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ABSTRACT

We examine the long-run economic impact of the Dissolution of the English monasteries in 1535, during the Reformation. Since monastic lands were previously not marketed and relatively unencumbered by inefficient types of customary tenures linked to feudalism, the Dissolution provides variation in the longevity of feudal institutions, which is plausibly linked to labor and social mobility, the productivity of agriculture and ultimately the location of the Industrial Revolution. We show that parishes impacted by the Dissolution subsequently had a greater share of the population working outside of agriculture, experienced higher innovation and yields in agriculture, a 'rise of the Gentry', and eventually higher levels of industrialization. Our results are consistent with explanations of the Agricultural and Industrial Revolutions which emphasize the commercialization of society as a key pre-condition for taking advantage of technological change and new economic opportunities.

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A remarkable economic transition took place in large parts of the world in the past 250 years. This "Great Divergence" (Pomeranz, 2000) led to the gap between poor and rich nations of the world expanding from a factor of 4 or 5, to as much as 100. It started with technological innovation, industrialization and urbanization in Britain. Critical to this process was a labor force that was mobile enough to move to the new factories and industrial cities such as Manchester and Birmingham and an agricultural surplus to feed them. The ability of factors of production, to be allocated through the market, rather than via feudal regulations or other customs has long been hypothesized to be a major factor behind the success of Britain, and the Agricultural and Industrial Revolutions more broadly (Pirenne, 1927, 1936, Polanyi, 1944, Hicks, 1969, Postan, 1973).

In this paper we empirically test the hypothesis that the release of factors of production, in particular land and labor, from feudalism and custom was an important precondition for agricultural modernization and industrialization. We do so by focusing on a particularly shock, the Dissolution of the English monasteries during the 1530s.[1] The impact of the Dissolution on factor markets was first emphasized by Tawney (1941a) who stressed that the expropriation of the assets held by the monasteries in Britain, including about 1/3 of all land, which followed the creation of the Church of England in 1534, created a huge impulse towards the marketization of both labor and land.

Why would the expropriation of land and other assets create markets and impact subsequent development patterns? Before the Reformation, monastic land could legally not be sold, thus inhibiting its efficient allocation to people who could use it best. The Dissolution changed this because the Crown rapidly sold off the expropriated monastic assets (Habakkuk, 1958). The key difference between monastic and non-monastic lands that enabled higher subsequent development lies in the incidence of post-feudal forms of land tenure. Critically, few monastic tenures were "customary" (Kerridge, 1969). Such tenan-

[1]The Dissolution began in 1535 when Henry VIII expropriated all monastic assets in England. By doing so, he broke with the Catholic Church and founded the Anglican Church.

cies had emerged as English feudalism collapsed and institutionalized norms which were highly favorable to tenants, in particular featuring fixed nominal rents. In the Appendix we develop a simple, historically grounded model of copyhold tenure - the main form of customary land tenure - and show that, in a world of emerging economic opportunity, copyhold is inefficient. This is for three reasons. First, even though a copyholder paying a fixed rent is the residual claimant of the returns on his investment, the investment is specific. This leads to inefficiently low rates of separation and labor mobility since the specific investments cannot be liquidated in the presence of potentially attractive outside options. Second, the presence of such options naturally leads to under-investment. Third, the presence of copyholding undermines the efficient allocation of land because those who could use it best are unable to benefit from any productivity increases they bring since such rents would completely accrue to the copyholders.

Because the monasteries were more effective at maintaining advantageous land tenure relationships through the (later) Middle Ages, the incidence of copyhold tenure on monastic lands was 80% lower than on non-monastic lands. We therefore anticipate monastic lands to feature relatively more mobility out of agriculture and into newly expanding sectors like manufacturing. Additionally we expect to see higher levels of agricultural innovation and yields due to the better incentives on land without copyholding. This second effect likely strengthened the first since much innovation in this period was associated with labor saving technologies (Allen (1992)).

To test these hypotheses we have collected data on the impact of the Dissolution, labor force composition, measures of agricultural innovation and yields, social change, government policy, and industrialization across 16,000 parishes - the lowest administrative unit in England until about 1860. We compare parishes that were impacted by the Dissolution in the 1530s to those that weren't and trace their subsequent development paths.

To measure the impact of the Dissolution we digitized the Valor Ecclesiasticus, the

survey of each monastic asset in the entire country with its annual income that Henry VIII commissioned prior to the expropriation in 1535. We focus on the extensive margin and for our main explanatory variable code an indicator variable to measure the presence of monastic properties in a parish. This captures the discrete impact of the opening of markets which scholars like Tawney argued was the key aspect of the Dissolution.

Our arguments above motivate as our main outcome variables the proportion of the labor force in agriculture and in industry in the early nineteenth century using census data. As our main result we find that the presence of monastic properties in a parish is associated with a reduction of employment in agriculture and a commensurate increase in employment in industry of about 10 percent. Figure 1 visualizes the relationship between monastic income and employment in agriculture, and figure 2 does the same for employment in industry.

Naturally, the pre-Dissolution distribution of monastic assets was not randomly assigned. We control for a large number of potential determinants of the location of monastic lands, and we use a tax census from just before the Dissolution as a summary measure of pre-existing differences in development. While we cannot fully rule out that there is a complicated historical process confounding our results, we present a large number of further robustness checks that suggest that this is unlikely.

The Reformation was not just about the breaking up of monastic assets of course. Potentially more profound was the religious conversion that scholars since Weber (1905) have connected to entrepreneurship, human capital formation and industrialization (Becker and Woessmann, 2009, Cantoni, 2015, Cantoni, Dittmar and Yuchtman, 2018, Barro and McCleary, 2003, McCleary and Barro 2019). In our context differential conversion across parishes could be both a confounder and/or a channel. To investigate this we digitized the 1767 Returns of papists, which was a government investigation reporting the number of Catholics in each parish. We find that our main results are unaffected by controlling for the

presence of Catholics. We also find that, throughout, presence of Catholics is negatively correlated with agricultural modernization and industrialization.

Our second main set of outcome variables focuses on crop yields as a proxy for productivity and a measure of innovation in agriculture. Our theory suggests that these should all be higher on monastic lands after the Dissolution. First, we use data on wheat yields per acre in 1836 from Kain (1986) to directly proxy agricultural productivity (since we do not have information on inputs other than land area). Second, to measure investment we use data recently compiled by Dowey (2013) on the number of agricultural patents registered in a parish between 1700 and 1850. We find that monastic income is positively and significantly correlated with wheat yields and with patenting. These results are consistent with our model of the adverse effects of copyholding.

The historical literature suggests many complementary channels via which the Dissolution might have fomented structural change and investment. One is via the impact on policy, specifically the enclosure of parishes. Enclosures featured both the enclosure of common lands and the rationalization and consolidation of open field systems. It is plausible that enclosure was more common on land which lacked copyholds because it was more productive and this creates a sort of "productivity multiplier" as a consequence of the Dissolution. We use the data compiled by Heldring, Robinson and Vollmer (2020) on the extent of parliamentary land enclosures between 1750 and 1840 at the parish level. We also directly test the idea that the Dissolution spurred social change, one of the most famous hypotheses in economic history, due to Tawney (1941a, b). He argued that the Dissolution created a class of commercialized farmers, the 'Gentry'. We use a unique census from 1700 that records the number of Gentry in each of 24,000 of the largest towns/cities and villages in England and Wales to measure the impact of the Dissolution on social change.

We find evidence for the public policy channel since we find that monastic income is positively correlated with whether or not land was enclosed in a parish. The simplest

interpretation of this is that copyholding reduced the return to enclosure. Finally, we also find that monastic income is positively correlated with the number of Gentry in a parish, consistent with Tawney's hypothesis and the emphasis of Doepke and Zilibotti (2008) on social change. These two findings may be connected since the historical literature suggests that Gentry were heavily represented in Parliament and active in passing enclosure acts.

We finally provide a 'reality check' on our initial results about structural change and the composition of employment by looking directly at the impact of the Dissolution on industrialization (very much the focus of Weber, 1905). We use the 1838 Mill Survey commissioned by the British Parliament which records, for each parish, the number of textile mills and their employment. We find a that the presence of monastic properties is positively and significantly correlated with a dummy variable for the presence of a textile mill in a parish, a count variable which measures the total number of mills in a parish, and total mill employment.

Taken together, our findings link the spread of the market, brought about by the Dissolution, to economic and social change. These changes have been hypothesized to be crucial preconditions for the Agricultural Revolution and ultimately industrialization, but have not been tested before. Our results suggest that the end of monastic restrictions on the marketability of 1/3 of the land in England and relative incidence of customary tenure, itself directly linked to feudalism, were important for fundamental changes within England. The lagged abolition of feudal land tenure in France and Germany may be behind why England pulled ahead on the world stage in the eighteenth century. Continental Europe only transformed after their political revolutions in the nineteenth century finally did away with servile labor and customary land tenure relationships (Acemoglu, Cantoni, Johnson and Robinson, 2011).[2]

[2]While our account restores a rather traditional theory of the prominence of England among Western European countries to the center of the discussion, our findings likely generalize outside this context. Precolonial Africa, for example, was characterized by an almost total absence of factor markets and land is not a marketable commodity in most of the continent today. Though a labor market appeared in the

Our paper is related to quite a few other contributions in addition to those we have discussed above. Our findings are consistent with the literature on the Agricultural Revolution which has stressed that this was due to changes in economic institutions, particularly the spread of markets often in connection with enclosures (Jones, 1974, Overton, 1996). Though our evidence does not speak to the issue of the extent to which the Agricultural Revolution helped to cause the Industrial Revolution (see Clark, 2014) they are consistent with them being connected. Our results are also consistent with Tawney's hypothesis.[3]

The paper proceeds as follows. The next section provides some important historical background including a discussion of the process of the Dissolution of the monasteries and what happened to monastic lands afterwards. Section 3 discusses the data in detail, particularly the collection of the Valor, and how we compiled this data. We also discuss the other variables we use in the analysis and present some of the descriptive statistics. Finally, we describe our econometric model. Sections 3-6 present our results. Section 7 concludes.

1 Setting: The monasteries and customary tenure

In this section, we provide the necessary background to the Dissolution of the Monasteries and our hypotheses. In particular, we discuss the emergence of a market for the monastic lands and the nature of customary tenure.

colonial period, slavery also persisted until after World War II in large areas. Similarly, eastern Europe was relatively poor and characterized by serfdom until the middle of the nineteenth century. In Latin America, explicit restrictions on indigenous labor persisted in Guatemala until the 1940s and Bolivia until the 1952 revolution. Finally, scholars point to the development of factors markets in Song China as one of the reasons why it had higher living standards than England before the Industrial Revolution (von Glahn, 2016).

[3]Tawney's papers generated a large literature. This focused on a plethora of issues; whether or not the aristocracy had really declined in favor of a rising class of Gentry (Stone, 1965); whether or not Gentry really were more commercial or efficient than large landowners (Heal and Holmes, 1994, Chapter 3 for this literature); and whether or not the Gentry were the group who led the rebellion against Charles I. The consensus view of historians on these issues, as expressed by Clay and Overton above, now seems to be that indeed there was a big change in the distribution of land in 16th century England as a result of the Dissolution and, moreover, it makes sense to talk about the rise of the Gentry.

In 1530 there were around 825 monasteries in England and Wales.[4] These monasteries, together with cathedrals and parish churches owned about a third of all land in England and Wales (see Table 1, Mingay, 1976, p. 44 and Woodward, 1966, p. 33).

Henry VIII, who had become King in 1509, declared himself head of the Church in 1534. His initial objective was to appropriate all taxes that churches and monasteries traditionally paid to the Pope. In order to assess the revenue potential of the Church, Henry ordered an assessment of the yearly income of all ecclesiastical possessions in England. The resulting reports are published in 1535 as the *Valor Ecclesiasticus*.[5] Between 1536 and 1540 parliament passed several acts that transferred their ownership of all monasteries in England to the Crown, effectively expropriating all assets of the entire monastic sector.[6] The consensus in the historical literature is that the main effect of this expropriation was to free up lands for sale and re-allocation. Prior to this there were outright bans on sale and transfer of ecclesiastical land, such as the Statute of Mortmain (Raban, 1974).[7] Most important for us, the Dissolution made available a large amount of land relatively

[4]See Woodward (1966, p. 2). There were many types of monastic religious establishments, such as nunneries, friaries, abbeys and priories. We use the term monasteries throughout this paper. Much has been written on the Dissolution and the reformation more generally, see for instance Gasquet (1899), Woodward (1966), Youings (1971), Knowles (1979) and Duffy (2005). Savine (1909) deals exclusively with the *Valor Ecclesiasticus*. See Haigh (1993) and Bernard (2007) on the Reformation more broadly, Scarisbrick (1968) on Henry VIII and Elton (1953) on Henry's government.

[5]The titles and specifics of the relevant acts, the state of the surviving Valor records, the methods of the Valor enumerators as well as our method of coding the Valor data are all described in Sections 3 and 4 of the Appendix. Section 4 includes a description the Valor records for the manor of Helton, Lolbroke and Bell as an example. The Appendix also describes the process of Dissolution followed by the Crown.

[6]Dissolution of church property was not without precedent in England. During the Hundred Years War and throughout the later Middle Ages, the alien priories, priories that were dependent on a monastery in France, were dissolved. In 1520 Cardinal Wolsey dissolved some twenty monasteries to pay for the foundation and endowment of an Oxford college and a school in Ipswich. On the continent, Swedish, German and Swiss rulers had successfully dissolved several catholic monasteries in the early sixteenth century (Woodward, 1966, p. 49).

[7]It is plausible that monastic lands were also not used efficiently prior to the Dissolution because ecclesiastical owners did not maximize profits but used non-economic criteria. For example, marketing products was thought to be inappropriate and that monastic properties aimed for self-sufficiency (Swanson, 1989, pp. 229-230). Monastic incentives to invest were even weaker since investment decisions were usually entrusted to one monk, the obedentiary, whose task was to ensure adequate food supplies for the monks rather than raise profitability of monastic agriculture (he/she had only a very small claim, if at all, on any potential profits from agriculture). See Kosminsky (1961), North (1981), Campbell (1983, p. 397) and Campbell (2006, pp. 179, 421) for arguments about the relative efficiency of the church.

unencumbered by customary tenurial contracts.

Existing evidence certainly suggested that the land market sprung into action after the Dissolution. In 1603, one commentor remarks: "In these days there go more words to a bargain of ten-pound land a year than in former times were used in the grant of an earldom" (Youings, 1967, p. 304). By 1600, the land market had developed, and many buyers had consolidated small pieces of lands into estates. One commenter remarks in 1610: "lands pass from one to another more in these latter days than ever before" (Youings, 1967, p. 303). In Devon, the number of transactions in the land market tripled in the years immediately after the Dissolution (Kew, 1970).

