

THE ECONOMIC EFFECTS OF THE ENGLISH PARLIAMENTARY ENCLOSURES*

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Abstract

We use a dataset of the entire population of English Parliamentary enclosure acts between 1750 and 1830 to provide the first causal evidence of their impact. Exploiting a feature of the Parliamentary process that produced such legislation as a source of exogenous variation, we show that enclosures were associated with significantly higher crop yields, a lower proportion of the population in agriculture, but also significantly lower population density and higher land inequality. Our results are in line with a literature going back to Karl Marx on the effects of enclosure on structural change and inequality. They do not support the argument that informal systems of governance or “private orderings”, even in small, cohesive and stable communities, were able to efficiently allocate commonly used and governed resources. Parliamentary intervention was necessary.

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1 Introduction

The English Parliamentary enclosure movement is one of the most contentious economic policies in history. Scholars from across the historical and social sciences have taken enclosures as alleviating the exemplary case of coordination failure (Hardin, 1968), or as the the opposite, destroying harmonious community cooperation (Hammond and Hammond, 1911), and have not reached a verdict on its effect.

In this paper, we combine comprehensive parish level data on enclosure, agricultural yields, structural change, population and inequality covering all of England to estimate the economic effects of Parliamentary enclosures.¹ Enclosure went on throughout the Middle Ages and Early Modern periods by voluntary (unanimous) agreement. The key change Parliament enacted around 1700 was to provide an institutional way to manage the process of enclosure through a Parliamentary procedure, which could be initiated by the owners of three quarters of the land (by value). Henceforth a majority of local landowners could petition Parliament to enact a proposal for enclosure of *all* common property. By about 1900, virtually all of England was under private consolidated ownership.²

Enclosure involved two distinct changes to rural property rights. It privatized the commons - land under common ownership to which villagers had several different usage rights - and consolidated scattered plots of land farmed by an individual household on the ‘open fields’ into one large plot, obviating the need to coordinate agricultural practices. Such changes may in theory lead to large productivity improvements because landowners become the residual claimant on the return on any agricultural investment. Usage would no longer be subject to the ‘tragedy of the commons’ (Hardin, 1968) and investment returns would now accrue privately rather than be public (Samuelson, 1954). However, both the commons and the open fields were governed by informal institutions and norms regulating usage and cooperation, which could be enforced both through social sanctions and in the manorial courts (Ault, 1965). Therefore, rationalizing informal property rights may be superfluous (Ostrom, 1990), especially if they were already well defined (Coase, 1960) and could be expected to change endogenously in an efficient way (Demsetz, 1967). Starting from these basic diverging positions, economists and economic historians have argued both sides, but have not, as we elaborate in the next section, reached a consensus on the economic effects of enclosure (Allen, 1992; Turner, 1980).

In a new dataset covering 15,000 parishes in England, we compare parishes that were enclosed in the Parliamentary period (1750-1830), to parishes that were not, at the end of the period in 1830. We study the agricultural and social consequences of enclosure by measuring agricultural yields and the fraction of

¹A parish is a local administrative unit typically coincidental with a village.

²In fact the first Parliamentary enclosure was in 1604, at Radipole, Dorset, but it did not become established as a regular process until the eighteenth century.

the population in agriculture, as well as population density and land inequality, all around 1830. Our focus reflects the most famous hypotheses in the literature. First, contemporaries such as Arthur Young or modern economic historians such as Overton (1996), McCloskey (1975), and Thirsk (1961) emphasized likely productivity improvements and structural change, echoing the theoretical arguments of Samuelson and Hardin. Others instead emphasized the social consequences of enclosure. Marx (1990), Hammond and Hammond (1911) and Thompson (1963) all argued that the main impact of enclosures was to dispossess smallholders and many with informal rights in the commons, increase land inequality and create a labor force for the industrial economy.

We first estimate the effect of enclosure using Ordinary Least Squares (OLS). We find that in 1830, parishes that were enclosed experience higher agricultural yield and a lower proportion of the population in agriculture. We then use data from Gray (1915) on the geographical distribution of open fields to show that these effects are concentrated in parishes where open fields were the dominant form of field organization. Where fields were already privately owned, enclosure privatized the commons and enforced existing private claims, but there was less scope for wholesale field rationalization. We find muted effects of enclosure on agricultural change here. Turning to social change, we find that enclosed parishes had lower population density and higher land inequality. These effects, instead, are more pronounced where the commons were the primary object of enclosure, reflecting Marx's insight that dropping the requirement of unanimous support for enclosure extinguished informal claims of poorer parishioners, who could not be employed on the already enclosed fields.

Whether or not a parish was enclosed, however, is clearly endogenous. Not only did parishes choose to petition Parliament for enclosure, but voluntarily enclosed parishes, such as parishes that enclosed before 1700, would be unlikely to petition again, while realizing at least some of its (beneficial) effects. Because such parishes are in our control group, our OLS results underestimate the true effect of Parliamentary enclosure.

To establish a causal interpretation of our results, we exploit a particular feature of the legal process of Parliamentary enclosure as a source of quasi-experimental variation. Getting enclosed involved three steps. First, a parish petitioned Parliament with a draft enclosure act. Then, a committee of Members of Parliament (MPs) was tasked to judge the quality of the act against a large number of legal requirements, called standing orders. Finally, a potential amended act passed or failed in a vote. Because the recommendation of the committee was often followed Tate (1945) notes that a leading reason that "an enclosure bill failed" was "failure to comply in detail with the standing orders of the House (pp. 138-139)." We posit that there are differences across MPs in the degree of meticulousness with which they applied these standing orders, and use the leave-one-out mean of an indicator for whether an enclosure passed across the careers

of all MPs that represented a parish over our sample period as an instrument for enclosure. We leave out the petitioning parish capturing the direct effect a petitioning parish may have, and a ‘doughnut’ of three rings of adjacent parishes, to address spill-over effects. This design is similar to ‘examiner’ designs that are common in labor and public economics, and fundamentally goes back to the JIVE instrumental variable strategy pioneered by Angrist et al. (1999).

To validate this strategy, we note that parishes were small relative to the constituencies their MPs represented, and electoral incentives for individual MPs were largely absent.³ In addition, any involvement a MP may have had with an petitioning parish would be captured by the removing the petitioning parishes and the doughnut. To substantiate these assertions, we show that a large number of variables that would plausibly correlate with the expected return to enclosure at the parish level are uncorrelated with our instrument. We also show that parishes did not wait to petition until a more lenient MP came along, nor that meticulous MPs selected into constituencies that were about to enclose. Finally, we show that our instrument generates an informative first stage: differences in the meticulousness of the political representatives that judged a draft enclosure Bill correlates with enclosure.

Using this instrument, we find that enclosure leads to an increase in agricultural yield of about five bushels per acre. Between 1300 and 1750, the start of our study, yields increased on average by 9 bushels to about 20 (Allen, 2005). Enclosure led to a increase equal to 55% of the increase brought about by 450 years of accumulated improvement, or about a quarter of the mean of yield in our data. We find that the fraction of males over 20 employed in agriculture shrank by about 9 percentage points relative to a mean of 16%. For social changes, we find that enclosure leads to lower population density equal to about a quarter of a standard deviation, and a 10 percentage point increase in the Gini coefficient of the value of plots of land in an enclosing parish.

We do not expect this treatment effect to be constant across parishes. In particular, because our instrument is only informative for parishes that consider the Parliamentary mechanism for enclosure, we estimate the treatment effect for this group of ‘compliers’ (Imbens and Angrist, 1994). This means that by using this strategy we identify the object of interest of our paper: the treatment effect of *Parliamentary* enclosure relative to informal governance and ownership rather than relative to a mix of informally governed parishes and ‘never-takers’ - parishes that already voluntarily enclosed without resorting to Parliament.

Our results show that enclosure led to substantial changes in agriculture: yields increased and the agricultural sector shrank. At the same time, enclosure led to lower population density and increases in inequality. Our results are therefore in line with the ‘tragedy of the commons’ and other theoretical

³About 85% of elections were uncontested, and less than 10% of the population was enfranchised. Considering that the average member of Parliament represented 350 parishes, electoral incentives were largely absent.

arguments pointing to potential inefficiencies in shared governance and ownership of land. Even in communities as small, cohesive and stable as a parish, informal governance mechanisms coordinating behavior and investment were less efficient than private ownership. Achieving private ownership was also subject to coordination failure, however, and Parliamentary intervention was necessary to consolidate all of England under private ownership.

We then explore mechanisms through which enclosure may have affected agriculture and inequality. We focus on two types of mechanisms: innovation and coordination. Contemporary advocates of enclosure suggested that it promoted “improvement”, by which they meant investment and innovation and experimentation in new techniques. We capture innovation with data on agricultural patents and the quality of local infrastructure. Infrastructure is a novel channel, not emphasized in the literature so far, but often enclosure acts specified road building, both as part of general improvement but also because privatization revoked right of passage. To capture coordination, we measure the acreage in a parish sown with turnips and fallowing practices. Both sowing turnips, because they replenish depleted soils, and optimal fallowing were known to improve output, but may not have been adopted because their implementation required coordination among villagers with disparate interests but commonly governed fields. Enclosure gave each individual the decision to implement best practices. As before, we distinguish open field villages from villages where enclosure primarily affected the commons. We find evidence that enclosure is associated with both innovation and improved agricultural practices. These effects are primarily driven by enclosures on the open fields.

Finally, we use our dataset to compare our results to those of Allen (1982), the most influential existing empirical study of enclosures. Using data for a sample of farms from the English Midlands, he finds no effect of enclosure on crop yields. When we focus on the subset of our dataset which coincides with his sample, we replicate his findings. His conclusion that enclosure had no effect on yields was therefore correct within his sample, but for England as a whole we find that enclosure is associated with an increase in yields.

Our paper contributes to an at least 250 year long debate (documented in the next section) on the economic effects of the English enclosures by showing that enclosure had a positive effect on agricultural yields, structural change, but also on inequality. We also contribute to the broader debates on the role of property rights in development. In this seminal case, our findings do not support the notion that communities can innovate systems of governance to efficiently allocate collectively managed resources, the same conclusion reached by Bogart and Richardson (2009, 2011) for our context and period. In this sense our work coincides with research on the efficiency benefits of individualized private property rights (Besley and Ghatak, 2009; Field, 2007; Galiani and Schargrodsky, 2010; Fergusson, 2013; Besley, 1995).

This paper proceeds as follows. The next section discusses the relevant historical and institutional

background to this paper, focusing on the process of enclosure, and the political procedures in Parliament that led to an enclosure act being passed. Section 3 introduces our dataset. Section 4 presents our main OLS results, and introduces our doughnut identification strategy. Section 5 presents our main instrumental variable strategy, and section 6 presents instrumental variable estimates of the effect of enclosure. Section 7 discusses mechanisms. section 8 focuses on the Midlands, and section 9 concludes.

2 Setting and context

2.1 What was an Enclosure?

What happened when a parish was enclosed?⁴ Mingay’s (1997, p. 7) definition of a (Parliamentary) enclosure is that

“it meant the extinction of common rights which people held over the farm lands and commons of the parish, the abolition of the scattered holdings in the open fields and a re-allocation of holdings in compact blocks, accompanied usually by the physical separation of the newly created fields ... by the erection of fences, hedges and stone walls.”

In parts of England at the start of the period of Parliamentary enclosures, canonical versions of medieval strip farming systems still persisted. The most famous version of this featured (usually) three “open” fields, like in Barton-upon-Humber which we show as Figure 1. The left panel shows the situation in Barton prior to enclosure. The defining feature of open fields is that farmers owned a fixed amount of land, but this land lay scattered in strips in the three large fields. Barton also had various types of “common land” such as the Ings at the top left which were meadows leading down to the river Humber. It also had a marsh (known as ‘waste’) and cow and horse pastures and the ‘common wolds’ at the bottom of the map. These lands were not normally farmed. Instead, local inhabitants had all sorts of common rights, what Thompson (1963) calls “a dense cluster of claims and usages” (p. 239), to the use of these lands: the right to graze livestock on the three main fields after crops had been harvested, the use of meadow, common land, and woodlands, for example to collect firewood. They also had the right of estover on the cutting of bracken and furze, and for the digging of building materials such as stone, clay and sand. In addition there was the right of turbarry to cut turf for burning.

In places like Barton, as Mingay notes, enclosure both eliminated the big open fields and allocated these lands in consolidated holdings, and divided up the common land between anyone who could establish

⁴For this and the next subsection we rely on several standard works, particularly Tate (1967), Yelling (1977), Turner (1980) and Mingay (1997)

their rights to use it. The right panel shows the map of Barton after the enclosure and shows the new consolidated farms. All common lands have been eliminated. This map shows a few of the other things that were packaged with this. A new system of roads was built. In addition in the top right one sees lands “for tithe”. In 1797, when enclosure started, tithe incomes, 10% of agricultural output, was often in the hands of private people. Frequently, in the process of enclosure, the titheholder was persuaded to give up this right in exchange for an enlarged landholding.

