

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 Parliamentary enclosures were associated with significantly higher crop yields, but also higher land inequality. Our results are in line with a literature going back to Arthur Young and Karl Marx on the effects of Parliamentary enclosure on productivity 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.

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1 Introduction

In 1808 the English agriculturalist and arch “improver”¹ Arthur Young stumbled on a natural experiment. He noticed that the adjacent Cambridgeshire parishes² of Childersley and Hardwicke, even though “divided only by a hedgerow” (Young, 1808, p. 217), had startlingly different economic outcomes. In Hardwicke wheat yields were 16 bushels per acre while in Childersley, on the other side of the hedgerow, they were 24, 50% higher. What could explain the difference? Not the economic fundamentals since Childersley consisted of “perfectly similar soil” (Young, 1808, p. 217). Rather, Young attributed the difference to the fact that Hardwicke “remains in common field” while the land in Childersley had been enclosed.

From one perspective this difference is easy to explain. The opposite of being “in common field” was being enclosed. Parliamentary 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 and investment. Such changes may in theory lead to large productivity improvements. Land usage would no longer be subject to the ‘tragedy of the commons’ (Hardin, 1968) and investment returns would now accrue privately rather than publicly (Samuelson, 1954). Yet 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) and Neeson (1993), chapter 5). 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). If this is right Young might have studied an outlier and not identified the general pattern.

Conjectures about the impact of Parliamentary enclosure are not restricted to its impact on productivity. Just as debated have been the distributional consequences. Even as Young wrote others condemned enclosure for creating mass poverty by undermining the incomes of the rural poor, a position famously articulated by Marx (1990, p. 885) when he called enclosures a “form of robbery”. Modern historians have instead emphasized the strict legality of the process concluding 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” (Tate, 1967, p. 173).³

¹On “improvement” see Slack (2015).

²A parish is a local administrative unit typically coincidental with a village.

³The legality of the process is emphasized by virtually every study of Parliamentary enclosure. For example, “the process as a whole did offer some limited safeguards, and certainly a considerable degree of openness” Mingay (1997, p. 57-58) and “the work of the commissioners was usually carried out with scrupulous fairness and attention to detail” Armstrong (1989, p. 721). An earlier synthesis by Gonner (1966, p. 76-77) reached a similar conclusion, stating even more confidently that “there

Despite these views a great deal of case study evidence, which we discuss below, has shown that the division of common lands, even if legalistic, was often inequitable because some sorts of rights were far easier to establish than others. Moreover, Parliamentary enclosure was expensive, and small landowners often had to sell out because they did not have the liquidity to pay for the costs up front. In addition, it typically involved the commutation of the tithe with the tithe holder, nearly always an elite or large landowner, being compensated with substantial amounts of land (usually around 20 % of the land which was redistributed (Turner, 1984, p. 65)). Indeed, Neeson, using a similar natural experiment methodology to that wielded by Young, showed that the number of small landowners fell by 21% in Northampton parishes after they were enclosed, while there was no change in unenclosed ones (Neeson, 1993, p. 249). The net consequence of these factors is that Parliamentary enclosure was likely associated with large increases in land inequality.

In this paper, we combine data on the universe of Parliamentary enclosure acts with data on agricultural yields and land inequality covering all of England to estimate their economic effects. Key to our study is the fact that enclosure without the involvement of Parliament had gone on throughout the Middle Ages and Early Modern period 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).⁴ Henceforth, the owners of a majority of the land 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.⁵

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 enclosed by this method by the end of the period. We study the agricultural and social consequences of Parliamentary enclosure around 1830 by measuring agricultural yields and land inequality. Our focus reflects the most famous hypotheses in the literature. First, the arguments of contemporaries such as Young, or modern economic historians such as Overton (1996), McCloskey (1975), and Thirsk (1961), who have emphasized the likely productivity improvements and structural changes, echoing the theoretical arguments of Samuelson and Hardin. Second, we investigate the hypotheses of Marx (1990), Hammond and Hammond (1911) and Thompson (1963) who all argued that the main impact of Parliamentary enclosures was to dispossess smallholders and many with informal rights in the commons, increase land inequality and in the process creating a labor force for the industrial economy.

seems to be no ground for alleging a general partiality on behalf of any particular class.”

⁴This figure was never officially stated and in some accounts it was $\frac{4}{5}$. One interpretation is that while $\frac{4}{5}$ was desirable enclosure could still take place with the owners of $\frac{3}{4}$ of the land in favor.

⁵In 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.

We first estimate the effect of Parliamentary enclosure in a linear model, using Ordinary Least Squares (OLS). We find that in 1830, parishes that were enclosed by Parliament experienced higher agricultural yields and had higher land inequality. Our estimated effects are quantitatively small. For example, we find that Parliamentary enclosure is associated with a 3% increase in agricultural yield and a similarly small, if significant, increase in the Gini coefficient of land values. These results appear inconsistent with the claims of Young (1808) and Marx (1990), especially considering the substantial costs enclosure entailed. To interpret these OLS results, however, one must recognize that prior to the period of Parliamentary enclosure, voluntary enclosure had already been taking place by unanimous agreement among landowners. Unanimous agreement was obviously easier to reach when enclosure was likely to be highly productive. Such parishes self-select out of Parliamentary enclosure as they stand to gain little from it, but are part of the control group, together with completely unenclosed parishes. In comparing parishes enclosed by Parliament to the rest, therefore, our OLS estimates of the impact of Parliamentary enclosure on productivity are likely biased downwards. Moreover, the historical literature suggests that it was far easier to get unanimous agreement when most of the parish was owned by a single person or perhaps a very small number of landowners. Therefore, informally enclosed parishes in the control group would tend to have high levels of land inequality, biasing down the OLS estimates of the impact of Parliamentary enclosure on inequality. The potential impact of the presence of an informal alternative to the formal Parliamentary method of enclosure on its estimated treatment effect has not been emphasized in previous studies of Parliamentary enclosure.

