

Monks, Gents and Industrialists: The Long-Run Impact of the Dissolution of the English Monasteries*

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Abstract

In this paper we undertake an investigation of the long-run economic impact of the dissolution of the English monasteries by Henry VIII in the 1530s. This event is plausibly linked to the "rise of the gentry", the commercialization of agriculture and political and economic change in early modern England potentially facilitating its precocious industrialization. To measure the dissolution we digitized the Valor Ecclesiasticus, the census Henry commissioned of monastic incomes in 1534 and use monastic income at the parish level from the Valor as a measure of the local impact of the dissolution. We show that parishes which the dissolution impacted more were more likely to have a textile mill in 1838, tended to have more mills and greater mill employment. We also show that they tended to have a lower proportion of their labor force in agriculture in 1831 and a higher proportion in retail trade. In addition we demonstrate that parishes where the dissolution had a greater impact had more gentry in 1700, were more likely to have land enclosed by parliament and had more innovative agriculture as measured by patents. We show these results are robust to controlling for many other potential determinants of the location and extent of industry and for a variety of strategies for accounting for unobservables. The results are consistent with Tawney's famous thesis of the "rise of the gentry" but extend it by making the link between social change and the industrial revolution.

Keywords: Church land, reformation, gentry, industry.

JEL classification: N43, N63, N93, O14, Q15.

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1 Introduction

There is consensus amongst economists and economic historians about the significance of the British industrial revolution. They agree that it was a broad movement which featured technological innovation in key areas such as textile manufacture and metals, in new forms of inanimate power such as the steam engine, in novel methods of the organization of production, such as the introduction of the factory system, and new methods of transportation, such as the railway.

There is much less agreement on why the industrial revolution happened when it did and why it happened in Britain first and not elsewhere. Some explanations address both the timing and the comparative context. Allen (2009), for example, argues that the industrial revolution happened in Britain because Britain had uniquely high real wages which stimulated labor saving technological innovation. Wages were differentially high in Britain because of the discovery of the Americas and Britain's involvement in Atlantic trade. Other arguments play down the 'Britishness' of the revolution, placing it within broader forces that impacted Europe in similar ways. For example, Mokyr (2010) emphasizes the Enlightenment and intellectual and scientific change; Voth (2001) and de Vries (2008) instead argue that changes in tastes and preferences and the creation of a 'consumer society' was critical to stimulating labor effort and incentives; Rosenthal and Wong (2011) follow Tilly (1990) is arguing that warfare was a driving force behind institution building in Western Europe arguing that it led to urbanization and via this technological change.

A further set of hypotheses emphasize the distinct institutional development of Britain. North and Thomas (1973) proposed that Britain uniquely developed economic institutions, like the patent system, that created incentives for innovation and a complementary constitutional political system (see also North and Weingast, 1989, Pincus, 2011, and Pincus and Robinson, 2014). Acemoglu, Johnson and Robinson (2005) show empirically that the dynamics of political institutions are closely related to economic growth in early modern Europe (and Acemoglu, Cantoni, Johnson and Robinson, 2011, find something similar for the 19th century). Specifically, places which imposed more constraints on the executive experienced more economic growth and also more rapid urbanization, a phenomenon closely associated with the industrial revolution.

The focus on political and institutional change leaves open the question of what impulse set the process in motion and led Britain to diverge from the rest of Europe. North and Thomas (1973) took their cue

from Postan (1944) in emphasizing the demographic shock caused by the Black Death as breaking apart the feudal economy and leading towards better economic institutions, though Brenner (1976) challenged this explanation on the grounds that the Black Death was a shock common in Europe and thus could not explain a distinct British institutional trajectory (see Aston and Philpin eds., 1987, for this debate). Acemoglu, Johnson and Robinson (2005) instead argued it was the discovery of the Americas and expansion of Atlantic trade, interacting with initial institutions, measured by constraints on the executive in 1500, which can explain the variation. The discovery created differential institutional responses depending on whether or not there was a class of merchants who were independent of the Crown. There was in places where constraints on the executive in 1500 were relatively strong a relatively class of merchants (and small differences may matter, Acemoglu and Robinson, 2012) and these merchants were able to push for improved economic and political institutions. Such a class of merchants did not exist everywhere, in Spain, for example.

This account heavily emphasizes both change in social structure and how this led to political conflict in the 17th century, in particular the English Civil War of the 1640s and the Glorious Revolution of 1688, and ultimately institutional change. But in doing so it coincides with an older literature about the causes of these political conflicts. Indeed, if it is the institutional changes which were unleashed by Britain's political conflicts of the 17th century that are responsible for the industrial revolution, then anything which influenced these conflicts or created a demand for such institutional changes might also be an important source of Britain's unique trajectory, in addition to the heterogeneous effects of the Atlantic trade.

The most significant hypothesis in this respect is the one advanced by Tawney (1941a,b). Tawney proposed that the demand for institutional change and the English civil war were an outcome of a large change in the rural social structure which he characterized as the "rise of the gentry".¹² This was a process which combined the decline of the traditional landed aristocracy and a rise of a new class of commercially minded entrepreneurs. Several processes linked up to lead to the rise of this new class, such as inflation eroding the value of traditionally set nominal rents and supposedly unsustainable consumption by landed

¹The definition of who were the gentry is a bit vague. Heal and Holmes (1994, p. 7) note "all non-noble landowners with some claim to exercise lordship or jurisdiction were unquestionably gentlemen" and significant landownership or wealth appear to be the key criteria. This obviously creates something of a subjective dividing line between richer yeomen and gentlemen with the holding of local offices, such as justice of the peace, often being used as the distinction. The possession of a coat of arms has also been used empirically to determine the number of gentry.

²It should be clear that both Tawney's hypothesis and indeed those of North and Thomas (1973) and Acemoglu, Johnson and Robinson (2005) are related to Marxist arguments about the 'rise of the bourgeoisie' as creating capitalism in Britain (see Stone, 1965b, for reprints of some of the classic writings by Freidrich Engels and Christopher Hill, and Stone, 1972 and 1985, for overviews and assessments of this debate. See also the postscript of Brenner, 1993).

elites, but the most significant factor was the huge shock to rural society created by Henry VIII's dissolution of the monasteries between 1532 and 1540. After Henry's break with Rome and the founding of the Church of England, he expropriated the monastic lands in England and Wales, representing around 20-30% of agricultural land. This land was then rapidly sold off, 2/3 by 1547 and most of the rest by 1554 during the reign of Edward VI. (Clay, 1984, p. 145). Clay (1984, p. 144) notes about the period 1500 to 1640

“The pattern of landownership ... was to undergo a profound change ... The single most important factor in bringing this about was the partial dismantling of the enormous estates of the Church and the crown from the 1530s onwards”

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 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 1690. Though the crown did sell off its own land, this fall mostly represented the impact of the dissolution. In the same period the gentry went from 25% to 45-50%. In 1524 the 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, 1600). Gregory King's calculations of the social structure of England in 1688 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. More 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). Overton (1996, p. 169) concludes “it seems clear that the gentry class ... did grow considerably in numbers from the mid-sixteenth century.”

In this paper we provide to our knowledge the first systematic investigation of the link between the Dissolution of the Monasteries and long-run British economic growth, in particular changes in social structure and the industrial revolution. Though Tawney's original work was focused on the civil war, not the industrial revolution, the institutional literature suggests that there ought to be a reduced form relationship between the extent to which monastic lands were expropriated and the subsequent spread of the industrial

revolution, not just nationally but at a regional level. This is because it is natural to hypothesize that while to some extent this process manifested itself as a change in national level institutions, as a consequence of the civil war and Glorious Revolution, it ought also to create within-England variation. For instance, in parishes or counties where the gentry rose more, where commercial farming was more advanced, one would hypothesize that the gentry would be involved in other activities which would ultimately coalesce into the industrial revolution. An obvious example of the potential local impact of the gentry would come via the fact that they were enfranchised and able to sit in parliament to get legislation favorable to their economic interests. As Heal and Holmes put it (1994, p. 204)

“In the Tudor period the gentry ‘swarmed’ into Parliament. Not only the county seats, but those of the old parliamentary boroughs, and those of towns newly enfranchised by the Crown, were taken by gentlemen. Some 80% of the 372 so-called ‘burgesses’ in the late Elizabethan House of Commons were country gentlemen.”

Gentry were not just in a good position to sit in parliament, they could also lobby it. For example, Daunton (1994) notes how

“The leading Birmingham industrialist, Matthew Boulton, was able to lobby leading politicians and obtain a new assay office for the town in 1773, with the support of local aristocrats and gentry who felt that they were under an obligation to promote the interests of the midlands, in whose industries many had a direct stake. ‘These old country families’, remarked Samuel Garbett, another successful Birmingham lobbyist, in 1766, ‘look upon themselves as the Patrons of the Trade of the Neighbourhood and really have great inclination to serve us when they distinctly understand the subject.’”³

Moreover, it is plausible that there was a connection between the rise of the gentry and proto-industrialization which is often argued to have been a critical step to the industrial revolution. That there were such local connections is suggested by the large case study literature both on the gentry and on 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

³See Robinson (1964) for more on Boulton’s political lobbying.

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 on 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 leashed and operated by gentry (1979a, Figure 28, p. 124).⁴

Our claim is not that Manchester was Manchester because it had a lot of gentry and some extraordinary concentration of monastic lands in the 16th century. Obviously Manchester had many things going in its favor. Our claim is more modest: the change in social structure identified by Tawney is plausibly a significant determinant of the location of the industrial revolution and is consistent with quite a bit of case study evidence. This hypothesis is of course rather inconsistent with the notion that economic revolutions are always initiated by ‘new people’, an idea going back at least to Pirenne (1914) and Schumpeter (1954). Crouzet (1985) in his detailed study of the social background of the industrialists of the British Industrial Revolution argued that it was the ‘middling sort’ that led the way. For example, in his sample of the fathers of 226 founders of large industrial undertakings between 1750 and 1850 only 16 were gentry (see also Rabb, 1999). Yet Crouzet used a very narrow definition of ‘founder’ which ruled out partners if they were not directly involved in the running of businesses and people who financed such enterprises. 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).

Both theory and case study evidence therefore suggests that the dissolution of the monasteries could have impacted not just the structure of English society, but also set in motion forces which impacted the

⁴Swain (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.

spatial distribution of the industrial revolution. To investigate whether or not such conjectures are right we use several sources of data. Most important we digitized the Valor Ecclesiasticus (henceforth Valor), the great survey of monastic incomes implemented by Henry VIII prior to the dissolution. Though selected numbers from this survey have been presented and interpreted by scholars in the past, for example Knowles (1979) and Schofield (1965), to our knowledge this data has never been used systematically before. We describe the process via which the Valor was collected and the data it contains in Section 2. The Valor does not contain systematic evidence on the amount of land or property the church held, but it does give the amount of income which was generated by these assets at the time of the dissolution. We use this income total as our basic measure of the impact of the dissolution at the parish level. We hypothesize that in places where church assets generated more income the dissolution had a bigger impact, either in terms of redistributing more productive lands or greater amounts of land.

For outcome variables we use two main sources of information. The first is the 1838 Mill Survey commissioned by the British Parliament (and also recently used at the county level by Crafts and Wolf, 2013). The second is the 1831 British census which gives us data on the structure of employment, in particular the proportion of the labor force in retail and agriculture.⁵

Our first main set of results show that there is a very robust reduced form relationship between Valor income in 1534 and our measures of industrialization. Valor income 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. We also find that Valor income is positively and significantly correlated with the proportion of the labor force in manufacturing and retail but negatively so with the proportion in agriculture.

The effects we estimate are quantitatively important. For example, moving from the 25th to the 75th percentile in the log of income as recorded in the Valor increases the number of mills by one quarter of one industrial mill. This effect appears small but this is due to the wide geographical coverage in our dataset. The mean number of mills in a parish in England in its entirety is 0.17. Within our sample the mean is 0.20. Moving through the interquartile range, therefore, increases the number of mills by 1.25 times its mean. Similarly, the average probability of having a mill, as recorded by the mill dummy is 0.04 both in England as a whole and within our sample. Moving from the 25th to the 75th percentile increases the probability of having a mill by 0.02. When we consider the number of people employed in industrial mills, the effect becomes even more pronounced. Compared to an average number of people employed of 16 (17

⁵We did not use the share in manufacturing because the average is very low, about 3%, and there is little variation.

in our sample) increasing Valor income gives rise to 30 more people employed in industrial mills.⁶

Trying to interpret these findings as causal faces a number of challenges. Most obviously, the location of monastic land was not randomly assigned in 1534 and it could be that monasteries just happened to hold land in places which were attractive for industrialization for other reasons, thus creating potential omitted variable bias, at least to the extent we cannot control for these other factors. For instance, if monasteries were able to acquire the most productive land then this may lead redistributed lands to yield more output. If, as some claim, an agricultural revolution was a prerequisite for an industrial revolution, in a period with high transportation costs one might anticipate that industry would locate close to places with high agricultural productivity.

Though at the moment we do not have a credible exogenous source of variation in monastic income (an instrument) we use four main strategies to address these concerns. First, we show our results are robust to a number of covariates which are plausible candidates for such omitted variables. These include measures of slope, to capture suitability for water power and the presence of coalfields both potentially critical elements in the industrial revolution. They also include distance to the coast, distance of a navigable river and distance to an urban area to capture the importance of proximity of markets. Second, our results hold when we use a variety of fixed effects to control for omitted variables. Most stringently we are able to get down to a very low geographical level (below country) with the use of both hundred and deanery fixed effects (in our sample there are 7824 parishes, 908 hundreds and 371 deaneries)⁷ so estimate our main effects using only within hundred and within deanery variation. Third, we digitized the Lay Subsidy of 1524/25 and matched the returns to our units of observation. This subsidy was a tax imposed prior to the dissolution by Henry VIII and people were taxed in a mildly progressive way on various types of income. Hence this data gives us a useful pre-control for differences in productivity which are not an outcome of the dissolution.⁸ Our results are all robust to this pre-control. Finally, we argue that historical evidence suggests that the location of church lands had been fairly constant since the Anglo-Saxon period, therefore for at least 500 years prior to the dissolution. Though the Norman conquerors expropriated the lands of

⁶We find smaller effects for the employment data in the 1831 census, using the relevant specifications with fixed effects at the hundred level. For these dependent variables the sample means and the means for England as a whole coincide. For the share of males over 20 employed in agriculture we find that moving along the interquartile range decreases this share by 0.03, compared to a mean of 0.62. For the share of males employed in retail the effect is, expressed as a fraction of the mean of the dependent variable, considerably larger. Increasing the log of Valor income increases the share by 0.02, compared to a mean of 0.18.

⁷For England as a whole there are 16297 parishes and 966 hundreds. As discussed later our sample is restricted to those parishes for which we have an observation from the Valor.

⁸The historical literature suggests that a great deal of caution is required in using the lay subsidies to measure wealth, yet they have proved an invaluable source, see Schofield (1965, 2004), Darby, Glasscock, Sheail, Versey (1979), Husbards (1987), and Nightingale (2004).

the Anglo-Saxon elite (Fleming, 1991) the lands of the church was only marginally affected. Thomas notes (2007, p. 68) that in 1066

“The church collectively held about one quarter of the land in England. The church’s share remained largely unchanged.”