At the time of the Dissolution, as much as two thirds of all land in England was held in a particular form of customary tenure, known as copyhold (Youings, 1967, p. 308). There were two sorts of copyholds: 'of inheritance' which lasted forever, and 'for lives' usually three lives (or three generations). It was called copyhold because a copy of the agreement was kept in the local manor court. Vinogradoff (1923, p. 80) traces copyhold to norms that "a free man ... cannot be ejected by his lord against his will, providing he is doing the services due from the holding" arguing that this was the "germ of copyhold tenure". Tawney (1912, pp. 46-47) observed "copyholders are the descendents of villeins ... copyhold tenure, is in fact, villein tenure to which the courts from the end of the fourteenth century have gradually extended their protection" and Overton (1996) notes "villein tenure gradually changed its name to copyhold" (p. 31). Remarkably, copyhold tenure, a direct descendent of feudal tenure, lasted until it was finally abolished in 1925 by the Law of Property Act. As late as 1600 2/3 of land was still under customary tenures with about half copyhold of inheritance and half copyhold for lives (Tawney, 1921, p. 26, Overton, 1996, p. 35) and Allen (1992, p. 95) accepts a similar number for 1688. Even as late as the 19th century copyhold was widespread and Beckett and Turner (2004) document that the Copyhold Commission, formed in 1841 to convert copyholds into freeholds, had to deal

with thousands of cases.

Copyhold of inheritance lasted forever and stipulated a fixed "customary" nominal rent in perpetuity which was typically far below market levels. Though the laws passed to expropriate the monasteries explicitly protected such tenancies (Youings, 1971, p. 43) the evidence suggests that "On ecclesiastical estates ... after 1540, leases were mostly either for twenty-one years or for three lives" (Kerridge, 1969, p. 47, see also Youings, 1971. p. 115). This is significant because, as we argued in the introduction, copyholds of inheritance, relatively absent from monastic lands, had significantly negative effects on productivity, labor mobility and the efficient allocation of land. We make these points more formally in the Appendix with a simple model of the incentives to invest in monastic land. These effects were less pronounced on copyhold for lives because, while nominal rents were also fixed at customary levels, after three lives, possibly 100 years, the copyhold contract lapsed and had to be re-negotiated. At such a juncture landlords could adopt more market based contracts in order to claim part of the agricultural surplus which had, before the Dissolution, accrued to tenants under customary land relations.

If there were minimal copyholds of inheritance on former monastic lands,[8] given that 1/3 of total lands were under such tenure, this implies that close to one half of non monastic lands were under such tenancies.[9] The stark difference between levels of perpetual copyhold tenure motivate our hypotheses about the differences between monastic and non-monastic lands.

[8]There is no comprehensive data on where copyholds were (see French and Hoyle (2007) for a discussion of available sources). Nevertheless, when a monastic property was expropriated, surveyors would draw up a new valuation, which would serve as the basis for taxation. In some cases, these records include additional information on the type of contract between the monastery and the tenant. These additional returns are published in the seven volumes of the *Monasticon Anglicanum* (Dugdale, 1693). For 2,136 tenure contract we are able to ascertain whether it was a perpetual copyhold of inheritance contract or a copyhold for lives or another type of contract. 13% of these contract were copyhold of inheritance contracts. Though it is not clear how representative this sample is, this number is consistent with the conventional wisdom amongst historians that copyholding of inheritance was relatively rare on monastic lands.

[9]Given our estimate for the share of copyhold of inheritance, this means that the incidence of copyhold of inheritance is at least 80% lower on monastic lands.

Why was it that monastic lands featured so little copyholding? This seems to be because when copyholds emerged, they reflected the powerful bargaining position of villeins in the wake of the Black Death (Bailey (2016) for a comprehensive review of the evidence). This is why they were so favorable to the tenants. But, as Swanson (1989) notes, the Church was more aggressive in opposing the changes which were forced on landowners by the collapse in their labor supply arguing that after the Black Death there was a "gradual decline (but not total abolition) of serfdom. Here again, ecclesiastics faced the same forces as their lay counterparts, but were seemingly less willing to give way" (Swanson, 1989, pp. 201-202).[10] In other words, monastic lands were more 'feudal' before the Dissolution, but better positioned economically afterwards.

In the remainder of this paper we empirically examine the impact of this arguably exogenous shock to England's countryside on factor markets, and we trace several channels of impact, such as changes to agricultural productivity and innovation and social change.

2 Data and Empirical Framework

For our empirical specifications we use parishes as our unit of observation. Parishes are the relevant local ecclesiastical and civil administrative unit for much of England's history, and their boundaries have changed very little between the Dissolution and the Industrial Revolution. Names of individual villages and manors within our parishes sometimes change considerably over time. Section 4 in the Appendix describes the procedure we followed to assign observations in different datasets to the appropriate parish.[11] The Appendix also contains an overview of all data sources for this paper.

[10]For example, Durham priory was drawing up lists of serfs until well into the 15th century, in 1497 Tavistock abbey was collecting servile dues and enforcing labour services and in 1502-3 the bishopric of Lichfield and Westminster abbey demesne leases were still demanding customary labor services from serfs. See MacCulloch (1988) on the widespread persistence of serfdom into early Tudor England.

[11]Kain and Oliver (2001) reconstructed the administrative map of parishes for England. Their map has been digitized as the *GIS of ancient parishes*, which we use in this paper

2.1 The Valor Ecclesiasticus

We obtain our main independent variable, an indicator for whether a monastery generated income within a parish, from the Valor Ecclesiasticus. We use a transcript of the surviving original returns made by the British Record Commission in the first half of the nineteenth century as our source (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). We exploit the fact that each individual revenue generating unit, such as a manor or an individual tenant, is located in a village and a parish and, therefore, has a place name (see the example return in Section 4 of the Appendix). This enables us in principle to identify each unit and attributed it to a parish, even though the owner of the unit, such as a monastery, may be located elsewhere. This way we attribute income to the location where it is generated instead of to the location to where it accrues. Figure 3 maps the spatial distribution of Monastic properties across England, and shows that our data covers modern England almost entirely.[12] We record several alternative measures of the impact of the Dissolution for robustness checks. We introduce these as part of the empirical analysis below.

2.2 Outcome variables

2.2.1 Occupational structure

We use the digitized version of the 1831 Population Census (Gatley, 2005) to compute shares of adult male population above twenty employed in different occupational categories.[13] We focus on the share of adult males over 20 years of age employed in agriculture which, on average, equals 62 percent across our dataset of parishes, and the share employed in industry, which equals 21 percent on average. We construct employment in industry by adding up employment in 'manufacturing' and 'trade and handicraft'. Other categories

[12]We restrict our attention to income from physical assets. This income is referred to in the records as 'temporal income'. The Valor also records 'spiritual income', which are mostly customary duties payable to monastic or ecclesiastical officers.

[13]The 1831 census is the first proper complete census in England, earlier returns in 1801, 1811 and 1821 are all incomplete and were collected indirectly (for example by asking local priests).

that are distinguished in the census data are people employed as laborers, people employed as bankers or in other skilled professions and a category for those not fitting one of these categories.[14]

2.2.2 Agricultural Yields

We record wheat yields from the 1836 tithe surveys, digitized by Kain (1986), as our proxy measure of productivity. As part of the tithe commutation act of 1836 which commuted the tithe into money payments, agricultural statistics were collected for large parts of England. After assigning parishes to individual yield observations in this dataset we obtain a sample of 4148 parishes for which we have wheat yield, measured in bushels per acre.

2.2.3 Agricultural Patents

We compute the number of patent holders from the returns of patent holders in Woodcroft (1854), which were previously used by Dowey (2013). These returns record the place of residence of the patent holders and we used this place to geographically locate the patents. We use the count of patents in a particular place, not the count of patentees (there can be multiple patentees on one patent). The variable we construct is the total number of patents that were registered to people living in a parish between 1700 and 1850.

2.2.4 The Gentry

We collect data on the presence of the Gentry come from John Adams' *Index Villaris, or an Alphabetical Table of all Cities, Market-towns, Parishes, Villages, Private Seats in England and Wales* (Adams, 1700) which is a systematic survey of the 24,000 largest cities/towns/villages in England published originally in 1680. We use the total number of

[14]We have been able to reconstruct census data for about twelve thousand of our parishes. Regressions including variables based on the census will therefore have a lower number of observations than variables that do not include such variables.

Gentry living in a particular locality from the most up to date version published by Adams, from 1700.

2.2.5 Enclosures

We use data on the location of parliamentary enclosures from *A Domesday of English enclosure acts and awards* by Tate and Turner (1978) as compiled and analyzed by Heldring, Robinson and Vollmer (2020). We record parishes mentioned in each enclosure act and code a dummy that is equal to one if land in a parish was enclosed between 1750 and 1840.

2.2.6 Industrialization

In 1838 Parliament ordered a return of the 'number of persons employed, of the description of the manufacture, and of the nature and amount of the moving power in all the Factories...' (Parliament, 1839, p. 3). This return records each industrial mill in England indicating its manufacture (cotton, wool, worsted, flax or silk), whether it was water or steam powered and the number of people employed. We record an indicator variable equal to one if a parish contains at least one textile mill, a variable measuring the number of mills in a parish, and a variable measuring total employment in all mills in a parish.[15]

2.3 Control Variables

2.3.1 Religion

In the seventeenth and eighteenth century, the English House of Lords initiated several surveys to document the extent of Catholicism in England. The resulting figures are known as several 'Returns of Papists'. The most complete return is from 1767 and it documents about 70,000 Catholics in nearly 2,500 parishes (Worrall, 1980, 1989). We digitized this

[15]For employment we take total employment which includes not just adults of both sexes but also children. Children aged 0-9 made up 0.4% of total employment. Children aged 9-13 were 8.3%. Children aged 13-18 were 38.4% hence children aged 0-18 made up 47.1% of total employment.

source and count the total number of Catholics in each parish. We normalize the total number of Catholics by population in 1831.[16]

2.3.2 The Tudor Lay Subsidies

We record a proxy for income from 1525, as a summary measure of development differences just before the Dissolution. The source for this measure is the Tudor lay subsidies analyzed by John Sheail (Sheail, 1968, see Hoyle, 1994, for a useful introduction to interpreting Tudor tax subsidies). The original Lay Subsidy was carried out in 1524/25 and records the amount of tax raised and the number of taxpayers in each parish or village. It taxed, for each household, the most important source of income of the head of a household, defined as either personal property, landed incomes, or wages (Sheail, 1968, p. 111).[17] Tax rates were: a flat rate of four pence per pound if the primary source of income was wage income, one-fortieth (six pence per-pound) on goods and one-twentieth (one shilling per pound) on landed incomes. If the goods were valued at more than twenty pounds, the rate increased to one-twentieth as well. Hence taxation was to some extent progressive. If the household did not earn at least one pound in wages per year, had one pound in landed income per year, or possessed two pounds worth of goods, it was not recorded in the survey. From this data, we record total income per capita in each parish.

2.3.3 Other Data

Throughout our analysis we use several geographical covariates. To account for the different sizes of parishes, we control or parish area throughout. Using ArcGIS we compute the distance to London, the distance to the sea or the border with Scotland (whichever one is

[16]Note that the normalization means that the number of observations we have for this variable is equal to the number of observations in the 1831 census.

[17]The returns cover the entire country except the counties Northumberland, Durham, Cumberland, Westmorland and Cheshire (all in the North). The Cinque Ports (Hastings, New Romney, Hythe, Dover and Sandwich) were also omitted. If there were several returns available (such as one for 1524 and one for 1525) we averaged over the available returns.

nearest) and the distance to the nearest river (we include here all rivers with year round water flow (perennial) since we care more about water as a source of power than transport). From the Food and Agricultural Organization we got data on wheat suitability and soil type.[18] In ArcGIS we then measure for each of our parishes the soil type and wheat suitability under the centroid in this parish. Ideally, we would like to average over the shape, but the granularity of the suitability and soil type grids is too coarse to enable us to do this. We also control for elevation and slope, again measured under the centroid. To obtain the distance to the nearest coalfield for each parish we digitized a map of the coalfields in England and Wales in 1912 (Strahan, 1912) and computed the distance in ArcGIS. Finally, we control for distance to the nearest market town in 1680. This measure controls for proximity to an urban center (see more on the influence of urban units below). The data come from John Adams' *Index Villaris* which is described above.

2.4 Descriptive Statistics

Table 2 contains the descriptive statistics of our outcome variables, and our variable of interest, an indicator equal to one if a parish was 'monastic'. The first two columns give means and standard deviations of all variables. Subsequent columns give means for parishes that were monastic and parishes that were not. The last two columns provide a t-test of the difference of means. In Appendix table A-1 we provide summary statistics for all variables used in this paper.

[18]The FAO has classified the earth's land surface into 32 reference soil groups, based on observable characteristics such as accumulation of organic matter and porosity (for a full description, see IUSS, 2014). These classifications have been published as a GIS raster file. The most common soil types in our dataset are Cambisols ("Soils with at least the beginnings of horizon differentiation in the subsoil, evident from changes in structure, colour, clay content or carbonate content", p. 143), Gleysols ("Soils with clear signs of groundwater influence", p. 150), Luvisols ("Soils with a pedogenetic clay differentiation (especially clay migration) between a topsoil with a lower and a subsoil with a higher clay content, high-activity clays and a high base saturation at some depth", p. 156) and an "Urban, mining, etc." group. Soil groups differ in irrigation and drainage requirements, salinity, and fertility, and are therefore differentially suitable for agriculture. Cambisols, for instance, "generally make good agricultural land and are used intensively" (p. 144). For Gleysols, on the other hand, "the main obstacle to utilization is the necessity to install a drainage system to lower the groundwater table" (p. 150).

There are several interesting patterns in this table. First, about a third of parishes are monastic, which is in line with the estimates cited in section 1 of the total share of land owned by monasteries being equal to about a third. Second, when we implement a simple difference of means exercise we see that employment is lower in agriculture and higher in industry in monastic parishes, we also see that wheat yield is higher (although not significantly so), as are the number of Gentry, the probability of getting enclosed and the number of agricultural patents. Finally, monastic parishes are more likely to have a textile mill. We now introduce our estimation framework for estimating the effect of being monastic on these outcomes studied in this section.

2.5 Estimation framework

In this section we discuss the nature of selection into monastic status, and present our main estimating equations.

We naturally face the question what determines whether a plot of land in a parish is owned by a monastery. Ultimately, this is the product of a long historical process, starting with the founding of early Benedictine monasteries after the collapse of the Roman empire. Because most of these early monasteries were destroyed in Viking raids, the most important defining event for the distribution of monastic properties was the Norman Conquest in 1066. William the Conqueror redistributed virtually all land in England to his knights and to abbots of new monasteries. This introduced the continental orders to England (e.g. Franciscans, Cluniacs), and reshaped the pattern of land ownership in England.

It may be the case that monasteries got more attractive land, or that the subsequent patterns of bequest of land to the monasteries favored land that was more desirable. It may also be the case that monasteries acquired land in a way that correlates with subsequent patterns of development, independent of the transformation of local factor markets.

