or not, founded before 1066 | Authors' calculations based on EMA[2] |
| Pre900 | Monastery founded up to 900 AD | EMA[2] |
| Stable OL/TC | Dummy equal to 1 if the lord in 1086 coincides with the Tenant-in-Chief and with the Overlord, but it is different from the lord in 1066 | Authors' coding based on DDB[1] |

*Notes*:
[1] Domesday Book Statistics, Palmer (2008)
[2] English Monastic Archive, D'Avray (2015)
[3] Global Agro-Ecological Zones (GAEZ v3.0), IIASA/FAO (2012)
[4] Archaeology Data Service, The Rural Settlement of Roman Britain: an online resource, Allen et al. (2018)
[5] The Barrington Atlas of the Greek and Roman World, Talbert (2000). Digital maps retrieved at http://awmc.unc.edu/wordpress/map-files/

# F Additional Mechanisms

In this appendix we discuss in detail how we rule out alternative mechanisms that may explain our main result in the least restrictive subsample. One mechanism could be cultural proximity, meaning that it is not having a monastic lord that matters, but just being close to one, so that people can acquire the related mentality of "hard work". This would be broadly consistent with Andersen et al. (2017), for example. To test this idea, we geocoded the location of every English Benedictine monastery, irrespective of whether it was a landlord or not. Then, for all our holdings, we were able to calculate the distance between them and the closest monastery and see whether it might explain the productive capacity growth. Table F1 shows that this is not the case. Using a cross-sectional specification with geographic fixed effects when the outcome is the growth rate[8] we show that the distance to the nearest monastery has no statistically significant effect.

**Table F1: Growth rate of holding value:**
**Benedictine rule and proximity to monastery compared**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Dist. nearest monastery | -0.001 | 0.000 | -0.000 | -0.001 | 0.001 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Hundred FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography[1] | No | Yes | No | No | Yes |
| Market access[2] | No | No | Yes | No | Yes |
| History[3] | No | No | No | Yes | Yes |
| Obs | 7555 | 7555 | 7555 | 7555 | 7555 |

*Notes.* OLS, cross-section. Dependent variable: value growth rate. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4). Each period includes 7395 secular and 160 Benedictine

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines, holding's value in 1066 and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.

$* p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

[8] We use a cross sectional specification because the distance to the closest monastery is a time invariant characteristic of our estates. The sample includes all observations used in the main Difference-in-Difference analysis, hence including secular, Benedictine, and other ecclesiastical holdings.

A way to assess the importance of human capital is through the comparison older and more recent monasteries. Older monasteries may have had more time to develop specific skills, learn about specialisation, acquire expertise, invest in training and so on. If those factors are important for our results, we should expect holdings assigned to older monasteries to perform better than holdings assigned to more recently founded monasteries. We test this hypothesis by adding to equation (1) an interaction term between the Benedictine dummy and a dummy equal to 1 if the lord-monastery was founded before 900 AD.[9] The results of Table F2, however, point in the opposite direction: the coefficient of the interaction term is never statistically different from zero and the figure is almost always negative. We interpret this result as further suggestive evidence against the "human capital" channel.

**Table F2: Holding value, old vs new monasteries**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.152*** | 0.077*** | 0.077*** | 0.125*** | 0.076*** |
| | (0.039) | (0.030) | (0.024) | (0.041) | (0.021) |
| Benedictine*Pre900 | -0.068 | -0.003 | -0.030 | -0.069 | -0.011 |
| | (0.074) | (0.056) | (0.061) | (0.078) | (0.057) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 14504 | 14504 | 14504 | 14504 | 14504 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 7151 secular holdings and 101 Benedictine holdings (for which foundation date was available).
Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines, holding's value in 1066 and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.

$* p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

[9] The number of observations drops because we do not have the foundation date for every monastery in our sample.