The quarter share is similar to that in 1436 in Table 1. Though there certainly was some change and Anglo-Saxon bishops were replaced by Norman bishops, Barlow (1979a) (see also Barlow, 1979b) puts it like this

“The great abbeys of the Anglo-Danish kingdom remained the great abbeys under the Normans and Angevins” (p. 315)

But while the location of monastic properties might have been quite constant, the distribution of wealth in England was not. Indeed, analysis of the Lay Subsidies by Schofield (1965) and Darby, Glasscock, Sheail and Versey (1979) suggest that between the Domesday Book of 1086 and the Tudor period there was a large change in the regional distribution of income in England. It therefore seems very unlikely that there is some omitted variable which determined the location of monastic lands in Anglo-Saxon England which also helped to predict where the textile industry would develop during the industrial revolution. It is also true that there seem to have been a large number of idiosyncratic shocks to the distribution of church properties during the Anglo-Saxon period. Barlow (1999, p. 21) notes that during this period of political instability “In Britain the dioceses had perforce to coincide with the areas ruled by the local kings, and the sees to be situated in any convenient settlement. This expedient caused the area of the bishoprics to fluctuate as the boundaries of the petty kingdoms changed” (see also Blair, 2005). Such fluctuations also give one some confidence that we might be able to interpret our findings as causal.

To buttress our interpretation of the reduced form evidence we then examine in more detail the channels via which the dissolution might have worked. First, it is interesting to explore whether or not our measure of Valor income is indeed correlated with the presence of the gentry. We are able to do this by using a unique census from 1700 which records the number of gentry in each of 24,000 of the largest towns/cities and villages in England and Wales. Again, to our knowledge, this data has never previously been analyzed systematically. We show that Valor income is positively and significantly correlated with the number of gentry in a parish in 1700. We also show, using data recently compiled by Dowe (2013), that Valor income is positively correlated with the number of agricultural patents registered between 1700

and 1850, suggesting that the dissolution of the monasteries might indeed have led to greater innovation, at least in the rural sector. Finally, with Matthew Boulton in mind, we can examine directly one policy channel by using data collected by Heldring, Robinson and Vollmer (2014) on the extent of parliamentary land enclosures at the parish level (Heal and Holmes, 1994, argue that the gentry were heavily involved in enclosing, see pp. 108-113). Using their data we show that Valor income is positively and significantly correlated with the proportion of land in a parish that was enclosed between 1750 and 1840.

Our paper is related to quite a few other contributions in addition to those we have discussed above. Tawney's bold hypothesis created a very large literature, some supportive, but much negative. This focused on a plethora of issues; whether or not the aristocracy had really declined in favor of a rising class of gentry (Stone, 1965a); 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 and whether the English Civil War can be understood as a conflict between the gentry and traditional landed elites with the latter siding with the Crown. 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. Nevertheless, the traditional landed elites managed to reinvent themselves to quite a large extent (and not simply as a consequence of the dissolution but also of other state building that was taking place in Tudor times, for instance the disarming of the aristocracy and the establishment of a central monopolization of violence, see Pincus and Robinson, 2013). Finally, few would now agree that the civil war was a conflict of gentry against traditional elites and Jha (2010) finds no evidence that being a member of the gentry predicts the propensity of a person to side with parliament in the civil war. In our view, the most plausible modern interpretation is due to Brenner (1993) who sees both gentry and traditional landed elites as having much in common, but splitting because of differences in the extent to which they were prepared to side with far more radical groups of new merchants in London in attempting to guarantee that Charles I stuck with his promises of reform.⁹ Nevertheless, it is not crucial for our research whether or not Tawney's hypothesis about the social origins of the Civil War is correct or not. Even if the newly rising gentry's interests were not different enough from traditional elites to create a war, it could still be true that the gentry were more likely to modernize their commercial practices and

⁹We cannot do justice here to the many positions on the nature of the English Civil War, see Hughes (1998) and Richardson (1998) for a good overview. Russel (1990) and Morrill (1993) are influential interpretations, though very different from our own. Russell emphasizing the very heterogeneous and idiosyncratic nature of the conflicts which became the Civil War, with Morrill proposing that it was mostly a religious conflict. Blackwood (1978) and Cliffe (1969) are detailed studies of the role of the gentry in the Civil War in the important cases of Lancashire and Yorkshire.

more prone to get involved in the operation or financing of industry.

Our paper is also related to research on the geographical location of the industrial revolution. What consensus there is on this issue appears to suggest that this was a simple matter of geography, proximity of natural resources such as coal, or the closeness of markets (see the essays in Hudson, 1989, and Jones 2010). Crafts and Wolf (2013) for example, in one of what appears to be a remarkably few econometric investigations of this issue, only examine geographical determinants of the location of textile mills within Britain. Yet institutional explanations are not entirely missing. Daunton (1995), for example, suggests that the industrial revolution occurred in the north of England because it was outside the control of craft guilds who were organized better in the historically more prosperous south of the country.

Our paper is also related to a large and heterogeneous literature on the impact of religion on economic development. A view most consistent with our extension of the Tawney thesis is that the rise of the gentry had important economic effects because the land held by the Church was utilized inefficiently. There is a large debate about whether or not this is so. North (1981, p.125) argued that “Monasteries were often the most effective farming centers in the Middle Ages” and the book by Ekelund, Hébert, Tollison, Anderson and Davidson (1996) more broadly argues that the economic activities of the Medieval Church can be modelled as profit maximizing from an economic point of view. If these views were correct, it might be surprising that the dissolution of the monasteries had a major impact on productivity. Whether or not it is true empirically is controversial. Most scholars note important differences between lay and church lands. It is clear, for instance, that the church was the most sustained and strongest defender of feudal privileges in England in the wake of the Black Death. Swanson (1989) notes how 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).

Swanson lists numerous incidents where religious houses fought to retain feudal privileges. 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 granting customary labor services from serfs. Evidence also suggests

that the church was under pressure to adhere to non-economic practices, that marketing products was thought to be inappropriate and that monastic properties aimed for self-sufficiency (Swanson, 1989, pp. 229-230). While not denying that there are examples where the church was an innovator in terms of agricultural practices (Bolton, 1980, Hare, 1985) the evidence that feudal agricultural practices lasted longer on church land is certainly consistent with them being less efficient economically (the evidence suggests that in general cereal yields were stagnant or declining between 1300 and 1600 (see Overton, 1996, Table 3.1, p. 86)).

In addition canon law forbade the selling of church lands while following the Statute of Mortmain in 1279 transfers of land to religious control had to have a royal license. A further statute of 1391 closed some major loopholes (Raban, 1974). This freezing of church land stymied the emergence of a land market and might be thought naturally to lead to land being held by those who would not be able to use it best. To some extent tenancy might be able to mitigate this problem, but the entire modern theory of the firm stemming from the research of Williamson (1985) and Grossman and Hart (1986) suggests that when contracts are complete, ownership is of critical importance for incentives and productivity.

Another distinction, noted by Kosminsky (1961) was that the church was more likely to have perpetual rights to land rather than be in control of 'heritable estates'. The more secure property rights might have promoted investment and encouraged the build up of larger flocks and herds and support higher stocking densities than their lay counterparts. But they were also more susceptible to conservatism and inertia (see Campbell, 2006, pp. 179, 421) leading to inconclusive conclusions about relative productivity (see Campbell, 1983, p. 397).

These issues fit into a much broader debate about the role of the Church and the Reformation in underpinning modern economic growth. Schumpeter (1954) claimed that the Medieval Church played a positive role in stimulating innovation and even education, and other positive arguments include the idea that the Church stimulated the emergence of the rule of law, placed beneficial checks and balances on secular power and destroyed traditional kinship and family structures paving the way to modern economic men and women (Berman, 1983, Moore, 2000, North and Gwin, 2010). More recently Andersen, Bentzen, Dalgaard and Sharp (2013) show that the presence of Cistercian abbeys in the Medieval period is positively correlated with long-run economic growth at the county level which they argue works through a positive impact on the development of a work ethic. A more typical view would follow Weber (1993) in arguing that Catholicism was probably an impediment to economic growth, or at least much less of a stimulus

than Protestantism. Becker and Woessmann (2009) show in the German case that this might have worked via educational expansion, though Cantoni (2013) found no impact on city growth and urbanization. Our emphasis is very different since we do not examine the impact of changing religious beliefs after the English reformation on subsequent economic growth, but the impact that the Reformation had on the social structure and distribution of land holdings.¹⁰

Finally, our paper is related to studies which have examined the long-run impact of agrarian reforms. While there are few identified empirical studies of this literature there is a general argument that agrarian reform in East Asia was important in stimulating agricultural productivity (see Griffin, Khan and Ickowitz, 2002, for an overview, and Bramall, 2004, for skepticism). A lot of this literature resonates with Tawney’s analysis, in particular Dore (1959, 1965) argues that the beneficial impact of land reform in Japan was because land was redistributed from absentee landlords to more efficient commercially minded farmers. There is even revisionist research on the impact of ‘Fast-Track Land Reform’ in Zimbabwe (Scoones, Marongwe, Mavedzenge, Mahenehene, Murimbarimba and Sukume, 2010) which makes a similar case.

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 analyzed this data. We also discuss the other variables we use in the analysis, such as the Tudor Lay Subsidy of 1525/26, and discuss some of the descriptive statistics. In section 4 we present our econometric model and the basic results. Section 5 concludes.

2 Historical Background

In 1530, on the eve of the dissolution of the monasteries, some 825 religious establishments, housing around 10,000 people, were scattered throughout England and Wales¹¹. Together with their tenants these monks, nuns and friars made up a significant share of England’s 2.5 million inhabitants (Woodward, 1966, p.2).

¹⁰It is possible that differential religious conversion is one of the channels via which the dissolution worked. It would be possible to examine this, for example with the Protestation Returns of 1642 which lists of males over the age of eighteen who took, or did not take, an oath ‘to live and die for the true Protestant religion, the liberties and rights of subjects and the privilege of Parliaments’. We are still trying to identify if is possible to put together a relatively complete dataset of these returns.

¹¹Much has been written on the dissolution and the reformation more generally, see for instance Woodward (1966), Youngs (1971), Gasquet (1899), Duffy (2005) and Knowles (1979). 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.

Yet the economic impact of the monasteries was even larger¹². Youings claims “...that almost every parish contributed in some way to the maintenance of the great monasteries and religious houses by fixed rent charges in cash and kind, tithes profits from manor courts and customary obligations.” (Youings, 1967, p. 306). Overall, the church is thought to have held between a quarter and a third of all land in England and Wales, as Table 1 suggested (Mingay, 1976, p. 44; Woodward, 1966, p. 33).

In two acts passed in 1532 and 1534 parliament made Henry VIII, who had become king in 1509, head of the church. These acts also diverted all taxes paid by the church from the papal See to the Crown. In order to assess what the clergy owed the Crown, Henry ordered an assessment of the yearly income of all ecclesiastical possessions in England. The resulting reports are published as the *Valor Ecclesiasticus* (henceforth: *Valor*)¹³.

In 1536 parliament passed the Dissolution of the Lesser Monasteries act. This act granted ownership of all possessions of religious houses that had 200 pounds income per year or less to the crown¹⁴. Although many houses were granted an exception, over two hundred monasteries, priories and nunneries were dissolved before the end of 1536. After this initial wave of expropriation, 1537 saw little activity with just a few voluntary surrenders of property. A renewed effort by the Crown resulted in the next wave of expropriations which lasted from late 1537 until 1540 and expropriated all remaining religious houses, large or small, in England and Wales. The Act for the Dissolution of the Greater Monasteries, passed in 1539, provided the legal basis for this effort¹⁵.

¹²Aside from maintaining property and collecting rents, the members of religious housing engaged in prayer and singing for the local community, were active in education, were expected to provide food and lodging to travellers and to distribute alms to the poor. Many monasteries also provided social insurance or retirement schemes in the form of annuities. The abbots of the larger abbey generally had a seat in parliament (Woodward, 1966, Ch. 2).

¹³The 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 Appendix I. This appendix also includes the entry of the manor of Helton, Lolbroke and Bell as an example.

¹⁴Dissolution 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). The cut-off of two hundred pounds was most likely chosen to maximize the income from expropriation without scaring the abbots of the larger monasteries, who had to vote over the act in parliament (Youings, 1971).

¹⁵It remains a question the full dissolution was planned all along and whether the dissolution was anticipated or not. Scholars have cited Cromwell’s previous experience with dissolution as the aide of Wolsey as well as primary sources as evidence that he planned all along to expropriate the entire church and that the different phases of expropriation were deliberately chosen (Stone, 1951). Others have pointed to the (re)establishment of monasteries in 1537 as evidence that the crown planned to stop after the dissolution of the smaller monasteries (Hallam, 1978). The monasteries, initially, did not anticipate expropriation. There had been *Valors* conducted in the past and these usually led to higher taxation, not expropriation. However, after the dissolution of the lesser monasteries, the larger monasteries anticipated their expropriation. Although Cromwell sent letters to the Abbots guaranteeing their survival they started entrenching their position by increasing their mutual dependence on the country side. They leased out more land, employed more local people and gave out more annuities (see f.i. Youings (1971, p. 109) and Woodward (1966, p. 68)).

The rest of this section details the process by which the ecclesiastical property was confiscated, the methods of disposal of the land once expropriated, the main beneficiaries of the disposal and ends with a more detailed case study of the Hesketh family which directly connects the dissolution to the industrial revolution.

2.1 The process of dissolution

Although the main goal of the dissolution was to transfer the income of the religious houses to the Crown, Cromwell, who was in charge of the dissolution, cited clerical moral turpitude as the reason for expropriation. Before the passing of the first dissolution act, therefore, commissioners were sent around the country to assess clerical moral transgressions¹⁶.

In order to execute the dissolution, the Court of Augmentations was founded in 1536 (Richardson, 1961). This government body oversaw the transition from clerical to state ownership of all ecclesiastical assets. The court had receivers and auditors in every county who would, together with the local gentry, visit a monastery and record its possessions and dependants. This resulted in an official act of dissolution, outlining what was to happen to all possessions and dependants of the monastery¹⁷. The furnishings were auctioned off, the lead from the roofs, the church bells, the precious metals and other items of value were shipped to the Tower of London. Then, the land would be given in stewardship to a local notable, usually a member of the country gentry. After ownership was transferred, the court acted as the new landlord (Woodward, 1966).

¹⁶These official visitations resulted in the *Compendium Compertorum*, a book detailing, per monastery, moral transgressions. In the preamble of the act for the dissolution of the lesser monasteries it is recorded that monasteries are places of 'manifest sin, vicious, carnal, and abominable living' and that they will therefore be dissolved. One example is Abbot John Hexham of Whitby in Yorkshire. He was reported to harass the monastic tenants, to brawl with the local mariners and to be in league with French pirates operating off the coast (Woodward, 1966, p. 9)

¹⁷There 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 religious houses. 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. Many chose a safe pension. Some refused and their possessions were, after conviction of the abbot, forfeited. The most famous example of this is the Abbot of Glastonbury abbey, the most splendid monastery in England after Westminster abbey, who refused to surrender and was hanged, drawn and quartered (Gasquet, 1899). The third way was dissolution by negotiation. Some of the larger abbeys managed to secure favourable arrangements for themselves before signing the deed of Gift. The full procedure of dissolution is given in Youngs (1971, p. 73).

2.2 The local gentry and the disposal of the monastic lands

Some of the expropriated lands were given away as grants 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, Richard Rich¹⁸. Other grantees included Cromwell and several members of the aristocracy. The total amount of land granted appears to have been small. For Devon, it was about 25% of the expropriated monastic land and for Leicestershire around 15% (Youings, 1967, p. 343).