There is little credible hope to identify a sources of quasi-experimental variation in the

long and complicated process that led to the pattern of monastic land ownership before the Dissolution. Our approach instead is the following. First we rely on a historical feature of the overall development of the English economy. Before the Dissolution, the richest and most developed part of England was the South, which was heavily involved in wool trade with the Continent. The Industrial Revolution made the North the richest part of the country (Darby et al, 1979). If historically monasteries were simply located in the richest or most productive parts of the country, we would not expect to see a relationship between the Dissolution and industrialization. It may instead be the case that monastic property is located in the less desirable, or less inhabited parts of the country, such as the North. Our strategy to is to compare parishes within the North and within the South using county fixed effects (n=44). Second, within counties, it may of course still be the case that monastic property is located in parishes that are more desirable. We measure the desirability of parishes before the Dissolution, we use income differences proxied by income measured in the Lay Subsidies, which we introduced in the previous section. These incomes measure pre-existing differences in development. We also control for several measures of the fixed productivity of the soil, such as elevation and the FAO measures of productivity introduced above. Third, because economic activity tends to cluster (in the presence of increasing returns to scale) we may simply measure the fact that economic activity in the Industrial Revolution clusters where there was economic activity in the past. Although this argument seems less plausible in the light of the evidence cited above for economic activity moving from the South to the North, we nevertheless control for the total area of a parish to capture scale, and focus on the extensive margin of monastic presence, rather than its scale. Our main measure of the impact of the Dissolution is therefore an indicator equal to one if a parish was impacted by the Dissolution. This indicator captures the idea that the main impact of the Dissolution is institutional: the creation of local factor markets.

To estimate the reduced form relationship between the impact of the Dissolution of the

Monasteries and our outcome variables we estimate the following model using OLS:

$$y_{pc} = \gamma_c + \alpha_M \cdot M_p + \mathbf{X}'_p \cdot \alpha_X + \varepsilon_p \tag{1}$$

Here y_{pc} is our dependent variable of interest in parish p in county c which could be, for instance, the proportion of the labor force employed in agriculture. M_p is an indicator if a monastery owned land in parish p so that α_M is the main coefficient of interest. γ_c is a county fixed effect (n=44). The vector $\mathbf{X}'_p$ always includes the physical area of parish p and Lay Subsidy revenues. In a series of robustness checks, we allow the level of fixed effects to vary, and include numerous covariates in $\mathbf{X}'_p$. These covariates capture the broad geographical attractiveness of a parish for attracting economic activity, such as the proximity of coal deposits, underlying soil productivity, and proximity to markets or London. Finally ε_p is a heteroskedasticity robust (White) standard error.

3 Main Results

In this section we present the main results of our paper. The results support our hypotheses since we find that parishes that were impacted by the Dissolution employ relatively fewer people in agriculture and more in industry. When the Industrial Revolution started, these parishes were better positioned to take advantage of the new innovations and opportunities that arose because their labor force was more mobile. Impacted parishes also have higher yields and more innovation, they are in addition more likely to experience enclosure and have a higher density of Gentry, indicating changes in social structure usually associated with economic change (Tawney, 1941a). Finally, and consistent with our initial results on structural change textile mills are more likely to be located in impacted parishes. Throughout, we find that changes in religious composition do not affect our results.

3.1 Occupational structure

Table 3 presents our first main results, focusing on employment in agriculture and industry. Columns (1) and (2) use employment in agriculture as the outcome variable, and columns (3) and (4) employment in industry. In even columns, we include the share of population that was Catholic in 1767. In column (1) we include county fixed effects, parish area and total tax revenue (per capita) in 1525 as covariates and find that $\hat{\alpha}_M = -0.025$ (s.e.=0.004). This result is unaffected by including the share of Catholics, which itself is positively correlated with employment in agriculture in column (2). In columns (3) and (4) we change the dependent variable to the share of the labor force employed in industry. Here we find a significant positive relationship at the 1% level. The effect of the Dissolution is unchanged when including share of Catholics.

Monastic parishes see a 2.5 percentage point reduction in employment in agriculture, and 1.6 percentage point increase in employment in industry. Relative to its mean of 62%, the reduction in agricultural employment does not appear to be large. But, most of this decrease goes into an increase in employment in industry. A 1.6 percentage point increase in employment in industry is about 8 percent of its mean, which we interpret as a sizable increase.

3.1.1 Robustness: markets and geography

Table 4 examines the robustness of our main results. As in Table 3 there are two sets of columns corresponding to the different dependent variables, which vary by whether we add the share of Catholics as a covariate. We now report standardized coefficients to facilitate comparisons across point estimates. In all columns, we control for a set of geographical variables: terrain elevation and slope, wheat suitability, distance to nearest river, market town, to the border, to London and to the nearest coalfield and a vector of soil type dummies (n=31).

First, note the standardized estimated coefficient for employment in agriculture and industry are equal, suggesting that the reduction in employment in agriculture is absorbed by industry. Second, when we control for our set of geographical controls, the estimated effect of being monastic remains strong and significant. Some of the estimated coefficients on the controls are of independent interest. For example, there are significant negative relationships between distance to market towns and coalfields and industrialization, precisely as one would hypothesize. Typically, the relationships between geographical covariates and employment in agriculture and industry are of opposite sign, as we would expect.

The findings from Table 4 confirm the basic results of Table 3, that there is a strong positive and robust conditional correlation between the impact of the Dissolution of the monasteries in the 1530s and occupational structure in the Industrial Revolution.

3.2 Further Robustness Checks

We now conduct some more robustness tests to further probe our findings.

3.2.1 Alternative ways of measuring the impact of the Dissolution

So far we have measured the impact of the Dissolution in a particular parish by an indicator equal to one if a parish contained monastic property. We now investigate the robustness of our results using two alternative appealing ways of measuring the impact of the Dissolution in a parish. We first constructed total Monastic income by adding all income that is generated in a parish Our final approach is to build a count variable which is equal to the number of monastic properties in a parish.

The results of using these other three measures of impact are recorded in table A-2 in the Appendix. All results show a negative and significant effect of the Dissolution for employment in agriculture and a positive and significant effect for employment in industry.

We find that our basic results are very robust to these different ways of measuring the impact of the Dissolution.

3.2.2 Relaxing the fixed effects

In our results so far we included fixed effects at the county level. These fixed effects account for unobservables at the county level that would confound our estimated relationships when not included. Restricting to within-county variation, however, precludes drawing conclusions about the pattern of industrialization across England. Although we believe that our estimation strategy is not particularly well suited to speak to these patterns, we nevertheless relax our fixed effects and report results from re-estimating equation 1 in Panel C of table A-2 in the Appendix. Specifically, we report results for our main dependent variables without any fixed effects and with a North-South fixed effect, which splits England in two parts, one formed by Cheshire, Cumberland, Derbyshire, Durham, Lancashire, Lincolnshire, Nottinghamshire, Northumberland, Staffordshire, Westmorland, Yorkshire: West Riding, Yorkshire: East Riding, Yorkshire: North Riding and one formed by all other counties. We find a consistent negative and significant effect for employment in agriculture and a positive and significant effect for employment in industry. These results show that our main results do not depend on our fixed effects.

3.2.3 Dropping urban parishes

One might be concerned that our results are driven by the fact that monastic orders owned properties in urban areas and that these were also places where industrialization took place (obviously the Industrial Revolution was associated with very rapid urbanization). We tried to address this issue so far by using various types of covariates, but here we take a more direct strategy and check that our results are robust to dropping urban parishes. Table A-3 in the Appendix shows two sets of results, which differ in the way urban status

is defined. The first two columns consider parishes urban if they are coded as urban in the 1831 Census. The second set of results uses post-1832 reform parliamentary constituencies. Parliamentary constituencies were either county constituencies or borough constituencies. For these columns we treat all parishes falling in a borough constituency as urban. Our main results are insensitive to dropping urban parishes.

3.2.4 Matching estimates

An alternative approach to controlling for covariates is to implement a matching exercise, and find pairs of parishes that look similar in terms of observables, but differ in terms of monastic presence. The idea behind such an exercise is that if matching induces balance on observables, it is more likely that there is balance on unobservables as well. We present the matching and estimation details in our appendix, and table A-4 presents results. Estimated treatment effects using a nearest-neighbor match are in line with the estimated effects in Table 3.

4 Agricultural yields and patents

In the previous section we showed that the Dissolution impacted the allocation of labor between agriculture and industry. In this section we focus on showing changes in (our proxy for) agricultural productivity, which are of direct significance and in addition facilitated the release of labor. Specifically, we study wheat yields and innovation in agriculture, measured by the number of agricultural patents filed by residents of parish p in the period 1700-1850. We repeat the basic structure of Table 3, and report robustness results in Table A-5.

Table 5 reports the basic results. In columns (1)-(2) we use wheat yield as the dependent variable. We see that there is a robust and positive correlation between monastic income and wheat yield. Due to the lower number of available observations for agricultural yield, we lose some precision. Monastic parishes see agricultural yields that are about 10 percent

higher than non-monastic parishes (column (1)). This result is robust to accounting for religious differences in column (2). Columns (3) and (4) examine the impact of monastic income of agricultural innovation as measured by the total number of patents registered to inhabitants of a particular parish between 1700 and 1850. We find that there is a significant and positive relationship which changes little when we include the share of Catholics. Monastic parishes see the number of patents filed increase by about its sample mean.

Table A-5 in the appendix then reproduces our basic robustness checks with very similar findings to those from before. Our baseline results for patents is robust to all of the geographic covariates. For wheat yield, the (standardized) coefficients are stable, but we lose further precision.

5 The Rise of the Gentry and Parliamentary Enclosure

In this paragraph we study social change and land reform as two more potential effects of the Dissolution. First, we examine the impact of monastic income on the rise of the Gentry and parliamentary enclosure between 1750 and 1840. Existing data strongly suggests that the Gentry increased greatly in numbers and in the amount of land they controlled. Table 1, from Overton (1996, Table 4.8), shows that while in 1436 the Church held around 20-30% of land with the Crown holding 5%, the sum of these two numbers declined to 5-10% by 1688, mostly due to the Dissolution. In the same period the landholdings of the middling and lesser Gentry, the people relevant for Tawney's hypothesis, went from 25% to 45-50% of the total. In appendix section 2, we provide case study and family history evidence for individuals who 'rose' as a consequence of the Dissolution. In this section, we use the number of Gentry present in parish p in 1700 (Adams, 1700). Second, we

measure the incidence of parliamentary enclosure. Enclosure is argued to have been an efficiency improving policy, and members of the Gentry were disproportionally involved with enclosure in their roles as landowners and as members of Parliament (see Heldring, Robinson and Vollmer (2020) for detailed evidence on both these potential channels). We code an indicator variable equal to one if a parish is mentioned in a parliamentary enclosure act between 1750 and 1840.

Table 6 reports results. For both the presence of the Gentry and parliamentary enclosure, we find robust, positive and significant effects. We find that monastic parishes are home about 30 percent more Gentry than non-monastic parishes are, which is consistent with Tawney's Rise of the Gentry hypothesis (Tawney, 1941a,b). These Gentry are hypothesized to have been active in parliament to lobby for legislative change that would benefit agriculture, and to more generally be commercially minded. One way in which we can test this idea is to look at enclosure. We find that monastic parishes are about 20% more likely to be enclosed between 1700 and 1850.[19] We believe the most plausible interpretation of this finding is that parishes which were not encumbered with copyhold tenancies were far more attractive places to enclose. Enclosure did not liquidate copyholds and the presence of such tenancies made enclosure less productive for landowners, while not reducing the cost of the process (which were born by people in the parish and proportional to landownership).

Table A-6 repeats the robustness exercise for geography of the previous sections. The patterns of Table 6 are robust and stable throughout all estimations.

[19] Jha (2015), using different sources of information, fails to find support for Tawney's claims about the Gentry's role in the English Civil War.

6 Textile mills

In this section we turn to estimating the effect of the Dissolution on industrialization by using data on the location and size of textile mills. The main motivation for this is as an independent check on our initial results which showed a shift out of agriculture into industry in parishes that were impacted by the Dissolution. If this is right then, given that the census is from 1831, it is plausible that we should also see more mills in such parishes. If we do not, then one may doubt our initial results.

In Table 7, we use three sets of columns with different dependent variables. The first two, (1) to (2) use an indicator variable equal to one if parish p has at least one mill and equal to zero otherwise. The second two columns, (3) and (4), use the number of textile mills as the dependent variable. Columns (5)-(6) use instead use the total number of mill workers in a parish. Even columns, like before, add the share of Catholics as a control. We find a strong, positive relationship between monastic parishes and the location of industrial activity, measured by the textile mill indicator in column (1). Monastic parishes are about 25 percent more likely to have a textile mill than non monastic parishes. When we look at the scale of industrialization in columns (3)-(6), monastic parishes are also more industrialized on the intensive margin, although these results are less precisely estimated.

Table A-7 then probes the robustness of the results of Table 7 using exactly the same strategy and structure as before. For each measure of industrialization, the measured effects are robust throughout.

7 Conclusions

In this paper we conducted what to our knowledge is the first empirical investigation of the long-run economic impact of the Dissolution of the monasteries in England between

1536 and 1540. Tawney (1941a,b) first proposed that the Dissolution and subsequent sell off of church land, representing around 25-30% of land in England, created a huge shock to the land market with profound consequences. We argue that this can be viewed as a natural experiment in the modernization of economic institutions and we hypothesized that the subsequent emergence of a land market would have had a major positive impact on resource allocation and incentives. This was particularly because monastic lands were relatively free of customary copyhold tenancies. To investigate this we digitized the 1535 Valor Ecclesiasticus, the census that Henry VIII commissioned on monastic incomes.

Using the presence of monastically owned land at the parish level as our main explanatory variable we showed that the Dissolution had significant positive effects on structural change, the movement of labor out of agriculture and into industry. It also positively impacted agricultural yields and innovation which we interpret as being consistent with the hypothesis that copyholding inhibited investment. The Dissolution was further associated with social change, in particular the rise of the Gentry and productivity improving policies like enclosure. Finally, we linked the Dissolution with industrialization which we measured using data from the 1838 Mill Census, the first time the British government collected systematic data on this driving sector of the Industrial Revolution. We further argued that there are grounds for believing that these correlations can be interpreted causally.

All in all, our findings support a quite traditional theory of the industrial, and perhaps agricultural revolution; that it was at least partially caused by the increasing marketization and commercialization of the economy. Our findings also support other channels, such as the importance of the presence of natural resources emphasized by Clark and Jacks (2007), Allen (2009), Crafts and Wolf (2014) and Fernihough and O'Rourke (2014).