Table F3 compares the growth in productive capacity of holdings controlled by Benedictines in both 1066 and 1086 and holdings that were secular in 1066 and did not change lord, hence that probably remained Anglo-Saxon throughout the period.[10] Again, we see a strongly positive and significant effect of Benedictine control, and this suggests that - in the main specification - we are not capturing just an "Anglo-Saxon effect", or the consequence of a better knowledge of the territory by Benedictine decisionmakers when compared with the newly arrived Norman conquerors. They were better than Anglo-Saxon landlords as well.[11]

**Table F3: Holding value, Benedictines vs Anglo-Saxon landlords**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine (1086) | 0.077*** | 0.130*** | 0.076*** | 0.073*** | 0.132*** |
| | (0.028) | (0.037) | (0.027) | (0.028) | (0.036) |
| County FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography[1] | No | Yes | No | No | Yes |
| Market access[2] | No | No | Yes | No | Yes |
| History[3] | No | No | No | Yes | Yes |
| Obs | 823 | 823 | 823 | 823 | 823 |

*Notes.* OLS, cross-section, including. 395 stable secular holdings and 428 Benedictine stable holdings. Dependent variable: value growth rate. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086. We keep only holdings that were either always Benedictine or that remained in Anglo-Saxon hands after the Conquest.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines, holding's value in 1066 and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.

$* p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

A complementary way to test this channel is by comparing holdings that changed lord and holdings that were kept by the same lords before and after the Conquest. It is possible that Norman conquerors were generally less efficient in managing their land since most of their aristocracy was newly arrived,

[10] In this case here we are estimating an OLS model on a cross-section, as we did for Table F1 but using the subsample of "stable" holdings, only considering Benedictine and secular landlords.

[11] Importantly, none of those holdings has been re-assigned, hence we do not need to worry about the effect coming from a replacement of the landlord.

spoke a different language and had a poorer knowledge of the environmental context (although Loyn, 2013, p. 339, stresses the continuity in rural institutions before and after the Conquest). To assess this potential effect, we compare secular holdings that changed lord after the Conquest against "stable" secular holdings. In other words, we consider only secular holdings, focusing on those that reasonably remained in Anglo-Saxon hands - since their landlords did not change after the Conquest *vis-`a-vis* those that ended up in Norman or Benedictine hands. Table F4 presents the results of this comparison, showing that the coefficient of the variable identifying stable secular holdings[12] (first line) is, if anything, negative, although sometimes not significant. Therefore, holdings that remained in the same hands they were at the time of King Edward performed equally or, at most, worse than secular holdings passed over to Norman landlords at the time of King William. In case of Benedictine-controlled land, the "stability effect" (the sum of the first two coefficients) is positive but typically not significant, and the same is true for the sole interaction. Taken together, those pieces of evidence suggest that Norman lordship is not negatively correlated with growth in land productive capacity and that holdings that belonged to Benedictine monasteries in 1086 performed in a similar way, irrespective of their landlord in 1066. Once again, note that all this analysis looks only at changes at the lord level, not at the superior level of the feudal structure.

[12] The interaction with the time dummy is needed since the variable is time-invariant and we are using a time fixed-effect difference-in-difference estimator.

**Table F4: Holding value, Stable vs Non-stable landlords**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Stable landlord | -0.072*** | -0.027 | -0.018 | -0.050** | -0.016 |
| | (0.027) | (0.019) | (0.017) | (0.023) | (0.017) |
| Stable landlord*Benedictine | 0.085* | 0.049 | 0.038 | 0.065 | 0.037 |
| | (0.049) | (0.047) | (0.042) | (0.048) | (0.044) |
| Benedictine | 0.114*** | 0.061*** | 0.053** | 0.085** | 0.058** |
| | (0.033) | (0.024) | (0.025) | (0.033) | (0.022) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 16442 | 16442 | 16442 | 16442 | 16442 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 7633 secular holdings (7238 non-stable and 395 stable) and 588 Benedictine holdings (160 non-stable and 428 stable). Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines, holding's value in 1066 and (log of) size;

[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;

[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.