The remaining land was initially leased out by the crown. Although selling of the lands started as early as 1539, it was not until 1543, when war with France broke out, that the crown started selling large swathes of monastic lands. 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). The sale of the monastic land was in hands of the Court of Augmentations¹⁹. Most sales of monastic land were concluded at the fixed price of 20 years income, with the rent being a tenth of annual income. A pervasive pattern is that:

”Most purchasers came from landed stock, even if at the time of making their purchase they happened to be engaged in trade or following a profession.” (Woodward, 1966, p. 131).

In other words, the ecclesiastical land was disproportionately sold to members of the gentry²⁰. Families such as the Knatchbulls from Kent and the Cholwicks from Devon were yeomen at the beginning of the sixteenth century but settled among the gentry over the course of the century, rising to the peerage later. The Levesons of Staffordshire invested profits from wool trading to buy the former Augustinian priory at Trentham. Other members of the gentry used their positions of power in London to obtain lands in their home parishes. Samuel Whitbread used proceeds from the brewing business to set up an estate in Bedfordshire, where his family lived. The three sons of Ronald Barkley, a clothier’s apprentice in London, established themselves as members of the minor gentry in the country side. Famously, Sir Nicholas Bacon rose from being a lawyer to Lord Keeper of the Great Seal and was granted a substantial estate by Henry

¹⁸Richard 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).

¹⁹The process of obtaining land was as follows: Prospective buyers would need to obtain an updated *valor* of the lands they desired from the local augmentations officer. The request and the *valor* would then be submitted to the Court in London. If approved, the sale would be concluded. The prices would initially be set at twenty year’s rent. Around 1560 the price had gone up to 30 and by 1600 it was 40 (Habakkuk, 1958).

²⁰For instance, in Devon, well over 50% of monastic lands were bought by local gentry (Kew, 1970). In Norfolk, the gentry possessed 70% of 1527 manors by 1545; by 1565 this was 76% (Swales, 1969). Not all these gentry were established before and merely expanded their possessions. 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). For Monmouthshire, see Gray (1987). For evidence that monastic land sales around 1600 were still mainly local and that the gentry was still heavily involved in these, see Outhwaite (1971).

(Simpson, 1961). Overall, as noted in Table 1, the proportion of land owned by the gentry increased from 25% in 1436 to 45-50% by 1690. The Church and Crown's share went from 25-35% in 1436 to 5-10% in 1690²¹. The great landowners and the yeomanry, who made up the rest, were relatively stable (examples from Mingay (1976, pp. 8, 9, 41, 59)).

Why was the gentry so disproportionately represented among those buying the monastic land? First, the local gentry were intimately associated with monastic life. Almost all religious houses had a steward, who would officially represent the monastery, acting as an ambassador, and one or more receivers, who would collect rents and other dues. Most houses also employed bailiffs, associated with the manor courts²². Often, these positions were filled by local gentlemen²³. Second, the gentry were granted many new leases on monastic land before the dissolution when the monasteries anticipated expropriation and sought to entrench their positions, probably because of their intimate relation (Woodward, 1966, p. 328; Jack, 1965). Third, the gentry were part of almost every commission involved in the dissolution procedure. The Valor enumerators were by and large members of the local gentry and the higher clergy (Woodward, 1966, p. 59). Often, these enumerators would also be the stewards in the monasteries they assessed. When dissolution was decided, the surrender documents were signed in the presence of the local knights and gentry (Youngs, 1971, pp. 67, 70). After the dissolution, the same gentlemen would be employed as auditors for the Court of Augmentations. Finally, and most importantly, the Court of Augmentations explicitly favoured local people when selling the land. As the gentry had previous claims on monastic property as either employee or lessee, was well informed about what to ask for, had often been employed by the Court, and actively campaigned for dissolution, it is not a surprise that so much land ended up in the hands of the gentry.

A case in point is the case of two brothers, John and Christopher Hales, two Kentish Gentlemen. John Hales, who was also Baron of the Exchequer, held the Stewardship of Canterbury cathedral. Christopher was steward in the monastery of the cathedral. He was also steward in the abbey of St. Augustine, Canterbury, and the park of Chystlett. He furthermore held stewardship with four other monasteries in Kent. Despite their important state positions, Christopher was attorney general, their monastic connections were local. After the Dissolution, this paid off. The lands acquired by Christopher after the Dissolution were by and large formerly owned by the monasteries he used to be Steward for (Savine, 1909, pp. 357-358).

²¹For a detailed study of the rise of then gentry in Huntingdonshire, see Bedells (1990).

²²For a description of the various offices associated with a early modern manor, see Levett (1927).

²³In the *Valor*, the gentry are referred to as *miles*, *armiger* or *magister*. The office of Bailiff is *Ballius* and the office of steward is called *Seneschallus*. Savine (1909, p. 358) provides lists of gentry mentioned in the *Valor*.

2.3 Connecting the dissolution and the industrial revolution: The Case of the Hesketh Family

In the introduction we suggested that even though this connection has not been explored much before, there is a great deal of case study evidence that suggests that the gentry played important roles in the industrial revolution. 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 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. His son, Thomas, was knighted in 1553. In 1561, Thomas 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 Heskeths 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 Heskeths 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).

3 Data and descriptive statistics

For our empirical specifications, we use a parish or a comparable unit for unparished areas from the *GIS of the Ancient Parishes of England and Wales*, based on the work of Roger Kain and Richard Oliver (Kain and Oliver, 2001), as our unit of observation. When we collect parishes that consist of several disjoint tracts of land into a single unit, we have 17,796 units across England and Wales. We then proceed to match every variable of interest to this unit of observation, using the database of parishes underlying the GIS of Ancient Parishes shapefile or a spatial join procedure in ArcGIS. Appendix 1 describes the matching procedure in detail and gives a full description of all variables used in this paper.

3.1 The Valor Ecclesiasticus

We obtain our main independent variable, ecclesiastical income, from the Valor Ecclesiasticus. As described above, Henry VIII sought to divert ecclesiastical income from the Pope to the Crown and the Valor was a survey of the income he could expect to tax. 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). The survey records, deanery by deanery²⁴, sources of temporal income, that is income derived from physical assets such as land, and spiritual income, income derived from holding a particular ecclesiastical office. We exploit the fact that although the survey is categorized by deanery, each individual revenue generating unit is, for instance, located in a village or is a separate manor and, therefore, has a place name (see the example return in Appendix 1). This enables us in principle to locate each unit and attributed it to a parish, even though the owner of the unit, such as a monastery, may be based elsewhere. This way we attribute income to the location where it is generated instead of to the location to where it accrues. We use the full income of the church in England, instead of confining ourselves to income that can with certainty attribute to the monasteries. There are two reasons for this approach. First, the church was intertwined with the monastic economy, many nominally independent rectories and manors paid fees and tithes to a religious house. The dissolution of these houses therefore freed up resources of the nominally independent clergy as well. Second, the monasteries were not the only ecclesiastical units to be dissolved. Chantry (private chapels) and shrines were also dissolved, as were hospitals and religious guilds (Youings, 1971, p. 90). We therefore focus on the income of the church, rather than of the monastic sector.

Locating each entry in the Valor this way yields a dataset of ecclesiastical income that covers modern England almost entirely²⁵. Because we stress the importance of the relationship between the expropriation of ecclesiastical assets and the rise of the gentry, we use only temporal income, being income from physical assets, in our analyses. Figure A1-1 in the appendix gives a heat map of this income, indicating its geographical spread.

²⁴A deanery is an ecclesiastical administrative unit, it is comparable to the hundred, a civil administrative unit.

²⁵See appendix 1 for the missing counties/deaneries.

3.2 Outcome variables

3.2.1 The Mills

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). The return covers, parish by parish, for the entire country, each industrial mill indicating their manufacture (cotton, wool, worsted, flax or silk), whether they were water or steam powered and the number of people employed. For employment we take total employment which includes not just adults of both sexes but also children. Since child labor played such an important part of employment in the early industrial revolution it seems sensible to include them.²⁶ The fact that the geographical unit of observation is the parish enables us to match it directly to the database underlying the GIS of Ancient Parishes. Figure A1-3 below gives a map of the distribution of the number of mills.

3.2.2 Occupational structure

We use the digitized version of the 1831 census (Gatley, 2005) to compute shares of adult male population above twenty employed in different occupational categories. We focus on the share employed in agriculture which, on average, equals 62 percent across our dataset of parishes and on the share employed in retail which, on average, equals 18 percent. Being employed in retail is described as 'Being employed in retail, or in handicraft as masters of workmen' (source: data description file in Gatley (2005)). We use this category rather than the share employed in manufacturing because the manufacturing share is very small, around 3 percent on average. Other categories that are distinguished are people employed as labourers, people employed as bankers or in other skilled professions and a category for those not fitting one of these categories.

3.2.3 The Gentry

The 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 24000 largest cities/towns/villages in England published originally in 1680. For each locality, the survey records the members of the nobility and the number of members of gentry living there. We use the total number of gentry living in a particular locality from the most up to date version published by Adams, from 1700.

²⁶For example in the 1838 data 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 mill employment.

3.2.4 Enclosures

We use data on the location and timing of the parliamentary enclosure movement from *A Domesday of English enclosure acts and awards* by William Tate (Tate and Turner, 1978) as compiled and analyzed by Heldring, Robinson and Vollmer (2014). We describe the matching procedure for this dataset in appendix 1. From this we have whether or not there was an act of parliamentary enclosure between 1750 and 1840 which mentions a particular parish.

3.2.5 Agricultural Patents

We compute the number of patent holders from the returns of patent holders in Woodcroft (1854). These returns²⁷ records 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 the parish between 1700 and 1850.

3.3 Control Variables

3.3.1 The Tudor Lay Subsidies

As discussed above, we exploit the fact that we have a measure of income just before the dissolution of the monasteries to control for pre-existing differences. The source for this measure are the Tudor lay subsidies analyzed by John Sheail (Sheail, 1968), who also provides an abstract of the tax returns (see Hoyle, 1994, for a useful introduction to interpreting Tudor tax subsidies). The original Lay Subsidy was carried out in 1524/25 and records each tax payer and his wealth. It taxed, for each household, the most important source of income of the head of a household. The sources were identified as either personal property, landed incomes or wages. The goods category is not well defined in the survey. It does include cash held, debts owed to the taxpayer and plate. Standing corn and personal attire were not taxable (Sheail, 1968, p. 111). Taxation rates were: a flat rate of 4 pence if the primary source of income was wage income. One-fortieth on goods and one-twentieth 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, he or she was not recorded in the survey. In practice, most people were taxed

²⁷The returns were transcribed and generously made available to use by James Dowey, who uses them in his Ph.D. thesis.

on the goods they possessed.²⁸ In order to identify the total tax income of every household, surveyors were sent out to every hundred and every borough to record this income.

Sheail made an abstract of the returns categorized by county, hundred and then parish/village, recording the number of taxpayers and their income. We digitized his abstract and identified the places by assigning a location code, called a grid reference, to the observations which we subsequently matched to parishes using ArcGIS²⁹. Figure A1-2 below gives a heat map of the income recorded in the Subsidy returns. The survey covers the entire country but the counties Northumberland, Durham, Cumberland, Westmorland and Cheshire (all in the North). The Cinque Ports (Hastings, New Romney, Hythe, Dover and Sandwich) are also omitted. If there were several returns available (such as one for 1524 and one for 1525) we averaged over the available returns.

3.3.2 Other Covariates

Throughout our analysis we use several geographical covariates. In ArcGIS we compute the distance to London, the distance to the sea or the border with Scotland (whichever one is 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 get data on crop suitability and soil type. In ArcGIS we then measure for each of our parishes the soiltype and the crop suitability under the centroid in this parish. Ideally, we would like to average over the shape, but the granularity of the crop 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 proved 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.

3.4 Descriptive Statistics

Table 2 contains the descriptive statistics of our main variables. The first two columns give the means and standard deviations of the variables and then the next two sets of columns report the means of the

²⁸For instance, in the Earsham hundred of Norfolk, 70 percent of all people were taxed on goods. Furthermore, taxes on goods accounted for 90 percent of the total tax paid in this hundred. For Happening hundred in Norfolk, 90 percent of wealth was in goods (Sheail, 1971, 112). For an attempt to estimate total population figures from the 1524/25 returns as well as an attempt to assess the dependence of the total on the omission of the clergy, see Campbell (1981).

²⁹In assigning grid references to the Lay Subsidies, a file of grid references based on Robin Glasscocks gazetteer of the 1334 Lay Subsidy (Glasscock, 1975) has been very helpful. It was generously made available to us by Bruce Campbell. See Appendix 1 for the exact matching procedure

variables for those parishes above the median in terms of the Valor income and below the median. For example, in the first row we report the log of Valor income. This has a mean of 2.48 for the whole sample with a standard deviation of 1.26. The mean for those parishes above the median is 3.37 while that for those parishes below the median is 1.59. The raw data shows some interesting patterns. For example, average mill employment for below median Valor income parishes is 3.39 while for above median it is 30.32. The last two columns show that the difference between these two numbers is statistically significant at the 1% level. Thus mill employment is significantly higher in places which have higher Valor income. This is true also of the number of mills and the presence of mills (when we code a dummy variable=1 if a parish has any textile mills =0 otherwise). The table also shows that the proportion of the labor force in agriculture is lower and retail higher in places with above median Valor income. It also shows, following Tawney (1941a,b) that the average number of gentry per parish is higher in above median Valor parishes. There are 1.26 gentry per parish in the above median parishes but only 0.89 on average for below median parishes a difference which is significant at the 1% level.

However, the data also shows that caution is required. For example, the value of the Lay Subsidy is higher in above median Valor parishes, though the difference is only significant at the 10% level. Higher Valor parishes also tend to be closer to London and the nearest market town, though they are further from a river. Though there are not significant differences in our measures of geographical characteristics, such as wheat suitability, terrain slope and elevation, these numbers do suggest that there may be some underlying fundamental which differ between high and low Valor parishes making it important that we control for these directly and to use other strategies, such as fixed effects, to control for unobservables. Interestingly however, above median valor parishes are further from coalfields on average than below median ones.

4 Main results

4.1 Reduced Form Results

We now turn to examine the reduced form relationship between Valor income and our main outcome variables, starting with the 1838 Mill Census and then moving to the 1831 Census. The econometric model we use here is simple and of the form

$$y_p = \gamma_f + \alpha_V \cdot \log V_p + \mathbf{X}'_p \cdot \alpha_X + \varepsilon_p \quad (1)$$

Here y_p is our dependent variable of interest in parish p which could be the number of mill employees in 1838 or it could be the proportion of the labor force employed in agriculture. $\log V_p$ is log of Valor income in parish p so that α_V is the main coefficient of interest. γ_f is a fixed effect which will be either at the county, hundred or deanery level, $f \in \{c, h, d\}$. The vector \mathbf{X}_p' includes all our other control variables, for example distance to London, terrain slope or the wheat suitability index. Finally ε_p is the error term. We estimate (1) with Ordinary Least Squares.

4.1.1 Using the 1838 Mill Data

Table 3 presents the most parsimonious way of estimating (1). There are three sets of columns with different dependent variables. The first three, (1) to (3) use the number of textile mills as the dependent variable. (4)-(6) use a dummy variable =1 if parish p has at least one mill =0 otherwise. Columns (7)-(9) instead use the total number of mill workers in a parish. The main difference between the three columns within each subset is the level at which the fixed effects are. The first column ((1), (4) and (7)) just uses county fixed effects, the next three use deanery fixed³⁰ effects and the final three use hundred fixed effects. The first row records the coefficient on $\log V_p$. For example in column 1 we see that $\hat{\alpha}_V = 0.254$ with a standard error of 0.105 and highly significant. Column (2) uses the deanery fixed effects instead of the county fixed effects which is at a much lower level of aggregation. The coefficient falls somewhat but as does the standard error so it is still highly significant. In column (3) we use hundred fixed effects instead, giving $\hat{\alpha}_V = 0.189$ with a standard error of 0.0578, again significant at the 1% level. It is interesting to note in all the specifications that the use of hundred fixed effects significantly increases the R^2 of the regression.