Though enclosures of the type that took place in Barton-upon-Humber were common, it was not the only sort. First, in large parts of England by 1750, though common land remained, the open fields had already been enclosed. Such places, depicted in Figure 2, taken from Gray (1915), were divided into two distinct areas; one east of a line running due south from the Wash to the Sussex coast; the other west of a north-south line running along the Welsh border. In these areas enclosure generally meant that the commons was divided up and privatized.⁵ It is within these limits that Gray located the two and three field open system at the start of the period of Parliamentary enclosures.⁶ Second, the enclosure in Barton was a radical re-organization from scratch of the entire parish. Prior to the Parliamentary enclosures, much enclosure instead was piecemeal with only parts of the parish being enclosed (these, minor areas in Barton, appear as “old enclosures” on the bottom right-hand corner of the left panel of Figure 1). Such piecemeal enclosure had taken place even within the central zone of Gray (1915)’s map.

2.2 The Process of Enclosure

Enclosing a parish was a very bottom up process before and during the period of Parliamentary enclosures. In either epoch, it started with a negotiation between the landowners of a parish who had to gain sufficient consensus for the process to move forward. The period before the eighteenth century is much less well documented, but it is clear that enclosures were taking place by the fifteenth century. This seems to have been dominated by lords enclosing their *demesne* land, which was manorial land that was farmed by what would have originally been villeins. By this time it was usually leased under various types of tenancy, such as copyhold. Early enclosure also took place in parishes where all the land was owned by one landowner. Kerridge (1969) notes that

“the clearance of landed estates in the North-east lowlands ... was facilitated by the circumstance that the tenants were mostly without genuine estates in land; they were mere tenants at will

⁵We say “generally” because it was sometimes the case that even if land were enclosed, a Parliamentary act gave landowners the opportunity to re-arrange and further rationalize their holdings.

⁶There are various versions and updates of this map. It is very similar to Map C on p. 465 in Gonner (1966) and is reproduced in Yelling (1977) p. 40. See Baker and Butlin (2009) for a recent overview.

... usually the landowner or the farmer of the demesnes, strove to enclose the whole township for himself.” (pp. 96-97)

It is instructive to ask why this would happen more often in a place like the “North-east lowlands”. Looking at Figure 2 one sees indeed that this is an area where open fields vanished first. This was because it was on the Scottish and Welsh borders that larger estates emerged after the Norman conquests in order to facilitate the raising of military forces. Subsequently, this turned out to be a propitious situation for enclosure to take place since it could be achieved more or less by one person. It is one of the themes of Gray (1915) and the subsequent literature, that the variation in the timing of enclosure, as depicted most dramatically on Figure 2, is related to such idiosyncratic factors that influenced ‘frictions’ in the process of enclosure. This was just as true in other areas on Gray (1915)’s map, for example in Kent or the Celtic influenced areas of the Southwest.

By the middle of the sixteenth century however “enclosure is no longer primarily the work of the manorial lord who possesses all or virtually the whole of the lordship” (Yelling (1977) p. 22). Now groups of landowners had to voluntarily agree to enclosure. This was a much more complex process as Chambers (1932) pointed out

“though townships might be similarly situated in regard to the quality of soil they held ... a township that was divided amongst numerous owners ... would have many conflicting interests to overcome before enclosure could take place; while one that was in the hands of a single owner, and occupied mainly by tenants at will, or short leaseholders and so on, would be free from obstacles of this kind.” (p. 142)

If it turned out to be impossible to get all landowners to agree to enclose, partial or piecemeal enclosure was frequently the outcome.⁷ Whether or not this could happen depended on the distribution of rights to commons and often settlement patterns. For example, Gray (1915) contrasting the earlier timing of enclosure in Herefordshire compared to Oxfordshire, notes that this could be explained by it being much easier to agree in the former because the size of townships were smaller (see page 153). If there were separate hamlets within a parish a small one might be able to enclose the parish partially (Yelling (1977) provides several examples in Chapter 5).

Enclosure in the sixteenth century was not encouraged by the fact that the Tudor government, rather than facilitating it, as was subsequently the case during the period of Parliamentary enclosures, actively

⁷Thirsk (1964) comments in this context “agreements between two persons or a small group to extinguish common rights over the arable were far more easily reached ... than agreements between inhabitants of the village” (pp. 23-24). The contemporary commentator Henry Homer observed that “The necessity of universal agreement among proprietors especially where they are numerous is an almost insurmountable obstruction to any improvements being made in lands during their open field state” (Homer (1766), pp. 7-8)

discouraged it since it was thought to lead to village depopulation. Starting in 1489 and for the next hundred years, Parliament actually passed acts to discourage enclosure.

If an agreement to enclose took place this could stop at being documented locally, or the landowners could attempt to get a decree from the Court of Chancery court to ratify it though as Yelling (1977) notes “Chancery Decrees usually give only a general indication of the acreage and type of land enclosed, and some uncertainly may remain as to the precise date the enclosure took place” (p. 18). Moreover, as Beresford (1961) observed, this was quite a contrived process since “it was a necessary fiction that a dispute existed, otherwise the jurisdiction of the court might not run” (p. 58).

Since these pre-Parliamentary enclosures form the background to our study and the main control group it is good to reflect on what is known about their incidence. The argument in Gonner (1966) is that early enclosures could be explained by a focus on lands that were most valuable commercially (for example most suited for sheep farming, since wool was a dynamic export, or close to markets like London). More contemporary work, building on the quotation by Chambers (1932) above, has focused more on factors that influenced the ability of landowners to solve the inherent political problem in enclosure. Hence the observation about dominant landowners from Kerridge (1969). This also explains Yelling’s comment that in terms of the early enclosures “the distribution could plausibly be explained by the ease with which unity of control could be obtained” (Yelling (1977) p. 26). The nature of these political problems could be related to historical field systems, as in Kent or Cornwall, and different settlement patterns. Moreover, the extent to which the open field system was consolidated differed a lot. Thirsk (1967) argues that one “must differentiate between areas in which the classic common field system prevailed and those characterised by more loosely organized ... systems” (p. xi). Her argument is that in places which were “more loosely organized” it was much easier to implement an enclosure. These places were “early enclosed, only because they had never known a fully-developed common field system” (Thirsk (1964) p. 23).

The nature of piecemeal enclosure and the way in which pre-Parliamentary enclosures were created provides priori rationales for why organizing enclosure through Parliament may have an economic impact. The first is that the partially documented nature of such arrangements led to disputes. Yelling (1977) notes that an advantage of a Parliamentary enclosure was that it “had the advantage that it set aside all doubt about the validity of enclosure” (p. 9).⁸ Gray (1915) also notes that a consequence was “to establish authoritative titles to ownership” (p. 305). Hence by confirming “the entire existing arrangement” (Yelling (1977) p. 13) Parliamentary enclosures helped to definitively settle property rights. In McCloskey’s (1972) view a Parliamentary act “was necessary in order to prevent one man from imposing on his fellow villagers a revival of the open fields whenever it suited his immediate convenience, by reasserting his ancient rights

⁸“piecemeal activity gave little incentive to the production of special maps or surveys” (Yelling (1977) p. 71).

of common after the enclosure” (p. 24).

The second, is that the myopic and piecemeal process of much pre-Parliamentary enclosure, what Yelling (1977) calls a “structure of holdings ... built up in uncoordinated steps by a succession of individuals” (p. 84), did not lead land to be efficiently organized. In discussing the economic benefits of enclosure in 1794 Thomas Stone remarked

“The first great benefit resulting from an enclosure is contiguity, and the more square the allotments are made, and the more central the buildings are placed, the more advantages are derived to the proprietors in every respect” (Stone (1794) p. 143).

Such views were commonly expressed amongst contemporary observers. As William Marshall put it “In Rural Economy, straight lines and right angles are first principles which can seldom be deviated from with propriety” (Marshall (1788), p. 125). Yet on his extensive travels he found that reality was different noting in the piecemeal enclosed Vale of Pickering that “each man’s property is still perhaps scattered over the township” (Marshall (1788), p. 8) while in East Norfolk he noted the “abundance of petty enclosures” which he found “disgraceful” (Marshall (1787), p. 130). Summing up a large literature Yelling (1977) opines

“the effects of piecemeal enclosure ... were .. deplored by those concerned with the proper layout of farms. For the structure of piecemeal-enclosed holding rarely approached the ideal: normally the process of enclosure and consolidation had drifted apart ... so that enclosures preserved many of the defects of the old open-field arrangements” (pp. 125-126).

A third important reason that the Parliamentary process may lead to economic consequences where “private orderings” had failed was because of “the opportunity provided by the Parliamentary procedures to overrule opposition from small landowners” (Yelling (1977), p. 113). Though as we shall see later, the preponderance of evidence is that the Parliamentary process was reasonably fair, this certainly makes it plausible that it increased inequality.

2.3 The Parliamentary Process

The institutionalization of the Parliamentary route to enclosure in the eighteenth century brought greater clarity to the process and critically, it made it easier to implement a general enclosure because it provided rules which over-ruled opposition to the enclosure. To start the process the parishioners had to themselves propose an act to enclosure a parish. When this was submitted to Parliament, the parishioners had to simultaneously present a “consent document” listing all the landowners in the parish and the value of their

holdings with their signature as to whether they were in favor of the enclosure (Consent), against (Dissent) or neuter (indifferent).

No official figure was laid ever laid down for the proportion of these landowners who had to be in favor for Parliament to proceed. It was said to be 3/4 or 4/5 of landowners by value (though there are documented cases of parishes that were enclosed where less than 3/4 of the landowners were in favor, (Mingay, 1997) p. 67). It was only in the 1836 General Enclosure Act that a number was first specified which was 2/3. The high bar meant that before moving forward local people had to reach some sort of consensus.

Though negotiations started informally, there would typically then be an open public meeting to discuss a potential enclosure bill which the parishioners would have to get a hired lawyer to draw up. When they had done this it had to be fixed to the church door for three summer Sundays prior to any Parliamentary session. If there was sufficient agreement the bill would be presented to Parliament and this would typically form the basis of what would be an Parliamentary enclosure Act. In Parliament, the Bill was judged against a large number of legal requirements, called the standing orders by a committee of Members of Parliament (MPs). If these were judged to have been satisfied, these MPs would recommend that the Bill be enacted into law after a vote on the house floor. We describe this process in detail in Section 5 of the paper, in the context of our identification strategy.

Once passed, the bill specified the names of people who would become the commissioners, usually three, and the name of a surveyor. If the bill became an act of Parliament it was the commissioners who under-took the division and re-organization of the lands. First the surveyor would map the lands to be divided and then the commissioners would hold a series of meetings where people would come forward to present their claims and try to establish their rights. Rights to the fruits of the commons were complex and informal and the commissioners had to spend a long time soliciting evidence and interviewing multiple local residents to try to establish who used the commons and for what purpose. In the written bill itself considerable attention was paid to these processes emphasizing transparency and the points at which people could protest against decisions. Finally the commissioners made the Award which specified the division of the lands, had to be placed on the church door and read in public. (Mingay, 1997) pp. 72-73 lays out all the events in the process from the first meeting of the commissioners on June 30, 1782 in Kingston Deverill to the final legal Award on August 23, 1785.

At the end of their deliberations, which in Kingston Deverill took 14 months, and often took longer, the commissioners produced their Award, which was the definitive distribution of property. In the meantime they allowed people to exchange plots outlined in preliminary awards so as to get as close as possible to a distribution which was mutually satisfactory (see Kain and Oliver (2011) for a collection of the Award

maps). Such an agreement was not always possible and ultimately appeals against commissioners decisions could be taken to the local Quarter Sessions or the Court of Chancery.

This process generated considerable costs. The parishioners had to pay the lawyer who drafted the bill and the commissioners and surveyor (and sometimes a clerk). In addition they had to pay for public works like the new roads and of course the fences or walls around their new plots. These costs were divided between the landowners in proportion to the size of their holdings. In order to pay for some of this the commissioners sometimes partially sold off the newly enclosed lands.

2.4 The Literature

Enclosures and their consequences received a great deal of comment at the time from politicians and intellectuals. William Cobbett in his *Rural Rides* continuously blames them for ruining the countryside. On October 31st 1822, travelling from Oakingham to London, he concludes “These enclosures and buildings are a waste, they are means misapplied, they are proof of national decline not prosperity” (Cobbett (2001) p. 41) and he gives a firm “No” to the question as to whether or not enclosures represent “improvements”.

The most famous nineteenth century hypothesis about the impact of enclosures was advanced by Karl Marx in Volume I of *Capital*. He argued that:

“the law itself now becomes the instrument by which the people’s land is stolen .. The Parliamentary form of the robbery is that of ‘Bills for Inclosure of Commons’, in other words decrees by which the landowners grant themselves the people’s land as private property, decrees of expropriation of the people ... the systematic theft of communal property was of great assistance ... in ‘setting free’ the agricultural population as a proletariat for the needs of industry.” Marx (1990) pp. 885-886.