To establish a causal interpretation of our results and make progress towards a more realistic estimate of the effects of Parliamentary enclosure, we need an exogenous source of variation Parliamentary enclosure. 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 in the form of a draft enclosure Bill. Then, a committee of Members of Parliament (MPs) was tasked with judging the quality of the Bill against a large number of legal requirements, called standing orders. Finally, a potentially amended Bill 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” (Tate, 1945, p. 138-139). Since committees for parishes were typically composed of local MPs we posit that, if petitions were checked against the standing orders similarly in parishes that likely would have had similar committee composition, we can use the leave-one-out probability of passing as an instrument for passing a Parliamentary enclosure Bill in the left-out parish. The main advantage of this source of variation is that it is defined for both parishes that petition and parishes that never petition, but is unlikely to generate variation in the likelihood of

enclosure for informally enclosed parishes, as these do not consider Parliamentary enclosure (Imbens and Angrist, 1994). This design is similar to ‘examiner’ designs that are common in labor and public economics (e.g. Dahl et al. (2014)), 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.⁶ In addition, any involvement an MP may have had with a petitioning parish would be captured by removing the petitioning parishes. To substantiate these assertions, we show that a large number of variables that would plausibly correlate with the expected return to Parliamentary enclosure at the left-out parish are uncorrelated with our instrument.

Since parishes voluntarily petition Parliament for enclosure, and because our instrument induces variation in the likelihood of passing a Bill successfully through Parliament, our instrumental variable strategy estimates the (local average) treatment effect for those ‘complier’ parishes that self-select into considering or taking the Parliamentary route to enclosure. Parishes that had already informally enclosed self-select out of the Parliamentary procedure, are ‘never-takers’ for this instrument, and are downweighted by our Two Stage Least Squares estimator. Using our instrument, we find that Parliamentary enclosure leads to an increase in agricultural yield of 44%. This estimated effect is in line with Young’s study of Childersley and Hardwicke and the ‘before-after’ comparisons of single parishes made in contemporary agricultural reports (Stone, 1794; Rudge, 1807). This estimated effect is more realistic given the very large costs of implementing Parliamentary enclosure. We also find a 25 percentage point increase in the Gini coefficient of the value of plots of land in an enclosing parish (relative to a mean of 0.74). This last estimated effect is far more consistent with case study evidence on the division of the commons, the compensation for the tithe, and the intensity of land sales that took place in its wake.

We interpret these effects through the lens of a recent literature on Marginal Treatment Effects (Heckman and Vytlačil, 2005; Brinch et al., 2017). We find that 78 percent of the difference between our OLS and IV estimates is indeed explained by the fact that we downweight informally enclosed parishes in our IV analyses. This result is consistent with our conjecture that previous studies found a small treatment effect of Parliamentary enclosure due to the fact that the preponderance of the parishes in the control group may have stood to gain nothing from Parliamentary enclosure. Since potential gains are a counterfactual outcome, econometric techniques that allow us to estimate such counterfactual outcomes are necessary to estimate a more realistic treatment effect of Parliamentary enclosure.

Our results are therefore in line with the ‘tragedy of the commons’ and other theoretical arguments

⁶About 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.

pointing to the 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. The fundamental reason for the inability of shared governance to allocate efficiently appears to be the varying enforceability of property rights in the commons, which led to inability to coordinate unanimously on better outcomes. Anticipating that enclosure would skew the distribution of the commons towards those with legally better defined rights seems to have been a potent source of lack of unanimity. Even when property rights would plausibly be equally respected at Parliamentary enclosure, the costliness of the process along with imperfections in the capital market deterred enclosure for smallholders. On the open fields, farmers who did not have sufficient liquidity to pay for the costs could not afford the costs of Parliamentary enclosure. This led them to oppose enclosure and if it took place, sell out, thus contributing to increases in land inequality. Parliamentary intervention was necessary to consolidate all of England under private ownership reaping the productivity benefits of enclosure. These improvements came at the cost of large increases in land inequality.

We then study mechanisms. For productivity, we focus on two types of mechanisms: Innovation and coordination. Contemporary advocates of Parliamentary enclosure suggested that it promoted “improvement”, by which they meant investment, innovation, and experimentation in new techniques. We capture innovation with data on the count of agricultural patents filed in a parish and the quality of local infrastructure. Infrastructure is a novel channel, not emphasized in the literature so far, but often Parliamentary enclosure acts specified road building, both as part of general improvement and because privatization revoked rights of passage. To capture coordination, we measure the acreage in a parish that was either sown with turnips or subject to appropriate fallowing practices. Both tasks, sowing turnips and optimal fallowing, were known to replenish depleted soils and improve output, but may not have been adopted because their implementation required coordination among villagers with disparate interests within commonly governed fields. Parliamentary enclosure gave everyone the freedom to implement best practices without the need for coordination. We find evidence that Parliamentary enclosure is associated with both innovation and improved agricultural practices. For inequality, we study the ‘selling out’ mechanism. We find that Parliamentary enclosure is associated with significant falls in the number of small landowners, known as “cottagers”, as a fraction of all landowners in a parish.