In columns (4) to (6) we then estimate the same model but with the mill dummy as the dependent variable. The findings here are very consistent across specifications with almost no change in either the estimated coefficient or the standard error. For example, in column (6) when we use hundred fixed effects we find $\hat{\alpha}_V = 0.0165$ (s.e.=0.00299) and significant at the 1% level.

The final three columns then use the total number of people employed in mills as the dependent variable. Columns (7) through (9) show that there is a robust positive correlation between the log of Valor income and this variable and neither the estimated effects nor the standard errors vary much across specifications.

These results suggest that there is a robust and positive correlation between the importance of monastic income in a parish in the 1530s and the subsequent extent of industrialization. As we noted in the

³⁰Aside from being a low level administrative unit, the deanery is also the unit by which the data in the Valor is organized. The methods coding of the original data by the Valor surveyors as well as the survival of the records vary, therefore, at this deanery level. Including fixed effects at this level therefore helps to alleviate issues arising from differences in coding of the source material and from differential degrees of survival of the material.

introduction these effects are quantitatively important. Moving from the 25th to the 75th percentile in the log of income as recorded in the Valor increases the number of mills by one quarter of one industrial mill. The mean number of mills in a parish in England in its entirety is 0.17. Within our sample the mean is 0.20. Moving through the interquartile range, therefore, increases the number of mills by 1.25 times its mean when we use the specification with fixed effects (column (3)).

What does it mean to be at the 25th percentile (or the 75th) in the distribution of the log of income in the Valor? At around the 25th percentile we find, for instance, the village and parish of Thorney in Nottinghamshire. In 1535, inhabitants of Thorney leased lands generating 20 shillings per year from the Premonstratensian canons who lived in Broadholme priory, some three miles away. Furthermore, the parish had a church that generated tithe income from grain for the priory worth 40 shillings. Lastly, this parish had a vicarage where the parish priest lived, called Robert Yngylbright. The lands belonging to this vicarage were yielding hay, some rye and hemp, and were grazed by sheep, pigs, geese and chickens. All in all, the vicarage yields some 4 pounds in income. The priory was dissolved in 1536 and granted to a Ralph Jackson by the Crown in 1537 (Page, 1910, p.138).

At around the 75th percentile we find the larger village of Sutton Bonnington. In 1535 most of Sutton Bonnington's income was generated by the rectory (16 pounds out of 24). The rector, William Ordinner, had glebe land, land farmed for the benefit of the rector, generating income as well as wheat fields containing a mill. Several pigs, sheep and geese generated tithe income for the rector. In 1870 we find that most manors are held by members of the gentry, W. and G.E. Paget (Wilson, 1872). G.E. Paget would be given the title of Baronet Page, of Sutton Bonnington in 1897 (Kidd and Williamson, 1990). In 1838, Sutton Bonnington had a worsted mill, powered by steam and water power, employing 72 people (Parliament, 1839).

Table 4 examines further the robustness of our main results. As in Table 3 there are again three sets of columns corresponding to the different dependent variables. We use hundred fixed effects in all specifications in the table. The three sets of columns have a similar structure. In the first column of each ((1), (4) and (7)) the only covariate is the log of Lay Subsidy levied in that parish in 1524/25. In the second set of columns ((2), (5) and (8)) we instead control for a parsimonious set of geographical variables: terrain elevation and slope and wheat suitability, while in the last set of columns we add to these the distance to nearest river, market town, to the border and to London.

The main point of this table is to show that the results of Table 3 hold when we control for a proxy for pre-existing income differences across country and for the geographical variables. These could be picking

up several things, for instance factors which might be influencing the intrinsic income of an area, perhaps through agricultural productivity, or alternatively factors that might influence industrialization, perhaps because they facilitate the use of water or steam power. They also capture transportation costs and proximity to large centers of demand, which again likely influenced the location of textile mills.

The main message from Table 4 is that the results of Table 3 are robust to all these strategies. Controlling for Lay Subsidies does reduce the size of the coefficient on Valor and it is only significant at the 10% level in columns (1) and (7) but the Lay Sidsidy variable is not significant in either specification. Though there is obviously some correlation between the Lay Subsidies and Valor income we interpret this as showing that there is not a strong correlation between what regions were prosperous in 1524/25 and where the industrial revolution was, while there is such a correlation between Valor income and the incidence of the industrial revolution. Adding the geographical variables has even less impact on the results. The estimated coefficients change little compared to those in Table 3 and standard errors are very similar. For instance, when we use mill employment as the dependent variable the coefficient without the geographical covariates but with hundred fixed effects is 24.31 (s.e.=7.203) (Table 3 column (9)), and when we add the covariates (Table 4 column (9)) we find the coefficient is 23.42 (s.e.=6.991).

Though they do little to alter the main results of interest some of the estimated coefficients on the controls are interesting. For example, there is a significant negative relationship between distance to market towns and industrialization.

4.1.2 Using the 1831 Census

We now re-work Tables 3 and 4 with different dependent variables taken from the 1831 population census. In Table 5 we reproduce Table 3 where there are now two sets of columns, the first use the proportion of the labor force in agriculture while the second set uses proportion of the labor force employed in retail. The columns differ within these sets by the different type of fixed effect as before. In column (1) we use county fixed effects and find that $\hat{\alpha}_V = -0.0228$ (s.e.=0.00244) and these results are unchanged when we use either the deanery or hundred fixed effects. In all cases there is a significant (at the 1%) negative relationship between Valor income and relative employment in agriculture. The columns (4) to (6) we change the dependent variable to the share of the labor force employed in retail. We again find very robust and significant results. For example, in column (6) when we use hundred fixed effects we find $\hat{\alpha}_V = 0.0137$ (s.e.=0.0014) so there is a positive and highly significant correlation between Valor income and the proportion of the labor force in retail.

We find smaller effects for the employment data in the 1831 census, using the relevant specifications

with fixed effects at the hundred level. For these dependent variables the sample means and the means for England as a whole coincide. For the share of males over 20 employed in agriculture we find that moving along the interquartile range decreases this share by 0.03, compared to a mean of 0.62. For the share of males employed in retail the effect is, expressed as a fraction of the mean of the dependent variable, considerably larger. Increasing the log of Valor income increases the share by 0.02, compared to a mean of 0.18.

Table 6 then examines the robustness of the results of Table 5 using exactly the same strategy as Table 4. The findings are quite similar to those from before. Controlling for Lay Subsidies reduced the estimated coefficient on the Valor substantially but it is still significant and robust across specifications. Lay Subsidy is now significant in columns (1) and (4) with the same sign as Valor income. As before the geographical covariates have little impact of the estimated coefficient of Valor or its standard error.

Taken together these last two tables suggest that in places which had more monastic lands in the 1530s and where the dissolution of the monasteries had a bigger relative impact, there was subsequently more of a movement out of agriculture and into retail a process which is clearly linked to structural change and the industrial revolution.

4.2 Examining the Channels

We now switch to examine three of the channels via which the dissolution of the monasteries might have influenced the industrial revolution. Our econometric strategy is again to estimate (1) by OLS but where now y_p is one of the intermediate variables meant to capture channels. Table 7 reports the basic results where we just control for fixed effects at different levels.

In columns (1)-(3) we use the number of gentry in a parish in 1700 as the dependent variable. We see that there is a robust and positive correlation between Valor income and the number of gentry in 1700. In column (1) $\hat{\alpha}_V = 0.161$ (s.e.=0.012) and highly significant. This result changes little when we use fixed effects at different levels.

The next set of regression examine the impact of Valor income on parliamentary enclosures between 1750 and 1840. We find very robust and significant effects. Since the dependent variable is a dummy one can interpret this model as a linear probability model so what we find is that the greater was Valor income the higher was the probability that land within the parish would be enclosed by an act of parliament. This is consistent with the evidence we cited in the introduction that the gentry were very active in parliament and promoted legislation that furthered their economic interests.

The final three columns examine the impact of Valor income of agricultural innovation as measured by the total number of patents between 1700 and 1850. We find that there is a significant and positive relationship which changes little when we use fixed effects at different levels. For example, with the hundred fixed effects we find an estimated coefficient of $\hat{\alpha}_V = 0.0116$ (s.e.=0.00326) which is significant at the 1% level.

We now turn to the magnitude of the effects for the various channels we consider in table 7. We consider again the specifications with fixed effects at the hundred level. In 1700, there were on average 1.7 members of the gentry in a parish (1.1 in our sample). Moving along the distribution of Valor income we see an increase of 0.17 members of the gentry, or around one fifth of the mean. Similarly, the mean probability of being enclosed is 0.36 (0.46 in our sample). Increasing the log of the Valor income increases the probability of being enclosed by 0.06, or about one eighth of the mean. Finally, the mean number of agricultural patents is 0.02 (0.03) in our sample.

Table 8 then reproduces our basic robustness checks with very similar findings to those from before. Lay Subsidy income does reduce the size of the estimated coefficient on Valor income and is significant itself but only in the case of agricultural patents does it make Valor income insignificant. The Geographical covariates do little to change our basic results.

The results of this section then give credence to all the channels we suggested. First, and most important it shows that Tawney was indeed correct that there was an association between the dissolution of the monasteries and the rise of the gentry. Since the empirical evidence for this has been very controversial (see the essays in Stone, 1965b, and Cooper, 1983), this finding is interesting in itself. It also shows that places where it is likely that the dissolution had more impact tended to have more enclosures, a policy which favored the construction of infrastructure and the rationalization of farming practices and the same places also tended to have more innovation in agriculture.

4.3 Further Robustness Checks

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

4.3.1 Looking just at North-West England

In Table 9 we return to Table 3 but drop all of our sample except for the North-West of England. This gives us 1,193 observations rather than 7,824. Part of the reason why we have such low averages for the number of mills and the probability of having a mill is that industrial activity was disproportionately

located in the North-West part of England. We should therefore expect that, when we limit our sample to the North-West, both the averages as well as the effects increase. This is precisely what we observe. Using the point estimates from Table 9 column (3) we observe that moving from the 25th to the 75th percentile in the distribution of the log of Valor income gives rise to 0.88 extra mills (compared to a sample mean of 0.66), a 0.04 increase in the probability of having a mill (using the coefficient in column (6) and compared to a mean of 0.1) and 119 extra people employed in industrial mills (column (9) - compared to an average number of 63).

4.3.2 Dropping Urban Parishes

Another concern might be that the results using data from the 1831 Census are driven by urban areas. The 1831 census includes an indicator whether or not a parish is urban or not. We drop all urban parishes from the sample and study the association between ecclesiastical income and industrialization for the sub-sample of non-urban parishes. We do the same for borough constituencies. In both cases, the significance and the general magnitude of the coefficients does not change (Table 10).

4.3.3 Artificial parishes

Our actual unit of observation is a specific location defined by coordinates. We have used GIS to assign these observations to administrative units. While administrative units arguably are the natural choice they are also somewhat arbitrary. As a robustness check we divide the country in squares of 5 times 5 kilometers and 10 times 10 kilometers respectively and assign the observations to these shapes³¹. We then study the association between ecclesiastical income and industrialization for these artificial shapes. In the case of 5 times 5 kilometer squares we run the regression with and without fixed effects for the corresponding 10 times 10 kilometer squares. These results are reported in Table 11. It turns out that the ecclesiastical income no longer predicts the number of mills nor the number of people employed in mills. However, it is still strongly associated with the probability of having at least one mill in the parish.

4.3.4 Partial identification

Another threat to our empirical strategy is the fact that we cannot locate all entries of the Valor Ecclesiasticus in GIS. To get a sense of the magnitude of the potential bias resulting from this we assign all unassigned observations from the valor ecclesiasticus randomly to parishes and repeat our main regression with the number of mills and a mill dummy variable as outcome variables. For each observation we at least

³¹The grid is defined as the smallest 5 times 5 kilometer grid that covers the entire country

know the county it belongs to, we can thus do the random assignment in two different ways. In the first case, we assign an unassigned observation to any random parish from the entire country. In the second case, we randomly assign the unassigned observations to a random parish from its own county. We repeat both random assignments 500 times (we will increase this to 10,000 in the final version) and store the p-value of the log ecclesiastical income variable in the regression.

Table 12 shows the summary statistics of the p-values of these regressions controlling for geographical variables and hundred fixed effects. For the number of mills, the average p-value is around 0.03 both for the county match and for the general match. For the general match the p-values range from 0.008 to 0.125 with 12.2 percent of the p-values being above 0.05 and 0.2 percent being above 0.1. For the county match the p-values range from 0.011 to 0.067 with 5.2 percent of the p-values being above 0.05 and none being above 0.1. These results show that the unassigned observations from the valor are not a major threat to our findings. For the mill dummy as outcome variable, all p-values are fairly close to zero and none are larger than 0.05 or 0.1, neither for the general match nor for the county match.

5 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 during the reign of Henry VIII 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 social structure. In particular, Tawney argued that it precipitated the rise of the gentry, a new commercially oriented class of farmers who played a leading role in the political conflicts of 17th century England. Though historians now do not believe that the evidence which Tawney presented supports his original arguments about the connections between the dissolution and the civil war or Glorious Revolution, we argued that nevertheless both theory and case study evidence leads one to hypothesize that there might be a reduced form relationship between the dissolution, the rise of the gentry and the industrial revolution.

The bulk of the paper investigates precisely this. To measure the impact of the dissolution at the parish level we digitized the Valor Ecclesiasticus, the survey of church incomes that Henry VIII commissioned just prior to the dissolution. We showed that the greater was monastic income according to the Valor, the more industrialization there was in 1838 in terms of the presence and number of textile mills and the number of mill employees. We also showed that greater levels of Valor income were associated with a smaller proportion of the labor force employed in agriculture according to the 1831 census, and a larger

share of the labor force employed in retail. We further argued that there are grounds for believing that these correlations can be interpreted causally.

In addition to this reduced form evidence we explored some of the likely channels via which the dissolution of the monasteries might have impacted industrialization. We showed that parishes which had higher levels of Valor income had more gentry in 1700, consistent with Tawney's thesis. We also showed that they had a greater proportion of land enclosed, consistent with the notion that the gentry influenced industrialization via their large influence on parliament. Finally, we also showed that higher levels of Valor income were associated with a greater number of agricultural patents, suggesting that the rise of the gentry was associated with greater agricultural innovation.

All in all, though Tawney might not have been right about the connection between the gentry and the civil war, he was correct that the rise of the gentry was associated with the dissolution of the monasteries and our evidence suggests that it was also connected to perhaps an even more momentous event, the industrial revolution.

6 References

Acemoglu, Daron, Simon Johnson and James A. Robinson (2005) "The Rise of Europe: Atlantic Trade, Institutional Change and Economic Growth," *American Economic Review*, 95, 546-579.

Acemoglu, Daron, Davide Cantoni, Simon Johnson, and James A Robinson (2011) "The Consequences of Radical Reform: The French Revolution," *American Economic Review*, 101(7), 3286-3307.

Acemoglu, Daron, James A. Robinson (2012) *Why Nations Fail*, New York: Crown Business.

Adams, John (1700) *Index Villaris*.