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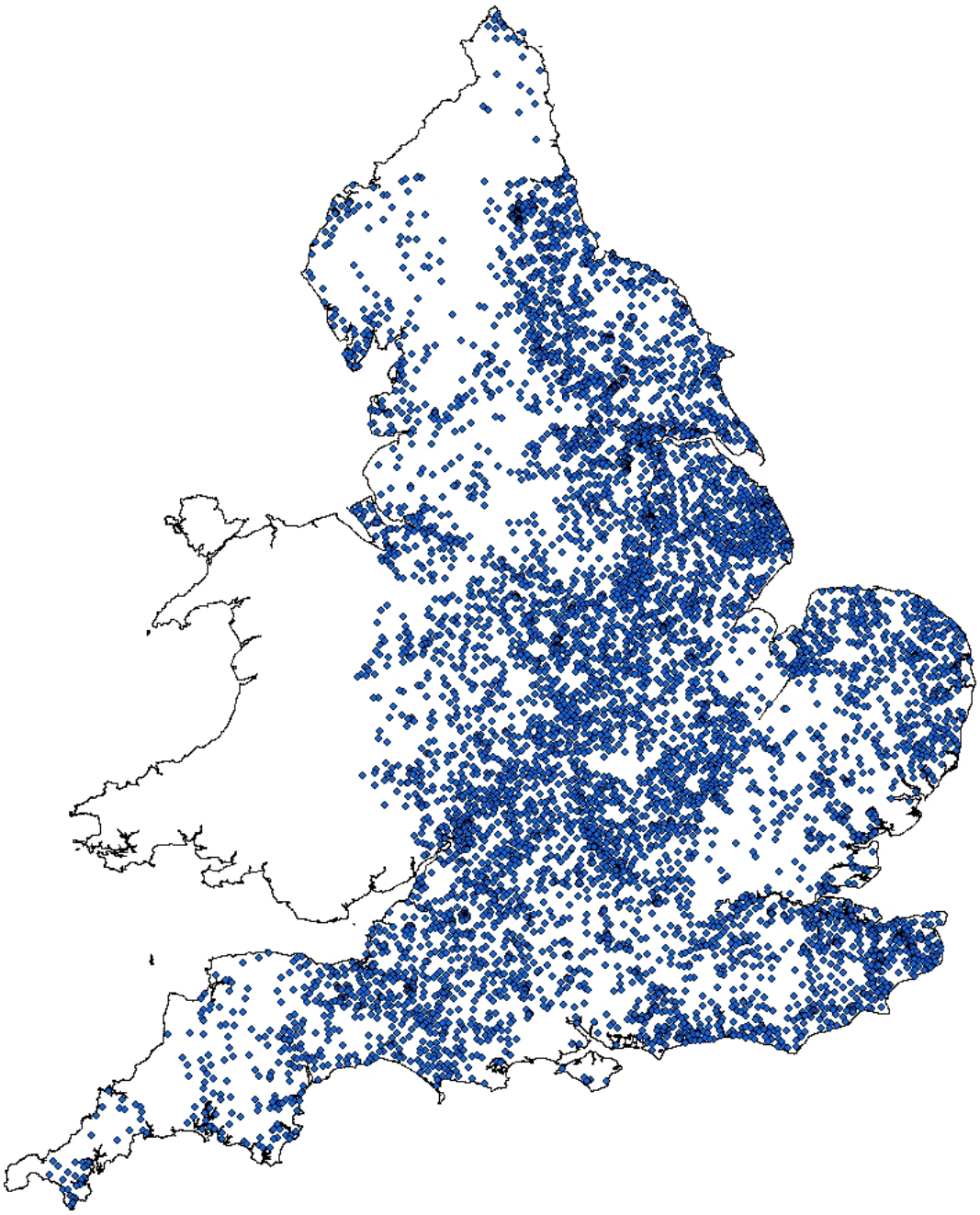


Figure 1: Spatial distribution of Monastic property. One dot indicates at least one monastic property in 1535.

Figure 2: Dissolution is correlated with a lower share of population employed in agriculture

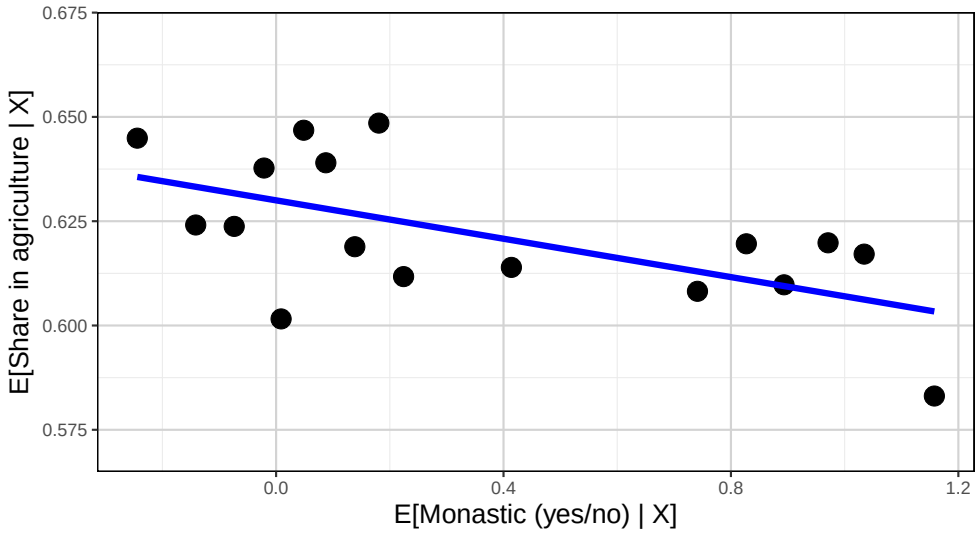


Figure 3: Dissolution is correlated with a higher share of population employed in industry

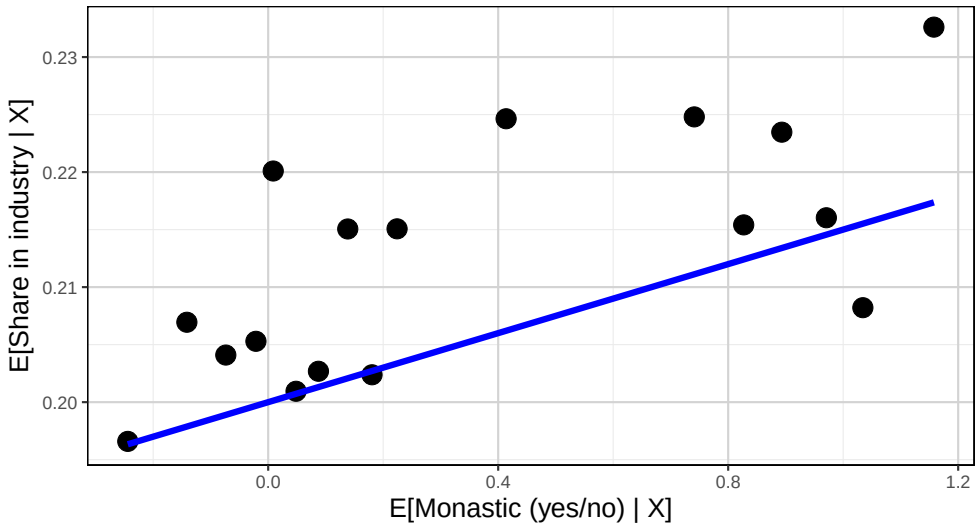


Table 1: Distribution of Landownership in England in 1436 and 1688: Percentages of cultivated land owned

	1436	1688
Aristocracy and greater Gentry	15-20	15-20
Middling and lesser Gentry	25	45-50
Yeomen, family farmers and other small owners	20	25-33
Church & Crown	25-35	5-10

Notes: Adapted from Clay (1986, p. 143)

Table 2: Summary statistics for outcome variables variables

	Mean	Standard Deviation	Mean Monastic	mean non-Monastic	Difference	t-stat
Monastic (yes/no)	0.32					
Share in agriculture	0.62	0.25	0.62	0.63	-0.01*	1.82
Share in industry	0.21	0.17	0.22	0.21	0.01***	3.15
Wheat Yield (bushels/acre)	21.68	4.49	21.83	21.61	0.22	1.47
Number of Gentry in 1700	0.67	1.00	0.87	0.56	0.29***	17.61
Parliamentary Enclosure 1750-1840	0.37	0.48	0.48	0.31	0.16***	20.25
Nr. of Agricultural Patents 1700-1850	0.02	0.28	0.04	0.01	0.03***	5.33
Mill (yes/no)	0.04	0.20	0.05	0.04	0.01**	2.26
Nr. of Mills	0.17	4.05	0.27	0.13	0.14**	2.01
Mill Employment	15.68	279.71	18.70	14.23	4.47	0.95

Table 3: The Dissolution and Occupational Structure

	Share in agriculture		Share in industry	
	(1)	(2)	(3)	(4)
Monastic (yes/no)	-0.0254***	-0.0247***	0.0163***	0.0160***
	(0.00463)	(0.00462)	(0.00309)	(0.00309)
Share Catholic		0.0205***		-0.0107***
		(0.00549)		(0.00338)
Control for Lay Subsidy Revenue	Y	Y	Y	Y
Control for Parish area	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y
Mean dep. var.	0.622	0.622	0.213	0.212
Observations	12831	12803	12831	12803
R^2	0.104	0.111	0.109	0.113

Notes: All regressions are estimated using OLS. The unit of observation is a parish. Heteroskedasticity robust standard errors are reported in parentheses. Share in agriculture is the share of males aged 20 and above employed in agriculture in the 1831 census. Share in industry is the share of males aged 20 and above employed in manufacturing, trade or handicraft in the 1831 census. Monastic (yes/no) is an indicator equal to one if a parish contained at least one manor owned by a monastery in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). Share Catholic is the total number of Catholics in a parish in 1767, normalized by population in 1831. * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 4: Occupational Structure and controls

	Share in agriculture		Share in industry	
	(1)	(2)	(3)	(4)
Monastic (yes/no)	-0.104***	-0.103***	0.104***	0.103***
	(0.0171)	(0.0171)	(0.0174)	(0.0174)
Share Catholic		0.0709***		-0.0553***
		(0.0196)		(0.0186)
Terrain elevation	0.127***	0.121***	-0.0939***	-0.0891***
	(0.0172)	(0.0172)	(0.0175)	(0.0176)
Terrain slope	-0.174***	-0.172***	0.130***	0.128***
	(0.0153)	(0.0153)	(0.0158)	(0.0158)
Wheat suitability	0.0707***	0.0722***	-0.0333***	-0.0348***
	(0.0122)	(0.0122)	(0.0119)	(0.0120)
Distance to nearest river	0.0741***	0.0757***	-0.0779***	-0.0790***
	(0.00877)	(0.00878)	(0.00816)	(0.00819)
Distance to nearest market town	0.227***	0.225***	-0.185***	-0.184***
	(0.0100)	(0.0100)	(0.0100)	(0.0100)
Distance to the border	-0.0126	-0.0104	0.110***	0.108***
	(0.0174)	(0.0174)	(0.0179)	(0.0178)
Distance to London	-0.000761	-0.00622	-0.0262	-0.0206
	(0.0458)	(0.0458)	(0.0453)	(0.0453)
Distance to nearest coalfield	0.136***	0.132***	-0.121***	-0.118***
	(0.0216)	(0.0216)	(0.0198)	(0.0198)
Control for Lay Subsidy Revenue	Y	Y	Y	Y
Control for Parish area	Y	Y	Y	Y
Soil type dummies	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y
Observations	12819	12791	12819	12791
R^2	0.229	0.234	0.195	0.197

Notes: All regressions are estimated using OLS. The unit of observation is a parish. All coefficients are standardized. Heteroskedasticity robust standard errors are reported in parentheses. Share in agriculture is the share of males aged 20 and above employed in agriculture in the 1831 census. Share in industry is the share of males aged 20 and above employed in manufacturing, trade or handicraft in the 1831 census. Monastic (yes/no) is an indicator equal to one if a parish contained at least one manor owned by a monastery in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). Share Catholic is the total number of Catholics in a parish in 1767, normalized by population in 1831. Elevation is the average elevation of the terrain measured in meters. Slope is the average slope of the terrain measured in degrees. Wheat suitability is the average value of an index of soil suitability for growing wheat ranging from 0 to 100. Distance to the nearest river, the nearest market town, the sea and London are based on our own calculations in GIS and are measured in kilometers. The database of market towns comes from Adams (1700). * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 5: The Dissolution and Agriculture

	Wheat Yield (bushels/acre)		Nr. of Agricultural Patents 1700-1850	
	(1)	(2)	(3)	(4)
Monastic (yes/no)	0.223*	0.245*	0.0226***	0.0243***
	(0.132)	(0.138)	(0.00654)	(0.00647)
Share Catholic		-0.134*		-0.00218***
		(0.0764)		(0.000839)
Control for Lay Subsidy Revenue	Y	Y	Y	Y
Control for Parish area	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y
Mean dep. var.	21.68	21.73	0.0237	0.0237
Observations	4153	3724	16243	12816
R^2	0.304	0.307	0.00462	0.00514

Notes: All regressions are estimated using OLS. The unit of observation is a parish. Heteroskedasticity robust standard errors are reported in parentheses. Wheat Yield is the agricultural yield in bushels per acre of plots growing wheat in parish p (Kain, 1986). Number of Agricultural Patents is the total number of agricultural patents that were registered to people living in parish p between 1700 and 1850 (Woodcroft, 1854, 1862). Monastic (yes/no) is an indicator equal to one if a parish contained at least one manor owned by a monastery in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). Share Catholic is the total number of Catholics in a parish in 1767, normalized by population. * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 6: The Dissolution, Gentry and Enclosure

	Nr. of Gentry in 1700		Parliamentary Enclosure	
	(1)	(2)	(3)	(4)
Monastic (yes/no)	0.230***	0.205***	0.0762***	0.0608***
	(0.0181)	(0.0198)	(0.00820)	(0.00899)
Share Catholic		-0.0143***		-0.00768*
		(0.00456)		(0.00420)
Control for Lay Subsidy Revenue	Y	Y	Y	Y
Control for Parish area	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y
Mean dep. var.	0.670	0.749	0.368	0.415
Observations	16243	12816	16243	12816
R^2	0.119	0.105	0.187	0.180

Notes: All regressions are estimated using OLS. The unit of observation is a parish. Heteroskedasticity robust standard errors are reported in parentheses. Nr. of Gentry in 1700 is the number of Gentry in 1700 in parish p, recorded in Adams (1700). Parliamentary Enclosure is an indicator variable equal to one if an act of parliamentary enclosure between 1750 and 1840 included part of parish p (Tate and Turner, 1978). Monastic (yes/no) is an indicator equal to one if a parish contained at least one manor owned by a monastery in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). Share Catholic is the total number of Catholics in a parish in 1767, normalized by population in 1831. * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 7: The Dissolution and the Location and Scale of the Textile Industry

	Mill (yes/no)		Number of Mills		Mill Employment	
	(1)	(2)	(3)	(4)	(5)	(6)
Monastic (yes/no)	0.0136***	0.0149***	0.204*	0.258*	11.37*	15.48**
	(0.00377)	(0.00402)	(0.113)	(0.135)	(5.945)	(6.993)
Share Catholic		-0.00465***		-0.0606*		-5.403**
		(0.00142)		(0.0317)		(2.253)
Control for Lay Subsidy Revenue	Y	Y	Y	Y	Y	Y
Control for Parish area	Y	Y	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y	Y	Y
Mean dep. var.	0.0432	0.0413	0.175	0.174	15.72	14.47
Observations	16243	12816	16243	12816	16243	12816
R^2	0.0511	0.0418	0.0125	0.0124	0.0235	0.0238

Notes: All regressions are estimated using OLS. The unit of observation is a parish. Heteroskedasticity robust standard errors are reported in parentheses. Mill (yes/no) is an indicator variable equal to one if there was a mill in parish p in 1838. Number of Mills is the total number of cotton, wool, flax and worsted mills in parish p in 1838, and Mill Employment is the total number of people employed in mills in parish p in 1838 (Parliament, 1839). Monastic (yes/no) is an indicator equal to one if a parish contained at least one manor owned by a monastery in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). Share Catholic is the total number of Catholics in a parish in 1767, normalized by population in 1831. * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Appendix for: The Long-Run Impact of the Dissolution of the English Monasteries

This appendix contains supplementary material for the paper The Long-Run Impact of the Dissolution of the English Monasteries.