In Marx’s argument enclosures were the process by which large landowners expropriated small landowners, leading to a large rise in land inequality and the creation of a landless population which migrated to work in the factories of the industrial revolution. This process was lodged within a larger dynamic of “primitive accumulation” which included the expropriation of the lands of smallholders via enclosure. His views were largely re-affirmed by famous 20th century studies such as by Hammond and Hammond (1911) and by Thompson (1963) who states “Enclosure ... was a plain enough case of class robbery, played according to fair rules of property and law laid down ... by property owners” (pp. 237-238). Thompson, like Marx, emphasized the dispossession of small landowners and landless who, unable to survive anymore without access to the commons, became available for factory work.

Like Cobbett, Marx and Thompson, most of the more recent academic literature has also focused on the social consequences of enclosure. Many, following Marx, emphasizing the effects on inequality and the supposed dispossession of smallholders. That this could have happened is made possible by the fact that, as we saw, Parliamentary enclosure could go ahead even if smallholders opposed it (those who owned 20% or even 25% of the value of the land). The case study evidence is probably consistent with this hypothesis. Land inequality seems to have risen (Allen, 1992) and smallholders or “cottagers” do seem to have sold out and migrated after enclosure (Neeson (1993) is a seminal study). But the question is how exploitative this was, or to what extent smallholders or even the landless with common rights, were defrauded. One can certainly find contemporary discussion about the bias of Commissioners. Young (1771) for example writes of them as “having neither integrity, abilities, or attention” (p. 231). Yet Mingay (1997) probably articulates the consensus amongst modern British social historians when he says about the Commissioners that “taken as a whole, the evidence suggests that they discharged a complex and difficult duty with a large degree of competence and such fairness as their remit allowed” (p. 82). Tate (1967) concludes that existing evidence tends to “show how very scrupulously and conscientiously the commissioners carried out their duties. They display almost an excessive regard for legality .. and a meticulous attention to the minutiae of the business” (p. 173). Most likely, even a fair distribution of common rights left the landless or smallholders with very small and uneconomic plots of land which they found it desirable to sell given the increasingly appealing outside options in an industrializing economy. Evidence from other instances of land reform (e.g. Galan (2019)) suggests that people who received private property rights may sell out and migrate, which provides a channel of upward social mobility.

While clearly the distributional effects of enclosure are potentially significant, from an economic perspective, there might also have been large efficiency benefits. Though Cobbett might not have agreed, in fact the preponderance of opinion at the time (and what Thompson (1963) calls the “enclosure propagandists” p. 237) seems to have been that enclosure would improve investment and productivity. The Bill submitted to Parliament in 1782 for the enclosure of Kingston Deverill in Wiltshire began:

“The lands .. lie intermixed and dispersed, in small parcels and most of them are inconveniently situated in respect to the Houses and inclosed lands of the Owners and Proprietors thereof; and in their present Situation are incapable of any considerable Improvement; and it would be very advantageous to the several Persons interested therein ... if the same were divided, and specific Shares thereof allotted to them in Severalty, in proportion to their respective Rights and Interests therein; but the same cannot be effected without the Aid and Authority of Parliament” (Mingay, 1997) p. 33.

This clearly suggests that those proposing “inclosure” thought it would promote “improvement”.

There are several issues here. One is the consolidation of the strips in the open fields. A common argument is that the efficient use of these required mass coordination within the village and stopped individuals experimenting with new techniques. Moreover, land was wasted in the many “balks” which were lands reserved for divisions or access ways between strips. The fact that herds mingled together on the open field also made it very difficult to engage in selective breeding of animals, an important investment. The other main issue was the over-use of common resources. Foremost amongst the propagandists was Arthur Young who in his *General Report on Enclosures* submitted to the Board of Agriculture in 1808 argued that

“there can be no doubt of the superior profit to the farmer by cultivating enclosures, rather than open-field arable. In one case he is in chains - he can make no variation according to soil, to circumstances, or times. He is bound down to the production of corn only .. a mere horse in a team, he must jog on with the rest.” Quoted in Daunton (1995) p. 113.

Young himself made many calculations suggesting that enclosure improved productivity. For example, he compares Childesley which was enclosed, to Hardwicke which was not, noting “which parishes contain a perfectly similar soil and are divided only by a hedgerow” (Young (1808), pp. 273-275) but in which wheat yields were 24 and 16 respectively.

A modern assessment by Overton simply states:

“Enclosure facilitated innovation and changes in land use because the constraints imposed by common property rights, the scattering of land, and collective decision making could be overcome.” Overton (1996) p. 167.

Though most of the mechanisms advanced suggest that unenclosed parishes would be less efficient, there is little agreement on this in the literature. Mingay (1997, p. 94) ends up arguing that “There can be no general conclusion that enclosure, by releasing farmers from the limitations of communal farming, inevitably led to general improvements.” And Thirsk (1963) (pp. 99-100) concludes that the open field system was innovative and flexible. Indeed, the most sophisticated empirical work on the productivity effects of enclosure, due to Allen (1982) finds, as we noted, very little effect and some scholars, like Daunton (1995) (see pp. 114-117), accept this evidence as establishing that there were indeed few productivity effects.

On the other hand other scholars, like Overton, regard the correlation between improved agricultural productivity, technological change and enclosures to be so strong that a causal connection seems highly likely. He concludes:

“the major upsurge in agricultural output and productivity came after the mid-eighteenth century: this coincides with the major burst of Parliamentary enclosure.” (p. 167)

Another authoritative source, Clay (1984), though he recognizes that “open field communities could and did make alternations to their field course, and even to the physical lay-out of their fields .. as was necessary for the incorporation of the new crops into their farming system” (pp. 133-134) he nevertheless concludes “there is no doubt that where open field prevailed the need for communal agreements did retard the pace of change” (p. 134).

Ultimately then this literature is inconclusive. One can make theoretical arguments about the efficiency of the open fields system (McCloskey, 1972; Townsend, 1993) and the usage of the commons (Ostrom, 1990), but one can also argue, on theoretical grounds, the opposite (Hardin, 1968; Samuelson, 1954). All the mechanisms emphasized make conceptual sense, the question is their quantitative significance. The empirical evidence is similarly mixed with different authors emphasizing different pieces of case study evidence with the most prominent empirical study, by Allen (1982), finding no efficiency benefits of enclosure but significant effects on inequality. Nevertheless, Allen (1982) treats enclosure as exogenous and he uses information from only a part of England. The salience of the question and the unsettled state of the evidence motivates our study.

3 Data

In this section we introduce the unit of observation used in the empirical analyses in this paper. We also introduce the main variables, and discuss measurement. Table 1 presents summary statistics.

3.1 Unit of observation

The unit of observation in this study is a parish. There were about 15,000 parishes and parish-like units in England around 1830.⁹ Since a parish often overlapped with a historical manor, the parish was historically the focal unit of local administration in England and typically coincided with one village or several smaller hamlets. Importantly, each enclosure act explicitly enclosed either a single parish, or a field common to several parishes. The parish is therefore the natural unit of observation for studying enclosure. We use a cross section of parishes prepared for the 1851 census as our unit of observation (Kain and Oliver, 2001). Using parish names, we then merge other data sources to our cross-section of parishes. The effective number of observations in our regressions depends on the geographical coverage of our outcome variables.

⁹Although the parish was the most important local administrative unit, there were others as well. We have extra-parochial tracts, hamlets, chapelries and other small units in our data. Since such units would be mentioned in enclosure acts if enclosed, we keep them as part our dataset.

3.2 Enclosure

We measure enclosure from the *Domesday of English enclosure acts and awards* (Tate and Turner, 1978). This source lists each enclosure act passed during the Parliamentary enclosure period. In total it records 5,383 acts and covers the universe of Parliamentary enclosure. For each act, we record the parish(es) it enclosed, the year it was passed, and the acreage that was enclosed. Figure 3 shows the number of parishes enclosed over time. The appendix provides a photograph of an enclosure act and a bar graph of the number of parishes enclosed by county.

We measure enclosure by an indicator equal to one if a parish was enclosed in the Parliamentary period. The main reason for binarizing the impact of enclosure is that sometimes a single enclosure *act* encloses land in several units of observation in our dataset (a common that was shared between villages, for example). We have no systematic means of attributing the share of land that is in each of the parishes mentioned in the act. As a robustness check, we divide the enclosed area equally among parishes, and use the share of land enclosed in a parish as the measure of enclosure. We find similar results.

Pre-Parliamentary enclosure. Before the Parliamentary enclosure period, a substantial fraction of land was already in private hands. We measure the share of land enclosed before our study period using a map of early enclosures from Gonner (1966).

Failed enclosure acts. As described in section 2 of this paper, enclosure had to be proposed to Parliament. Often, these bills failed, and were not enacted into law. Failed acts are not in the database of realized enclosure of Tate and Turner (1978). We therefore expanded their database to include all failed enclosure acts as well. For acts proposed before 1800, we rely on Hoppit (1997) who records all failed acts in Parliament. For acts proposed after 1800, we read the *Journal of the House of Commons* which records Parliamentary proceedings. We recorded each instance of enclosure being proposed. By comparing the resultant list with the realized enclosures from Tate and Turner (1978) we identified enclosures that were proposed but did not pass.

In sum, for each parish we know whether it was enclosed, the fraction of land that was enclosed before the Parliamentary period, the number of times enclosure was proposed, and whether a proposed enclosure passed. We use failed enclosures as part of our identification strategy, which we discuss below.

3.3 Outcome variables

We focus on the hypothesized economic and social consequences of enclosure, which we introduced in section 2. Here we discuss data sources and measurement. First, we use agricultural yield from Kain and Prince (2006) who records wheat yield in bushels per acre around 1840. We focus on wheat, which has the

most observations and was the most important staple crop around this time. Results for other common crops, such as oats and barley, are similar but Kain and Prince (2006) collected fewer observations which reduces statistical power to detect an effect. Second, we record the the number of males over 20 employed in agriculture (Gatley, 2005), which we then divide by total population. On average 16% percent of the total parish population (men, women and children) is employed in agriculture. We use these to outcomes to study the effect of enclosure on agriculture. Third, we record population density in a parish from the 1831 census. Fourth, we collected data from the tithe commissioners' acts, who recorded the extent and value of each plot in England, and whether tithes were due or not Kain and Prince (2006). From these records, we compute a Gini coefficient at the parish level of inequality in the value of land. Since the tithe records include individual's allotments on the common, we can use this data to study the effect of enclosure on land inequality. We use population density and Gini to study the social consequences of enclosure. To study mechanisms, we record several new measures of innovation and change in agricultural practices, which we will introduce below.

3.4 Members of Parliament

Our identification strategy uses variation in the leniency of political representatives in judging a proposed enclosure against the standing orders that governed it. To get data on the members of Parliament, we digitized the biographies of all members of Parliament that represented each of 208 constituencies from Namier and Brooke (1964); Thorne (1986) and Fisher (2009). In total, we collect information for 2182 representatives.

3.5 Other variables

We collect a large number of additional covariates, which we introduce below as they become relevant in the empirical part of this paper.

3.6 Summary Statistics

In Table 1 we provide summary statistics of our main outcomes, split by an indicator equal to one if a parish experienced Parliamentary enclosure between 1750 and 1830. In a simple t-test we find that enclosed parishes have higher yields, and employ a smaller share of the workforce in agriculture. They are, on average, less densely settled, and more unequal. In the next sections we explore these patterns in detail.

4 Results: enclosure and economic development

In this section we estimate a linear relationship between enclosure and agricultural and social change. We find that enclosure is associated with higher agricultural yield, a lower proportion of the the populatin in agriculture, lower population density and higher land inequality.

4.1 Estimating equations

We start by estimating a simple model, using OLS:

$$Y_p = \beta_0 + \beta_1 \text{enclosed}_p + X_p' \beta_2 + s + \epsilon_p \quad (1)$$

This model relates an outcome Y in parish p to enclosure through an indicator enclosed_p , which again equals one if parish p is enclosed at any point between 1750 and 1830. Since our outcomes variables are measured close to 1830, we measure the effect of being enclosed during 1750-1830 at the end of this period. Our coefficient of interest is $\hat{\beta}_1$, the measured effect of being enclosed.

X_p is a vector of covariates. This vector includes a cubic polynomial in the fraction of land that was left unenclosed by 1700 to capture the scope for Parliamentary enclosure. To account for scale differences, we control for the area of the parish. To capture geographical differences, we control for elevation and terrain slope. We also include a full vector (n=11) of soil type fixed effects, which capture further differences in the agricultural potential of a parish (see Allen (1982) on the importance of soil type as a measure of productivity differences). To measure the location of a parish within England, we include distance to London in kilometers. We refer to these covariates as our *baseline* covariates. ϵ_p is a White standard error, capturing parish-level heteroskedasticity.