Allen, Robert C. (2009) *The British Industrial Revolution in Global Perspective*, New York: Cambridge University Press.

Andersen, Thomas Barnebeck, Jeanet Bentzen, Carl-Johan Dalgaard and Paul Sharp (2013) "Pre-Reformation Roots of the Protestant Ethic,"

<http://www.econ.ku.dk/dalgaard/Work/WPs/Prereformationroots.pdf>

Aston, T.S. and C. H. E. Philpin eds. (1987) *The Brenner Debate: Agrarian Class Structure and Economic Development in Pre-industrial Europe*, New York: Cambridge University Press.

Blackwood, B. G. (1978) *The Lancashire gentry and the Great Rebellion, 1640-60*, Manchester: University of Manchester Press.

Barlow, Frank (1979a) *The English church, 1000-1066: a history of the later Anglo-Saxon church*, 2d ed., New York: Longman.

Barlow, Frank (1979b) *The English church, 1066-1154: a history of the Anglo-Norman church*, New York: Longman.

Barlow, Frank (1999) *The Feudal Kingdom of England, 1042-1216*, 5th Edition, New York: Longman.

Becker, Sascha O. and Ludger Woessmann (2009) "Was Weber Wrong? A Human Capital Theory of Protestant Economic History," *Quarterly Journal of Economics*, 124(2), 531-596.

Bedells, John (1990) "The Gentry of Huntingdonshire," *Local Population Studies*, 44, 30-40.

Berman, Harold J. (1983) *Law and Revolution: The Formation of the Western Legal Tradition*, Cambridge: Harvard University Press.

Bernard, G.W. (2007) *The King's Reformation: Henry VIII and the remaking of the English Church*, New Haven: Yale University Press.

Blair, John (2005) *The Church in Anglo-Saxon society*, New York: Oxford University Press.

Bolton, J.H. (1980) *The Medieval English Economy, 1150-1500*, London: J.M. Dent.

Bramall, Chris (2004) "Chinese Land Reform in Long-Run Perspective and in the Wider East Asian Context," *Journal of Agrarian Change*, 4(1), 107-141.

Brenner, Robert (1976) "Agrarian Class Structure and Economic Development in Pre-Industrial Europe," *Past & Present*, 70, 30-75.

Brenner, Robert (1993) *Merchants and Revolution: Commercial Change, Political Conflict, and London's Overseas Traders, 1550-1653*, Princeton; Princeton University Press.

Caley, John and John Hunter (eds.) (1810) *Valor ecclesiasticus temp. Henr. VIII: auctoritate regia institutus*, Volume I, Record Commission.

Caley, John and John Hunter (eds.) (1814) *Valor ecclesiasticus temp. Henr. VIII: auctoritate regia institutus*, Volume II, Record Commission.

Caley, John and John Hunter (eds.) (1817) *Valor ecclesiasticus temp. Henr. VIII: auctoritate regia institutus*, Volume III, Record Commission.

Caley, John and John Hunter (eds.) (1821) *Valor ecclesiasticus temp. Henr. VIII: auctoritate regia institutus*, Volume IV, Record Commission.

Caley, John and John Hunter (eds.) (1825) *Valor ecclesiasticus temp. Henr. VIII: auctoritate regia institutus*, Volume V, Record Commission.

Caley, John and John Hunter (eds.) (1831) *Valor ecclesiasticus temp. Henr. VIII: auctoritate regia institutus*, Volume VI, Record Commission.

Campbell, Bruce M. S. (1981) “The Population of Early Tudor England: A Re-evaluation of the 1522 Muster Returns and 1524 and 1525 Lay Subsidies,” *Journal of Historical Geography*, 7: 145–154.

Campbell, Bruce M. S.(1983) “Arable productivity in medieval England: some evidence from Norfolk,” *Journal of Economic History*, XLIII, 379-404.

Campbell, Bruce M.S. (2006) *English Seigniorial Agriculture, 1250-1450*, New York: Cambridge University Press.

Cantoni, Davide (2013) “The Economic Effects of the Protestant Reformation: Testing the Weber Hypothesis in the German Lands,” <http://ideas.repec.org/p/lmu/muenec/14811.html>

Carpenter, Christine (1992) *Locality and Polity: a Study of Warwickshire Landed Society, 1401-99*, New York: Cambridge University Press.

Carter, P. R. N. (2004) *Rich, Richard, first Baron Rich (1496/7 –1567)*, *Oxford Dictionary of National Biography*, Oxford: Oxford University Press.

Clay, C.G.A. (1984) *Economic Expansion and Social Change: England 1500-1700: Volume 2, Industry, Trade and Government*. Cambridge University Press.

Cliffe, J.T. (1969) *Yorkshire Gentry from the Reformation to the Civil War*, London: The Athlone Society.

Cooper, J.P. (1967) “The Social Distribution of Land and Men in England, 1436-1700,” *Economic History Review*, 20(3), 419–436.

Cooper, J.P. (1983) *Land, Man and Beliefs: Studies in Early-Modern History*, London: The Hambledon Press.

Crafts, Nicholas and Nikolaus Wolf (2013) “The Location of the UK Cotton Textiles Industry in 1838: a Quantitative Analysis,” http://www2.warwick.ac.uk/fac/soc/economics/research/centres/cage/research/wpfeed/148-2013_crafts.pdf

Crouzet, François (1985) *The First Industrialists: The Problem of Origins*, New York: Cambridge University Press.

Darby, H.C. , R.E. Glasscock, J. Sheail, G.R. Versey (1979) “The changing geographical distribution of wealth in England: 1086–1334–1525,” *Journal of Historical Geography*, 5(3) 247–262.

Daunton, Martin J. (1994) “The Entrepreneurial State, 1700-1914,” *History Today*, 44(6), 11-16.

Daunton, Martin J. (1995) *Progress and Poverty: An Economic and Social History of Britain 1700-1850*, New York: Oxford University Press.

de Vries, Jan (2008) *The Industrious Revolution: Consumer Behavior and the Household Economy, 1650 to the Present*, New York: Cambridge University Press.

- Dore, Ronald P. (1959)** Land Reform in Japan, Oxford: Oxford University Press.
- Dore, Ronald P. (1965)** “Land Reform and Japan’s Economic Development,” *The Developing Economies*, 3(4), 487–96.
- Duffy, Eamon (2005)** The stripping of the altars: Traditional religion in England, c. 1400- c. 1580, New Haven: Yale University Press.
- Ekelund, Robert B., Robert F. Hébert, Robert D. Tollison, Gary M. Anderson and Audrey B. Davidson (1996)** Sacred Trust: The Medieval Church as an Economic Firm, New York: Oxford University Press.
- Elton, Geoffrey R. (1953)** The Tudor revolution in government: administrative changes in the reign of Henry VIII, Cambridge: Cambridge University Press.
- Farrer, William and J. Brownbill (1908)**. The Victoria history of the county of Lancaster, Volume 2, London: Constable.
- Fleming, Robin (1991)** *Kings and Lords in Conquest England*, New York: Cambridge University Press.
- Gatley, D. (2005)**. 1831 Census Database as Organised by the Registration Districts of 1851 [computer file]. SN: 4961, <http://dx.doi.org/10.5255/UKDA-SN-4961-1>.
- Gasquet, Aidan (1899)** Henry VIII and the English monasteries. London: Nimmo.
- Glasscock, Robin E. (1975)**. The lay subsidy of 1334. Oxford: Oxford University Press for the British Academy.
- Gilchrist, John T. (1969)** The Church and Economic Activity in the Middle Ages, London: St. Martin’s Press.
- Gray, M. (1987)**. “Crown property and the land market in south-east wales in the sixteenth century” *The Agricultural History Review* 35 (2), 133–150.
- Griffin, Keith, A. Rahman Khan and A. Ickowitz (2002)** “Poverty and Distribution of Land,” *Journal of Agrarian Change*, 2 (3), 279–330.
- Grossman, Stanford J. and Oliver D. Hart (1986)** “The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration,” *Journal of Political Economy*, 94(4), 691-719.
- Habakkuk, H. J. (1958)** “The market for monastic property, 1539–1603 ” . *The Economic History Review* 10 (3), 362–380.
- Haight, C. (1993)** English Reformations: Religion, Politics, and Society Under Tudors, Nation. Oxford: Oxford University Press.

Hallam, E. M. (1978) “Henry VIII’s monastic refoundations of 1536–7 and the course of the dissolution ” , *Historical Research* 51 (124), 124–131.

Hare, J.B. (1985) “The monks as landlords: The leasing of the demesnes in southern England,” in Caroline M. Barrows and Christopher Harper-Bill eds. *The Church in pre-Reformation society: Essays in honour of F.R.H. du Boulay*, London: Boydell & Brewer.

Hasler, P. W. (2006) *The History of Parliament: The House of Commons, 1558-1603*, London: Boydell and Brewer.

Heal, Felicity and Clive Holmes (1994) *The Gentry in England and Wales, 1500-1700*, Stanford: Stanford University Press.

Heldring, Leander, James A. Robinson and Sebastian Vollmer (2014) “Enclosures and Agricultural Productivity in England,” work in progress.

Hoyle, Richard W. (1994) *Tudor taxation records: A guide for users*, London: Public Records Office.

Hoyle, R. (1995) “The Origins of the Dissolution of the Monasteries ” *The Historical Journal* 38 (02), 275 – 305.

Hudson, Pat (2002) *The Genesis of Industrial Capital: A Study of West Riding Wool Textile Industry, c.1750-1850*, New York: Cambridge University Press.

Hudson, Pat ed. (1989) *Regions and Industries: A Perspective on the Industrial Revolution in Britain*, New York: Cambridge University Press.

Hughes, Ann (1998) *The Causes of the English Civil War*, New York: St. Martin’s Press.

Husbands, Chris (1987) “Regional change in a pre-industrial economy: wealth and population in England in the sixteenth and seventeenth centuries,” *Journal of Historical Geography*, 13(4), 345–359.

Jack, Sybil M. (1965) “Monastic lands in leicestershire and their administration on the eve of the dissolution,” *Transactions of the Leicestershire Archaeological and Historical Society*, 1965–6.

Jenkin, Philip (1983) *The Making of a Ruling Class: The Glamorgan Gentry 1640-1790*, New York: Cambridge University Press.

Jha, Saumitra (2010) “Financial Innovations and Political Development: Evidence from Revolutionary England,” http://papers.ssrn.com/sol3/papers.cfm?abstract_id=934943

Jones, Eric L. (2010) *Locating the Industrial Revolution*, London: World Scientific.

Kain, R. and R. Oliver (2001) *Historic Parishes of England and Wales : an Electronic Map of Boundaries before 1850 with a Gazetteer and Metadata [computer file]*. SN: 4348, <http://dx.doi.org/10.5255/UKDA-SN-4348-1>.

Kew, J. (1970) “The disposal of crown lands and the devon land market, 1536-58,” *The Agricultural History Review* 18 (2), 93–105.

Kidd, Charles and David Williamson (Eds.) (1990) *Debretts Peerage and Baronetage*, New York: St. Martin’s Press

King, Gregory (1696) *Natural and Political Observations and Conclusions Upon the State and Condition of England*, 1696. Published 1810, London: Stockdale.

Knowles, D. (1979) *The religious orders in England, Volume 3*. Cambridge: Cambridge University Press.

Kosminsky, E. A. (1961) *Studies in the Agrarian History of England in the Thirteenth Century*, Oxford: Basil Blackwell.

Langton, John (1979a) *Geographical Change and Industrial Revolution: Coalmining in South West Lancashire, 1590-1799*, New York: Cambridge University Press.

Langton, John (1979b) “Landowners and the Development of Coalmining in South-West Lancashire, 1590-1799,” in H.S.A. Fox and Robin A. Butlin eds. *Change In The Countryside - Essays on Rural England 1500-1900*, London: Institute of British Geographers.

Levett, Ada E. (1927) “The financial organization of the manor,” *The Economic History Review* 1 (1), 65–86.

McKendrick, Neil (1964) “Josiah Wedgwood and Thomas Bentley: An Inventor-Entrepreneur Partnership in the Industrial Revolution,” *Transactions of the Royal Historical Society* (Fifth Series), 14, 1-33.

Mingay, Gordon E. (1976) *The gentry: the rise and fall of a ruling class*, London: Longman.

Mokyr, Joel (2010) *The Enlightened Economy: An Economic History of Britain 1700-1850*, New Haven: Yale University Press.

Moore, R. I. (2000) *The First European Revolution, 970-1215*, Oxford: Basil Blackwell.

Morrill, John S. (1993) *The Nature of the English Revolution*, Longman; New York.

Nef, John U. (1966) *The Rise of the British Coal Industry, Volume II*, Routledge.

Nightingale, Pamela (2004) “The lay subsidies and the distribution of wealth in medieval England, 1275–1334,” *Economic History Review*, 57(1), 1-32.

North, Charles M. and Carl R. Gwin, (2010) “Religion and the Emergence of the Rule of Law,” in Ilkka Pyysiäinen ed. *Religion, Economy, and Cooperation*, New York: Walter de Gruyter.

North, Douglass C. (1981) *Structure and Change in Economic History*, New York; W.W. Norton & Co.

North, Douglass C. and Robert P. Thomas (1973) *The Rise of the Western World: A New Economic History*, Cambridge University Press, Cambridge UK.,

North, Douglass C. and Barry R. Weingast (1989) “Constitutions and Commitment: Evolution of Institutions Governing Public Choice in Seventeenth Century England, *Journal of Economic History*, 49, 803-832.

Overton, Mark (1996) *Agricultural Revolution in England*, New York: Cambridge University Press.

Outhwaite, R. (1971) “Who bought crown lands? the pattern of purchases, 1589–1603,” *Historical Research* 44 (109), 18–33.

Page, William (Ed.) (1910). *The Victoria history of the county of Nottinghamshire*, Volume 2, London: Boydell and Brewer.

Parliament (1839) *Return of All the Mills and Factories*.

Pincus, Steven C.A. (2011) *1688: The First Modern Revolution*, New Haven: Yale University Press.

Pincus, Steven C.A. and James A. Robinson (2013) “The Rise of the Developmental State,” working paper.

Pincus, Steven C.A. and James A. Robinson (2014) “What Really Happened during the Glorious Revolution?” in Sebastián Galiani and Itai Sened eds. *Institutions, Economic Growth, and Property Rights: The Legacy of Douglass North*, New York: Cambridge University Press.

Pirenne, Henri (1914) “The Stages in the Social History of Capitalism,” *American Historical Review*, 19(3), 494-515.

Postan, M.M. (1944) “The Rise of a Money Economy,” *Economic History Review*, 14(2), 123-134.

Raban, Sandra (1974) “Mortmain in Medieval England,” *Past & Present*, 62, 3-26.

Rabb, Theodore K. (1999) *Enterprise and empire: Merchant and gentry investment in the expansion of England, 1575-1630*, New York: Routledge/Thoemmes Press.

Richardson, R.C. (1998) *The Debate on the English Revolution*, 3rd Edition, Manchester; University of Manchester Press.

Richardson, Walter C. (1961) *History of the Court of Augmentations, 1536-1554*, Baton Rouge: Louisiana State University Press.

Robinson, Eric (1964) “Matthew Boulton and the Art of Parliamentary Lobbying,” *The Historical Journal*, 7(2), 209-229.

Rosenthal, Jean-Laurent and R. Bin Wong (2011) *Before and Beyond Divergence: The Politics of Economic Change in China and Europe*, Cambridge: Harvard University Press.

Russell, Conrad (1990) *The Causes of the English Civil War*, New York; Oxford University Press.