1: A model of copyhold agriculture

We now develop a simple model to illustrate the argument in the introduction that copyholding is economically inefficient and which provides a theoretical foundation for why the dissolution of the monasteries led to greater labor mobility and higher productivity. We sketch the implications for the efficient allocation of land. We focus on copyholding of inheritance because this was permanent. With copyholding for lives, at some point, often after three lives, a landlord could refuse to re-new the copyhold and could instead rent out the land under a different market based tenancy agreement. One could imagine therefore that as copyholding became less efficient, such copyholders vanished. Indeed, the gap between copyhold rents and market rents became increasingly large. Tawney (1912, p. 122) gives many examples of the divergence between customary and market rents. For example, "At Amble, in 1608, the surveyor gives the rent of the customary tenants as 16 pounds and five pence" while the market rent would be "93 pounds 4 shillings and 4 pence". On the manor of Hexham, 314 copyholders paid a rent which was one quarter of the market rent. Thus we would expect copyhold for lives to vanish. This is exactly what Beckett and Turner's (2004, p. 288) data suggest since they find that 95% of the cases dealt with by the Copyhold Commission in the nineteenth century were copyholds of inheritance.

Copyholders of inheritance were a different matter. As Clay (1984, p. 88) puts it "the only way open to the lord of a manor to rid himself of copyholders of inheritance was to buy their farms if and when they were prepared to sell." The data suggest that this by and large did not happen and this would be consistent with the type of imperfect capital

markets story formalized by Galor and Zeira (1993) and particularly Banerjee and Newman (1993) where capital market imperfections stop efficient ownership structures emerging.

The key theoretical observation is that in a copyholding contract, while copyholders had the right to pay a fixed 'customary rent' (and a 'fine' which we abstract from since adding it into the analysis does not change anything of substance) and therefore were the residual claimants on their own investments, this can only lead to efficient outcomes in the case where the copyholder (or his dynasty) remains on the land forever. Yet in the period we consider, early modern and modern England, there was rapid socio-economic change, urbanization and industrialization, so it is very plausible that attractive outside options were emerging. In this case, while a copyholder may have a low fixed rent, he cannot liquidate or realize the value of any investment in the land, which is specific. This feature leads to two outcomes; under-investment relative to the social optimum; and a socially inefficient level of separations since the presence of the fixed investment leads the copyholder to stay on the land when, from the social point of view, they should be exercising the outside option. This is so since we assume that a landlord can hire someone else to farm the land should the copyholder quit. We show that copyholding was inefficient relative to both the farming of the land by the owner and "rack renting" which seem to have been the two most important alternatives. Our model also shows that various arguments in the economic history literature about the efficiency of copyholding are implausible.

The Model

Consider a farm with the land owned by a landowner which can be farmed by one tenant. The model is static and all agents have linear utilities. At the start of the period the tenant can make an investment i to increase producticity. After doing so he may receive an outside option $w \in \{w^H, w^L\}$ with $w^H > w^L$. We assume that the option w^H arises with probability p, w^L arises with probability q and with probability $1 - p - q$ there is no

outside option. If the tenant does not take any of the outside options then he produces output which is a differentiable, strictly increasing and strictly concave function f of i, with derivative denoted f'.

We first consider the case of a copyholder. In this simplest of models, if the copyholder does not quit, he pays a fixed 'customary' rent r^c to the landowner, making him the residual claimant on his investments. We assume that if an agent quits then whoever is the owner of the land has the ability to hire another agent to farm the land and that person would be willing to accept a contract as long as $f(i) - r^c \geq 0$.[20] Though the copyholder is the residual claimant if he does not quit, since he does not own the land, this investment is specific in the sense that the copyholder cannot realize its value unless he stays on the farm. It is immediate that the copyholder will quit if

$$w^s \geq f(i) - r^c \text{ for } s \in \{H, L\} \tag{2}$$

To focus on the case of interest we now state a sufficient condition on r^c so that when the outside option is high, the copyholder will find it optimal to quit, while when it is low he will not. This is

$$f(f'^{-1}(\frac{1}{1-p})) - w^L > r^c > f(f'^{-1}(1)) - w^H. \tag{3}$$

The second inequality in (3) implies that even if the copyholder invests at the surplus maximizing level, it is still optimal to quit if the outside option is high. The first inequality assures that it is not optimal to quit in the low state.

Such a copyholder therefore solves the maximization problem (folding in the optimal quitting decisions using backward induction)

$$\max_i -i + pw^H + (1-p)\left(f(i) - r^c\right) \tag{4}$$

[20]It would be straightforward to allow for frictions in this process and it would not alter the basic conclusions of the analysis, though of course the details would change in important ways.

This problem has the first-order condition at an interior solution $1 = (1-p)f'(i^c)$. Since $1-p<1$ and f is concave, investment is below the socially optimal level. This is for the intuitive reason that the investment is specific to the land. The copyholder has the right to farm the land and pay the fixed rent r^c, but he cannot realize the value of any investment if he leaves and this leads to under-investment. If the value of the outside option is extremely attractive, then the copyholder quits anyway.

Not only is investment inefficiently low here, but so are separations. The fact that in state w^L the copyholder does not quit is because he cannot realize the value of his specific investment. In this model, give the assumption about frictionless replacement, expected total surplus is $f(i) - i + pw^H + qw^H$ which is obviously maximized when the copyholder quits if an outside option materializes.

It is clear in this set-up that the landlord himself would not have any incentive to invest in the land, this is because all marginal rents would accrue to the copyholder. This is consistent with the historical record. Clay (1985, p. 206) observes "Inevitably customary tenants ... received less day-to-day attention from their landlords ... than did those let for rack rents" and in many cases they were "left to their own devices" since custom did not entitle "Landlords to regulate their tenants' husbandry practices in detail in the way that owners of non-customary lands ... were able to do". He also notes that copyholders "stood in the way of estate reorganization" (Clay, 1986, p. 87). French and Hoyle (2007, p. 9) describe copyhold as "fatal to the landowning interest" and Tawney describes it as "a safeguard of the tenants' interest rather than of those of the manorial authorities" (1912, p. 132).

We now consider the polar opposite case where the agent owns the land. In this case if an attractive outside option appears then the agent can exercise it and sell the land. Denote the price of the plot of land by ℓ. To simplify notation, we fold in the fact that it will be optimal to sell the land in the case that the agent receives an outside option. Hence

his optimization problem is

$$\max_i -i + p\left(w^H + \ell\right) + q\left(w^L + \ell\right) + (1-p-q)f(i)$$

The price of land will be determined by it's value. If the landowner has invested an amount i, then the plot will produce $f(i)$ and someone would be willing to pay up to that amount. Hence $\ell \leq f(i)$. For simplicity we assume that the landowner is on the short side of the market so that this inequality holds as an equality. In this case we can re-write the maximand

$$\max_i -i + p\left(w^H + f(i)\right) + q\left(w^L + f(i)\right) + (1-p-q)f(i).$$

It is immediate that investment is efficient and $1 = f'(i^\ell)$ with $i^\ell > i^c$ and that with probability $p+q$ the landowner takes the outside option and sells his land. With probability $1-p-q$ no outside option appears and the landowner works his own land.

In this model it is clear that separations are also socially efficient. Now that the tenant owns the land he can realize his specific investment by selling the land and thus take advantage of the outside option.

A third situation which arises frequently in the literature on British economic history is so-called "rack rent". The loose idea is that in such a contract the landlord is able to manipulate the rental rate on the land in order to extract all of the surplus from the tenant. A simple way of formulating this idea in the context of the present model would be to assume that the landlord can set the rental rate and that he also himself decides on the amount of investment in the farm. Let r^R denote the rental rate. Let r^Q be the rental rate charged to a new tenant who is brought in if the initial tenant quits. Under the assumptions so far, $f(i) - r^Q \geq 0$.

Now the landlord chooses these rates and the amount of investment to maximize expected profits net of investment costs and taking into account the endogenous decision of

the tenant to take the outside option. This maximization problem has to satisfy a participation constraint so that a tenant initially accepts the contract. Define $\mathbf{1}_{w^H \geq w^R}$ to be an indicator function such that $\mathbf{1}_{w^H \geq w^R} = 1$ if $w^H \geq w^R$ where w^R is the income a tenant receives if they stay on the farm and pay the rent r^R. If the tenant quits the landlord hires a new tenant and pays then r^Q. The participation constraint follows from the fact that if a tenant does not accept the contract we assume they get in expectation $pw^H + qw^L$. Hence it is

$$\begin{aligned} & p\left(\mathbf{1}_{w^H \geq w^R} w^H + (1 - \mathbf{1}_{w^H \geq w^R})\left(f(i) - r^R\right)\right) \\ & +q\left(\mathbf{1}_{w^L \geq w^R} w^L + (1 - \mathbf{1}_{w^L \geq w^R})\left(f(i) - r^R\right)\right) \\ & \qquad +(1-p-q)\left(f(i) - r^R\right) \quad \geq \quad pw^H + qw^L \end{aligned}$$

In considering the optimal level of r^R note that for the landlord to always stop the tenant quitting then it would have to be that $\tilde{r}^R = f(i) - w^H$. However, since, if we assume that a replacement tenants breaks indifference by accepting a contract, we have $r^Q = f(i) > \tilde{r}^R$. Thus it cannot be optimal to stop quitting. This implies that the participation constraint collapses to

$$\begin{aligned} pw^H + qw^L + (1-p-q)\left(f(i) - r^R\right) \quad &\geq \quad pw^H + qw^L \\ \text{or } (1-p-q)\left(f(i) - r^R\right) \quad &\geq \quad 0. \end{aligned}$$

Thus the rack-renting landlord maximizes

$$\max_i pf(i) + qf(i) + (1-p-q)f(i) - i$$

imposing $r^Q = f(i)$ and from the participation constraint $f(i) = r^R$. Investment is again

efficient with $1 = f'(i^R)$. Moreover, separations are also socially efficient.

We can sum up the results of this model in the following way

Proposition: Compare two parishes, one dominated by copyholding of inheritance and the other not. The parish with copyholding would be characterized by lower average investment and productivity and lower rates of exit from agriculture.

This is the main result which we use to interpret our data. It is worth emphasizing again that it does hinge on imperfect capital markets. If these were not present then the landowner would be able to buy out the copyholder of inheritance and move to either of the other options. However, as we have discussed, the assumption that capital markets were imperfect seems reasonable in early modern England and as a matter of fact, extensive copyholds of inheritance persisted into the 19th century. Critically, as we discussed in the introduction, monastic lands seem not to have developed copyholds of inheritance which predominated in non-monastic lands. Hence the Dissolution made available land which was not encumbered by such contractual forms.

That it did so has a further implication for the efficiency of resource allocation. Imagine that there are idiosyncratic factors that influence the productivity of land, so that some people are more productive on a farm than others. Normally, one would imagine that markets would efficiently match those who could use land most efficiently to it. It is clear that copyholding would impede this efficient matching since if a more productive person purchased a piece of land any rents they generated would completely accrue to the copyholder. Thus not only would investment and separations be inefficient with copyholding, productivity would also suffer because matching would not be efficient.

It is worth discussing a common argument in the literature about the efficiency of copyholding. French and Hoyle (2007, p. 11) state, for example, that "it is not clear why the survival of copyhold should have inhibited capitalist development, because copyholds could be bought, sold and let just like any form of freehold property". Our model shows that this

argument is not correct unless the transaction sold the land to the sitting copyholder. The fact that a landlord could sell a copyhold to someone else, who was not the copyholder, does not imply that copyhold was economically efficient. Anybody who bought such a copyhold would have a sitting copyholder with exactly the incentives that we have outlined. The new owner would anticipate that the copyholder might receive an attractive outside option in the way we have modelled it above and would tend to under-invest. Therefore, even if one bought a copyhold from an existing landlord, this does not stop the logic driving the inefficient under-investment derived above, or the socially inefficient quitting decision. Therefore, although an individual would be prepared to pay up to the maximized value of (4) to obtain a copyholding, the fact that they did so does not imply that the allocation of resources is efficient. Finally, the last argument we made shows that even if land subject to copyholds was transacted, there were no incentives for the person who could have used that land best to purchase it.

One final important conceptual issue to discuss is how, when the results of this section depend on imperfect capital markets, it was possible for a land market to emerge after the Dissolution. If people could afford to buy land why could they not buy out copyholders of inheritance? The reason seems to be related to the distribution of wealth. Landowners who had sitting copyholders of inheritance were outside the monastic sector. They got a very poor return on their lands and would not have been in a position to buy out their tenants, nor purchase monastic lands. Instead these were likely bought and sold by others, both by favorites of the Crown who had received the lands on the cheap and by new Gentry who had made their money elsewhere, for example in commerce.

2: Further historical background

This section reviews the historical background to the Dissolution of the monasteries and the Valor Ecclesiasticus, the relationship between the expropriation of the monastic lands,

institutional change in the land market and the rise of then Gentry.

Acts of parliament leading up to the compilation of the Valor

In 1532 Parliament passed 'An Acte concernynge restraynt of payment of Annates to the See of Rome'.[21] This act diverted the Annates payed by anybody with the rank of bishop or higher from the Pope to the Crown. Hunter (1834) argues that this act was meant to strengthen the kings bargaining position with the Pope. A second act was passed in the parliament that sat from January 15th 1534. This act made it 'unlawful to make any payment on any pretence to the See of Rome, and severing the connection which had existed between the two states' (Hunter, 1834, p.13).

Parliament next decided that all payments to the Pope were now to be paid to the king instead. This passed in the parliament that sat from November 3rd 1534 in the act titled 'An Acte Concerninge the payment of Firste Fruites of all dignities benefices and promocyons spirituall, and also concerning one annuell pencyon of the tenthe parte of all the possessions of the Churche, spirituall and temporall, graunted to the Kinges Highnes and his heires'. This act also named the king as the head of the Church of England for the first time. In order to assess how much revenue Henry VIII could expect he sent out surveyors, called commissioners, to record the value of incomes generated by ecclesiastical property in England. The Valor Ecclesiasticus is the summary report of these commissioners.