Finally, we use our dataset to compare our results to those of Allen (1982), the most influential existing empirical study of Parliamentary enclosures. Using data for a sample of farms from the English Midlands, he concludes that there is no effect of Parliamentary enclosure on crop yields, only on inequality. When we focus on the subset of our dataset which coincides with his sample, we replicate his findings for agricultural yield. His conclusion that Parliamentary 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 Parliamentary enclosures by showing that Parliamentary enclosure had a positive effect on agricultural yields, 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, the political procedures in Parliament that led to a Parliamentary enclosure act being passed and the literature which has assessed enclosure's impact. Section 3 introduces our dataset. Section 4 presents our main OLS results and introduces our leave-one-out identification strategy. Section 5 presents our main instrumental variable strategy. Section 6 presents the Two Stage Least Squares estimate of the effect of Parliamentary enclosure. Section 7 discusses heterogeneous treatment effects. Section 8 discusses mechanisms. Section 9 focuses on the Midlands. Section 10 concludes.

2 Setting and context

In this section we provide the necessary background to pre-Parliamentary as well as Parliamentary enclosure. We first discuss that Parliamentary enclosure entailed the division of the commons among those with enforceable claims, and the reorganization of scattered strips on the open fields into consolidated holdings. We then discuss that the process of Parliamentary enclosure was a bottom-up process instigated by the parish landowners. In contrast to previous informal enclosure, Parliamentary enclosure could take place if the owners of three quarters of the amount of land were in favor. We then discuss the historical literature on the consequences of enclosure.

Although the historical literature is inconclusive on the ultimate economic effects of Parliamentary enclosure, it emphasizes several aspects of enclosure that are relevant for our study. First, enclosure meant a re-organization of rights, some of which were better defined legally than others. In the process of Parliamentary enclosure rights that were easier to establish legally typically trumped the others. Second, Parliamentary enclosure interacted with other simultaneous processes, particularly the commutation of the tithe in ways that likely increased land inequality. Third, Parliamentary enclosure was expensive and

because capital markets were highly imperfect, small landowners or “cottagers” found it difficult to raise the necessary resources to pay the costs of Parliamentary enclosure upfront.

2.1 What was Parliamentary enclosure?

What happened when a parish was enclosed?⁷ Mingay (1997, p. 7) defines a (Parliamentary) enclosure as involving

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 large 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. 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 turbary to cut turf for burning.

2.2 The Process of Enclosure

Enclosing a parish was a bottom-up process. Both before and after the period of Parliamentary enclosures, it started with negotiations between the landowners of a parish, who had to gain sufficient consensus for the process to move forward. The key distinguishing feature of enclosures prior to the institutionalization of the Parliamentary process is that there had to be unanimity amongst the landowners. The main point of this section is to show that the case study literature suggests that the main determinant

⁷For this and the next subsection we rely on several standard works, particularly Tate (1967), Yelling (1977), Turner (1980) and Mingay (1997)

of pre-Parliamentary enclosure was how concentrated landownership was. Parishes with one or very few landowners could reach a unanimous agreement more easily.

While it is clear that enclosures were taking place by the fifteenth century, in general, enclosures were much less well documented before the eighteenth century. Enclosures in this period seem to have been dominated by lords enclosing their *demesne* land, which was manorial land that was farmed by what would have originally been villeins (serfs). (Kerridge, 1969, p. 96-97) 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 ... usually the landowner or the farmer of the demesnes, strove to enclose the whole township for himself.

In his study of Kesteven, Lincolnshire, Mills (1959) found that early enclosure was initiated by resident lords and monastic foundation and the greater the presence of freeholders, the more enclosure was delayed. Martin (1979) also found that in Warwickshire early enclosures were promoted by the squirearchy attempting to consolidate estates. Thirsk (1967a, p. 254) sums up the evidence from Lincolnshire as indicating that “Something like 70% of the reported enclosures in the period 1485-1550 were carried out by the nobility and squirearchy alone”. Slater (1907, p. 155) sums up his discussion of pre-Parliamentary enclosure by stating

It is clear that the Parliamentary enclosure of a given parish indicates that the lord of the manor, or principal landlord, had not secured such a complete ... influence over the parish as to enable him to effect an enclosure without an act of Parliament.

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 discouraged it since it was thought to be driven by lords and led to increased land inequality. This was thought to be a cause of village depopulation and political instability and social discontent. Starting in 1489 and for the next hundred years, Parliament actually passed acts to discourage enclosure Thirsk (1967a) provides a detailed overview of this legislation).

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, p. 142) 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.

The eighteenth century 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, p. 7-8). Turner summarizes the consensus view when he notes “the fracture of landownership among a large number of small proprietors was a reason for delayed enclosure” Turner (1984, p. 66).⁸

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. Above we have emphasized that, given the difficulty of negotiating agreement amongst multiple parties, for example on the rights over the commons, the extent of land concentration was an important source of variation. This 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). In consequence the acceleration of enclosures in the eighteenth century was a consequence of “the opportunity provided by the Parliamentary procedures to overrule opposition from small landowners” (Yelling, 1977, p. 113). In sum, parishes that enclosed before the Parliamentary period are likely to have been parishes with highly unequal landownership, since this concentrated decision making power.