- Savine, Alexander (1909)** "English Monasteries on the Eve of the Dissolution," In P. Vinogradoff (Ed.), *Oxford Studies in Social and Legal History*, Volume I.
- Scarisbrick, John J. (1968)** *Henry VIII*, Berkeley: University of California Press.
- Schofield, Roger S. (1965)** "The Geographical Distribution of Wealth in England, 1334–1649," *Economic History Review*, 18(3), 483–510.
- Schofield, Roger S. (2004)** *Taxation Under the Early Tudors 1485-1547*, New York: Wiley.
- Schumpeter, Joseph A. (1954)** *A History of Economic Analysis*, New York: Oxford University Press.
- Scoones, Ian, Nelson Marongwe, Blasio Mavedzenge, Jacob Mahenehene, Felix Murimbarimba and Chrispen Sukume (2010)** *Zimbabwe's Land Reform: myths and realities*, Oxford: James Currey.
- Sheail, John (1968)** *The regional distribution of wealth in England as indicated in the 1524/5 lay subsidy returns. The List and Index Society special series*, London: The List and Index Society.
- Sheail, John (1972)** "The Distribution of Taxable Population and Wealth in England during the Early Sixteenth Century," *Transactions of the Institute of British Geographers*, 55, 111-126.
- Simpson, Alan (1961)** *The wealth of the gentry, 1540-1660: East Anglian studies*, Chicago: University of Chicago Press.
- Stone, Lawrence (1951)** "The political programme of Thomas Cromwell," *Historical Research* 24 (s12), 1–18.
- Stone, Lawrence (1965a)** *Crisis of the Aristocracy, 1558-1641*, Oxford: Clarendon Press.
- Stone, Lawrence ed. (1965b)** *Social Change and Revolution in England, 1540-1640*, New York: Longman.
- Stone, Lawrence (1972)** *The Causes of the English Revolution, 1529-1642*, New York; Routledge.
- Stone, Lawrence (1985)** "The Bourgeois Revolution of Seventeenth Century England Revisited," *Past and Present*, 109, 44-54.
- Strahan, A. (1912)** *Map Showing Visible and Proved Coal Fields of England and Wales*. In W. McInnes, D. Dowling, and W. Leach (Eds.), *The Coal Resources of the World*. Toronto: Morang & co.
- Swain, John T. (1986)** *Industry Before the Industrial Revolution: North-east Lancashire, C. 1500-1640*, Manchester: University of Manchester Press.
- Swales, T. (1969)** "The redistribution of monastic lands in Norfolk at the dissolution," *Norfolk Archaeology* 34, 14–44.
- Swanson, R.N. (1989)** *Church and Society in Late Medieval England*, Oxford: Basil Blackwell.

- Tate, William E. and Michael Turner (1978)** *A Domesday of English enclosure acts and awards*. Reading: University of Reading.
- Tawney, R.H. (1941a)** "The Rise of the Gentry," *Economic History Review*, 11(1), 1-38.
- Tawney, R.H. (1941b)** "Harrington's Interpretation of his Age," *Proceedings of the British Academy*, Volume 27, 1941.
- Thirsk, Joan and J.P. Cooper eds. (1972)** *Seventeenth Century Economic Documents*, Oxford: Oxford University Press.
- Thomas, Hugh M. (2007)** *The Norman Conquest: England after William the Conqueror*, New York: Rowman & Littlefield Publishers.
- Tilly, Charles (1990)** *Coercion, Capital, and European States, AD 990-1990*, Cambridge MA; Basil Blackwell.
- Voth, Hans-Joachim (2001)** *Time and Work in England, 1750-1830*, Oxford: Oxford University Press.
- Weber, Max (1993) [1905]** *The Protestant Ethic and the Spirit of Capitalism*, Routledge, London.
- Williamson, Oliver (1985)** *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*, New York: The Free Press.
- Wilson, Thomas (1936)** *The State of England, "anno Dom." 1600*. Camden Society
- Wilson, John Marius (1872)** *Imperial Gazetteer of England and Wales*
- Woodcroft, Bennet (1854)** *Titles of Patents of Invention, Chronologically Arranged: From March 2, 1617 (14 James I.) to October 1, 1852 (16 Victoriae)*, London: G.E. Eyre & W. Spottiswoode.
- Woodward, George W. O. (1966)** *The dissolution of the monasteries*. London: Blandford Press.
- Youngs, Joyce A. (1967)** The church. in Joan Thirsk, ed., *The Agrarian History of England and Wales* volume 4, 1500–1640.
- Youngs, Joyce A. (1971)** *The Dissolution of the Monasteries*, London: Allen and Unwin.

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

The figures are taken from Clay (1986, p. 143). Clay uses different cutoffs. He breaks up the Aristocracy and gentry into great magnates and middling and lesser gentry. We have termed the great magnates Aristocracy and greater gentry.

Table 2: Summary Statistics for selected variables

	Full sample		Above median log income in Valor		Below median log income in Valor		Difference of means	
	mean	sd	mean	sd	mean	sd	difference	t-stat difference
ln(Valor income)	2.48	1.26	3.37	0.64	1.59	1.09	1.781***	(88.31)
Nr. of Mills	0.17	4.05	0.36	7.75	0.05	0.51	0.314*	(2.52)
Mill dummy	0.04	0.20	0.06	0.23	0.03	0.17	0.0263***	(5.70)
Mill employment	15.67	279.66	30.32	447.40	3.39	37.70	26.93***	(3.75)
Income p.c. Lay Subsidies	45.46	125.09	47.84	128.60	41.27	88.56	6.576*	(2.18)
Share employed in agriculture 1831	0.62	0.25	0.61	0.22	0.65	0.24	-0.0375***	(-6.87)
Share employed in retail 1831	0.18	0.13	0.20	0.12	0.17	0.13	0.0262***	(8.94)
Number of Gentry in 1700	1.70	66.27	1.26	1.19	0.89	0.99	0.363***	(12.77)
Terrain elevation	88.40	75.53	76.26	59.25	80.88	63.89	-4.612***	(-3.31)
Terrain slope	2.63	1.96	2.45	1.72	2.43	1.64	0.0248	(0.65)
Wheat suitability	37.68	15.45	41.05	14.79	41.47	14.86	-0.422	(-1.26)
Distance to nearest river	2.47	2.12	2.62	2.17	2.53	2.09	0.0969*	(2.01)
Distance to nearest market town	6.12	3.41	5.75	3.25	5.98	3.05	-0.239***	(-3.35)
Distance to the border	26.26	21.44	25.10	20.86	27.37	21.49	-2.278***	(-4.76)
Distance to London	199.13	107.16	166.37	89.23	179.85	92.66	-13.48***	(-6.55)
Distance to nearest coalfield	42.50	41.06	54.21	42.29	47.41	42.571	6.795***	(7.08)
Observations	16297		3912		3912			

Notes: The share employed in agriculture 1831 denotes the share of males over 20 that is employed in agriculture. Similarly for the share in retail.

Table 3: Income in VE predicts mills

	Number of Mills			Mill dummy			Number of people employed in mills		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ln(Valor income)	0.254** (0.105)	0.215*** (0.0728)	0.189*** (0.0578)	0.0172*** (0.00217)	0.0166*** (0.00228)	0.0165*** (0.00229)	21.59*** (6.040)	19.40*** (6.229)	24.31*** (7.203)
Fixed Effects	County	Deanery	Hundred	County	Deanery	Hundred	County	Deanery	Hundred
Mean dep. var.	0.17	0.17	0.17	0.04	0.04	0.04	16	16	16
Observations	7824	7824	7823	7824	7824	7823	7824	7824	7823
R^2	0.029	0.073	0.854	0.070	0.148	0.352	0.054	0.126	0.245

Notes: All regressions are OLS with fixed effects at the level indicated in the table. Robust standard errors are reported in parentheses. The unit of observation is an ecclesiastical parish in 1851. Number of mills is the total number of cotton, wool, flax and worsted mills in 1838, mill dummy indicates if there was a mill in 1838, and number of people employed in mills is the total number of people employed in 1838 (Parliament, 1839). ln(Valor income) is the log of total income of the Catholic Church generated by temporal possessions measured in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 4: Pre-existing differences and geographical controls

	Nr. of Mills			Mill Dummy			Nr. of people employed in mills		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ln(Valor income)	0.172* (0.103)	0.186*** (0.0565)	0.182*** (0.0567)	0.0120*** (0.00275)	0.0167*** (0.00228)	0.0159*** (0.00225)	17.05* (9.591)	24.11*** (7.146)	23.43*** (6.992)
ln(Lay Subsidy income)	0.0543 (0.0708)			0.0212*** (0.00337)			11.06 (10.15)		
Terrain elevation		-0.00214 (0.00138)	-0.00188 (0.00144)		-0.000185* (0.0000961)	-0.0000853 (0.000104)		-0.115 (0.141)	-0.0330 (0.151)
Terrain slope		0.0222 (0.0293)	0.0152 (0.0312)		0.0127*** (0.00322)	0.0113*** (0.00327)		-0.739 (4.162)	-1.962 (4.434)
Wheat suitability		0.000976 (0.00337)	0.00119 (0.00331)		-0.000323 (0.000241)	-0.000127 (0.000262)		-0.0343 (0.702)	-0.125 (0.558)
Distance to nearest river			-0.0188 (0.0123)			-0.00442*** (0.00122)			-1.284 (1.353)
Distance to nearest market town			-0.0386** (0.0159)			-0.00636*** (0.00107)			-6.477*** (2.470)
Distance to the border			0.00581 (0.00491)			0.000245 (0.000581)			0.0840 (0.628)
Distance to London			0.00595 (0.00521)			0.000287 (0.000483)			0.200 (0.955)
Distance to nearest coalfield			-0.00868* (0.00480)			0.000251 (0.000461)			-1.753* (0.905)
Soiltype dummies	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	5175	7819	7819	5175	7819	7819	5175	7819	7819
R ²	0.890	0.854	0.855	0.362	0.355	0.367	0.343	0.245	0.249

Notes: All regressions are OLS with fixed effects at the hundred level. Robust standard errors are reported in parentheses. The unit of observation is an ecclesiastical parish in 1851. Number of mills is the total number of cotton, wool, flax and worsted mills in 1838, mill dummy indicates if there was a mill in 1838, and number of people employed in mills is the total number of people employed in 1838 (Parliament, 1839). ln(Valor income) is the log of total income of the Catholic Church generated by temporal possessions measured in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). ln(Lay Subsidy income) is the log of taxable income from the 1524/5 lay subsidy returns (Sheail, 1968). Elevation is the average elevation of the terrain measured in meters (<http://srtm.csi.cgiar.org/>). Slope is the average slope of the terrain measured in degrees (<http://eros.usgs.gov>). Wheat suitability is the average value of an index of soil suitability for growing wheat ranging from 0 to 100 (<http://webarchive.iiasa.ac.at/>). Distance to the nearest river, the nearest market town, the sea and London are based on own calculations in GIS and are measured in kilometers. The database of market towns comes from Adams (1680[1700]). * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 5: Income in the Valor Ecclesiasticus and the 1831 census

	Share of males over 20 employed in agriculture			Share of males over 20 employed in retail		
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Valor income)	-0.0228*** (0.00244)	-0.0222*** (0.00258)	-0.0254*** (0.00229)	0.0132*** (0.00139)	0.0135*** (0.00144)	0.0137*** (0.00140)
Fixed Effects	County	Deanery	Hundred	County	Deanery	Hundred
Mean dep. var.	0.62	0.62	0.62	0.18	0.18	0.18
Observations	7139	7139	7139	7139	7139	7139
R^2	0.109	0.194	0.438	0.038	0.113	0.327

Notes: All regressions are OLS with fixed effects at the level indicated in the table. Robust standard errors are reported in parentheses. The unit of observation is an ecclesiastical parish in 1851. Agricultural share is the share of males aged 20 and above employed in agriculture in the 1831 census. Retail share is the share of males aged 20 and above employed in retail in the 1831 census. ln(Valor income) is the log of total income of the Catholic Church generated by temporal possessions measured in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 6: Pre-existing differences and geographical controls

	Share of males over 20 employed in agriculture			Share of males over 20 employed in retail		
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Valor income)	-0.0139*** (0.00279)	-0.0244*** (0.00228)	-0.0227*** (0.00219)	0.00640*** (0.00172)	0.0134*** (0.00140)	0.0125*** (0.00136)
ln(Lay Subsidy income)	-0.0611*** (0.00329)			0.0345*** (0.00196)		
Terrain elevation		0.000734*** (0.0000875)	0.000499*** (0.0000932)		-0.000291*** (0.0000493)	-0.000179*** (0.0000520)
Terrain slope		-0.0169*** (0.00307)	-0.0150*** (0.00298)		0.00190 (0.00169)	0.000709 (0.00169)
Wheat suitability		0.00101*** (0.000305)	0.000514 (0.000324)		-0.0000170 (0.000169)	0.0000870 (0.000184)
Distance to nearest river			0.00427*** (0.00145)			-0.00161* (0.000836)
Distance to nearest market town			0.0152*** (0.00112)			-0.00745*** (0.000677)
Distance to the border			0.000583 (0.000578)			-0.000231 (0.000335)
Distance to London			-0.000439 (0.000465)			0.000121 (0.000266)
Distance to nearest coalfield			0.00101* (0.000526)			0.000372 (0.000298)
Soiltype dummies	No	Yes	Yes	No	Yes	Yes
Observations	4915	7135	7135	4915	7135	7135
R^2	0.438	0.448	0.476	0.311	0.332	0.354

Notes: All regressions are OLS with fixed effects at the hundred level. Robust standard errors are reported in parentheses. The unit of observation is an ecclesiastical parish in 1851. Agricultural share is the share of males aged 20 and above employed in agriculture in the 1831 census. Retail share is the share of males aged 20 and above employed in retail in the 1831 census. ln(Valor income) is the log of total income of the Catholic Church generated by temporal possessions measured in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). ln(Lay Subsidy income) is the log of taxable income from the 1524/5 lay subsidy returns (Sheail, 1968). Elevation is the average elevation of the terrain measured in meters (<http://srtm.csi.cgiar.org/>). Slope is the average slope of the terrain measured in degrees (<http://eros.usgs.gov>). Wheat suitability is the average value of an index of soil suitability for growing wheat ranging from 0 to 100 (<http://webarchive.iiasa.ac.at/>). Distance to the nearest river, the nearest market town, the sea and London are based on own calculations in GIS and are measured in kilometers. The database of market towns comes from Adams (1680[1700]). * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 7: Income in Valor predicts intermediate variables

	Number of Gentry in 1700			Parliamentary enclosure 1750-1840			Nr. of Agricultural patents 1700-1850		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ln(Valor income)	0.161*** (0.0120)	0.152*** (0.0125)	0.141*** (0.0122)	0.0458*** (0.00439)	0.0427*** (0.00460)	0.0443*** (0.00470)	0.0160*** (0.00426)	0.0150*** (0.00381)	0.0116*** (0.00326)
Fixed Effects	County	Deanery	Hundred	County	Deanery	Hundred	County	Deanery	Hundred
Mean dep. var.	1.7	1.7	1.7	0.36	0.36	0.36	0.02	0.02	0.02
Observations	5978	5978	5977	7824	7824	7823	7824	7824	7823
R^2	0.091	0.173	0.313	0.145	0.205	0.304	0.012	0.074	0.328