How the survey underlying the Valor Ecclesiasticus was carried out

Every diocese received commissioners, at least three, tasked with assessing the value of all ecclesiastical possessions in that diocese. The survey started on January 30th 1535 and was

[21] This section builds mostly on Hunter (1834). See also Youings (1971) and Knowles (1979). Annates are synonymous with first fruits or first year's profits of every benefice, to be collected when the benefice changed occupier. A benefice is an ecclesiastical position, such as a parish priest.

to be finished by the Octaves of Holy Trinity (usually the 8th Sunday after Easter; Knowles (1979) cites the 1st of May). All commissioners were to be local notables, below the rank of Baron (Hunter, 1834, p. 19). These notables were usually the justices of the peace, mayors, sheriffs and the local Gentry (Savine, 1909, p. 17). The oath of the commissioners can be found in the second volume of the Valor. The commissioners then split up into parties of at least three, divided the diocese among them and administered the survey. The subsequent collection of the incomes was left to the bishops who were expected to collect the amount due by Christmas and deliver it to the Exchequer by April of the following year (Savine, 1909, p. 3).

After the survey, Henry decided to expropriate the English monasteries. He started with the monasteries that were valued under 200 pounds. In 1536, parliament passed an act popularly known as the Dissolution of the Lesser Monasteries Act, which expropriated 453 monasteries (Jack, 1970, p.1). In 1539, The Second Act of Dissolution followed, expropriating all remaining monasteries.[22]

The process of dissolution

There were three broad ways in which the Crown obtained ownership of a monastery. The first was outright expropriation. This method was most commonly used when dealing with smaller monasteries. The abbot would sign a 'deed of gift' transferring ownership to the Crown. A second way was surrender. After the initial wave of dissolution, larger monasteries were charged with some crime and were given the choice to surrender and receive pensions or to be tried in court. The third way was dissolution by negotiation. Some of the larger abbeys managed to secure favorable arrangements for themselves before signing the deed of gift. The full procedure of dissolution is outlined in Youings (1971, p. 73).

[22]For an exact chronology of the Dissolution of the lesser monasteries see Jack (1970) and Hoyle (1995). Gasquet (1899) includes in appendix I a list of monasteries that paid the Crown to not be dissolved.

After the Dissolution, some of the expropriated lands were given away as gifts by the King. Even before the first commission for the sale of lands was established in 1539 a total of 234 grants had been made (Youings, 1971, p. 117). Not coincidentally, one of the first grantees was the Chancellor of the Court of Augmentations (the government body in charge of the dissolution), Richard Rich.[23] Other grantees included Henry's Chief Minister Thomas Cromwell and several members of the aristocracy. The total amount of land granted appears to have been relatively small. For Devon, it was about 25% of the expropriated monastic land and for Leicestershire around 15% (Youings, 1967, p. 343).

Although the Crown initially intended to lease out the remaining land, it quickly decided to sell the land because the task of managing vast tracts of land was beyond the bureaucratic capacity of the government. Additionally, in 1543 a war with France broke out which left the Crown in need of quick cash. It is therefore no surprise that although selling of the lands started as early as 1539, between 1543 and 1547 the Court of Augmentations oversaw the sale of two thirds of all expropriated land. By 1558 virtually land had been sold (Habakkuk, 1958).[24] Most sales of monastic land were concluded at the fixed price of 20 years income.

Who were the people that bought the monastic land? Although no comprehensive data source exists, the case study evidence suggests that monastic lands were often sold to people who were associated with the monasteries, either as employees or as tenants (Youings, 1971). This meant that monastic land was sold locally. From the perspective of the Court of Augmentations, under pressure to sell land fast, selling to local people was the expedient manner to dispose of the land. For instance, almost all religious houses had a steward, who would officially represent the monastery, acting as an ambassador, and one

[23]Richard Rich was originally a lawyer with no noteworthy background. He would be knighted and be styled Baron Rich during his lifetime. For three centuries his descendants would be part of the English peerage (Carter, 2004).

[24]The process of obtaining land was as follows: Prospective buyers would need to obtain an updated assessment of the income of the lands they desired from the local augmentations officer. The request and the updated *valor* would then be submitted to the Court in London. If approved, the sale would be concluded. The prices were initially set at twenty years' rent. Around 1560 the price had gone up to the equivalent of 30 years' rent and by 1600 it was 40 (Habakkuk, 1958).

or more receivers, who would collect rents and other dues. Most houses also employed bailiffs, associated with the manor courts.[25] Once the Dissolution started, these officials often secured new leases on monastic land seeking to entrench their positions. After the Dissolution, they renewed these leases with the Court of Augmentations (Woodward, 1966, p. 328; Jack, 1965). Local people were also involved in the Dissolution as short-term employees of the court of augmentations. After the Dissolution, they were often the first to acquire former monastic lands (Youings, 1971, pp. 67, 70).

After the Dissolution of the Monasteries there were three remaining categories of church landholders: bishops, cathedrals, and colleges (both ecclesiastical and Oxford/Cambridge). Yet as Heal (2008) documents, by 1650 the lands of the bishops and cathedrals were sold off as a consequence of them siding with Charles I in the Civil War. Though after the Restoration the bishops got their land back it was generally leased out to the new occupant in very long leases (typically 99 years). At the end of this process, the only remaining lands in the hands of the Church were held by Oxford and Cambridge colleges and some cathedrals, and parish churches which owned the plot of land they were on.

We now discuss the Valor Ecclesiasticus in more detail.

The Valor Ecclesiasticus

This section describes the state of the Valor Ecclesiasticus archival records, our method for coding the data and an example from the manor of Helton, Lolbroke and Bell.

The state of the Valor Ecclesiasticus records

The original returns of the Valor are held in the National Archives at Kew Gardens in London and consist of 22 volumes and 3 portfolios.[26] The Record Commission published

[25]For a description of the various offices associated with a early modern manor, see Levett (1927).

[26]The dedicated website is at http://www.nationalarchives.gov.uk/records/research-guides/dissolution-of-the-monasteries.htm.

a transcription of the records titled *Valor ecclesiasticus temp. Henr. VIII. : Auctoritate regia institutus*, consisting of six volumes that were published, respectively, in 1810, 1814, 1817, 1821, 1825 and somewhere between 1831 and 1834 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). One of the editors, Joseph Hunter, wrote a historical introduction to the survey (Hunter, 1834). He reports that some parts of the survey are lost. The most important ones are:

- The diocese of Ely.
- A substantial part the diocese of London.
- The counties Berkshire, Rutland, Northumberland.
- A substantial part of the diocese of York, including the whole of the deaneries of Rydal and Craven.[27]

Smaller parts that were lost (such as an individual rectory, or some manors) were taken from third sources and printed in the Record Commission edition. The most important third source is the Liber Valorum (Ecton, 1711) which is a compilation of abstracts of the original records that were made for Henry VIII. These abstracts are usually referred to as the King's Book (or Liber Regis). These compilations, however, record the total (net) taxable income for an ecclesiastical unit and don't specify the geographical source where the components of the income was generated which precludes us from getting a clean measure of the income of a unit, see below. When recording the data, we have tagged the observations that are taken from third sources. Excluding them from the analysis does not change the results (not reported).

[27] A deanery is an ecclesiastical administrative division, comparable to the hundred.

The organization of the Valor

The Valor is recorded in a very systematic way. The main geographical unit by which the survey can be broken down is the diocese. Within every diocese there is a clear order in which the lower level units are coded, with the monasteries featuring most prominently. The exact order is given below. Next to this ordering of units, there is an ordering of the income data within each unit. All income is first of all divided into temporalities and spiritualities. Temporalities are all incomes that the monks/benefice holders receive from activities, like farming, that are not theirs by virtue of holding the specific benefice.[28] The most important parts of the temporal income are the incomes from demesnes in manu (farmed by the benefice holder) and from payments of tenants on Church lands (Savine, 1909, p. 85). Spiritualities are those incomes to which benefice holders are entitled by virtue of holding the benefice. It also includes income from glebe lands (lands designated to support the benefice holders) and from oblations (another church tax). The second distinction in the returns for individual ecclesiastical units is between gross and net income. Gross income represent total income, and net income represents income (*valet clare* or *Et remanclare* (clear value remaining) in the returns) over which sums payable to the king would be determined. The following deductions from gross income were allowed (Hunter, 1834):

1. Rents resolute to the Chief Lords, and all other annual and perpetual rents and charges.

2. The alms which were due to the poor, according to any foundation or ordinance.

3. Fees to stewards, receivers, bailiffs and auditors.

4. Synodals and procurations,[29] with which most abbeys and benefices were charged.

[28] A benefice is a position within the Church.
[29] Synodals and procurations are ecclesiastical fees.

Monetary values in the Valor are are recorded in *l.s.d.* or *£.s.d* notation. This refers to pounds (*librae*), shillings (*solidi*) and pennies (*denarii*). There are 12 pennies in a shilling and 20 shillings in a pound. Particular details regarding the notation of income are in Lindley (1957).

Within the Valor, there is a fixed order in which ecclesiastical units appear (taken directly from Hunter, 1834): per diocese we have

1. The See of the bishop or archbishop.
2. The endowments on the various offices in the cathedral church.
3. Archdeaconries/Deaneries with their claims, and per entry the following:
   (a) Monasteries and colleges.
   (b) Parsonage, vicarages, chantries and free chapels.

If a deanery is home to a monastery, this monastery is listed before the other benefices in the deanery and has a specific ordering, namely:

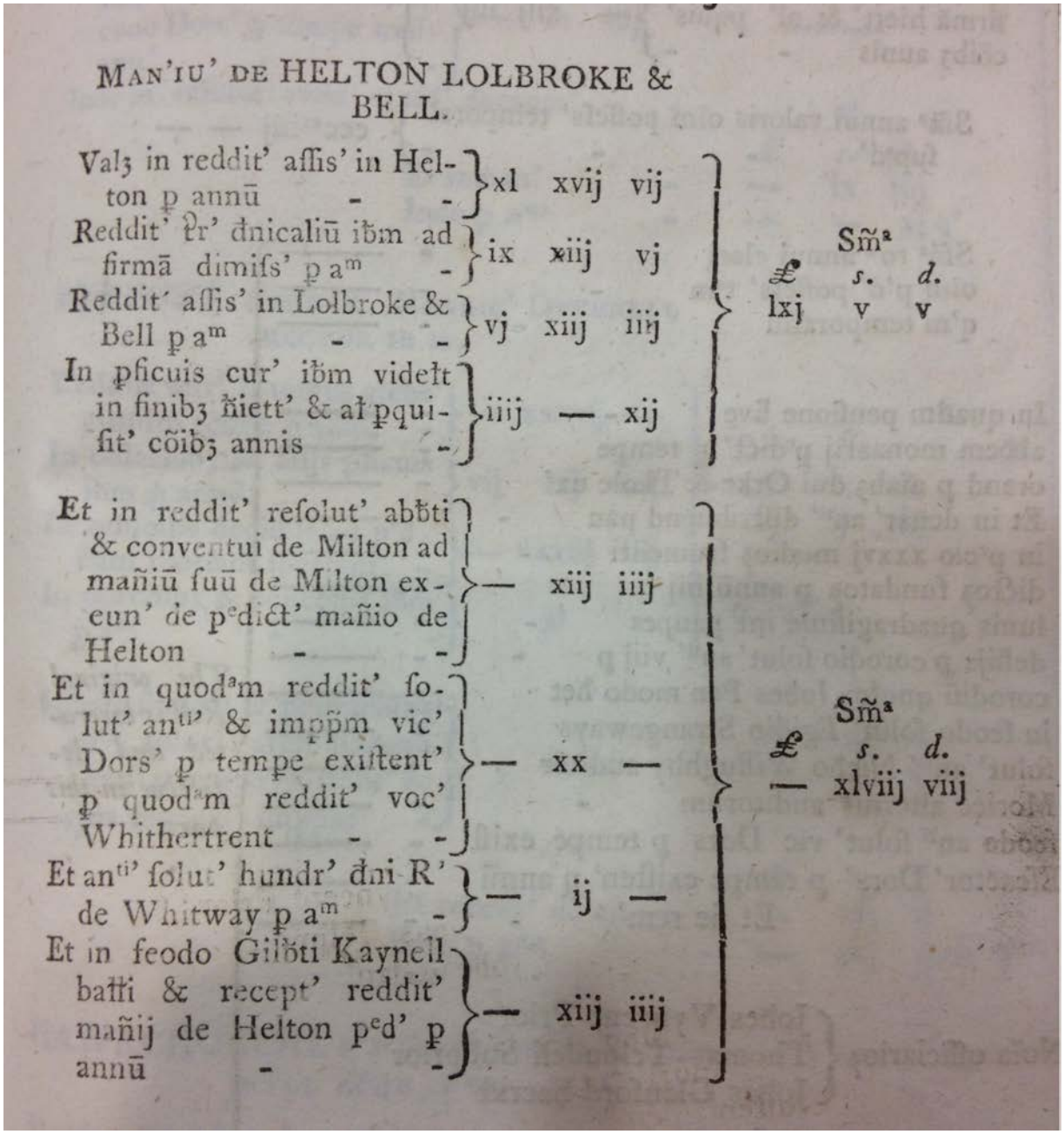
1. Income of the precincts (i.e. any land immediately surrounding the monastery).
2. Income from lands in the county in which the house stood.
3. Income from lands in other counties
4. Income from impropriate rectories (rectories for which the proceeds went to a layman).

An example: the manor of Helton, Lolbroke and Bell

The manor of Helton, Lolbroke and Bell was a possession of Abbotsbury abbey and was located in Bridport deanery (in the Valor it is called *Byrport*) in Dorset. Figure A-11 is a photograph of the entry as it appears in the Record Commission edition of the Valor.

Note that we omitted any deductions from this picture, it just lists temporal and spiritual income.[30]

Figure A-11: The manor of Helton, Lolbroke and Bell in the Valor Ecclesiasticus



MAN'IU' DE HELTON LOLBROKE & BELL.

				Sm̃ª £	s.	d.
Valꝫ in reddit' aſſis' in Helton p annū - -	xl	xvij	vij			
Reddit' ꝑr' đnicaliū ibm ad firmā dimiſs' p am -	ix	xiij	vj			
Reddit' aſſis' in Lolbroke & Bell p am - -	vj	xiij	iiij	lxj	v	v
In ꝑficuis cur' ibm videlt in finibꝫ ñiett' & alt ꝑquiſit' cõibꝫ annis -	iiij	—	xij			
Et in reddit' reſolut' abbti & conventui de Milton ad mañiū ſuū de Milton exeun' de p̄dict' mañio de Helton - -	—	xiij	iiij			
Et in quodam reddit' ſolut' antiq' & imp̄p̄m vic' Dors' p tempe exiſtent' p quodm reddit' voc' Whithertrent - -	—	xx	—			
Et antiq' ſolut' hundr' đni R' de Whitway p am -	—	ij	—			
Et in feodo Gilberti Kaynell batti & recept' reddit' mañij de Helton p̄d' p annū - -	—	xiij	iiij	—	xlviij	viij

[30]In order to distinguish these sources of income in the text knowledge of the scribal Latin in which the Valor is recorded is required. A valuable introduction to this as well as a glossary of terms and scribal abbreviations can be found in Martin (1949).