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 enclosure because it provided rules which over-ruled opposition to the enclosure. To start the process, the parishioners had to petition Parliament with a draft enclosure Bill. When this was submitted to Parliament, the parishioners had to simultaneously present a “consent document” listing all the landowners in the parish, the value of their holdings, and their signatures as to whether they were in favor of the enclosure (Consent), against (Dissent), or neuter (Indifferent). No official figure was 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

⁸One of the themes of Gray (1915) and the subsequent literature, is that the variation in the timing of enclosure is related to idiosyncratic factors that created ‘frictions’ in the process of negotiating enclosure. For example, he contrasts the earlier timing of enclosure in Herefordshire compared to Oxfordshire noting that this could be explained by it being much easier to agree in the former because the size of townships were smaller (Gray, 1915, p. 153). See also Thirsk (1967b) and (Thirsk, 1964, p. 23) for other related examples.

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 1836, with the passage of the General Enclosure Act, that a 2/3 majority was specified.

Though negotiations began informally, parishioners would typically have a hired lawyer draw up a potential enclosure Bill, then there would be an open public meeting to discuss it. After they had done this, the Bill 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. The presented Bill would then typically form the basis of a Parliamentary enclosure act. In Parliament, the Bill was judged by a committee of Members of Parliament (MPs) against a large number of legal requirements, called the standing orders. If these were judged to have been satisfied, the committee would recommend that the Bill be subject to a vote on the house floor and enacted into law. We describe this process in detail in the context of our identification strategy in Section 5 of the paper.

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, the commissioners undertook the division and re-organization of the lands. First, the surveyor would map the lands to be divided. Then, the commissioners would hold a series of meetings, where people would come forward to present their claims and try to establish their rights. As we noted, rights to the fruits of the commons were complex and informal. 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 processes emphasizing transparency and the points at which people could protest decisions. When agreement was not possible, ultimately, appeals against commissioners' decisions could be taken to the local Quarter Sessions or the Chancery Court. Finally, the commissioners made the Award, which specified the division of the lands and an award map (see Kain and Oliver (2011) for a collection of the Award maps), placed it on the church door and had it read in public. Mingay (1997, p. 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.

2.4 The immediate consequences of Parliamentary enclosure

In places like Barton Parliamentary enclosure eliminated the big open fields, allocated these lands in consolidated holdings, and divided up the common land between anyone who could establish their rights to use it. The right panel of Figure 1 shows the map of Barton and the new consolidated farms after Parliamentary enclosure. All common lands have been eliminated and the large landowners who pushed

for enclosure are clearly visible on the new map. These were Marmaduke Nelson Graburn, William Graburn, as well as the owners of the tithes, George Uppleby, Esq., and his wife Sarah (Ball, 1856, p. 69). After enclosure these three families owned 63% of the parish, Russell (1968, p. 36). This map also shows a few of the other things that were packaged with Barton's enclosure. A new system of roads was built, and in the top right one sees lands "for tithe". When enclosure started in 1797, tithe incomes, which accounted for 10% of agricultural output, were often in the hands of private people. In the process of Parliamentary enclosure, the tithe holder was usually compensated for surrendering his right to the tithe in exchange for an enlarged landholding. Other similar types of compensation appear on the map. George and Sarah Uppleby also received land for "glebe" and Marmaduke Nelson Graburn and the Upplebys also each got a "corn rent allotment". These ancient rights were also compensated with extra land.

There are a few important things to understand about this process. The first is the complicated nature of rights in the commons. Often, as in Croston, Lancashire, studied by Rogers (1993), common land, in this case Croston Finney, was "owned" by large landowners; "whereas the proprietary claims of the Hesketh and de Trafford families as Lords of the Manor were acknowledged, their possession was also conditioned by an insistence on userights which attached to copyholders and other freeholders" (Rogers, 1993, p. 146). However, "Such rights did not belong to every villager but were attached to open-field holdings or certain cottages, and only their owners or occupiers were certainly entitled to make use of them" Neeson (1993, p. 56). When Parliamentary enclosure came, the legal rights of the Hesketh and de Traffords trumped the informal use rights of other residents. They received almost 600 of the 800 acres of the Finney (Rogers, 1993, p. 146). The main problem was that "Mere customary users of the common land had no legal right to compensation in the event of an enclosure, and did not generally receive it" Armstrong (1989, p. 722). Alternatively, "only narrowly defined legal right was acknowledged at enclosure; more widely enjoyed customary right was sometimes ignored ... while rights attached to land were relatively safe ... rights and customs enjoyed by inhabitants were more vulnerable" (Neeson, 1993, pp. 63,78). In Barton-upon-Humber between 12% and 15% of claims that were made on the commons were rejected by the enclosure commissioners (Russell, 1968, p. 27-28). Thus the rights to collect furze and turbary were extinguished, typically without any compensation. Other rights, particularly those associated with cottages, which might involve the right to put a cow on the commons, were better defined legally and were compensated, but possibly insufficiently since their implications for land were not clear (how much land should one be compensated with now that there is no commons on which to tether your cow?). The general consensus amongst scholars is well summed up by Armstrong (1989, p. 722) when he notes "enclosure could be entirely legal in regard to respecting property rights and yet be inequitable". The pattern in Croston recurs frequently in the case study literature.