We restrict our sample in two ways. First, because enclosure was predominantly a rural phenomenon, we restrict our sample to rural England, defined by a parish being part of a rural Parliamentary constituency (see section 5.1 on types of constituencies). Second, we remove parishes that are enclosed after 1830. There are two reasons to stop in 1830. First, we measure most of our outcomes in the decade following 1830. Second, enclosure after 1830 did not need individual Parliamentary approval anymore but could be enclosed under the legal jurisdiction of two General Enclosure Acts, passed in 1836 and 1845. Since the individual Parliamentary procedure that processed each individual act is crucial for our identification strategy, we end our study in 1830.

We present results for our full sample, as well as within two sub-samples, parts of England where open fields dominated, and parts of England with ‘closed’ fields (measured from Gray (1915)). As discussed

in section 2, closed fields parishes would primarily enclose the commons and legally ratify pre-existing arrangements, whereas open fields parishes would fully rationalize property rights on the communally farmed open fields. We expect existing hypotheses on (the absence of) an effect of enclosure on agricultural productivity to primarily take place on the open fields. Other changes, like increased inequality, may result from both the enclosure of the commons and the rationalization of the open fields. When we use our full sample we include an indicator for field system as an additional covariate.

We present our results in several ways. In our appendix, we present regression estimates of equation 1 graphically, and in the next section we present estimates in table format.

4.2 Results

In this section we provide OLS results relating enclosure to agricultural and social consequences.

Agricultural Consequences. Table 2 reports estimates of equation 1 using wheat yield and proportion of the population in agriculture as the dependent variable. Columns (1)-(3) use wheat yield as the dependent variable, and columns (4)-(6) use employment in agriculture. Both outcomes are measured between 1830 and 1840, and we compare parishes that were enclosed in the decades preceding 1830 to parishes that were not. The point estimate that captures this comparison, $\hat{\beta}_1$, is in row 1. In addition to our baseline covariates, we control for measures of capital inputs when wheat yield is our dependent variable: an indicator that measures fertilizer use, and an indicator that measures the presence of agricultural machinery, such as threshing and harvesting machines, both from Kain and Prince (2006). We find that enclosure is associated with an increase in wheat yield (column (1)). This result is driven by the open fields (column (3)). The result that changes in agriculture are limited to the open fields is consistent with the view that common governance of resources leads to inefficient outcomes. In ‘closed’ field parishes, agricultural land was already in private ownership and privately governed, only the commons were divided up at enclosure. If the effect of enclosure on agricultural yield stems from alleviating coordination problems, we do not expect to see an effect of enclosure on yield in closed field villages. We observe this in column (2). To take the point estimate in column (1), enclosure is associated with an increase in yield of 0.5 bushels per acre. Average wheat yield in England around 1830 is 22 bushels per acre, but varies little (standard deviation: 4.5). Enclosure is associated with an increase in productivity of about 12 percent of a standard deviation. In columns (4)-(6) we relate enclosure to the proportion of the population in agricultural. We find that enclosure is associated with a two percentage point lower fraction of the population employed in agriculture (relative to mean of 16%). This effect is stronger on the open fields, which is consistent with the idea that enclosure increased labor productivity through complementary capital investments (Overton,

1996). In ‘closed’ field parishes, instead, the negative effect is consistent with the social effects that Marx (1990) discussed. If poorer parishioners no longer worked in agriculture they may have migrated away. We now turn to studying such social effects of enclosure directly.

Social Consequences. Aside from its effect on productivity, much of the debate on the enclosures has centered on its redistributive effects (Marx, 1990; Allen, 1992). In table 3 we study population density and land inequality to capture such effects. As before, we separately study open and closed fields. In columns (1)-(3) we use population density in 1831 as the dependent variable. We find that enclosure is associated with a lower population density. This effect is stronger when enclosure impacted just the commons, consisted with the view that poorer people, relying on the commons for part of their subsistence before enclosure, were not employed on the closed fields, but migrated. On the open fields, improvements in productivity offset out-migration. In columns (4)-(6) we study inequality in the value of individual plots. We find that enclosure is associated with higher land inequality, but only in closed villages. This result is consistent with the hypothesis that when the commons were divided up, poorer parishioners without a claim to the commons migrated away, which left larger, and more valuable, plots for those that did not migrate.

Robustness. In the appendix, we show that instead of using an indicator variable to measure enclosure, we can use the share of the area of the parish that was enclosed as our explanatory variable. We also use the number of years since enclosure instead of an enclosure indicator. Results are similar throughout.

Interpretation of the estimated effect size. The control group in these OLS regressions is composed of those parishes that would never enclose via Parliament, because they had only one proprietor for example, and parishes that enclosed by agreement. It is clear from the discussion in Gonner (1966) that the second type is far more prevalent. Because parishes that enclosed by agreement may also realize the concomitant productivity increases, our OLS results are likely to severely underestimate the true effect of *Parliamentary* enclosure. In other words, we have heterogeneous treatment effects by initial conditions: if already informally enclosed we expect formal enclosure to have a different potential treatment effect than it would have on unenclosed parishes. Previous attempts to estimate the effect of Parliamentary enclosure did not explicitly address this issue, and we return to it when we discuss our instrumental variables strategy.

In this section we found that enclosure is associated with higher agricultural productivity and a lower proportion of employment in agriculture. We also found that enclosure is associated with lower population density and higher in land inequality. Taken together, these results are consistent with enclosure having important economic and social consequences, many in line with the views of, among others, Overton (1996) and Marx (1990), who see enclosure as having economic benefits, but also profound social consequences. Our results are inconsistent with a prominent view of enclosure - and security of property rights more

broadly - that emphasizes the ability of communities to effectively enforce informal property rights and achieve similar economic efficiency as communities with ‘rationalized’ property rights (Ostrom, 1990).

However, for our results in this section to be interpretable as causal we require $Cov(enclosed, \epsilon|X, s) = 0$. As we argued in section 2, this is unlikely to hold in our context. In the next section, we introduce our identification strategy which aims to estimate the causal effect of enclosure for those parishes considering Parliamentary enclosure.

5 Identification

Our identification strategy exploits the fact that enclosure bills, although pertaining only to an individual parish, were enacted through Parliament in London. We proceed in two steps. First, we use the distinguishing feature of Parliamentary enclosure: the Parliamentary process for proposed enclosures, which fundamentally revolved around a judgment by MPs on whether a proposed enclosure satisfied a large number of legal requirements, called ‘standing orders’ (Lambert, 1971). This feature allows us to compute the leave-one-out mean of an indicator equal to one if a proposed enclosure passed averaged over the political representation - all MPs over our sample period - of a parish. Because the role of MPs can be interpreted as judging the quality of a proposed Bill, our strategy is essentially an ‘examiner’ design, common in labor and public economics (Dahl et al., 2014). To account for spill-overs, we augment this basic design by omitting a ‘doughnut’ of three rings of parishes around each parish when computing our instrument. Second, we note that due to the different groups of parishes in our sample - some already informally enclosed, others not yet enclosed - we estimate necessarily a heterogeneous treatment effect by informal enclosure status. Because our instrument only affects those parishes that consider the Parliamentary route for enclosure, our estimates reflect the treatment effect for this subgroup only (Imbens and Angrist, 1994). These two steps allow us to identify the treatment effect of Parliamentary enclosure.

For this strategy to be valid, we require that there is systematic variation across MPs in their ‘meticulousness’ of applying the standing orders, or their ‘leniency’ in keeping with the labor literature (Dahl et al., 2014). Our first stage estimates show that this is the case. For our estimates to have a causal interpretation we require that the meticulousness of MPs in London is uncorrelated with unobservables at the parish level that may correlate with our outcomes of interest. We show empirically that parish level observables are not correlated with the meticulousness of MPs in London. Note that leniency in enclosure acts is not likely to confound our effects through correlation with other economic policies: other policies that may affect a parish are typically national policies, not adjudicated by individual local MPs, and meticulousness of individual MPs is therefore only relevant for acts pertaining to an individual parish

rather than to national policies, a point which we return to below.

This strategy produces estimates of a treatment effect that is closer to the ‘true’ treatment effect of Parliamentary enclosure than our OLS estimates. Because parishes that enclose by agreement are ‘never-takers’ in the terminology of Imbens and Angrist (1994), they are downweighted to zero in our IV estimates. Instead, by computing the treatment effect for those parishes considering the Parliamentary procedure, or the ‘compliers’, we recover estimates of the causal effect of *Parliamentary* enclosure. In the remainder of this section, we provide the necessary background on the Parliamentary procedure for enclosure, and address potential challenges to our identification strategy.

5.1 Parishes and Parliament

Each parish in England was part of a constituency, and each constituency sent two MPs to Parliament. There were two types of constituencies. County constituencies were rural constituencies, covering large parts of England. There were 40 such constituencies. On average, a county constituency covers 387 parishes in our dataset. Borough constituencies covered medieval cities, and were often very small. Some borough were so small that they were called ‘rotten’, as a handful of voters elected two MPs, as many as were elected by the about ten thousand voters in Yorkshire. The franchise was heavily restricted to wealthy male citizens, less than ten percent to the population. Political competition was limited. About 80% of MPs were part of a dynasty, in the sense that their father, grandfather, uncle, son or grandson was or had been an MP as well. These MPs were often elected on an ‘interest’, which meant that a large landowner paid off the few voters in a borough constituency. This resulted in about 85% of elections in our sample period being uncontested. In our analyses, we restrict to county constituencies. In these constituencies, there were hundreds of parishes that had virtually no control over the outcome of elections, unless they happened to be home to a large landlord, or the MP himself. Note, and we will return to this issue below, that a MP or a large landowner would more likely be the only landowner in a parish, and therefore already de facto be enclosed.

5.2 The Parliamentary process for enclosure bills

In section 2 we discussed the process that led to an enclosure act. Here we provide the relevant detail on the Parliamentary stage of the process.

Once a bill was agreed upon in a parish it was submitted to Parliament by a lawyer hired by the petitioning parish. In Parliament, it was subject to what was called the ‘Private Bill procedure’. Any bill in Parliament can either be public or private, pertaining to the entire country, such as bill on tariffs or war,

or pertaining to a local or individual issues, initially typically naturalization and divorce, but from about 1700 also local issues to do with property, like enclosure. Both types of acts were are subject to separate procedures, the Public and Private Bill procedures. We provide a step by step breakdown of the Private Bill procedure in the Appendix. The most important part of the Private Bill procedure was the formation of a committee to judge a proposed bill. Within these committees, MPs were tasked with judging a bill by a large number of legal requirements for the contents of the bill, called standing orders. There were numerous standing orders for private bills, and additional standing orders for enclosure bills in particular. For private bills, the most important distinguishing standing orders required that all stakeholders in the proposed bill needed to be appropriately heard. Such requirements are of course impractical for public bills, but make sense for divorce and other private matters. By submitting enclosure bills as private Bills petitioners ensured that the interests of all stakeholders were represented. For example, the requirement that bills needed to be posted on the church door came from the enclosure specific standing orders. These orders also stipulated that a committee formed to judge a bill should review the enclosure consent document, and ascertain that the requisite majority of landowners as well as other stakeholders (such as the Lord of the Manor, the owners of the great and little tithes, and the local Church of England representative) were adequately represented. To do this, MPs were authorized to request documentary evidence, to call witnesses, and to require amendments to proposed bills. After this, there was room for ‘counter-petitions’ from stakeholders who felt disadvantaged by the proposed bill, and the committee was required to hear their complaints. At the end, a committee made a recommendation, and there was a vote by the house. Through the standing orders and the committees, Parliament offered a mechanism to resolve disputes that would potentially scuttle an informal agreement.

Throughout these procedures, it was by no means guaranteed that a bill would pass. For Oxfordshire, about a third of proposed bills failed (Tate, 1949). For Nottinghamshire, the number is also about a third (Tate, 1942). In our database of all enclosure acts, about 20 percent of acts failed.

In principle, any MP could be assigned to be on a committee, but in practice the MPs representing the constituency from which a petition came, and MPs from surrounding constituencies constituted the committee formed to judge a Bill (Tate, 1942). Cf. also “The members .. are usually the county members, or those from a neighboring constituency” (Tate, 1967) p. 95.

5.3 The committee in practice

We described so far the theoretical legal procedure. The formal procedure may of course differ from the de facto implementation of the law. As for the task of the committee, it is clear from contemporaries’

descriptions of the process that its de facto mandate was the resolution of potential conflicts of interest in the Bill (May, 1844, p. 76):

“a bill for the particular benefit of certain persons may be injurious to others; and to discriminate between the conflicting interests of different parties, involves the exercise of judicial inquiry and determination.”

The members did so by applying the standing orders. In fact (Fisher, 2009) notes:¹⁰

“A private bill could not be introduced without confirmation that the standing orders had been complied with, and the committee’s function was to establish whether this was so, and report its conclusions to the House.”