The first entry is an assize rent (*reddit assis'*, a fixed rent) in Helton, which gives an annual income of £: xl s: xvii d: vii. The next entry is a part of the demesne (*tr'daicaliu*) that is not farmed by the rector (*firma dimiss'*) for which he receives a rent. The next entry is another assize rent in Lolbroke & Bell. Then we have an entry that records proceeds from the manor court (*pficuis cur'*) and several other incomes (*al' pquisit'*) taken for an average year (*coibs annis*).

The next two entries are two rents (*reddit'resolut*) that are owed to an abbott and payable to his manor (*abbti & conventui de Miltonad maniu suu*). The second figure is payable to the vicar of archdeaconry of Dorset (*vic'Dors'*). The third entry is payable to the master of the hundred Richard de Whitway (*hundr dni R de Whitway*). The last entry is payable due to the local bailiff of the manor Gilbert Kaynell (*Gilbti Kaynell balli*).

We are interested in the income from assets, or temporal income. For this manor, these are the assize rents from lands held by the manor, or the first three entries in figure A-11. We therefore coded three entries into our database for this manor, two in Helton and one in Lolbroke and Bell. The next step is to assign Ordnance Survey grid references to each of the three places. To find these we followed the method outlined below. Going through every entry in the six volumes of the Valor this way created the database we used for the analysis in this paper.

The Rise of the Gentry

In this section, we provide case study evidence on the connection between the Dissolution and the rise of the Gentry. We also provide evidence for the involvement of the Gentry in early industrialization.

There is a large body of case study evidence that suggest that the people who bought

the monastic land became members of the Gentry later on. For instance, of the leading Gentry families in Hertfordshire in 1642 less than 10% had been settled there before 1485. In Essex this figure stood at 18%, in Norfolk 42% and in Suffolk 13% (Mingay, 1976, p. 9).[31] Families such as the Knatchbulls from Kent and the Cholwichs from Devon were yeomen at the beginning of the sixteenth century but rose to be among the Gentry over the course of the century, rising to the peerage later. Overall, as noted in Table 1 in the paper, the proportion of land owned by the Gentry increased from 25% in 1436 to 45-50% by 1688. The Church and Crown's share went from 25-35% in 1436 to 5-10% in 1688.[32] The shares of land owned by great landowners and the yeomanry were relatively stable. The numbers in this table square with a great deal of other evidence. For example, the 1524 Lay Subsidy suggests that there were 200 knightly families and 4,000 to 5,000 esquires and gentlemen in England at that time. Thomas Wilson, in his book The State of England Anno. Dom, 1600, estimated that these numbers had increased to 500 and 16,000 respectively (Wilson, 1936). Gregory King's calculations of the social structure of England in 1688 (King, 1810) suggest there were 620 knights, 3,000-3,500 esquires and between 12,000 and 20,000 gentlemen (see Thirsk and Cooper, 1972, pp. 755, 766-8, Cooper, 1983, pp. 20-42). Even though the population of England approximately doubled over this period this suggests that the Gentry were indeed relatively rising. Micro estimates for different counties tell a similar story, for instance in Yorkshire heraldic evidence suggests that there were 557 Gentry families in 1558, 641 in 1603 and 679 in 1642 (Cliffe, 1969, pp. 5f). For Warwickshire a similar measure increases from 155 families in 1500 to 288 in 1642 (Carpenter, 1992, p. 90, and see Heal and Holmes, 1994, pp. 11-12, for more discussion).

In the introduction to the paper we suggested that even though this connection has not been explored much before, there is a great deal of case study evidence that suggests

[31]For additional evidence for Monmouthshire, see Gray (1987). For evidence on sales of monastic land around 1600, see Outhwaite (1971).

[32]For a detailed study of these patterns in Huntingdonshire, see Bedells (1990).

that the Gentry played important roles in the Industrial Revolution. For example, in his seminal study of the history of the British coal industry Nef pointed out the intensity with which Gentry were involved not just in mining the coal under their own lands but also renting other lands with coalfields. In Lancashire and the West Riding of Yorkshire there were

> "the Andersons of Lostock, who had pits in Leeds and the surrounding manors, the Ashtons, a well-known Lancashire family with many branches who had pits in the lands around Oldham, the Hultons of Preston, who had pits near Bolton, the Listers, a West Riding family with colliery interest about Halifax and also at Colne, the Gascoignes of Gawthorpe, with colliery interests at Kippax and Barwick-in-Elmet, the Mallets of Normanton, who worked coal in the adjoining manor of Rothwell, and many others. Among the Lancashire families, the Listers alone appear to have been of yeoman extraction. In Durham and Northumberland many of the prominent local Gentry became interested during the sixteenth and seventeenth century in the coal industry" (Nef, 1966, p. 9).

The central role of the Gentry in the Lancashire coal mining industry is amply documented by Langton (1979a,b). He notes for the period 1590 to 1689 that in the coal industry "the landed Gentry provided most of the investment and ability" (1979a, p. 74). Though the Gentry suffered financial problems after this, his data indicates that for the period between 1690 and 1739 almost 50% of the collieries in central Lancashire were both owned and operated by landed Gentry while more were leased and operated by Gentry (1979a, Figure 28, p. 124).[33]

A fascinating case which brings together many of our arguments is that of the Hesketh family. The Hesketh family had lived in Rufford in Lancashire from around 1250. On the

[33]Swain (1986, p. 197) concludes his study of Lancashire by noting "Thus we find that the Gentry predominated amongst colliery entrepreneurs." See Jenkin (1983) for a similar conclusion in the case of South Wales.

eve of the Dissolution, the family owned several manors around Rufford and leased lands from Chester Abbey. After the Dissolution, these lands were leased from the king. One member of the Hesketh family, Thomas, was knighted in 1553 and in 1561 he purchased the manor of Hesketh-with-Becconsall (around five miles from Rufford) that had until recently been part of the Priory of St. John of Jerusalem in England. His son, called Sir Robert Hesketh, was elected a member of parliament for Lancashire. His will indicates that he had the right to 'dig and delve for coal and other materials'. Indeed, by the middle of the seventeenth century we find the Hesketh partnering with four local gentlemen and a yeoman to open a mine in Wrightington, some six miles from Rufford. Many years later, in 1761, a Thomas Hesketh acquired the title of baronet. The baronetcy is called 'the Hesketh baronetcy, of Rufford in the county palatine of Lancaster'. By this time, the Hesketh were not only regular members of parliament but they were financing the Industrial Revolution, being involved in several mines in Shevington, a mere eight miles from Rufford (Farrer, 1908; Langton, 1979a, pp. 76, 126; Hasler, 2006).

Note that the importance of the Gentry was not simply that they themselves were involved in industry, but that they also played an important role in forming partnerships and financing the main entrepreneurs - for example the relationship between the gentleman Thomas Bentley and Josiah Wedgewood (McKendrick, 1964) (see Hudson, 2002, for more examples).

3: Construction of our dataset

This section discusses the unit of observation in our study, a historical parish, as well as our methods for matching data from different sources to individual parishes.

Unit of observation

Our unit of observation is an area from the *GIS of the Ancient Parishes of England and Wales*, which is based on the work of Roger Kain and Richard Oliver (Southall and Burton, 2004; Kain and Oliver, 2001). The GIS consists of an ArcGIS shapefile with an underlying database.[34] Since areas may consist of several disjoint shapes[35], we collapse the shapefile to collect these into one shape. The resulting database has 17898 unique shapes. Having created our unit of observation this way, we then merge each data source to this database using either one of two methods:

1. We directly match an observation in a data source based on its name to a corresponding area in the database underlying the shapefile of the GIS of Ancient Parishes.

2. We record Ordnance Survey grid references[36] for each unit we want to match, map these units in ArcGIS and spatially join them to the shapefile in the GIS of Ancient Parishes database. Grid references are found using third sources such as Vision of Britain through time project at http://www.visionofbritain.org.uk/, the gazetteer of British places names maintained by the association of British Counties at http://www.gazetteer.org.uk/map.php and the gazetteer of British placenames maintained by the Genuki project at http://www.genuki.org.uk/big/Gazetteer/. We only use this method if method 1 is unavailable.

[34]Each area in the underlying database has a type, which corresponds to an administrative unit that was used in the nineteenth century. The most common type is the ecclesiastical parish. Other types of units are townships, hamlets, boroughs, chapelries or divisions. Around fifty percent of areas are parishes, out of a total of 22729 areas. Townships and parishes together make up eighty percent of the areas. For sub parish units, there is a parish identifier as well.

[35]For instance, a parish can consist of a main portion where the parish church is and a smaller detached portion.

[36]The Ordnance Survey, a government mapping agency, has divided England, Wales and Scotland up into hundred by hundred kilometer squares (the 'grid') and assigned a two letter identifier to each grid square. A grid reference then records a place within each square by adding an even number of digits, measuring east and north distance within the grid square, measured from the bottom left corner. For instance, the Tower of London is located at TQ3350080599 which means that it is in square TQ and then 33 kilometers and 500 meters to the North and 80 kilometers and 599 meters to the East, measured from the bottom left corner of the square.

Using either method, we assign a parish to the observations in each data source. For our main variables the exact assignment method is described below. If it was impossible to assign an area number to an observations using either of the above methods, we have not used it in our analysis.

The GIS of Ancient Parishes database uses the administrative structure of England around 1850 whereas we use data that is from before 1850. This creates a problem since in 1844 parliament passed the *Counties (Detached Parts) Act* that reassigned several detached parts of counties (exclaves) to formally be under their 'mother' county instead of the county they were physically in. Since we matched names within counties to minimize confusion resulting from repetition of names, this could create a problem. However, the GIS of ancient parishes database records in the commentary category whether a part was transferred. Using this information we matched within county/parish composition as it was before 1844.

We match each variable to our GIS of parishes to arrive at the dataset used in this paper.

4: Extra Results

Table A-1 provides summary statistics for all variables used in this paper.

Table A-2 tests the robustness of our main results for employment in agriculture and industry to using different ways of measuring the impact of the Dissolution. In the main text our measure of the impact of the Dissolution is an indicator measuring the extensive margin of ownership of land by monasteries. In panel A we instead use the natural log of the total income generated by assets owned by monasteries. Panel B, we count the number of monastic assets generating income in a parish. In panel C we vary fixed effects. Throughout our main analyses, we include fixed effects at the county level (n=44). In panel D, we re-estimate our main regressions without any fixed effects, and with a fixed effect

that splits the count by North and South. For panels A-B, odd columns, as before, include the share of Catholics in 1767 as a covariate.

For each measure of the impact of the Dissolution, and for different fixed effects, we find a robust negative effect of the Dissolution on employment in agriculture, and a positive effect on industrialization.

In table A-3 we ask whether our main results are driven by urban areas. We either use the 1831 census or 'borough' electoral constituencies - constituencies that cover urban areas - to identify urban places, and restrict our sample to non-urban England. We find that our main results are significant and stable in this sample.

Table A-4 implements a matching exercise. To match parishes impacted by the Dissolution to comparable control parishes, we implement a nearest neighbor match.[37] We start by computing the Mahalanobis distance, D_{ij}, for every monastic parish i to each parish j without monastic presence. The Mahalanobis distance is defined as:

$$D_{ij} = \sqrt{(\mathbf{X}_i - \mathbf{X}_j)' \mathbf{S}^{-1} (\mathbf{X}_i - \mathbf{X}_j)} \tag{5}$$

Where $\mathbf{X}_k$ for $k = i, j$ is a vector of covariate data and $\mathbf{S}^{-1}$ is the variance covariance matrix of $\mathbf{X}$. We then proceed to match every parish i with monastic property to the parish j without monastic property that has the lowest Mahalonobis distance. Finally, we compute the average difference in outcomes across the matched samples for those parishes with monastic presence.

Table A-4 reports results of our matching approach using employment in agriculture and industry as dependent variables. Column (1) reports differences in means for these variables for the subsamples defined by our main treatment indicator, Column (2) reports the matched difference in treatment and column (3) reports results from an OLS regression

[37] We match, with replacement, on the following set of variables: income in the Lay Subsidy returns, area, slope, elevation, distance to the nearest river, distance to the nearest coalfield, distance to the nearest market town, and distance to London. For area, slope, elevation and distance to the nearest river, we include squared terms as well.

of the relevant outcome on the monastic indicator, including the set of matching variables as covariates. The main take away from this exercise is that the matching results yield a similar conclusion as the regression results reported in Tables 3 and 4. The monastic presence dummy is negatively correlated with employment in agriculture and positively correlated with employment in industry.

Columns (1) and (3) provide useful comparisons to our matching results. Comparing columns (1) and (2) is informative about selection into monastic presence. For a given outcome variable, if the raw difference in means is very different from the matching result, this means that there could be selection into monastic presence that is correlated with the outcome of interest. For both employment in agriculture and industry, the raw means are similar to the matched effect of the Dissolution. Comparing columns (2) and (3) provides a check on the matching procedure. Angrist and Pischke (2009) show that the key difference between matching and OLS is weighting. Matching puts most weight on observations with the highest probability of receiving treatment whereas OLS puts most weight on observations with a probability of treatment closest to 1/2. They argue that since both approaches are in essence weighted differences of means, OLS and matching estimates should not be too dissimilar. Comparing columns (2) and (3), this is what we find. Our OLS results are close to the matching results, both in size of estimated effects as well as in significance, though the OLS results are estimated with less precision.

Tables A-5, A-6 and A-7 repeat tables 5, 6 and 7, adding the same geographical covariates as we used in Table 4. Throughout, or results are qualitatively similar to the results in the main tables. For wheat yield, we lose some precision, but the point estimate is statistically unchanged.