Second, the commutation of the tithe seems to have complemented the impact of the iniquitous recognition of rights. In Neeson's research on Northamptonshire, in the parish of West Haddon, the Lord of the Manor Thomas Whitfield owned 262 acres and the right to collect the tithe prior to enclosure and 600 acres (about a quarter of the parish) afterwards (Neeson, 1993, p. 205). In Hibaldstow, Lincolnshire, the lord of the manor, William Dalison received 1241 acres of land in the "general allotment" and in addition 110 acres in lieu of tithes and a further 58 acres for giving up "manorial rights". His total allotment left him owning a third of the parish, (Russell, 1968, p. 16-17). The renegotiation of the tithe at Parliamentary enclosure seems to have been a systematic source of increased land inequality. Martin (1979, p. 333) calculated that "17.4 per cent [of lands] re-allotted under Warwickshire awards were transferred to compensate for loss of tithe dues." In Buckinghamshire it was 20% (Turner (1984, p. 65)). Turner comments "Tithe commutation was calculated at about one fifth or one sixth of the open field land and one eighth or ninth of the commons ... This ... was almost certainly in excess of the value of the original tithe" (Turner (1984, p. 65-66)). In Barton the tithe owners, mostly the Upplebys, were compensated with 1161 acres of land (Russell, 1968, p. 32) close to Turner's 20%. In addition the tithe owner did not have to cover the costs associated with this extra land, for example fencing, which fell on the other landowners, see Turner (1984, p. 54) in general and Russell (1968, p. 25) for the details of this in the Barton case.

Third, Parliamentary enclosure was a costly process. Leaving aside the value of all the time involved in making it happen, a lawyer had to be hired to make up the petition to Parliament which was the basis for an enclosure act. The landowners who wanted to enclose had to pay for the survey which would be the basis for the new land settlement, and they had to cover the costs of the commissioners who re-organized the land. In addition, Parliamentary enclosure forced parishioners to build new roads and fence their lands. These costs were divided between the landowners in proportion to the size of their holdings. Occasionally, the commissioners partially sold off portions of the newly enclosed lands to help pay some of these costs. In Barton, the costs of reorganizing the entire parish added up to about 13,000 pounds (Stone, 1794, p. 103). This was a very large sum relative to the total resale value of all land pre-enclosure of 2,000 pounds. Turner (1984, p. 59-60) summarizing a great deal of evidence, argues that over the whole period of Parliamentary enclosures the total cost of enclosing was at least 12 pounds per acre on average (a "lower bound"). For a farmer owning 20 acres of land, the total cost of enclosure could be 240 pounds. This was almost five times the annual income of such a farm in the late 18th century (Mingay, 1997, p. 113). Since these costs had to be paid at the time enclosure took place this represented a serious problem for smallholders or liquidity constrained individuals (Turner, 1981).

2.5 The Literature

Parliamentary 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 31, 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 Parliamentary enclosures represent “improvements”.

The most famous nineteenth century hypothesis about the impact of Parliamentary 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, 885-886).

In Marx’s argument, Parliamentary 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, who then migrated to work in the factories of the industrial revolution. This process was lodged within a larger dynamic of “primitive accumulation”. His views were largely re-affirmed by famous 20th century studies such as those by Hammond and Hammond (1911) and Thompson (1963). Thompson states that “Enclosure ... was a plain enough case of class robbery, played according to fair rules of property and law laid down ... by property owners” (p. 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 Parliamentary enclosure. Many, following Marx, emphasize the effects on inequality and the supposed dispossession of smallholders. This is made possible by the fact that, as we saw, Parliamentary enclosure could go ahead even if smallholders opposed it.

The case study evidence is probably consistent with this hypothesis. Inequality seems to have risen (Allen, 1992), and smallholders or “cottagers” do seem to have sold out and migrated after Parliamentary enclosure. This may have been because after they lost land through compensation for the tithe holder and the loss of commons rights, their farm was too small to be viable, or they did not have the wealth

to cover the costs of Parliamentary enclosure. In Croston, though others apart from the Heskeths and de Traffords did receive allocations, many sold out with the number of farmers owning less than 5 acres going from 68 before enclosure to 40 afterwards (Rogers, 1993, 146). In West Haddon, while the Whitfield family accumulated land, as we saw above, “After enclosure the number of landowners ... fell by 18 per cent” (Neeson, 1993, 204). In Burton Latimer the picture was similar. Neeson showed how the commissioners “compensated the house-dwellers and cottage commoners for their eight hundred acres of wold with about seventy three acres situated in the same place” (Neeson, 1993, 217). This inequitous allocation had led the smallholders to oppose the Parliamentary enclosure to start with and after it happened they “sold out to settle their tithe payments, or to avoid the cost of fencing and draining, or because the land was useless without the commons” (Neeson, 1993, 217). Arthur Young himself observed that few enclosure allotments for non-legal rights were above one acre in size and he quoted an enclosure commissioner as saying “which being insufficient for the man’s cow, both cow and land are sold to the opulent farmer” Mingay (1975, 101,137).

Neeson’s broader evidence from Northamptonshire shows both a contraction of small farms, an expansion of large farms and a rapid turnover in ownership, and using the Land Tax returns she shows that movement out of these returns after enclosure “was most common amongst those with least land” (Neeson, 1993, 230). These findings are echoed in Martin’s research on Warwickshire and he documents that as a consequence of enclosure “the overall share of the smaller proprietors was reduced as well as their numbers” Martin (1979, 337). In Buckinghamshire “It is quite clear from the evidence in the land tax that the total number of landowners decreased over the forty-year period from the 1780’s to the 1820’s” Turner (1975, 566).