$*$ $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table F5 ensures that our effect is not due to the monks having worked the land directly. They may have had different incentives, motivations and a different "work ethic" than ordinary peasants so, since we want to isolate the effect of a better decision-making structure, it makes sense to exclude places where they could have worked directly. To this effect, Table F5 excludes all the holdings that are less than 5km from a monastery, and the coefficients are basically unaffected.[13]

As we pointed out in the paper, all the demesne lands belonging to Tenant-in-Chiefs, both secular and ecclesiastical, were exempt from taxation. Therefore, we test whether this affected our main outcome by performing the Diff-in-Diff analysis in the subsample of "demesne only" land. Please note that this essentially implies considering holdings in which the landlord and the Tenant-in-Chief coincide. Table F6 shows that our results hold also in this restricted subsample, and the estimated coefficients, even

[13] Results are very similar using 4km and 6km as thresholds.

slightly larger than those reported in Table 4, Panel B have comparable size and significance. Therefore, our results are robust to limiting the sample to directly farmed land and to potential differential treatment in taxation depending on the land being a demesne.

**Table F5: Holding value, Benedictines vs secular landlords (excluding holdings close to a monastery)**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.112*** | 0.055** | 0.046* | 0.083** | 0.051** |
| | (0.035) | (0.027) | (0.027) | (0.036) | (0.025) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 14266 | 14266 | 14266 | 14266 | 14266 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 6986 secular holdings and 147 Benedictine holdings.
Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086. We keep only observations whose distance from a monastery is greater than 5km.
[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines, holding's value in 1066 and (log of) size;
[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;
[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in 10$^{th}$ century.
$*$ $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

**Table F6: Holding value, Benedictines vs secular landlords ("demesne only" subsample)**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Benedictine | 0.158*** | 0.049 | 0.059* | 0.118*** | 0.060* |
| | (0.040) | (0.037) | (0.033) | (0.041) | (0.033) |
| Holding FE | Yes | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| *Included controls:* | | | | | |
| Geography*time ctrls[1] | No | Yes | No | No | Yes |
| Market*time ctrls[2] | No | No | Yes | No | Yes |
| History*time ctrls[3] | No | No | No | Yes | Yes |
| Obs | 7028 | 7028 | 7028 | 7028 | 7028 |

*Notes.* Difference-in-Difference analysis based on two periods (1066 and 1086). Each period includes 3400 secular holdings and 114 Benedictine holdings.
Dependent variable: log of value. Standard errors clustered at landlord level (1086). We exclude holdings whose lords (1086) were ambiguous, female monasteries, or non-Benedictine monasteries, or monasteries created after 1076, and outliers (id est estates recording growth rate larger than 4), as well as holdings controlled by "other ecclesiastic" in 1086. We keep only observations whose distance from a monastery is greater than 5km. We keep only observations in which the holding is recorded as a "demesne" in the Domesday book.

[1] Geography controls include geographic/agriculture related features, namely: latitude, longitude, latitude×longitude, median altitude, crop suitability, ruggedness, pasture suitability, agricultural suitability, animal husbandry suitability, distance to mines, holding's value in 1066 and (log of) size;
[2] Market access controls include proxies for access to markets: distance (in km) to: rivers, coast, London, nearest borough, markets;
[3] History controls include proxies for the ancientness of the settlement, namely: distance (in km) to Roman settlements, to Roman roads and to Anglo-Saxon settlements; Viking influence in $10^{th}$ century.
$*$ $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