In the Appendix, we provide a description of the full practical procedure from a contemporary lawyer’s handbook. This handbook also lists in full text the standing orders an enclosure act was required to comply with (Ellis, 1802).

There was a committee for every enclosure. It stands to reason that there was variation across MPs in the meticulousness with which they applied the many standing orders for the enclosure of a single parish among the hundreds they represented. In addition, MPs were often more concerned with private business or with more visible acts than an enclosure act for a parish far away. For Private Bills, it is clear that MPs often did not show up, and that the committee had a large degree of discretion over the rigor with which the standing orders were applied (Lambert, 1971). The only effective check there was on their meticulousness was parishioners hiring a lawyer to check the proceedings, and counterpetition if they felt their interests weren’t represented.

When the committee reached a verdict, they “...report to the house that the Committee has gone through the bill, and then they will order it to be engrossed” (Ellis, 1802, p. 89). The committee then went up to the speaker of the House to vote. Although formally every MP was allowed to vote there is later, and probably representative, evidence from the 19th century that “that routine business, whether public or private, was transacted round the speaker’s chair, while the rest of the house chatted and moved about to speak to friends” (Lambert, 1971, p. 98).

In conclusion, MPs were required to formally judge a proposed enclosure against a large number of standing orders. At the end of the process, a law could be produced that prescribed enclosure. At this stage, as we saw in section 2, Parliament appointed commissioners that went to the involved parishes to survey everyone’s holdings, and implement the actual enclosure.

¹⁰We consulted the online version of this book, available here: <http://historyofparliamentonline.org/volume/1820-1832/survey/vii-procedure-and-business-house>. Current as of 12/01/2020. The quotation appears on this page.

5.4 Our identification strategy

We posit that there are differences in the meticulousness with which MPs judged a Bill against the standing orders. If true, this observation implies that we could use the leave-one-out fraction of enclosures proposed that passed under the jurisdiction of MPs representing a parish as an instrument for enclosure. Note that studies of individual counties' political history suggest strongly that there was variation in the extent to which MPs were involved with Parliamentary procedure, but do not formally test for differences (Tate, 1949; Martin, 1979).

Our identification strategy rests on the assumption that there are such differences. This assumption is equivalent to the requirement for instrumental variable analyses that there is a sufficiently strong first stage. The second identifying assumption is that parish level unobservables are uncorrelated with the meticulousness of their political representation in Parliament. While not formally testable, we will provide intuition and results to suggest that this exclusion restriction is met.

The textbook instrumental variables strategy assumes constant treatment effects: the hypothesized effect of the endogenous variable is constant across, in our case, parishes. We have seen in section 2, and in the discussion of our OLS results, that this is not the case for us. If a parish was fully enclosed informally, the treatment effect of Parliamentary enclosure is hypothetical, since such parishes would never petition. If instead, a parish was not enclosed, it may decide to petition Parliament, or may decide to enclose informally. The former is more likely, as we saw, if there were many small landowners. The latter may be more likely if there is a single large landowner. For these parishes, our instrument may induce a petition to pass, or a parish to consider petitioning. In the language of Imbens and Angrist (1994), we estimate a heterogeneous treatment effect: parishes that enclose by agreement without considering the Parliamentary route are 'never-takers'. We do not estimate the treatment effect of enclosure for these parishes. Our identification strategy instead recovers the effect of enclosure for those who consider the Parliamentary route, or the 'compliers'. We therefore identify the object of interest of this paper: The treatment effect of Parliamentary enclosure.

5.5 The construction of our instrument

In this section, we operationalize the use meticulousness of MPs as an instrument for enclosure. We proceed in several steps.

1. We identify the universe of MPs that were in Parliament at any point between 1750 and 1830. For each MP, we record which constituency they represent in which year(s).

2. For each parish and each MP m representing that parish, let a_m be the total number of enclosure acts proposed by parishes that this MP represented at any point during his career, and let c_m the number of of these acts that passed.¹¹
3. We now remove the proposed and passed acts in parish p itself from these totals, as well as for a ‘doughnut’ of three rings of neighboring parishes. Removing these neighboring parishes accounts for potential spillovers across parishes. For example, in the previous section we established a correlation between enclosure and population density. An enclosure may therefore affect neighboring parishes as parishioners migrate across parish boundaries, formally a SUTVA violation. Denote a_m^{-d} as the number of proposed acts outside a doughnut of size d . Define c_m^{-d} analogously.

Using these inputs we compute our instrument for enclosure of parish p as:

$$L_p^{-d} = \frac{1}{|M_p|} \sum_{m \in M_p} \frac{c_m^{-d}}{a_m^{-d}} \quad (2)$$

Where M_p is the set of members of Parliament that represented parish p between 1750 and 1830. Intuitively, this instrument measures the meticulousness of MPs representing a parish over their career, representing the constituency the relevant parish is in, but also in other constituencies this MP represented. Measuring meticulousness this way captures the idea that it is a personal attribute, exercised in London. This measure is defined for both parishes that end up petitioning in our sample period and those that do not, and guarantees that we can compare parishes that end up enclosing, to those that do not. By averaging over all MPs representing a parish, and therefore averaging over time to create a cross-sectional instrument, we naturally lose time information. Therefore, before averaging, we partial out a full set of year fixed effects, which capture any secular trend in meticulousness, for example due to simplified Parliamentary procedure (see e.g. Lambert (1971) on this). In short, this instrument captures the leave-one-out ‘doughnut’ estimate of the leniency of political representation of a parish over our sample period. Note that this measure varies parish by parish, and between parishes within the same constituency, because the three-ring doughnut is different for every parish.

Figure 4 contains four maps that provide intuition for the construction of the instrument for the parish of *Empingham* at the time for Sir Gilbert Heathcote (1773-1851). Heathcote represented Lincolnshire, a large constituency (649 parishes) and then Rutland between 1796 and 1841. During his tenure, 99 enclosure acts were proposed by landowners in his constituencies, and 68 passed. Subfigure (a) contains a map of

¹¹Formally, a_m is the sum of acts proposed for all parishes in the constituencies represented by a member of Parliament over all years that he was in Parliament: $a_m = \sum_t \sum_p \mathbb{1}(act_{pt})$ where p is a parish in a constituency the member of Parliament represents in year t and $\mathbb{1}(act_{pt})$ is an indicator equal to one if an enclosure was proposed in parish p in year t . c_m is defined analogously counting enclosure acts that passed.

England indicating the two constituencies Heathcote represented, Lincolnshire and Rutland. Subfigure (b) shows Rutland, and Empingham in red. Parishes with a black outline are enclosed in Heathcote’ time. Empingham, for example, is enclosed in 1794. Parishes shaded in white are within a three ring doughnut around Empingham, and parishes in gray are outside. Subfigure (c) shows by black outlines parishes that are enclosed during Heathcote’ tenure. The instrument value for Heathcote is computed as the number of enclosures in the gray parishes, divided by the number of attempts. In this computation, we leave out all parishes inside the three ring doughnut (see Subfigure (d)). The instrument value for Empingham, $S_{Empingham}^{-3}$, is subsequently computed by averaging over all MPs representing Empingham between 1750 and 1830 (after partialling out year fixed effects). Note that, like Heathcote, many MPs represented several constituencies with enclosures. In the appendix, we provide similar maps for another MP that represented Empingham in our sample period, Gerard Noel Edwards.

5.6 Challenges to identification

The most obvious challenge to identification is that, conditional on our covariates, parish observables correlate with our instrument, violating the exclusion restriction. The most direct way this could occur is if, for example, MPs live in parishes with certain characteristics, and they are more lenient when these parishes attempt to enclose.¹² The behavior of MPs in Parliament in connection with enclosure has been studied extensively by William Tate (Tate, 1942, 1945, 1949, 1967). Tate (1949, p. 220) concludes:

“Enough evidence has been adduced to suggest strongly, though hardly to prove, that on occasion members went out of their way to take part in enclosure proceedings for parishes where they or their friends, allies, or patrons had estates. But that this was done systematically, habitually, and upon a large scale is demonstrably untrue.”

Our leave-one-out strategy, including omission of the doughnut from our instrument, addresses these concerns in principle. Nevertheless, we provide a large number of balance checks below, which support our assertion that parish characteristics are uncorrelated with the behavior of MPs in London.

A more subtle variant of a correlation between parish observables and MP characteristics involves the timing of enclosure. A parish could hold off petitioning for an election to pass, for example. Similarly, a MP may run in a constituency that has a larger number of parishes that are about to enclose. In the appendix, we study a panel of MP elections and enclosure and show this is not the case. In the next section, we show balance results.

¹²For example, Sir Charles Mordaunt represented Warwickshire for 40 years, between 1734 and 1774. The first enclosure act that was proposed when he was in Parliament was for Wellesbourne Mountford, where he was the lord of the manor - the major local landowner. Note that in the construction of the instrument for Wellesbourne Mountford, this enclosure attempt would be omitted.

Finally, meticulousness in judging the legality of an enclosure Bill may correlate with meticulousness in judging other Bills. This concern is likely to be muted because most other legislation that passes in Parliament is national legislation, such as the Corn Laws, and is uniformly implemented throughout the country, involving all MPs.

5.7 Balance

In this section we study the exclusion restriction underpinning our identification strategy. We have argued that parishes are small relative to constituencies, and by leaving out individual parishes and neighboring parishes we purge the instrument of a direct connection with the parish whose (absence of) enclosure is being instrumented. For our identification strategy to be valid, we require the instrument to be excludable. Although this requirement is not formally testable, we study balance on observables to build intuition for its plausibility.

Table 4 reports results. We use several pre-determined variables as outcome variables, and our instrument as the main explanatory variable. In panel I the sample includes all parishes, as will our instrumental variable regressions below. In panel II, we instead restrict to our best of measure of compliers: those parishes that attempt enclosure at least once.¹³

The estimates in panels I and II help us study whether differences in economic development before the start of our study period correlate with our instrument. If so, the exclusion restriction is likely violated. We consider tax revenues in 1525 from the Tudor Lay Subsidies (Sheail, 1968), both per capita and in levels. The Lay subsidies are reported at the parish level and reflect income differences before the start of our study period. In fact, the Lay Subsidies were raised before the first Parliamentary enclosure in 1604. Column (3) studies potential productivity, measured by the agricultural suitability for growing wheat, as computed by the Food and Agricultural Organization, and column (4) population, measured from the Lay Subsidies. Next we study whether MPs or members of the nobility lived in a parish before the start of our study period, in 1700. We report standardized coefficients. On all measures, we find balance in the sense that estimated coefficients are small and insignificant.

While it is never possible to check balance on all (un)observables, these results provide credence to our assertion that our instrument is excludable: Characteristics of an individual parish that may correlate with the potential return to enclosure are uncorrelated with our instrument.

¹³Note that the true set of compliers is larger than this, as parishes that consider Parliamentary enclosure but decide against enclosure are also potentially compliers.

5.8 Estimating equations

We estimate the following system of equations. We model the decision to enact an enclosure as a probit model, capturing the binary outcome of the Parliamentary decision to allow a proposed enclosure:

$$Pr(enclosed_p = 1 | L_p^{-d}, X_p, s) = \Phi(\gamma_0 + \gamma_1 L_p^{-d} + X_p' \gamma_2 + s) \quad (3)$$

And we model an economic outcome of interest as a linear model of enclosure and covariates:

$$Y_p = \delta_0 + \delta_1 enclosed_p + X_p' \delta_2 + s + \mu_p \quad (4)$$

Where Y_p is an outcome of interest, as before. We now instrument $enclosed_p$ with L_p^{-d} , the doughnut measure of MP efficacy. Since two parishes that are far apart may share a history of the same two MPs that, for example, previously represented a third constituency together, the natural way to cluster standard errors is at the individual MP level. Since we estimate a cross-sectional model, averaging over MPs, we cluster standard errors at the constituency level.

The method to estimate a linear regression with a binary endogenous variable predicted from a probit first stage is developed in Maddala (1986). We assume that μ_p is normally distributed and estimate the system of equations using maximum likelihood (see Maddala (1986, p. 117-122).¹⁴)

For our IV analyses, we do not split the sample by field systems because for smaller samples our first stages become underpowered.

6 Results: the economic effects of enclosure

In this section we use our identification strategy to estimate the effect of enclosure on agricultural and social change. Our results are in line with our OLS results. Enclosure leads to increases in agricultural productivity, and a reduction in agricultural employment. It also leads to a fall in population density and increased land inequality inequality. Because we recover treatment effects for those parishes that consider Parliamentary enclosure, we estimate substantially larger treatment effects. Our results are inconsistent with a view of property rights regimes that view informal property rights as on par in terms of efficiency with rationalized property rights.