Though the Land Tax records do not directly speak to this, other evidence suggests it is likely that small proprietors sold out to larger landowners. Martin’s conclusion is that “enclosure held out a good opportunity, in a generally thin market, of enlarging upon an existing possession” Martin (1979, 339).⁹ Turner, studying the parish of Little Brickhill in Buckinghamshire, noted a large decrease in the number of landowners in the year prior to the enclosure act. “In this case there was a massive accumulation by a George Henry Rose of Westminster, including the prestigious purchase of the manor ... These declines measure a sudden selling out by the owners in an effort to avoid enclosure costs” Turner (1975, 568). Martin noticed that Parliamentary enclosure awards sometimes actually record incidences of land sales during the process of enclosure, which could take years. “In fact, land purchases are recorded in at least 55 of 133 awards which deal with common-field land, while some 34 (25 per cent) record the engrossment of purchased land by the principal estate owner” Martin (1979, 338). By engrossment Martin means the

⁹For similar evidence from Leicestershire see Hunt (1959)

expansion of their properties by large landowners.

While clearly the distributional effects of Parliamentary 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 (voiced by who Thompson (1963, 237) calls the “enclosure propagandists”) seems to have been that Parliamentary 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, 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. Contemporary comment consistently viewed this as a huge benefit. 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, 143).

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, 125). Moreover, the efficient use of the open fields required mass coordination within the village and stopped individuals experimenting with new techniques. Additionally, 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. 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).

Though most of the mechanisms advanced suggest that unenclosed parishes would be less efficient, there is little agreement on this in the academic literature. On the one hand, as we saw, Young himself and other contemporaries made many calculations suggesting that Parliamentary enclosure improved productivity. Young's side by side comparison of two parishes suggested that yield was 50% higher in enclosed parishes. Using a limited sample of parishes, Turner (1980) is the one modern estimate that comes closest, estimating a yield increase of about 26%. Other contemporary estimates employ a 'before-after' comparison of individual parishes (Batchelor, 1813; Young, 1813; Gooch, 1811; Rudge, 1807; Lowe, 1798). Their average estimated increase in yield is about 75%. Such estimates would justify the enormous up front investment necessary to complete transform the layout of a parish, build roads and bridges, and fence off the new plots. Some modern assessments follow Young, with Overton simply stating:

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, 167).

Overton regards 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 (Overton, 1996, 167).

Another authoritative source, Clay (1984) 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" (p. 133-134), but 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).

On the other hand, Mingay (1997, 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, 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 very little effect. He finds that the average treatment effect of Parliamentary enclosure on yield is rather low, with an increase of yield between 2.5% and 8.4%, depending on the dataset. McCloskey (1989)

estimates higher increases, between 10 and 13%. Some modern scholars, like Daunton (1995, 114-117), accept this evidence as establishing that there were indeed few productivity effects.

Ultimately then, this empirical 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, but what is their quantitative significance? Our study is motivated by the salience of the question and the unsettled state of the evidence.

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 1830.¹⁰ 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.

3.2 Enclosure

We measure Parliamentary 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. Figure 2 shows the number of parishes enclosed over time. Our Appendix provides a photograph of an enclosure act and a bar graph of the number of parishes enclosed by county. We measure Parliamentary enclosure by an indicator equal to one if a parish was enclosed in the Parliamentary period.

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

¹⁰In southern England, the parish was the main unit of local administration. In northern England, parishes were historically larger, and were often composed of several hamlets. We use the hamlets as the local unit of observation in this case. Some data vary only at the parish level. In this case, we aggregate hamlets to parishes.

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 resulting 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 by Parliament, the number of times enclosure was proposed, and whether a proposed enclosure passed. We use failed Parliamentary enclosures as part of our identification strategy, which we discuss below.

3.3 Outcome variables

We measure agricultural yield using data from Kain and Prince (2006), who study the records of the 1836 Tithe Commutation act, which converted all remain tithes in kind to monetary payments. In this process the commissioners measured agricultural yields for a large number of parishes. We record wheat yield in bushels per acre in 1836 from these returns. 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, reducing the statistical power to detect an effect. From the Tithe commissioners' records (Kain and Prince, 2006), part of the Tithe Commutation Acts we record the value of each plot in a parish. In total we have data on 8,333,558 plots, which gives us a dataset of 681,650 individuals who either own or farm one or more plots, and for whom we know the value of their holdings. From this dataset we compute the land value Gini coefficient for each parish for which we have data, assigning zero land value to individuals who don't own any land but do rent a plot from someone else owning the land. To study mechanisms, we record several new measures of innovation and change in agricultural practices as well as measures of the presence of cottagers, holders of small plots, which we will introduce below.

3.4 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.

3.5 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 have a higher land value gini. 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 Parliamentary enclosure and our outcomes of interest. We find that Parliamentary enclosure is associated with higher agricultural yield and higher land inequality. These results are consistent with the hypotheses advanced in section 2, but do not have a causal interpretation. We discuss our identification strategy in the next section.

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 Parliamentary enclosure through an indicator enclosed_p , which again equals one if parish p is enclosed at any point between 1750 and 1830. Since our outcome 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 $\hat{\beta}_1$.