Notes: All regressions are OLS with fixed effects at the level indicated in the table. Robust standard errors are reported in parentheses. The unit of observation is an ecclesiastical parish in 1851. Number of Gentry is the total number of gentry in 1700 recorded in Adams (1680[1700]). Parliamentary enclosure indicates if there was an act of parliamentary enclosure between 1750 and 1840 that includes part of the parish (Tate and Turner, 1978). Number of agricultural patents is the total number of agricultural patents that were registered to people living in the parish between 1700 and 1850 (Woodcroft, 1854, 1862). ln(Valor income) is the log of total income of the Catholic Church generated by temporal possessions measured in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 8: Intermediate variables and controls

	Nr. of Gentry in 1700			Parliamentary enclosure 1750-1840			Nr. of Agricultural patents 1700-1850		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ln(Valor income)	0.0756*** (0.0154)	0.139*** (0.0122)	0.133*** (0.0120)	0.0277*** (0.00657)	0.0449*** (0.00469)	0.0441*** (0.00469)	0.00278 (0.00422)	0.0112*** (0.00324)	0.0109*** (0.00326)
ln(Lay Subsidy income)	0.303*** (0.0189)			0.0646*** (0.00748)			0.0170*** (0.00406)		
Terrain elevation		-0.00134*** (0.000469)	-0.000213 (0.000501)		0.000506*** (0.000180)	0.000539*** (0.000198)		-0.000246*** (0.0000817)	-0.000205** (0.0000947)
Terrain slope		0.0233 (0.0169)	0.0155 (0.0172)		-0.0286*** (0.00623)	-0.0297*** (0.00633)		0.0114*** (0.00441)	0.0117** (0.00461)
Wheat suitability		0.000497 (0.00179)	0.000719 (0.00199)		0.00000596 (0.000665)	0.000158 (0.000758)		-0.00118*** (0.000448)	-0.000684* (0.000411)
Distance to nearest river			-0.00914 (0.00847)			-0.00382 (0.00337)			-0.00256* (0.00133)
Distance to nearest market town			-0.0498*** (0.00588)			-0.00330 (0.00228)			-0.00494*** (0.00145)
Distance to the border			-0.0102*** (0.00338)			0.000485 (0.00137)			0.00120 (0.00104)
Distance to London			-0.00291 (0.00271)			0.00152 (0.00107)			-0.000421 (0.000489)
Distance to nearest coalfield			-0.000504 (0.00317)			0.00398*** (0.00120)			-0.000900 (0.000606)
Soiltype dummies	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	4141	5974	5974	5175	7819	7819	5175	7819	7819
R^2	0.371	0.314	0.330	0.322	0.306	0.310	0.353	0.330	0.336

Notes: All regressions are OLS with fixed effects at the hundred level. Robust standard errors are reported in parentheses. The unit of observation is an ecclesiastical parish in 1851. Number of Gentry is the total number of gentry in 1700 recorded in Adams (1680[1700]). Parliamentary enclosure indicates if there was an act of parliamentary enclosure between 1750 and 1840 that includes part of the parish (Tate and Turner, 1978). Number of agricultural patents is the total number of agricultural patents that were registered to people living in the parish between 1700 and 1850 (Woodcroft, 1854, 1862). ln(Valor income) is the log of total income of the Catholic Church generated by temporal possessions measured in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). ln(Lay Subsidy income) is the log of taxable income from the 1524/5 lay subsidy returns (Sheail, 1968). Elevation is the average elevation of the terrain measured in meters (<http://srtm.csi.cgiar.org/>). Slope is the average slope of the terrain measured in degrees (<http://eros.usgs.gov>). Wheat suitability is the average value of an index of soil suitability for growing wheat ranging from 0 to 100 (<http://webarchive.iiasa.ac.at/>). Distance to the nearest river, the nearest market town, the sea and London are based on own calculations in GIS and are measured in kilometers. The database of market towns comes from Adams (1680[1700]). * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 9: Income in VE predicts mills in North West England

	Number of Mills			Mill dummy			Number of people employed in mills		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ln(Valor income)	1.018** (0.447)	0.930*** (0.338)	0.711*** (0.225)	0.0357*** (0.00677)	0.0326*** (0.00697)	0.0317*** (0.00730)	88.17*** (25.55)	87.64*** (29.18)	95.71*** (28.04)
Fixed Effects	County	Deanery	Hundred	County	Deanery	Hundred	County	Deanery	Hundred
Mean dep. var.	0.66	0.66	0.66	0.10	0.10	0.10	63	63	63
Observations	1193	1193	1192	1193	1193	1192	1193	1193	1192
R^2	0.033	0.090	0.860	0.063	0.173	0.318	0.063	0.159	0.257

Notes: All regressions are OLS with fixed effects at the level indicated in the table. Robust standard errors are reported in parentheses. The unit of observation is an ecclesiastical parish in 1851. The sample is restricted to observations from the northwestern counties Cumberland, Westmorland, Lancashire, Yorkshire West Riding, Cheshire, Derbyshire, Nottinghamshire and Staffordshire. Number of Gentry is the total number of gentry in 1700 recorded in Adams (1680[1700]). Parliamentary enclosure indicates if there was an act of parliamentary enclosure between 1750 and 1840 that includes part of the parish (Tate and Turner, 1978). Number of agricultural patents is the total number of agricultural patents that were registered to people living in the parish between 1700 and 1850 (Woodcroft, 1854, 1862). ln(Valor income) is the log of total income of the Catholic Church generated by temporal possessions measured in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 10: Dropping urban shapes

	Drop urban shapes from 1831 census			Drop borough constituencies		
	(1)	(2)	(3)	(4)	(5)	(6)
	Nr. of Mills	Mill dummy	Mill employment	Nr. of Mills	Mill dummy	Mill employment
ln(Valor income)	0.134** (0.0550)	0.0104*** (0.00207)	16.52*** (6.139)	0.164** (0.0680)	0.0169*** (0.00229)	22.37*** (7.960)
Observations	7526	7526	7526	6692	6692	6692
R^2	0.195	0.358	0.207	0.212	0.269	0.224

Notes: All regressions are OLS with fixed effects at the level indicated in the table. Robust standard errors are reported in parentheses. The unit of observation is an ecclesiastical parish in 1851. In columns (1) to (3) parishes that were classified as urban in the 1831 census were removed from the sample. In columns (4) to (6) parishes that were located in a borough constituency were removed from the sample (Cannon, 1973). Number of mills is the total number of cotton, wool, flax and worsted mills in 1838, mill dummy indicates if there was a mill in 1838, and number of people employed in mills is the total number of people employed in 1838 (Parliament, 1839). ln(Valor income) is the log of total income of the Catholic Church generated by temporal possessions measured in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 11: Virtual parish analysis

	5 by 5 kilometer square						10 by 10 kilometer square		
	Number of Mills		Mill dummy		Employment		Number of Mills	Mill dummy	Employment
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ln(Valor income)	0.110 (0.222)	0.375 (0.270)	0.0139*** (0.00398)	0.0289*** (0.00513)	7.492 (14.78)	30.53* (17.29)	-0.206 (0.620)	0.0169** (0.00862)	-.0755499 (0.0735)
Fixed Effects	N	Y	N	Y	N	Y	N	N	N
Observations	3581	3581	3581	3581	3581	3581	1295	1295	1295
R^2	0.000	0.521	0.004	0.514	0.000	0.592	0.000	0.003	0.000

Notes: All regressions are OLS with and without fixed effects for 10 by 10 kilometer shapes as indicated in the table. Robust standard errors are reported in parentheses. The unit of observation in columns (1) to (6) is a 5 by 5 kilometer shape. In columns (7) to (9) the unit of observation is a 10 by 10 kilometer shape. The shapes were generated from the smallest grid of the respective shape size that covers all of England. Number of mills is the total number of cotton, wool, flax and worsted mills in 1838, mill dummy indicates if there was a mill in 1838, and number of people employed in mills is the total number of people employed in 1838 (Parliament, 1839). ln(Valor income) is the log of total income of the Catholic Church generated by temporal possessions measured in 1535 (Caley and Hunter, 1810, 1814, 1817, 1821, 1825, 1831). * indicates statistical significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 12: Summary Statistics of p-values of repeated regressions

Dependent variable: Number of Mills	Average Coefficient	p-value summary statistics				
		Mean	Min	Max	fraction p-values>0.05	fraction p-values>0.1
General Match	0.097	0.034	0.008	0.125	0.122	0.002
County Match	0.118	0.031	0.011	.067	0.052	0
Dependent Variable: Mill dummy						
General Match	0.005	0.000	0.000	0.029	0	0
County Match	0.006	0.000	0.000	0.008	0	0

Figure 1: General Match (using nr of mills as dependent variable)

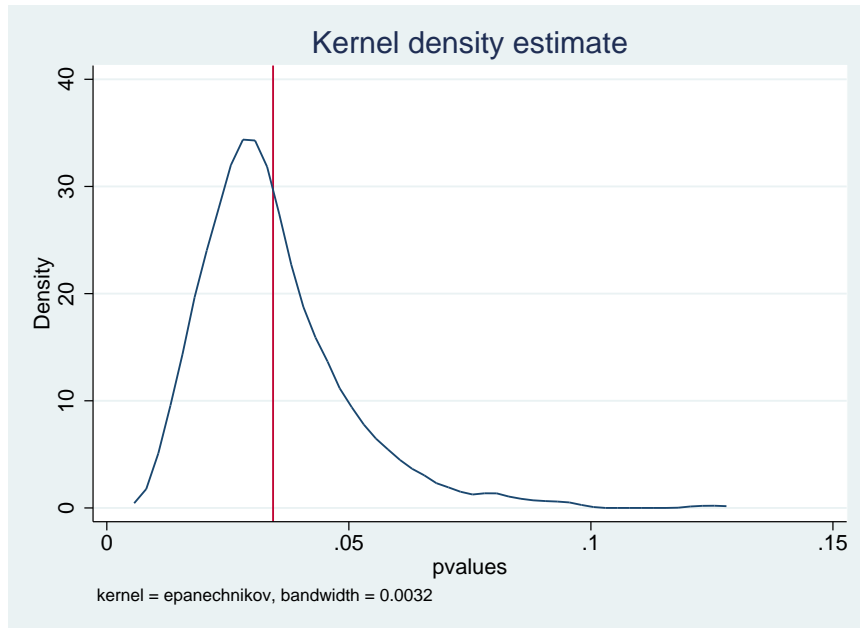
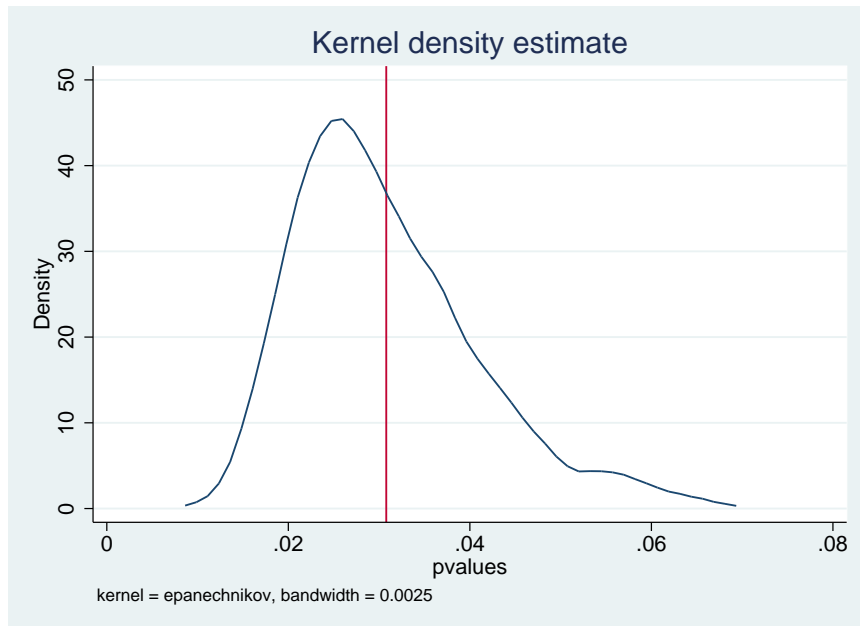


Figure 2: County Match (using nr of mills as dependent variable)



Appendix I: data

This appendix describes the sources and the method of coding for the variables used in the main body of the paper, focusing on the Valor Ecclesiasticus (henceforth: Valor). We include a short introduction to the Valor, a description of its structure, an outline of our method of coding the data and an example of applying this method. We conclude by discussing the quality of the data.

Since all our variables of interest, including income in the Valor, vary at a geographical level, we choose our unit of observation to be the lowest unit of geographical aggregation for which we have a reliable database. We start by describing this database.

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 database³². In this database each area is uniquely identified by an area number and each observation corresponds to a shape in the shapefile. Since areas may consist of several disjoint shapes³³, we collapse the shapefile to collect these into one shape, so that one observation in the database now has a unique area number and corresponds to one shape in the shapefile. The resulting database has 17898 unique shapes. Having created our unit of observation this way, we then proceed merge our data to this database using either one of the following two methods:

1. We directly match an observation in our data based on its name to a corresponding area in the database underlying the shapefile of the GIS of Ancient Parishes, copying the relevant area number.
2. We record Ordnance Survey grid references³⁴ for each unit we want to match, map these units in ArcMAP and spatially join them to the shapefile in the GIS of Ancient Parishes database, assigning an area number this way. 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

³²Each 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 below parish units, there is a parish identifier as well.

³³For instance, a parish can consist of a main portion where the parish church is and a smaller detached portion.

³⁴The British Ordnance Survey, the official British mapping agency, has divided the British Isles up into hundred by hundred kilometer squares (the 'Grid') and assigned a two letter identifier to each. A grid reference then records a place by adding an even number of digits to each code 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.

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.

Using either method, we assign an area number to the observations in each data source. We then proceed to match each data source to the collapsed database. 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 mostly 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.

The Valor Ecclesiasticus

This section describes the state of the Valor Ecclesiasticus archival records, a short historical background, the way the data was recorded when the survey was first held, our method for coding the data and an example from the manor of Helton, Lolbroke and Bell. A map of the ecclesiastical income in England is given below.

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 portfolios³⁵. The Record Commission published 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:

³⁵The dedicated website is at <http://www.nationalarchives.gov.uk/records/research-guides/dissolution-of-the-monasteries.htm>.

- 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.

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 Kings 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.

Acts of parliament leading up to the survey and the Dissolution

In 1532 Parliament passed 'An Acte concernynge restraynt of payment of Annates to the See of Rome'³⁶. At first this act aimed to have the Annates payed by anybody with the dignity of bishop or higher to be diverted from the Pope to the Crown. Hunter (1834) argues that this act was put in place to strengthen the kings negotiation position with the Pope. A second act was passed in the parliament that sat from January 15th 1534 that making 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' (Ibid., p.13).

Parliament next decided that the Annates and the tenths (or tithes, payable to the local benefice) were to be paid to the king. 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 Church, spirituall and temporall, graunted to the Kinges Highnes and his heires'. This act also names the king as the head of the Church of England for the first time. The Valor was intended to be a survey to assess how much money the king could expect now that all taxes were diverted to him.

³⁶This section builds mostly on Hunter (1834) but any book on the Dissolution of the Monasteries can be consulted, such as Youings (1971) and Knowles (1979). Annates are synonymous with first fruits or first years profits of every benefice, to be collected when the benefice changed occupier. A benefice is an ecclesiastical position, such as a parish priest.

After the Survey, Henry proceeded to expropriate the English religious houses, starting with the monasteries that were valued under 200 pounds, in 1536, by 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 monasteries worth over 200 pounds. These numbered 552 in total³⁷.