Agricultural Consequences. In table 5 we estimate the system of equations defined by equations 3 and 4 using Two Stage Least Squares. We use L_p^{-3} as the excluded instrument, and start with wheat yield

¹⁴The system of equations can alternatively be estimated using a control function approach (Wooldridge, 2015). Maximum likelihood has the advantage of allowing straightforward clustering of standard errors.

and employment in agriculture as our first outcome variables. This table therefore mimics columns (1) and (4) of Table 2.

Panel I reports estimates of equation 3, panel II provides estimates of equation 4. In column (1) we find a positive and significant effect of enclosure on wheat yield. The corresponding estimates in row 2 shows a positive and significant first stage, as well. Furthermore, the first stage F-statistic is high enough to be confident the informativeness of our instrument in this sample. Take the point estimate in column (1), $\hat{\delta}_1 = 4.81$ (clustered s.e.: 0.88). This means that increasing predicted enclosure probability from 0 to 100% increases yield by about 5 bushels per acre, or about 25% of its mean (and about 1 standard deviation). In column (2), we study employment in agriculture. We find that enclosure leads to a decline of employment in agriculture equal to about 9 percentage points relative to a mean of 16%.

An important point to note is that both these effects are larger than their counterpart OLS effects. This is in part due to the fact that our estimator is less susceptible to the attenuating effect of measurement error, but more substantively this is due to the fact that these treatment effect are for compliers only, i.e. only those parishes that consider Parliamentary enclosure and petition (or not). We therefore measure the effects of complier parishes, whose enclosure status can be expected to be changed by more lenient or less meticulous political representation. Informally enclosed parishes, in the control group in OLS regressions and simple comparisons of parishes with and without Parliamentary enclosure, do no longer function as a control. For yield we can benchmark our estimated effect against the long-run change in yield. Between 1300 and 1750, the start of our study, yields increased on average by 9 bushels to about 20 (Allen, 2005). Enclosure led to an increase of a five bushels, or about 50% of the increase brought about by 450 years of accumulated improvement.

Social Consequences. In table 6 we estimate the system of equations defined by equations 3 and 4 for population density and inequality. As in Table 5, Panel I reports second stage estimates of the effect of enclosure, and panel II reports the corresponding first stages.

In column (1) we focus on population density. We find, as before, a negative and significant effect of enclosure on population density. Similarly, we find a positive and significant effect on the Gini estimates. Take the point estimate in column (2), $\hat{\delta}_1 = 0.11$ (clustered s.e.: 0.03). This means that enclosure leads to a ten percentage point increase in inequality.

Taken together, the estimates in this section show a significant effect of enclosure agricultural yield, changes in the composition of the labor force, population density, and inequality. Subject to the exclusion restriction, these results are interpretable as causal. Our findings speak to the long standing debate on the effect of the enclosures on English development. We find evidence that is consistent with several proposed hypotheses in the vast literature on enclosure. Our evidence is not consistent with a view of enclosure that

emphasizes the absence of improvement as a consequence of enclosure. This literature claims that property rights can be efficiently negotiated absent formal procedure. We do not find support for these claims. We find that enclosure had distributional consequences. We argued in section 2, that plausibly the anticipation of this redistribution stifled local negotiation about potential improvements.

7 Mechanisms

As we discussed in section 2, the effects we find may be driven by many different mechanisms. Arthur Young, for example, suggested that common fields inhibited improvement in agricultural practices because everyone had to agree on the same practices and could not adapt to the conditions of a particular plot. Strip farming, for example, limited the scope to shift from arable to pasture due to shared investment in for example ploughs, and the larger contiguous fields necessary for pasture. A shift to pasture has potentially important consequences since fewer people are needed to work pasture. Separately, an enclosure act often stipulated to construction of roads or the improvement and extension of existing roads. Such infrastructure investments may separately have been conducive to trade and development. More abstractly, enclosure removed the need to coordinate. This may have led to greater flexibility in investment, adoption of best practices and, ultimately, to economic development. In this section we present OLS evidence on these potential channels.

We start by studying innovation, measured by agricultural patents, and the quality of roads, measured in an agricultural survey. If enclosures did lead to enhanced incentives for innovation and improvement we may see more agricultural patents being filed by residents of enclosed parishes. We use data from (Dowey, 2013) who collected a database of agricultural patents. These returns record the place of residence of the patent holders and we used this place to geographically locate the patents. We use the count of patents in a particular place, not the count of patentees (there can be multiple patentees on one patent). The variable we construct is the total number of patents that were registered to people living in a parish between 1750 and 1850. We next study roads, which is a novel mechanism, which has been less emphasized in the literature (but has been studied in other contexts, see Bogart (2005)). We code an indicator equal to one if the quality of roads in a parishes was assessed to be poor in the tithe surveys (Kain and Prince, 2006). Table 7 presents results. As in our earlier tables where we estimated OLS regressions, we split our samples by open and closed fields. We find that enclosure is associated with more agricultural patents being filed as well as with a lower probability of a parish having poor roads.

A second strand of proposed mechanisms do not concern patenting or infrastructure projects, but the adoption of more effectively agricultural practices, which may have been more attractive after enclosure

because there was no longer a need to coordinate (Young, 1771). To capture this potential mechanism, we consider the planting of turnips and fallowing as two basic agricultural improvements. Planting turnips or ‘nitrogen fixing’ crops like clover in between other crops like wheat, or between harvests, repletes the soil while still yielding a crop and allows for continuous harvesting (Allen, 2008). Fallowing instead allows the land to ‘recover’, and was common in open field villages. Fallow land, however, can be pulled into continuous cultivation, provided farmers find the appropriate crop mix. We record the adoption of these practices from survey data compiled by Kain and Prince (2006). Their surveys record the acreage of parish planted with turnips (at the time of the survey) and an indicator for whether a parish leaves lands fallow. We expect that enclosure improves agricultural practices because these improvements can now be chosen individually rather than through coordination. This is what we find in Table 8. These effects are more pronounced in the open fields, where the scope for such innovations was larger.

While it is never possible to fully explore all mechanisms, we have sketched in this section a number of potential mechanisms linking enclosure to economic and social change. We find support for increased innovation and the adoption of better, but known, agricultural practices which likely reflects the fact that individual farmers no longer needed to coordinate. Finally, we provide tentative evidence in support of enclosure being associated with infrastructure improvement.

8 The Midlands

In an important contribution, Allen (1982) studies the English Midlands, and concludes that enclosure did not lead to improvement in agriculture, but did lead to adverse social change. In this section, we use our dataset to compare the part of England he studies to the rest of England. We find that although employment in agriculture is reduced, there is no relationship between enclosure and agricultural yield in Allen’s sample.¹⁵

Table 9 presents four estimates of equation 1, estimated using OLS, for wheat yield and employment in agriculture,. Odd columns use our full sample, and even columns subset to the Allen (1982) sample. We find a negative effect of enclosure on employment in agriculture for the his sample, like in table 2. When we look at agricultural yield however, we find a positive effect for the entire country, but a smaller and insignificant effect for the Allen (1982) sample.

This observation may be behind the divergence in results between our studies. Our sample allows us to study the entire country, but when we subset to Allen’s sample, we replicate his findings.

¹⁵To construct the Allen (1982) sample, we restrict to the following counties: Bedfordshire, Berkshire, Buckinghamshire, Cambridgeshire, Huntingdonshire, Leicestershire, Northamptonshire, Rutland, and Warwickshire.

9 Conclusion

The English enclosure movement is one of the most controversial economic policies in history. In this paper we have provided the first causal evidence of its economic effects.

As a basis for our results, we constructed a dataset that allows us to link enclosures, development outcomes, and the biographies of members of Parliament at a granular level. Across about 15,000 parishes covering all of England, we compare enclosed to unenclosed parishes, conditional on the share of land that was already enclosed before Parliamentary enclosure begun, and other relevant covariates capturing underlying productivity and urbanization differences. The heart of our contribution is an identification strategy which instruments whether or not a parish is enclosed by a Parliamentary act with a leave-one-out measure of the leniency of its political representation in judging enclosure legislation.

We find that enclosure led to increases in agricultural yield, and a reduction in the fraction of the population in agriculture. Finally, we find that enclosure led to lower population density and an increase in inequality.

Our results confirm some famous hypothesis about the impact of enclosures, but also challenge notions that pre-modern agricultural institutions allocated resources efficiently.

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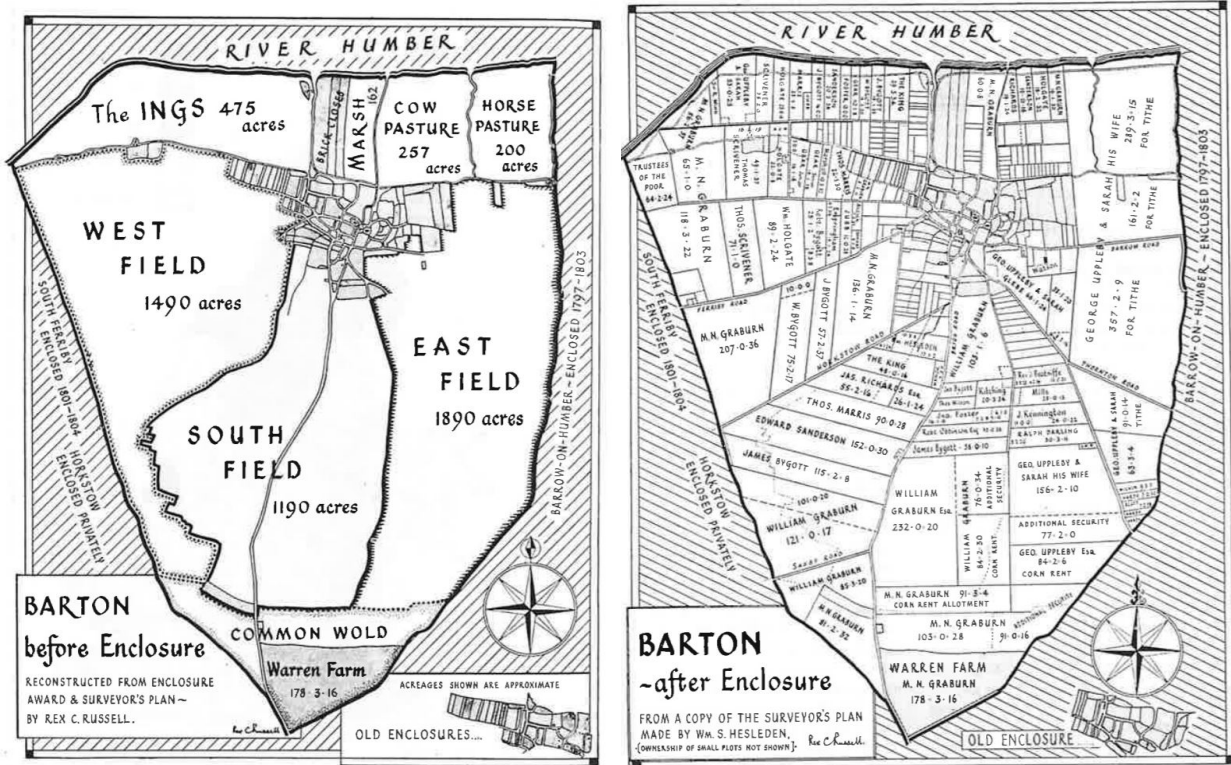
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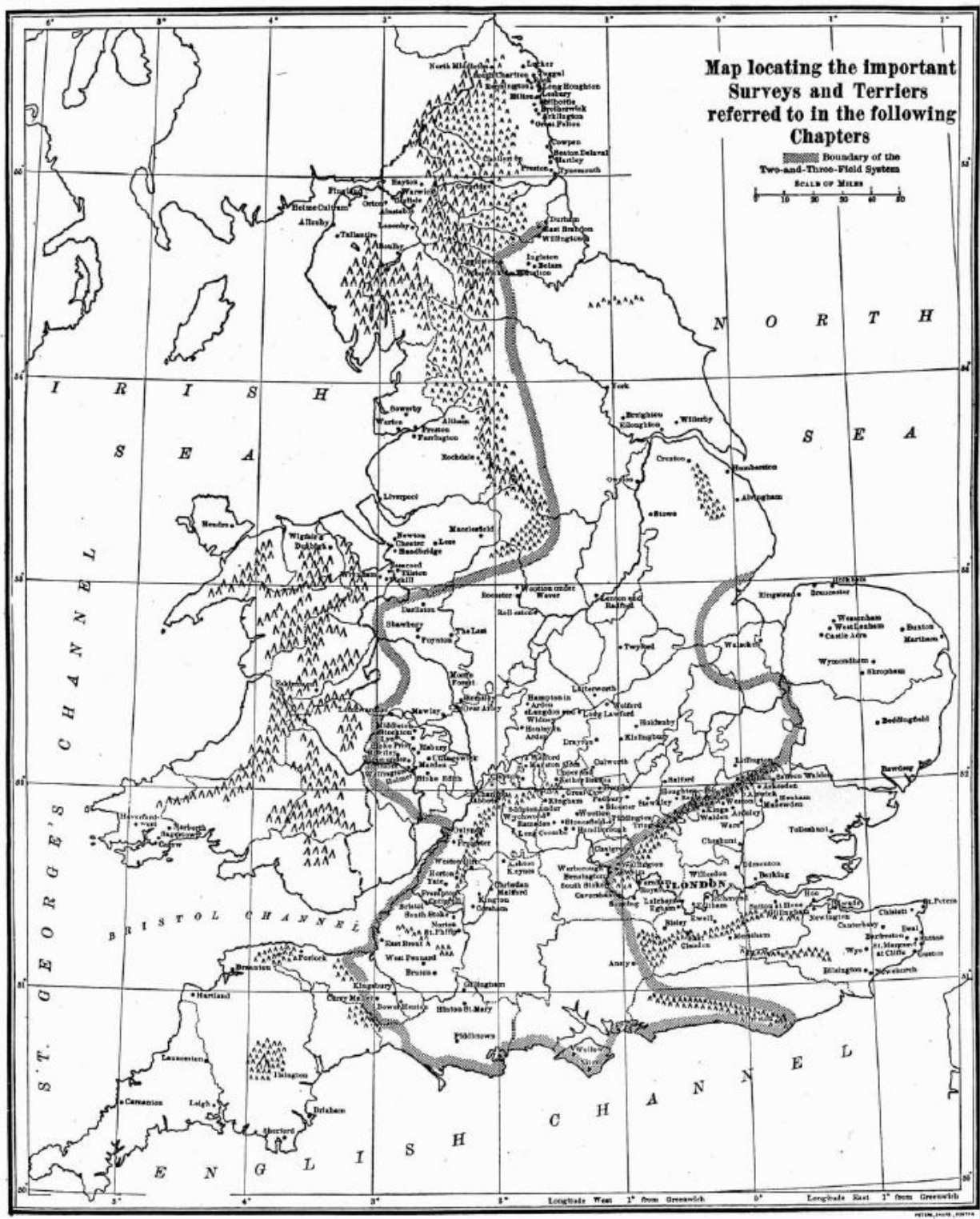
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Figure 1: ORGANIZATION OF LANDOWNERSHIP IN BARTON BEFORE AND AFTER ENCLOSURE