# G Extended historical background

*Land ownership in Medieval England*

The manor is the basic unit of analysis of the Domesday Book (Finn, 1963), and it was also the basic unit of the feudal structure of society, whose importance can be traced back to the Anglo-Saxon era (Aston, 1958; McDonald and Snooks, 1986; Roffe, 2000, 2007).[14] Landlords had absolute control over their land, which was granted by the King, or by the Tenant-in-Chief (Aston, 1958). Kings granted land to churchmen or monasteries directly, while other land was received from secular landlords as endowments or donations (Ayton and Davis, 1987). Landlords usually rented out part of the land. The rest, typically around 30% of the total (Kosminsky, 1961), called demesne, was kept under the direct control of the landlord. Peasants had to spend a certain number of days per year working on that land, in a "security for labour" contract that has attracted the attention of economists (such as North and Thomas, 1971; Jones, 1972; North and Thomas, 1973). As a result, the landlord derived income from two sources: the output of production from the demesne and the rents he received from the rest (Postan, 1973). Several authors (Kosminsky 1961; Postan 1973; Swanson 1979) highlight the similarity between the holdings of the Church and their secular contemporaries.

Although the manorial system reached its peak after the Norman Conquest (Postan, 1973), it was already in place way beforehand (Postan, 1973; McDonald and Snooks, 1986; Thomas, 2008; Pratt, 2013). Local landlords were already receiving land in compensation for administrative and military service (Postan, 1973) and were expected to contribute to the war effort.

Roffe (2007) provided an extensive account of pre- and post- Conquest similarities and differences. Overall, in both systems, land was held by lords from a king or other overlord, and the lords in turn granted land to their tenants. The main difference between the two systems was that the pre-Conquest system was based mostly on personal relationships, while the feudal system was based

[14] Most of the observations in our sample are manors, or other pieces of land associated with a manor (for example a dependency). There are also some "non manorial units" (Palmer, 1987) that although not legally part of a manor, still constituted holdings with a landlord in charge of them.

on legal contracts. In particular, both systems were hierarchical, with land held by lords from a king or other overlord; both systems involved the granting of land to tenants in return for services; in both systems, the tenants could be required to provide military service, labour, or payment to their lords.

In terms of relationship between Anglo-Saxon kings and monasteries, it is important to point out that, in Anglo-Saxon times, Benedictine houses "were closely bound in to the secular elites, who patronised a monastery as a matter of family prestige, to ensure that they would be remembered in the monks' prayers and buried in an honoured place in the church" (Dyer, 2003, but stressed also by Pratt, 2012), and this link was still alive after the Conquest (Knowles, 1963, p. 102). However, this relationship was not free of conflicts, as there is evidence of church land expropriation by Anglo-Saxon kings (Wareham 2012), and "a campaign of arm-twisting in order to gain monastic lands vital for defence" (Fleming, 1985, p. 253).

*Benedictine monasteries and the Rule*

The Benedictine order was (and still is) composed of a set of monasteries who are committed to following the Rule written by Benedict of Nursia[15] in the early Middle Ages (Knowles, 1963). They quickly became the most important monastic order in Europe, at least until the Cistercian reform in the XII century. In particular, Benedictine monasteries abided by the "Rule" established by Benedict of Nursia in 529 AD. This vast and comprehensive document, still in use today, was designed to regulate monastic life, including its governance.[16] According to the Rule, the head of a monastery (abbot) was an elective office, elected for life by the community of monks, and the council of monks (the Chapter) was explicitly mentioned in the Rule as a sort of "advisory board". As pointed out by Knowles (1963), Chapters met regularly, without the need of being summoned by the abbot.

Benedictines arrived in England in 597 AD and built a monastery at Canterbury. English Benedictine monasteries grew rapidly and acquired control of several holdings: partially through

[15] Nursia, *Norcia* in Italian, is a small village in central Italy where Benedict was born around 480 AD.

[16] And it did so in a way that scholars have defined as "monastic democracy" (Judson, 1898; Moulin, 2016).

endowments and partially through direct assignments from the Anglo-Saxon kings.[17] Importantly, the management of those holdings was highly centralised and was kept controlled by the monastic community until the XII century (Knowles, 1963).