Table 8: Table A-1: Summary statistics for all variables

	Mean	Standard Deviation	Min	Max
Monastic (yes/no)	0.32	0.47	0.00	1.00
Share Catholic	0.12	1.07	0.00	55.00
Share in agriculture	0.62	0.25	0.00	1.00
Share in industry	0.21	0.17	0.00	1.00
Wheat Yield (bushels/acre)	21.68	4.49	4.00	48.00
Number of Gentry in 1700	0.67	1.00	0.00	12.00
Parliamentary Enclosure 1750-1840	0.37	0.48	0.00	1.00
Nr. of Agricultural Patents 1700-1850	0.02	0.28	0.00	14.00
Mill (yes/no)	0.04	0.20	0.00	1.00
Nr. of Mills	0.17	4.05	0.00	439.00
Mill Employment	15.68	279.71	0.00	12371.00
ln(1 + Lay Subsidy Income)	3.16	3.34	0.00	12.16
ln(1 + Monastic Income)	0.71	1.28	0.00	7.77
Terrain elevation	88.41	75.54	-2.61	588.24
Terrain slope	2.63	1.96	0.00	22.39
Wheat suitability	37.68	15.45	0.00	96.01
Distance to nearest river	2.47	2.12	0.00	30.62
Distance to nearest market town	6.12	3.41	0.01	25.84
Distance to the border	26.26	21.44	0.00	89.54
Distance to London	199.18	107.16	0.60	495.03
Distance to nearest coalfield	42.51	41.06	0.00	194.28

Table A-2: Robustness of Occupational Structure results

Dependent variable:	Share in agriculture		Share in industry	
	(1)	(2)	(3)	(4)
	Panel A: Monastic income			
ln(1 + Monastic Income)	-0.0143***	-0.0141***	0.00867***	0.00860***
	(0.00173)	(0.00173)	(0.00114)	(0.00114)
Share Catholic		0.0204***		-0.0107***
		(0.00549)		(0.00338)
R^2	0.107	0.114	0.111	0.115
	Panel B: Nr. Monastic obs. in Valor			
Nr Monastic obs. in Valor	-0.0150***	-0.0149***	0.00949***	0.00945***
	(0.00209)	(0.00207)	(0.00146)	(0.00146)
Share Catholic		0.0205***		-0.0107***
		(0.00551)		(0.00339)
R^2	0.111	0.118	0.115	0.118
	Panel C: Different fixed effects			
Monastic (yes/no)	-0.0138***	-0.0141***	0.0124***	0.0127***
	(0.00451)	(0.00450)	(0.00299)	(0.00299)
R^2	0.0101	0.0118	0.00482	0.00922
Fixed Effects	None	North-South	None	North-South
Observations	12831	12831	12831	12831
Control for Lay Subsidy Revenue	Y	Y	Y	Y
Control for Parish area	Y	Y	Y	Y

Notes: All regressions are estimated using OLS and include fixed effects at the county level, except panel C which has fixed effects indicated separately. The unit of observation is a parish. Heteroskedasticity robust standard errors are reported in parentheses. Share in agriculture is the share of males aged 20 and above employed in agriculture in the 1831 census. Share in manufacturing is the share of males aged 20 and above employed in manufacturing in the 1831 census. Share in retail is the share of males aged 20 and above employed in trade or handicraft in the 1831 census. ln(1 + Monastic Income) is the log of total monastic income in parish p, measured in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). The North-South dummy is equal to one if parish p is in one of the following counties: Cheshire, Cumberland, Derbyshire, Lancashire, Lincolnshire, Nottinghamshire, Staffordshire, Westmorland or Yorkshire: West Riding, Yorkshire: East Riding or Yorkshire: North Riding. * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table A-3: Dropping urban parishes

Dependent variable:	Share in agriculture	Share in industry	Share in agriculture	Share in industry
	(1)	(2)	(3)	(4)
Monastic (yes/no)	-0.0133***	0.00852***	-0.0291***	0.0203***
	(0.00447)	(0.00298)	(0.00452)	(0.00298)
Control for Lay Subsidy Revenue	Y	Y	Y	Y
Control for Parish area	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y
Mean dep. var.	0.636	0.204	0.644	0.197
Observations	12418	12418	10672	10672
R^2	0.106	0.109	0.133	0.134

Notes: All regressions are estimated using OLS. The unit of observation is a parish. Heteroskedasticity robust standard errors are reported in parentheses. In columns (1) and (2) parishes that were classified as urban in the 1831 census are removed from the sample. In columns (3) and (4) parishes that were located in a borough constituency are removed from the sample (Cannon, 1973). Share in agriculture is the share of males aged 20 and above employed in agriculture in the 1831 census. Share in industry is the share of males aged 20 and above employed in manufacturing, trade or handicraft in the 1831 census. * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table A-4: Matching estimates

	Difference in means (1)	Nearest Neighbor match (ATT) (2)	OLS (3)
Employment in agriculture			
Monastic (yes/no)	-0.008*	-.0186***	-0.0111***
	(0.004)	(0.0047)	(0.00428)
Employment in industry			
Monastic (yes/no)	0.01***	.011**	0.01***
	(0.003)	(0.003)	(0.002)
Observations	12832	12832	12832

Notes: Monastic (yes/no) is an indicator equal to one if a parish contained at least one manor owned by a monastery in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831) Column (1) reports the difference in means across treatment status. Stars indicate the significance of the difference in a two-sided t-test. Column (2) reports the average treatment effect on the treated using a one-nearest neighbor match, where the nearest neighbor is found using the Mahalanobis distance described in the text. Standard errors are Abadie-Imbens robust standard errors for nearest neighbor matching (Abadie and Imbens, 2006). Column (3) reports coefficients and robust standard errors from an OLS regression of the relevant dependent variable on the set of matching variables. The set of matching variables includes Lay subsidy revenue per capita, area, area squared, slope, slope squared, elevation, elevation squared, distance to the nearest river, distance to the nearest river squared, distance to the nearest coal field, distance to the nearest market town, and distance to London. Share in agriculture is the share of males aged 20 and above employed in agriculture in the 1831 census. Share in industry is the share of males aged 20 and above employed in manufacturing, trade or handicraft in the 1831 census. * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table A-5: Agriculture and controls

	Wheat Yield (bushels/acre)		Nr. of Agricultural Patents 1700-1850	
	(1)	(2)	(3)	(4)
Monastic (yes/no)	0.0254	0.0395	0.0847***	0.0875***
	(0.0277)	(0.0290)	(0.0230)	(0.0233)
Share Catholic		-0.0196		-0.00408*
		(0.0172)		(0.00225)
Terrain elevation	-0.331***	-0.347***	-0.0239**	-0.0278**
	(0.0274)	(0.0296)	(0.00990)	(0.0109)
Terrain slope	-0.0231	-0.0137	0.0449***	0.0431***
	(0.0239)	(0.0259)	(0.0112)	(0.0121)
Wheat suitability	-0.00723	0.00120	-0.0378**	-0.0256*
	(0.0193)	(0.0201)	(0.0148)	(0.0137)
Distance to nearest river	0.0229*	0.0208	-0.0267***	-0.0344***
	(0.0132)	(0.0138)	(0.00820)	(0.00800)
Distance to nearest market town	-0.0861***	-0.0874***	-0.0522***	-0.0463***
	(0.0152)	(0.0163)	(0.0101)	(0.0110)
Distance to the border	0.119***	0.131***	-0.0236	-0.0152
	(0.0287)	(0.0305)	(0.0169)	(0.0187)
Distance to London	0.184**	0.136*	-0.0529	-0.0855*
	(0.0753)	(0.0796)	(0.0545)	(0.0514)
Distance to nearest coalfield	0.0655*	0.0560	-0.0530**	-0.0490*
	(0.0355)	(0.0369)	(0.0235)	(0.0256)
Control for Lay Subsidy Revenue	Y	Y	Y	Y
Control for Parish area	Y	Y	Y	Y
Soiltype dummies	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y
Observations	4148	3719	16228	12804
R^2	0.392	0.396	0.0230	0.0238

Notes: All regressions are estimated using OLS. The unit of observation is a parish. All coefficients are standardized. Heteroskedasticity robust standard errors are reported in parentheses. Wheat Yield is the agricultural yield in bushels per acre of a plot growing wheat in parish p (Kain, 1986). Number of Agricultural Patents is the total number of agricultural patents that were registered to people living in parish p between 1700 and 1850 (Woodcroft, 1854, 1862). Monastic (yes/no) is an indicator equal to one if a parish contained at least one manor owned by a monastery in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). Share Catholic is the total number of Catholics in a parish in 1767, normalized by population in 1831. Elevation is the average elevation of the terrain measured in meters. Slope is the average slope of the terrain measured in degrees. Wheat suitability is the average value of an index of soil suitability for growing wheat ranging from 0 to 100. Distance to the nearest river, the nearest market town, the sea and London are based on our own calculations in GIS and are measured in kilometers. The database of market towns comes from Adams (1700). * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table A-6: Gentry, enclosure and controls

	Nr. of Gentry in 1700		Parliamentary Enclosure	
	(1)	(2)	(3)	(4)
Monastic (yes/no)	0.219***	0.195***	0.146***	0.118***
	(0.0180)	(0.0197)	(0.0171)	(0.0187)
Share Catholic		-0.00775*		-0.0180*
		(0.00447)		(0.00950)
Terrain elevation	-0.0716***	-0.0863***	-0.0185	-0.00467
	(0.0129)	(0.0166)	(0.0132)	(0.0168)
Terrain slope	0.00911	0.0311**	-0.0617***	-0.0737***
	(0.0116)	(0.0151)	(0.0113)	(0.0145)
Wheat suitability	0.0234*	0.0253*	0.0203*	0.0105
	(0.0121)	(0.0137)	(0.0116)	(0.0131)
Distance to nearest river	-0.0124	-0.0155*	0.0179**	0.0133
	(0.00791)	(0.00933)	(0.00747)	(0.00872)
Distance to nearest market town	-0.0824***	-0.101***	0.00526	-0.000816
	(0.00878)	(0.0102)	(0.00803)	(0.00930)
Distance to the border	-0.00473	-0.00696	0.0228	0.0147
	(0.0168)	(0.0194)	(0.0164)	(0.0189)
Distance to London	-0.214***	-0.276***	0.00792	-0.0242
	(0.0426)	(0.0507)	(0.0407)	(0.0477)
Distance to nearest coalfield	0.0122	-0.00372	0.144***	0.167***
	(0.0228)	(0.0257)	(0.0201)	(0.0226)
Control for Lay Subsidy Revenue	Y	Y	Y	Y
Control for Parish area	Y	Y	Y	Y
Soiltype dummies	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y
Observations	16228	12804	16228	12804
R^2	0.132	0.126	0.191	0.189

Notes: All regressions are estimated using OLS. The unit of observation is a parish. All coefficients are standardized. Heteroskedasticity robust standard errors are reported in parentheses. Nr. of Gentry in 1700 is the number of Gentry in 1700 in parish p, recorded in Adams (1700). Parliamentary Enclosure is an indicator variable equal to one if an act of parliamentary enclosure between 1750 and 1840 included part of parish p (Tate and Turner, 1978). Monastic (yes/no) is an indicator equal to one if a parish contained at least one manor owned by a monastery in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). Share Catholic is the total number of Catholics in a parish in 1767, normalized by population in 1831. Elevation is the average elevation of the terrain measured in meters. Slope is the average slope of the terrain measured in degrees. Wheat suitability is the average value of an index of soil suitability for growing wheat ranging from 0 to 100. Distance to the nearest river, the nearest market town, the sea and London are based on our own calculations in GIS and are measured in kilometers. The database of market towns comes from Adams (1700). * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table A-7: Textile mills and controls

	Mill (yes/no)		Number of Mills		Mill Employment	
	(1)	(2)	(3)	(4)	(5)	(6)
Monastic (yes/no)	0.0823***	0.0826***	0.0547**	0.0654**	0.0484**	0.0601**
	(0.0181)	(0.0193)	(0.0265)	(0.0320)	(0.0214)	(0.0253)
Share Catholic		-0.0200***		-0.0151*		-0.0200**
		(0.00685)		(0.00797)		(0.00871)
Terrain elevation	-0.0486***	-0.0646***	0.000835	-0.0124	0.0127	0.00882
	(0.0161)	(0.0193)	(0.00986)	(0.0107)	(0.0134)	(0.0178)
Terrain slope	0.0862***	0.113***	0.0155**	0.0265***	0.00952	0.0222*
	(0.0159)	(0.0198)	(0.00779)	(0.00902)	(0.00970)	(0.0129)
Wheat suitability	-0.0383***	-0.0188	-0.00167	-0.00348	0.00243	0.00327
	(0.0110)	(0.0120)	(0.00823)	(0.00928)	(0.0101)	(0.0119)
Distance to nearest river	-0.0836***	-0.0731***	-0.0136***	-0.0148***	-0.0207***	-0.0225***
	(0.00685)	(0.00783)	(0.00407)	(0.00501)	(0.00521)	(0.00646)
Distance to nearest market town	-0.0866***	-0.104***	-0.0290**	-0.0368**	-0.0402***	-0.0397***
	(0.0103)	(0.0114)	(0.0144)	(0.0176)	(0.0111)	(0.0124)
Distance to the border	0.0465***	0.0615***	0.0458***	0.0463***	0.0561***	0.0396**
	(0.0160)	(0.0178)	(0.0115)	(0.0147)	(0.0153)	(0.0157)
Distance to London	0.0937**	0.132**	-0.0374	0.000498	-0.0442	0.00409
	(0.0473)	(0.0514)	(0.0235)	(0.0262)	(0.0376)	(0.0436)
Distance to nearest coalfield	-0.0130	-0.0141	-0.0524***	-0.0460**	-0.0605***	-0.0470***
	(0.0197)	(0.0218)	(0.0169)	(0.0185)	(0.0117)	(0.0118)
Control for Lay Subsidy Revenue	Y	Y	Y	Y	Y	Y
Control for Parish area	Y	Y	Y	Y	Y	Y
Soiltype dummies	Y	Y	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y	Y	Y
Observations	16228	12804	16228	12804	16228	12804
R^2	0.0960	0.0840	0.0155	0.0146	0.0311	0.0283

Notes: All regressions are estimated using OLS. The unit of observation is a parish. All coefficients are standardized. Heteroskedasticity robust standard errors are reported in parentheses. Mill (yes/no) is an indicator variable equal to one if there was a mill in in parish p in 1838. Number of Mills is the total number of cotton, wool, flax and worsted mills in parish p in 1838, and Mill Employment is the total number of people employed in mills in parish p in 1838 (Parliament, 1839). Monastic (yes/no) is an indicator equal to one if a parish contained at least one manor owned by a monastery in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). Share Catholic is the total number of Catholics in a parish in 1767, normalized by population in 1831. Elevation is the average elevation of the terrain measured in meters. Slope is the average slope of the terrain measured in degrees. Wheat suitability is the average value of an index of soil suitability for growing wheat ranging from 0 to 100. Distance to the nearest river, the nearest market town, the sea and London are based on our own calculations in GIS and are measured in kilometers. The database of market towns comes from Adams (1700). * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

4: Data sources

Variable	Source	Comment
	Main Variables	
The Valor Ecclesiasticus	Caley and Hunter (1810, 1814, 1817, 1821, 1825, 1831)	For coding method, see above.
Occupational structure variables – 1831 census	Gatley (2005)	
Agricultural yield	Kain (1986)	
The number of agricultural patent holders	Woodcroft (1854)	The data were transcribed and made available to use by James Dowey, see Dowey (2013)
Number of Gentry in 1700	Adams (1700)	
Enclosure dummy	Tate and Turner (1978)	
Textile mill variables	Parliament (1839)	
Number of Catholics	Parliament (1767)	
	Covariates	
The Tudor Lay Subsidies	Sheail (1968)	
Coal deposits	Strahan (1912)	Digital copy available through www.davidrumsey.com
Elevation	CGIAR consortium at http://srtm.csi.cgiar.org/	
Slope	Earth Resources Observation and Science Center of the USGS at http://eros.usgs.gov	
Inland rivers and water bodies	Digital Chart of the World available through www.diva-gis.org	Distances computed in ArcGIS
Distance to London		Computed in ArcGIS
Distance to national border		Computed in ArcGIS
Distance to market town	List of Market towns from Adams (1700). Distances computed in ArcGIS	
Suitability for wheat and barley	FAO at http://webarchive.iiasa.ac.at/Research/LUC/GAEZv3.0/	We used the rain-fed, low intensity, baseline period settings
Soil type	FAO at http://webarchive.iiasa.ac.at/Research/LUC/GAEZv3.0/	

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