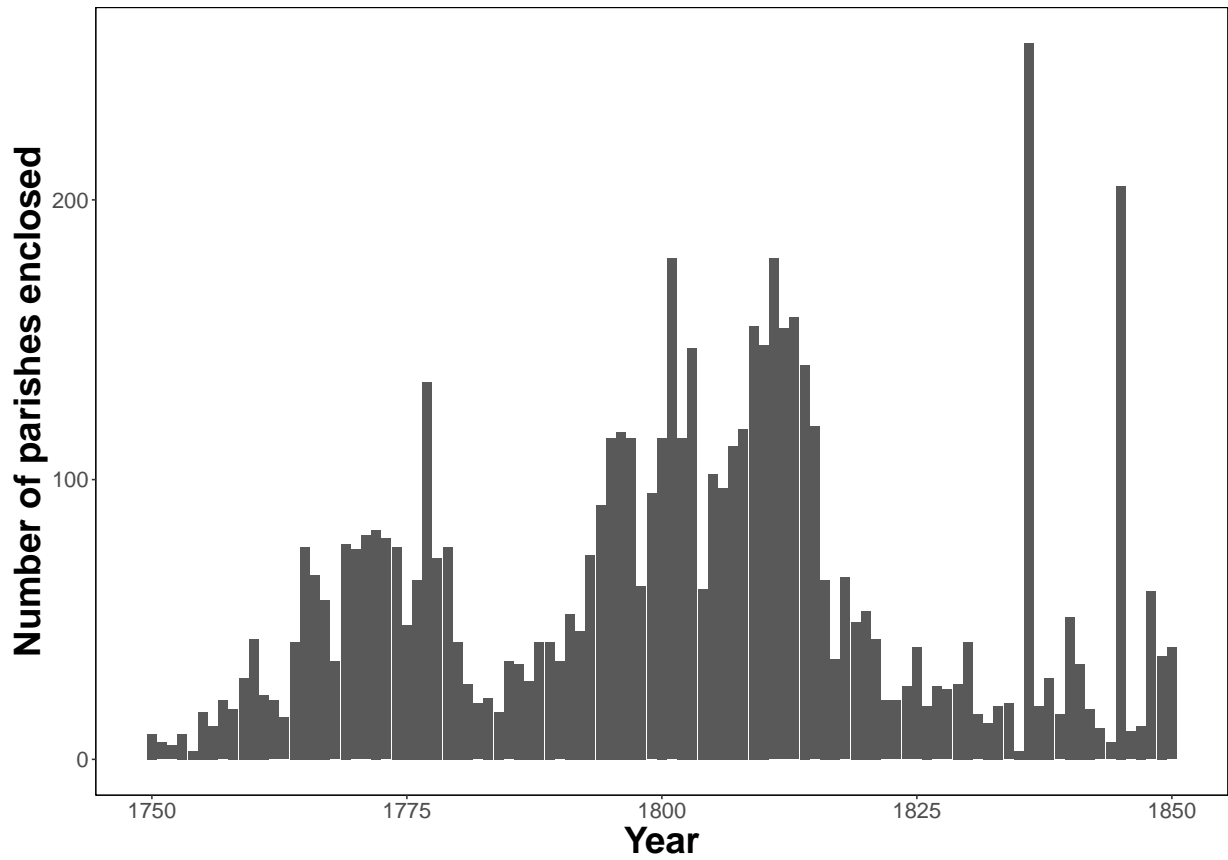
Notes: the map on the left shows the commonly held plots of land in Barton-upon-Humber, before enclosure. Barton was enclosed between 1797 and 1803. The right map reflects the results of enclosure. Source: Mingay (1997).

Figure 2: THE BOUNDARY BETWEEN THE OPEN AND CLOSED FIELD SYSTEMS



Notes: this map shows the boundaries between historical open and closed field systems. Source: Gray (1915).

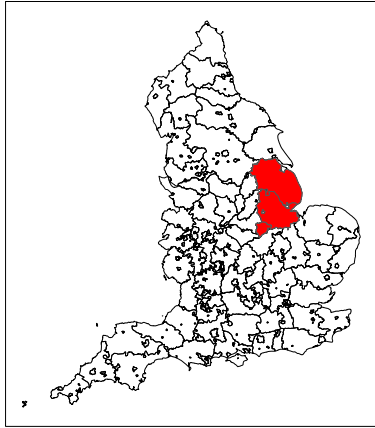
Figure 3: THE NUMBER OF ENCLOSED PARISHES, BY YEAR



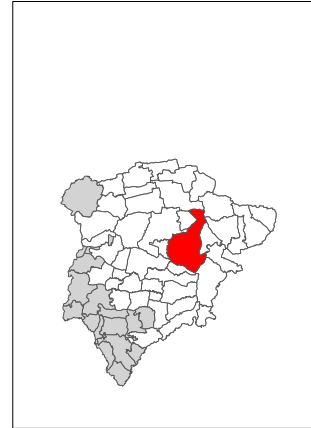
Notes: This graph shows the total number of enclosed parishes per year. Source: Tate and Turner (1978).

Figure 4: ENCLOSURE UNDER SIR GILBERT HEATHCOTE (1773-1851)

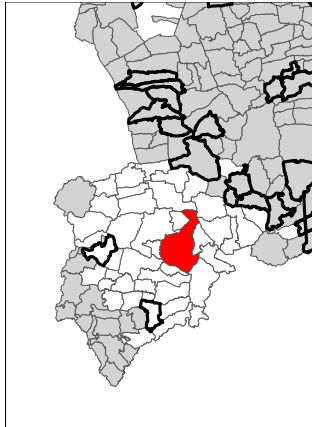
(a) Rutland constituency among all constituencies



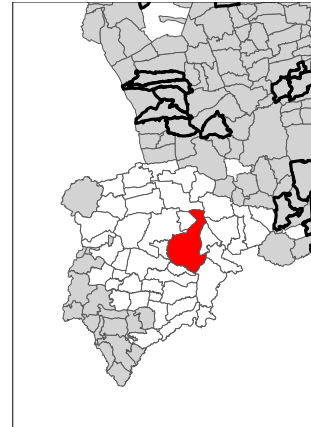
(b) Parishes, Empingham, and three-ring doughnut



(c) Enclosures under Heathcote, inside and outside donut



(d) Enclosures under Heathcote, outside doughnut



Notes: subfigure (a) shows Rutland and Lincolnshire, two Parliamentary constituencies. Rutland was represented by Sir Gilbert Heathcote between 1812 and 1841. The next panels show the construction of the instrument, based on his tenure. Subfigure (b) shows Empingham parish in red, and the other parishes in Rutland in white and grey. White parishes are the three nearest neighbors of Empingham. We refer to this ring as a three-ring doughnut. Subfigure (c) shows parishes that were enclosed during his tenure inside and outside the doughnut, and subfigure (d) shows the parishes that were enclosed under Heathcote's tenure, subsetting to parishes outside the donut. We use information for these parishes outside the donut to compute the value of our instrument for Empingham. The computation of the instrument proceeds in two steps. First, we compute the fraction of proposed enclosure acts that were enacted by Parliament during Heathcote's tenure, for parishes outside the doughnut. Second, we average this rate across members of Parliament that represented Rutland over our entire sample period, 1750-1830.

Table 1: SUMMARY STATISTICS FOR MAIN OUTCOME VARIABLES

<i>Sample, parishes:</i>	N	ENCLOSED		UNCLOSED		difference	t-stat
		mean	sd	mean	sd		
Wheat yield (bushels per acre)	4003	22.22	4.09	21.46	4.68	-0.76	-5.01***
Share of pop. (male, >20) in agriculture	12715	0.16	0.06	0.16	0.08	0.01	5.04***
Population density 1831 (ppl/km2)	12931	265.22	695.60	501.80	1084.72	236.58	13.89***
Inequality (gini)	1928	0.72	0.11	0.68	0.13	-0.04	-6.04***

Notes: Wheat yield (bushels per acre) is the number of bushels of wheat that a typical acre yields. Share of pop. (male, >20) in agriculture is the number of males over 20 employed in agriculture divided by total population in the 1831 census. Population density is the total number of people living in a parish at the time of the 1831 census, divided by parish area in square kilometers. Inequality (gini) is a land-value gini coefficient.

Table 2: Enclosure and agriculture

<i>Dependent variable:</i>	WHEAT YIELD (BUSHEL PER ACRE)			SHARE OF POP. (MALE, >20) IN AGRICULTURE		
	(1)	(2)	(3)	(4)	(5)	(6)
	<i>All</i>	<i>Closed</i>	<i>Open</i>	<i>All</i>	<i>Closed</i>	<i>Open</i>
<i>Fields:</i>						
Enclosure (yes/no)	0.52*** (0.16)	0.36 (0.22)	0.60*** (0.23)	-0.02*** (0.00)	-0.01*** (0.00)	-0.02*** (0.00)
Mean dep. var.	21.63	21.87	21.30	0.16	0.16	0.17
SD dep. var.	4.53	4.63	4.38	0.07	0.07	0.07
Observations	3434	1943	1491	11041	4586	6455
R^2	0.30	0.34	0.29	0.11	0.12	0.11
<i>Inputs:</i> fertilizer or machine use (yes/no)	Y	Y	Y	N	N	N
<i>Field system:</i> Open fields (yes/no)	Y	N	N	Y	N	N
<i>Pre-Parliamentary enclosure:</i> land enclosed before 1700 (%), cubic polynomial	Y	Y	Y	Y	Y	Y
<i>Scale:</i> parish area	Y	Y	Y	Y	Y	Y
<i>Geography:</i> elevation	Y	Y	Y	Y	Y	Y
<i>Location:</i> Dist. to London	Y	Y	Y	Y	Y	Y
<i>Soil characteristics:</i> soil type indicators (n=11)	Y	Y	Y	Y	Y	Y

Notes: All regressions are estimated using OLS. The unit of observation is a parish. All regression restrict to rural parishes. Wheat yield (bushels per acre) is the number of bushels of wheat that a typical acre yields. Share of pop. (male, >20) in agriculture is the number of males over 20 employed in agriculture divided by total population in the 1831 census. Enclosure (yes/no) is an indicator equal to one if a parish was enclosed at any point between 1750 and 1830. Standard errors correcting for heteroskedasticity at the parish level are in parentheses. * indicates significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 3: Enclosure and social change