X_p is a vector of covariates. To account for scale differences, we control for the area of the parish. To capture geographical differences, we control for terrain elevation and a full vector ($n=11$) of soil type fixed effects s , 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. Data come from the Food and Agricultural Organization (FAO)). We are concerned about spatial correlation in outcomes and regressors, as well as spatially correlated unobservables. We therefore include latitude and longitude, latitude interacted with longitude, and region fixed effects, ($n=5$) as covariates.¹¹ When studying agricultural yield, we in addition control for the geographical suitability of the soil for growing wheat, using data from the Food and Agricultural Organization, as well as an indicator that measures fertilizer use, and an indicator that measures the presence of agricultural machinery, such as threshing and harvesting machines, both from

¹¹Our regions are defined as follows. We define the ‘North’ as being composed of the Cheshire, Cumberland, Durham, Lancashire, Northumberland, Westmorland, and Yorkshire. We define the ‘South-West’ as Cornwall, Devon, Dorset, Gloucestershire, Somerset, and Wiltshire. We define the ‘South-East’ as Bedfordshire, Berkshire, Buckinghamshire, Cambridgeshire, Essex, Hertfordshire, Hampshire with the Isle of Wight, Huntingdonshire, Kent, Oxfordshire, Norfolk, Suffolk, Surrey, and Sussex. We define the ‘Midlands’ as Derbyshire, Herefordshire, Leicestershire, Lincolnshire, Northamptonshire, Nottinghamshire, Rutland, Shropshire, Staffordshire, Warwickshire, and Worcestershire. Our final region is composed of London and Middlesex.

Kain and Prince (2006). When studying inequality, we additionally control for the total number of people in a parish in the tithe returns. Throughout our analyses, we report heteroskedasticity robust standard errors, as well as Conley (1999) standard errors correcting for arbitrary two-dimensional spatial correlation. We consider parishes within 70 kilometers of one another to be potentially spatially correlated. We choose 70 kilometers because, when we vary this cutoff, 70 km yields the most conservative standard errors. In our OLS results, we find spatial standard errors are typically similar to or smaller than heteroskedastic robust standard errors. Because enclosure was predominantly a rural phenomenon, we restrict our sample to rural England, defined as being outside a historical city or borough. In practice, this excludes about 600 cities and towns. 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 Parliamentary enclosure to agricultural yield and land inequality. Table 2 reports estimates of equation 1. In section 2 we discussed that the ability to coordinate practices and the fact that landowners were now the residual claimants to any returns from agricultural investment may have increased agricultural yields. Columns (1) and (2) use the natural log of wheat yield in bushels per acre measured in 1836 as the dependent variable to study this idea. In column (1) we only include soil type and region fixed effects. In column (2) we include all covariates. We report estimates of $\hat{\beta}_1$ in row 1. We find that Parliamentary enclosure is associated an increase in the natural log of yield of 0.03, which corresponds to a 3 percent increase in yield. This estimated effect is stable across columns (1) and (2) and statistically significantly different from zero. In columns (3) and (4) we then study land value inequality. In section 2 we discussed how the costs of enclosure, as well as the loss of common rights, may have led to many parishioners having to sell their land to cover the costs of enclosure and tithe commutation or because their plot was no longer viable without common rights to, for example, pasturage. Larger land owners may have bought up smaller plots, increasing concentration of ownership. In columns (3) and (4) we find that, conditional on only fixed effects in column (3) or all covariates in column (4), enclosure is associated with a 0.03 increase in the Gini coefficient.

Interpretation of the estimated effect size. The control group in these OLS regressions is composed of those parishes that were unenclosed, and parishes that were enclosed unanimously. A parish with a handful of landowners who enclosed their landholdings before the start of Parliamentary enclosure, may already have more unequal landholdings, relative to a parish about to enclose through Parliament, and may have already realized the potential productivity increases of enclosure. Such parishes self-select out

of Parliamentary enclosure, and are part of our control group. Therefore, our OLS results are likely to severely underestimate the true effect of *Parliamentary* enclosure. This observation implies that we face an estimation challenge: We aim to recover the treatment effect of Parliamentary enclosure comparing to a control group that is highly heterogeneous in terms of how much they stand to gain from Parliamentary enclosure. Such ‘potential’ gain is unobservable, we don’t know how much or more less productive an informally enclosed parish would have been had it enclosed through Parliament. We introduce several ways of making progress on this issue below. Note that previous attempts to estimate the effect of Parliamentary enclosure did not explicitly address this issue, and we conjecture that this may be what is driving the small estimated effects in the literature so far we discussed in section 2.

5 Identification

For our results in the previous section to be interpretable as causal, we require $Cov(enclosed, \epsilon | X, s) = 0$. This is unlikely to hold in our context. In this section we introduce our identification strategy, which aims to estimate the causal effect of enclosure for those parishes considering Parliamentary enclosure. Aside from the potential effect of omitted variables, the fundamental identification challenge we face is self-selection out of Parliamentary enclosure of parishes that stood to gain little from it. We start by previewing identification, estimation, and inference.

Identification. Our identification strategy exploits the fact that enclosure Bills were enacted through Parliament in London, even though they often pertained to an individual parish, and at most to a few parishes. The decision in Parliament to pass a proposed enclosure fundamentally revolved around whether a committee of Members of Parliament (MPs) believed that a proposed enclosure satisfied a large number of legal requirements, called ‘standing orders’ (Lambert, 1971). This feature allows us to use the leave-one-out mean over parishes that would plausibly have had a similar committee in our sample period. We refer to such a group of parishes as a ‘synthetic committee’. The main advantage of such synthetic committees is that they are defined for both parishes that petitioned and for parishes that that did not. Because the role of a committee can be interpreted as judging the quality of a proposed Bill, our strategy is essentially an ‘examiner’ design, common in labor and public economics (e.g. Card et al. (2020) and Dahl et al. (2014) following the research of Angrist et al. (1999)).