Each individual monastery was an autonomous entity run by an abbot (there was no "head of the order"): therefore, common membership of the same order was granted by adherence to the Rule.

As Knowles (1963) p. 101 notes, by the time of the Conquest, monastic houses were substantially independent from each other, with no kind of federation or formal interdependence in place, nor any discernible dependencies or connections to foreign motherhouses. Furthermore, the internal organisation of a Benedictine monastery became explicitly independent from interference by local bishop following the Council of Hertford held by Archbishop Theodore in 672 AD (Lapidge, 1995; Dell'Omo, 2011). Independence from the King was granted usually by papal provision.[18]

Even though the main purpose of the Rule was ascetic, it contains detailed and comprehensive instructions for the community of monks (prayer times, kitchen duties and so forth). Its importance for the efficiency of monastic life has been noted by scholars of management science (Rost and Graetzer, 2013; Ehrmann et al., 2013; Rost, 2017). Inevitably, some of the rules where dedicated to the way the community was governed. Chapter 64 is the most important one, as it explains that the abbot is an elective office (elected for life by the monks) and that majority rule can be used if there is no unanimity in the community. In particular, it states:

> *At the election of an abbot let this principle be always observed, that he be appointed whom the whole community, being of the same mind and in the fear of God, or even a part albeit a small part of the community shall with calmer deliberation have elected.*

Obviously, peasants were not allowed to vote or to participate in the political decision-making process and the accountability of the abbot to the community was limited, as he was expected to be in

[17] Aston (1958); Ayton and Davis (1987).

[18] "*Epistulae privilegii*", as witnessed by some records in Bede's *Historia Ecclesiastica Gentis Anglorum* Dell'Omo (2011).

charge for the rest of his life. However, the selection method mentioned above seems quite different from the standard feudal institutional arrangements, where a landlord was not elected but simply appointed by the King or by a Tenant-in-chief (or was the heir of someone who had been appointed). This is also different from the way in which bishops were chosen. They share the religious nature of their legitimacy with abbots, but the Rule does not apply to them, and they were appointed rather than elected. The same was true for the other non-monastic ecclesiastical rulers. Interestingly, Moulin (2016) considers that the appropriate words to summarise the monastic institutional set up is "monastic democracy".

It is important to note, however, that we should not think about abbatial elections as we conceive them in the XXI century. Some of them were not free from external interference, especially by different kings. As noted by Burton (1994), the *Regularis Concordia*[19] preserved the prescriptions of the Rule, adding however that "Royal guidance should be taken. When a vacancy occurred, the monks or nuns applied to the king for permission to elect a superior, and afterwards for confirmation of their choice. Sometimes it suited the king to abide by the decision of the community; on other occasions he judged it necessary or expedient for his own interests to intervene to put in his own candidate" (Burton, 1994, p. 14). Similarly, Knowles (1963, p. 396) notes that, during the reign of King Edward the Confessor, "At least three different methods can be seen at work in his reign: the direct appointment of an outsider as a reward for services, as in the case of the ex-bishop Ralph from Scandinavia at Abingdon; the presentation of the person of his choice to a group of monks summoned to court to 'elect' him, as with Baldwin at Bury in 1065; and the designation by an abbot of his successor, as with Mannig and Aethelwig at Evesham in 1059" while there was no question of free elections under the reign of William. Still, the Rule and the *Regularis Concordia* were always preserved, including under the reign of William. And, especially before the conquest, some elections were held. Even though the king had some power to influence the outcome, we can still think about the winning person as the equilibrium outcome of a bargaining game between the monks and the king, where the bargaining power was not completely on one side. The elected abbots may have been

[19] Approved in 973, the document outlines the basic rules of reformed Benedictine monasticism in England.

different from those directly appointed, either because of the different selection procedure or because of the different degree of legitimacy they held in the community.