How the original survey was carried out

Every diocese received commissioners, at least three, that were to assess the value of all ecclesiastical possessions in that diocese. The survey started on January 30th 1535 and was 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). Savine argues that these usually were the justices of the peace, the mayors, sherrifs and the local gentry (Savine, 1909, p. 17). The oath of the commissioners can be found in the second volume of the Valor. These commissioners first proceeded to the bishop to ask which rural deaneries were within his diocese and whether he could give any info regarding the church positions that were held in the diocese (these were to be taxed by the annates). The commissioners then split up into parties of at least three, divided the deaneries among them and administered the survey. The subsequent collection of the taxes 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).

The organization of the Valor

The Valor, being the account of the commissioners, is recorded in a very systematic way. The main geographical unit by which the survey can be broken down is the diocese (this is in line with the requirement cited above to first consult the local bishop). 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. 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, by far the most

³⁷For an exact chronology of the dissolution of the lesser monasteries see Jack (1971), see also Hoyle (1995). Gasquet (1899) includes in appendix I a list of monasteries that paid the crown to not be dissolved.

important being the tithes. It also includes income from glebe lands (lands designated to support the benefice holders) and from oblations.

The second distinction in the returns for individual ecclesiastical units is between gross and net figures. Since the Valor was compiled to determine the amount to 'tax' later, there are deductions on taxable income. The income without these deductions is the gross income and the income after these deductions is called the net income (*valet clare* or *Et remanclare* (clear value remaining)). Over this net income the tithe is determined (*Xa inde* in the Valor). The following deductions were allowed (Hunter, 1834):

- I Rents resolute to the Chief Lords, and all other annual and perpetual rents and charges.
- II The alms which were due to the Poor, according to any foundation or ordinance.
- III Fees to Stewards, Receivers, Bailiffs and Auditors.
- IV Synodals and Procurations³⁸, with which most Abbies and Benefices were charged.

Monetary values in the Valor are recorded in *LsD* 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 outlined in ?.

Before we describe how we coded the data, we give the order the units in the Valor (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 monastery, this monastery is listed before the other benefices in the deanery and has a specific ordering, namely:

1. Annual value of the precincts.

³⁸Synodals and procurations are ecclesiastical fees.

2. Value of lands in the county in which the house stood.
3. The lands in other counties
4. Improprate rectories (rectories for which the proceeds went ot a layman).

Coding the Valor

Volume VI of the Valor has several indices, one of which is an index by deanery. Per deanery, it lists the monasteries, vicaries, rectories, hospitals and anything else there is in this deanery together with a page reference to the relevant volume. We followed this list and, per unit indicated in the index, we coded the income accruing from temporal possessions. Most importantly, we attributed it to the place where it generated income, not to the place where the ecclesiastical unit was to which the income accrued. That is, if a monastery was situated in place A, but held land in place B that generated income, we coded the diocese, county, deanery, the name of the place and the income, only for place B. We separately coded the incomes of the Sees of the bishops. Coding the sees of the bishops and then every deanery exhausts the list above.

The entries for individual places generating income, such as manors, have their income broken down into temporal/spiritual income and gross/net income, as outlined above. These distinct categories then follow a uniform format for listing the actual income figures, usually starting with temporal income, then spiritual income and lastly the deductible items. Both spiritual income and the deductions are established by tradition and do not reflect the economic value of the property that is being surveyed. Therefore, we only coded the income accruing from temporal possessions. In order to distinguish these sources of income in the text a 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). We will go through an example below.

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 survey it is called *Byrport*) in Dorset. Figure A1 has a picture 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.

The first entry is an assize rent (*reddit assis'*, a fixed rent) in Helton, which gives an annual income of L: 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 resolute (*reddit' resolut*) that are owed to an abbot and payable to his manor (*abbt' & conventui de Milton ad 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 hundred³⁹ 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*).

MANIU DE HELTON LOLBROKE & BELL.					
Valz in reddit' assis' in Helton p annu	xl	xvii vij	} £	S ^m ^a	s. d.
Reddit' tr' dnicaliū ibm ad firmā dimiss' p a ^m	ix	xiiij vj			
Reddit' assis' in Lolbroke & Bell p a ^m	vj	xiiij iiij			
In pficuis cur' ibm videt in finibz hiet' & al' pquisit' coibz annis	iiij	— xij	} £	S ^m ^a	s. d.
Et in reddit' resolut' abbt' & conventui de Milton ad maniu suū de Milton ex- eun' de p'dict' mañio de Helton	—	xiiij iiij			
Et in quodam reddit' foliut' an ^o & imp ^o vic' Dors' p tempe existit' p quodam reddit' voc' Whithertrent	—	xx —			
Et an ^o folu' hundr' dni R' de Whitway p a ^m	—	ij —	} £	S ^m ^a	s. d.
Et in feodo Gilbti Kaynell bati & recept' reddit' mañij de Helton p'd' p annu	—	xiiij iiij			
					xlviij viij

Figure A1: Valor Entry for the Manor of Helton, Lolbroke and Bell

We are interested in the income from assets, or the temporal income. For this manor, these are the assize rents from lands held by the manor, or the first three entries in figure 1. We therefore coded three entries, 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 above.

Going through every entry in the six volumes of the Valor this way created the database we used for the analysis in our main paper.

The quality of the Valor data

The most important problem with the Valor as a source is that clerics had an incentive to underreport their income, anticipating expropriation. If the ability/willingness to do so is correlated with characteristics of the place they were to report about, this may create a bias. Alexander Savine, in the second chapter of his

³⁹A hundred was an administrative level below the county.

book on the Dissolution addresses this issue (Savine, 1909). He uses monasteries for which there are returns in the suppression accounts (valuations drawn in 1536 starting with the dissolution of the lesser monasteries act, and aimed at providing a second valuation) to check the Valor figures. Overall, the Valor does not seem systematically undervalued. He also uses the paper surveys, surveys of the value of demesne land as well as several double surveys that exist by chance, such as a survey carried out in 1518 by the abbot of a monastery (Glastonbury) that was later to be surveyed in the Valor, to cross check the income figures in the Valor. Overall, he finds correct figures. There is, however, some variation across counties in under reporting. He notes that the Northern counties tend to be undervalued, possible because of the fact that there were too little surveyors for too large an area (Savine, 1909, p. 47). He attributes this mainly to under valuations of the value of woods and the demesne (p. 74). The rents on copyhold, leasehold and freehold lands were not underestimated. Knowles (1979, p. 247) notes that undervaluation may be a mechanical consequence of the fact that rents were fixed and that these were quickly renegotiated after the dissolution, so comparison to any valuation after the dissolution is bound to find an undervaluation in the Valor.

Another issue arises from urban holdings. For monasteries, Savine calculates that around twelve percent of all monastic holdings were urban (1909, p. 119). Generally, these urban holdings (called *burgagia*) are attributed to a church in this city. It is straightforward to identify these places since the names of churches in cities generally coincide with the name of the parish in which the church is located. In the main body of the paper we discuss ways of controlling for income accumulation in cities.

The structure of the entries such as the manor described above is uniform⁴⁰ but not all figures survived for all ecclesiastical units. Relatively often, only a total for rents and other income survives (the first four entries in the example above). We then coded this total. Less common is that we only have a total for temporal and spiritual income (all categories in the example). The most uncommon situation is that we only have a net figure. That is, the sum of the temporal and spiritual income minus the deductions. This data is generally from the *Liber Valorum* and this is indicated in the Valor. Solutions to these issues are discussed in the main body of the paper.

⁴⁰The instructions to the surveyor teams are printed in the second volume of the Valor.

Enclosure

Data on the parliamentary enclosure are recorded in the *A Domesday of English enclosure acts and awards* by William Tate (Tate and Turner, 1978). We recorded the year of enclosure, the location of the enclosed fields and the acreage that was enclosed as mentioned in the act. An enclosure act sometimes mentions several places (The field in question could be common bordering on several villages, for instance). We record every place mentioned in the act as enclosed. As with the yield data, the type of unit does not always match with the GIS of Ancient Parishes. Seventy percent of the acts explicitly mentions a parish level unit in it and we match these to the corresponding parish level units. For the other acts, we match to the lowest level unit available. If we have multiple names in the act, we follow this procedure for every name but only if the names refer to distinct places. For example, the entry 'Billington in Leighton Buzzard' in Bedfordshire gets one entry, either Billington or, if this is unavailable, Leighton Buzzard. However, an enclosure act mentioning 'Blunham and Northill and Moggerhanger' in Bedfordshire gets three entries. Figure 2 below gives a heat map of the density of enclosures, where a darker shade indicates more enclosures.

Other variables

Sources for variables and geographical covariates

Variable	Source	Comment
Main Variables		
The Valor Ecclesiasticus	Caley and Hunter (1810, 1814, 1817, 1821, 1825, 1831)	For coding method, see above.
The Mills	Parliament (1839)	For coding method, see above.
The Tudor Lay Subsidies	Sheail (1968)	For coding method, see above.
The enclosures	Tate and Turner (1978)	For coding method, see above.
Historic Variables		
The number of patent holders	Woodcroft (1854)	The data wer transcribed and made available to use by James Dowey
The gentry	Adams (1700)	
Retail Share	Gatley (2005)	
Agriculture Share	Gatley (2005)	
Geographic Covariates		
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 USGUS 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
Suitability for wheat	FAO at http://webarchive.iiasa.ac.at/Research/LUC/GAEZv3.0/	We used the rain-fed, low intensity, baseline period settings to select a raster file for downloading
Soil type	FAO at http://webarchive.iiasa.ac.at/Research/LUC/GAEZv3.0/	

Figure 3: A heat map of observations in the Valor and observations in the Lay Subsidies.

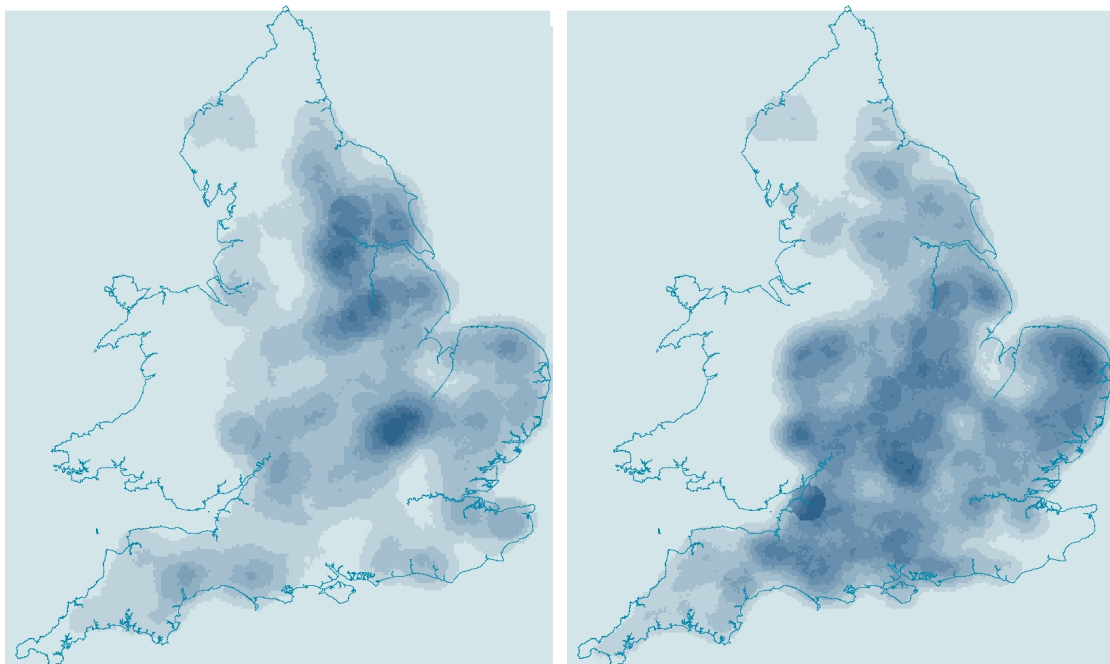
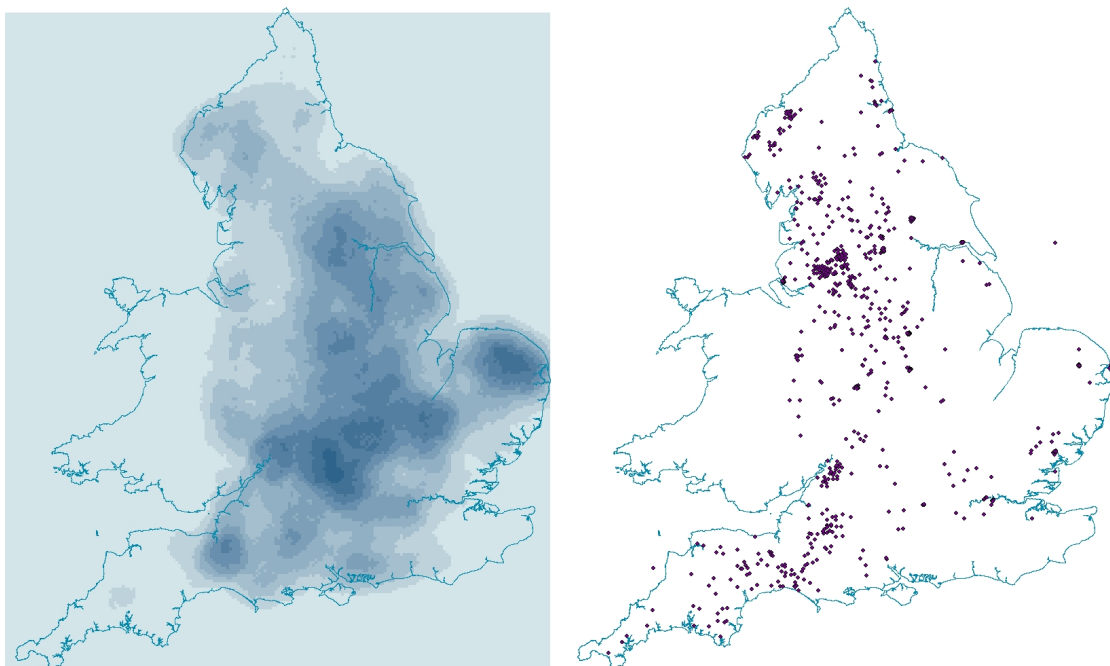


Figure 4: A heat map of the number of enclosures and a map of location of mills.



Extra References for the Appendix

Ecton, John (1711). Liber Valorum & Decimarum: Being an Account of the Valuations and Yearly Tenths of All Such Ecclesiastical Benefices in England and Wales, as Now Stand Chargeable with the Payment of First-fruits and Tenths. Printed for R. Gosling, W. Mears, J. Innys and T. Woodward.

Hunter, John (1834) An Introduction to the Valor Ecclesiasticus of King Henry VIII: With a Map of England and Wales, Showing the Distribution in Dioceses.

Jack, Sybil M. (1970) "Dissolution Dates for the Monasteries Dissolved under the Act of 1536," Historical Research 43 (108), 161–181.

Lindley, E. (1957) "A short study in the Valor Ecclesiasticus," Transaction of the Bristol and Gloucester Record Society 76, 98–117.

Martin, C. T. (1949) The Record Interpreter: A Collection of Abbreviations, Latin words and names used in English historical manuscripts and records, London: Stevens and sons, limited.

Southall, Humphrey and Nicholas Burton (2004) GIS of the Ancient Parishes of England and Wales, 1500-1850 [computer file]. SN: 4828, <http://dx.doi.org/10.5255/UKDA-SN-4828-1>.