<i>Dependent variable:</i>	POPULATION DENSITY (PPL/KM2)			GINI (LAND VALUE):		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Fields:</i>	<i>All</i>	<i>Closed</i>	<i>Open</i>	<i>All</i>	<i>Closed</i>	<i>Open</i>
Enclosure (yes/no)	-839.02*** (170.47)	-1992.25*** (449.27)	-407.40*** (157.94)	0.02*** (0.01)	0.04*** (0.01)	-0.00 (0.01)
Mean dep. var.	927.35	1342.67	627.99	0.68	0.67	0.69
SD dep. var.	11682.82	13389.86	10271.92	0.13	0.14	0.11
Observations	7640	3204	4431	1619	921	698
R ²	0.03	0.06	0.01	0.07	0.08	0.08
<i>Field system:</i> Open fields (yes/no)	Y	N	N	Y	N	N
<i>Pre-Parliamentary enclosure:</i> land enclosed before 1700 (%), cubic polynomial	Y	Y	Y	Y	Y	Y
<i>Scale:</i> parish area	Y	Y	Y	Y	Y	Y
<i>Geography:</i> slope, elevation	Y	Y	Y	Y	Y	Y
<i>Location:</i> Dist. to London	Y	Y	Y	Y	Y	Y
<i>Soil characteristics:</i> soil type indicators (n=11)	Y	Y	Y	Y	Y	Y

Notes: All regressions are estimated using OLS. The unit of observation is a parish. All regression restrict to rural parishes. Population density is the total number of people living in a parish at the time of the 1831 census, divided by parish area in square kilometers. Inequality (gini) is a land-value gini coefficient. Enclosure (yes/no) is an indicator equal to one if a parish was enclosed at any point between 1750 and 1830. Standard errors correcting for heteroskedasticity at the parish level are in parentheses. * indicates significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 4: Balance tests

<i>Dependent variable:</i>	TAX REVENUE PER CAPITA 1525 (1)	TAX REVENUE 1525 (2)	SUITABILITY FOR WHEAT (3)	POPULATION 1525 (4)	NUMBER OF MPs 1700 (5)	NUMBER OF NOBILITY 1700 (6)
	<i>Panel I: All parishes</i>					
Member of parliament leniency - leave out 3	-0.00 (0.02)	-0.00 (0.02)	0.05 (0.11)	0.02 (0.03)	-0.01 (0.01)	0.03 (0.02)
Observations	6326	7058	13814	7058	8814	8814
	<i>Panel II: Compliers (subset), parishes > 0 enclosure attempts</i>					
Member of parliament leniency - leave out 3	-0.03 (0.02)	-0.01 (0.02)	0.10 (0.10)	0.05 (0.04)	0.01 (0.01)	0.04 (0.04)
Observations	2702	3026	4445	3026	3271	3271
<i>Field system:</i> Open fields (yes/no)	Y	Y	Y	Y	Y	Y
<i>Pre-Parliamentary enclosure:</i> land enclosed before 1700 (%), cubic polynomial	Y	Y	Y	Y	Y	Y
<i>Scale:</i> parish area	Y	Y	Y	Y	Y	Y
<i>Geography:</i> elevation	Y	Y	Y	Y	Y	Y
<i>Location:</i> Dist. to London	Y	Y	Y	Y	Y	Y
<i>Soil characteristics:</i> soil type indicators (n=11)	Y	Y	Y	Y	Y	Y

All regressions are estimated using OLS. The unit of observation is a parish. All regression restrict to rural parishes. All point estimates are standardized. Tax revenue per capita 1525 is total tax revenue divided by total population in the 1525 Lay Subsidy returns. Income 1525 is total tax revenue in the 1525 Lay Subsidy returns. Suitability is the suitability of the soil for growing wheat. Population 1680 is total population in the 1680 hearth tax returns. Population 1525 is total population in the 1525 Lay Subsidy returns. Number of MPs living in parish in 1700 is the number of members of parliament in 1700 that have their residence in a parish. Number of nobility living in parish in 1700 is the number of members the nobility in 1700 that have their residence in a parish. Member of parliament leniency - leave out 3 is the fraction of acts proposed to parliament that were passed by members of parliament representing a parish, leaving out the parish itself and three consecutive rings of neighboring parishes, averaged over all members of parliament representing a parish between 1750 and 1830. Standard errors clustered at the constituency level are in parentheses. * indicates significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 5: The agricultural consequences of enclosure

<i>Dependent variable:</i>	WHEAT YIELD (BUSHEL PER ACRE) (1)	SHARE OF POP. (MALE, >20) IN AGRICULTURE (2)
<i>Panel I: IV estimates</i>		
Enclosure (yes/no)	4.81*** (0.88)	-0.09*** (0.01)
Mean dep. var.	21.62	0.16
SD dep. var.	4.52	0.07
Observations	3372	10874
<i>Panel II: first stage</i>		
	<i>Dep. var.: enclosure (yes/no)</i>	
Member of parliament leniency - leave out 3	2.43*** (0.61)	1.64*** (0.47)
F-stat excluded instrument	15.7	12.0
<i>Field system:</i> Open fields (yes/no)	Y	Y
<i>Pre-Parliamentary enclosure:</i> land enclosed before 1700 (%), cubic polynomial	Y	Y
<i>Scale:</i> parish area	Y	Y
<i>Geography:</i> slope, elevation	Y	Y
<i>Location:</i> Dist. to London	Y	Y
<i>Soil characteristics:</i> soil type indicators (n=11)	Y	Y

Notes: All regressions in panel I are estimated using Maximum Likelihood. The unit of observation is a parish. All regression restrict to rural parishes. Wheat yield (bushels per acre) is the number of bushels of wheat that a typical acre yields. Share of pop. (male, >20) in agriculture is the number of males over 20 employed in agriculture divided by total population in the 1831 census. Predicted enclosure probability is predicted enclosure from the first stage regressions in panel II. Member of parliament leniency - leave out 3 is the fraction of acts proposed to parliament that were passed by members of parliament representing a parish, leaving out the parish itself and three consecutive rings of neighboring parishes, averaged over all members of parliament representing a parish between 1750 and 1830. Standard errors clustered at the constituency level are in parentheses. * indicates significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 6: The agricultural consequences of enclosure

<i>Dependent variable:</i>	POP. DENSITY (1)	GINI (LAND VALUE) (2)
<i>Panel I: IV estimates</i>		
Enclosure (yes/no)	-751.02*** (251.23)	0.11*** (0.03)
Mean dep. var.	451.26	0.68
SD dep. var.	2963.62	0.13
Observations	7479	1598
<i>Panel II: first stage</i> <i>Dep. var.: enclosure (yes/no)</i>		
Member of parliament leniency - leave out 3	1.77*** (0.53)	2.97*** (0.51)
F-stat excluded instrument	11.1	34.3
<i>Field system:</i> Open fields (yes/no)	Y	Y
<i>Pre-Parliamentary enclosure:</i> land enclosed before 1700 (%), cubic polynomial	Y	Y
<i>Scale:</i> parish area	Y	Y
<i>Geography:</i> slope, elevation	Y	Y
<i>Location:</i> Dist. to London	Y	Y
<i>Soil characteristics:</i> soil type indicators (n=11)	Y	Y

Notes: All regressions in panel I are estimated using Maximum Likelihood. The unit of observation is a parish. All regression restrict to rural parishes. Population density is the total number of people living in a parish at the time of the 1831 census, divided by parish area in square kilometers. Inequality (gini) is a land-value gini coefficient. Predicted enclosure probability is predicted enclosure from the first stage regressions in panel II. Member of parliament leniency - leave out 3 is the fraction of acts proposed to parliament that were passed by members of parliament representing a parish, leaving out the parish itself and three consecutive rings of neighboring parishes, averaged over all members of parliament representing a parish between 1750 and 1830. Standard errors clustered at the constituency level are in parentheses. * indicates significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 7: Enclosure and innovation

<i>Dependent variable:</i>	NR. AGR. PATENTS			ROAD QUALITY POOR (YES/NO)		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Fields:</i>	<i>All</i>	<i>Closed</i>	<i>Open</i>	<i>All</i>	<i>Closed</i>	<i>Open</i>
Enclosure (yes/no)	0.02** (0.01)	0.01 (0.01)	0.02* (0.01)	-0.03*** (0.01)	-0.02** (0.01)	-0.02* (0.01)
Mean dep. var.	0.02	0.02	0.02	0.06	0.06	0.07
SD dep. var.	0.29	0.30	0.29	0.25	0.24	0.25
Observations	14055	5625	8430	4946	2601	2345
R^2	0.01	0.01	0.02	0.04	0.08	0.04
<i>Field system:</i> Open fields (yes/no)	Y	N	N	Y	N	N
<i>Pre-Parliamentary enclosure:</i> land enclosed before 1700 (%), cubic polynomial	Y	Y	Y	Y	Y	Y
<i>Scale:</i> parish area	Y	Y	Y	Y	Y	Y
<i>Geography:</i> slope, elevation	Y	Y	Y	Y	Y	Y
<i>Location:</i> Dist. to London	Y	Y	Y	Y	Y	Y
<i>Soil characteristics:</i> soil type indicators (n=11)	Y	Y	Y	Y	Y	Y

Notes: All regressions are estimated using OLS. The unit of observation is a parish. All regression restrict to rural parishes. Nr. of patents filed by residents is the number of agricultural patents filed by residents between 1750 and 1830. Road quality poor (yes/no) is an indicator equal to one if the qualities of the road in a parish is assessed poor by the tithe surveyors. Enclosure (yes/no) is an indicator equal to one if a parish was enclosed at any point between 1750 and 1830. Standard errors correcting for heteroskedasticity at the parish level are in parentheses. * indicates significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 8: Enclosure and coordination

<i>Dependent variable:</i>	TURNIPS GROWN (ACRES)			LANDS FALLOW (YES/NO)		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Fields:</i>	<i>All</i>	<i>Closed</i>	<i>Open</i>	<i>All</i>	<i>Closed</i>	<i>Open</i>
Enclosure (yes/no)	47.82*** (8.67)	47.97*** (12.17)	24.23* (13.15)	-0.07*** (0.02)	-0.04* (0.02)	-0.07*** (0.02)
Mean dep. var.	164.19	178.17	147.08	0.33	0.28	0.38
SD dep. var.	179.68	187.90	167.60	0.47	0.45	0.48
Observations	2177	1198	979	4946	2601	2345
R^2	0.29	0.26	0.38	0.08	0.09	0.10
<i>Field system:</i> Open fields (yes/no)	Y	N	N	Y	N	N
<i>Inputs:</i> fertilizer or machine use (yes/no)	Y	Y	Y	N	N	N
<i>Pre-Parliamentary enclosure:</i> land enclosed before 1700 (%), cubic polynomial	Y	Y	Y	Y	Y	Y
<i>Scale:</i> parish area	Y	Y	Y	Y	Y	Y
<i>Geography:</i> slope, elevation	Y	Y	Y	Y	Y	Y
<i>Location:</i> Dist. to London	Y	Y	Y	Y	Y	Y
<i>Soil characteristics:</i> soil type indicators (n=11)	Y	Y	Y	Y	Y	Y

Notes: All regressions are estimated using OLS. The unit of observation is a parish. All regression restrict to rural parishes. Irregular crop rotation (yes/no) is an indicator equal to one if a parish was recorded as not practising regular crop rotation. Lands fallow (yes/no) is an indicator equal to one if a parish was recorded as leaving lands fallow. Enclosure (yes/no) is an indicator equal to one if a parish was enclosed at any point between 1750 and 1830. Standard errors correcting for heteroskedasticity at the parish level are in parentheses. * indicates significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.

Table 9: The midlands

<i>Dependent variable:</i>	WHEAT YIELD (BUSHEL PER ACRE)		SHARE OF POP. (MALE, >20) IN AGRICULTURE	
	(1)	(2)	(3)	(4)
	Country	Midlands	Country	Midlands
Enclosure (yes/no)	0.60*** (0.23)	-0.02 (0.55)	-0.02*** (0.00)	-0.03*** (0.00)
Mean dep. var.	21.30	23.25	0.16	0.17
SD dep. var.	4.38	3.68	0.07	0.07
Observations	1491	208	11041	1446
R^2	0.29	0.11	0.11	0.12
<i>Pre-Parliamentary enclosure:</i> land enclosed before 1700 (%), cubic polynomial	Y	Y	Y	Y
<i>Scale:</i> parish area	Y	Y	Y	Y
<i>Location:</i> Dist. to London	Y	Y	Y	Y
<i>Geography:</i> slope, elevation	Y	Y	Y	Y

Notes: All regressions are estimated using OLS. The unit of observation is a parish. All regression restrict to rural parishes. Wheat yield (bushels per acre) is the number of bushels of wheat that a typical acre yields. Share of pop. (male, >20) in agriculture is the number of males over 20 employed in agriculture divided by total population in the 1831 census. Enclosure (yes/no) is an indicator equal to one if a parish was enclosed at any point between 1750 and 1830. Standard errors correcting for heteroskedasticity at the parish level are in parentheses. * indicates significance at the 10 percent level, ** at the 5 percent level, *** at the 1 percent level.