Finally, it is worth highlighting that the autonomy of monasteries was also ensured by the fact that the status of abbatial dignity was analogous to the episcopal dignity of bishops, as witnessed by the liturgical blessing of the abbot that increasingly resembled an episcopal consecration (Knowles et al., 2001, p. 4). Once an abbot had been elected, his removal or deposition by either the King or a bishop, was a very unlikely event.[20] However, there is historical evidence that William tried to interfere with the regular selection of abbots in English monasteries with the aim of imposing "aligned" abbots (preferably of Norman origin). Nonetheless, he was only partially successful in this endeavour, since there is historical evidence of abbots of Anglo-Saxon origin still in place at the time of William's death (Knowles, 1963).

*Abbots and their role*

According to the Rule of St. Benedict, the abbot "is deemed in the monastery the representative of Christ" (ch. 2). Moreover, "when anyone receives the title of abbot he ought to preside over his disciples with twofold manner of teaching: that is, to show forth all that is good and holy by deeds even more than by words, so as by his words to set the commandment of the Lord before the more intelligent disciples: but to those hard of heart and to those of less capacity to show forth the divine precept by his deeds" (ch. 2). Hence, he is supposed to be first and foremost a religious leader for the community of monks. However, his powers extended beyond the purely religious dimension, and there is historical evidence of abbots playing an important role in efficiently managing monastic estates. For example, Knowles (1963) highlights that one important innovation in monastic estates was the "gradual substitution of money payments for rents in kind" (p. 443). This innovation "is most remarkable upon the extensive properties of Bury, where its introduction can be precisely assigned to the twenty-five years immediately after the Conquest and appears to have been largely the work of the great abbot Baldwin" (p. 444). Furthermore, a later evidence, included in a passage of the "The Chronicle of Jocelin of Brakelond", referred again to the Abbey of Bury around the year AD 1173,

[20] In fact, the Rule does not even mention this possibility.

highlighting how abbots were wise in administering their land by choosing 'better' delegates than those who came before them: "For the management of the same manors and for the management of all other affairs, he appointed monks and laymen who were wiser than those who had previously held the posts, and who made careful provision for us and our lands."[21]

*The Monastic Chapter*

Another important feature of monastic governance was the Chapter, the assembly of all the monks in the community. The Rule of St. Benedict (ch. 3) already mentions it, although it states that the final decision lies with the abbot. However, Knowles (1963, p. 412) stresses the increasing importance of it, becoming "first the custom and later the canon law that on certain great issues affecting the life and fortunes of the house the abbot should not act without the formal consent of his community". This was important especially for the acquisition or alienation of properties, to avoid future controversies (Knowles, 1963, p. 413). As usual, King William's appointees "no doubt disposed of all things within and without their houses with very little reference to the wishes of their subjects" (Knowles, 1963, p. 412), but the formal consent of the Chapter was already required, on some matters, before the Conquest (p. 412), and it grew in importance after William. Importantly for this paper, Knowles (1963) himself uses the words "democratic movements" within monasteries, to describe the (post-William) push for a greater role of the Chapter, something that was later imposed by Pope Innocent III. Furthermore, he strikes an interesting parallel between monastic Chapters and national parliaments: "Although the competence of the Chapter was undefined on many important issues, it had one great advantage that was lacking to the various national parliaments in later centuries, for the constituent body met together every day independently of any initiative on the part of the abbot, and had constantly to be used in witnessing and agreeing to quasi-routine actions and transactions; it was therefore a simple matter to start a discussion" (p. 416).

*Other Ecclesiastic lords*

The third type of landowners we identify in the DDB are Other Ecclesiastic, who mostly consisted of bishops. They enjoyed a powerful religious legitimacy: bishops were in charge, as Christian

[21] The full text can be retrieved at: https://sourcebooks.fordham.edu/basis/jocelin.asp.

pastors, of large portions of the Church through Dioceses. Importantly, the role of bishops as the head of Dioceses and as landlords did not necessarily overlap, and these religious figures were also free from the constraints of the Rule.

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