Estimation. Due to the different groups of parishes in our sample - some already informally enclosed, others not yet enclosed, our instrumental variable analysis will estimate a heterogeneous treatment effect by what parishes stand to ‘gain’ from Parliamentary enclosure. The Two Stage Least Squares estimate of the effect of enclosure recovers the ‘Local Average Treatment Effect’ of enclosure, a weighted average across

the treatment effects of parishes with different potential ‘gain’ from enclosure (Imbens and Angrist, 1994; Heckman and Vytlačil, 2005). After estimating the LATE, we estimate the different treatment effects of enclosure, by how much parishes stood gain from enclosure, relying on recent advances in the literature on ‘marginal’ treatment effects (Björklund and Moffitt (1987); Heckman (1997); Heckman and Vytlačil (1999); Heckman and Vytlačil (2005); Heckman and Vytlačil (2007)). In line with our interpretation, these show that parishes that stood to gain little from enclosure are downweighted in our instrumental variable estimates. 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.

Inference. The key difference between standard examiner designs and ours is random assignment. Whereas in canonical examiner designs subjects are randomly assigned to examiners, parishes in our dataset are not randomly assigned to committees. We discuss this issue at length and provide narrative and econometric evidence that is consistent with our claim that parishes are as-good-as-randomly assigned to committees. In addition, we require that there is variation in the leave-one-out rate of passing enclosure Bills. Our first stage estimates show that this is the case. For our estimates to have a causal interpretation, we finally require that this rate exerts an effect on our outcomes of interest only through enclosure. In other words, our instrument should be uncorrelated with unobservables at the *parish* level. We provide several ‘balance checks’ that are consistent with our claim that parish level (un)observables are not correlated with our instrument. Provided these requirements are satisfied, the main remaining challenge to inference is spatial correlation. Our outcomes are plausibly spatially correlated, and our instrumental variable is spatially correlated by construction. When both outcome and right hand side variables of interest are spatially correlated, standard errors are particularly likely to be understated (Kelly, 2020). We discuss and implement a careful evaluation of spatial correlation and find that spatial correlation is indeed important for inference but does not invalidate our conclusions.

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 and borough. County constituencies were rural constituencies covering large parts of England. There were 40 such constituencies. In our dataset, an average county constituency covers 387 parishes. Borough constituencies covered medieval cities and were often very small. The electorate in some boroughs was 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. In our dataset of MPs, 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.

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. Public pertains to the entire country, such as Bill on tariffs or war. Private pertains to local or individual issues, such as naturalization and divorce, but also from about 1700 on included local issues to do with property, like enclosure. Both types of acts were subject to separate 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, called standing orders. There were numerous standing orders for private Bills, and additional standing orders for enclosure Bills in particular. Private Bills had the important distinction 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 enclosure specific standing orders specified that Bills needed to be posted on the church door. 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 owners of the tithe) were adequately represented. To do this, committees were authorized to request documentary evidence, to call witnesses, and to require amendments to proposed Bills. After this, the committee was required to hear any ‘counter-petitions’ from stakeholders who felt disadvantaged by the proposed Bill. At the end, a committee made a recommendation and there was a vote by the Commons. Through the standing orders and the committees, Parliament offered a mechanism to resolve

disputes that would potentially scuttle an informal agreement. After having been passed by the Commons, the Bill would move to the House of Lords where another vote occurred before a Bill was signed into law by the king.

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.

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:¹²

“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).

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: “The members .. are usually the county members, or those from a neighboring constituency” (Tate, 1967, p. 95).

There was a committee for every enclosure. It stands to reason that there was variation across committees in what fraction of enclosures within their jurisdiction passed. In addition, MPs were often more concerned with private business or with more visible acts than an enclosure act for one of 15,000 parishes

¹²We 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.

potentially hundreds of miles away from London. For Private Bills, it is clear that MPs that weren't on the committee often did not show up to vote, and that the committee had a large degree of discretion over the rigor with which the standing orders were applied (Lambert, 1971).

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, but probably representative, evidence from the 19th century "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, a committee of MPs was 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 enacted 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.

5.4 Our identification strategy

We posit that there are differences across committees in the fraction of proposed Bills under their jurisdiction that pass. If true, this observation implies that we could use the leave-one-out fraction of Parliamentary enclosures proposed that passed under the jurisdiction of the committees adjudicating a new petition as an instrument for enclosure. There are two challenges to this strategy. First, the precise composition of committees is not systematically recorded in the Parliamentary archives. Second, committees are not defined for those parishes that never petition. Our solution to both challenges is to identify a geographical area around a given parish which, we claim, the committees would have been similar in. We then measure the probability that other proposed enclosures over our sample period pass in this 'synthetic' committee and hypothesize that this probability correlated with the probability of a Bill passing in the left-out parish.

Our identification strategy rests on the assumption that there are local differences in the leave-one-out mean of the fraction of petitions that pass, and that the synthetic committee is a reasonable approximation of a committee. We will provide evidence consistent with these assertion as part of our 'first stage' estimates, that show that there is a strong correlation between the leave-one-out mean of Parliamentary enclosure in the synthetic committees and enclosure in the left-out parish. The second identifying assumption is that parish level unobservables are uncorrelated with our instrument. While not formally testable, we will provide intuition and results to suggest that this exclusion restriction is met.

We interpret our instrument as capturing the ‘meticulousness’ with which MPs applied the standing orders. Some committees were more involved with the process and that others, perhaps composed of absenteeist MPs, were more likely to let Bills pass with less scrutiny.

5.5 The construction of our instrument

In this section, we operationalize the use of the leave-one-out mean of Parliamentary enclosure as an instrumental variable. We proceed in several steps.

1. For each parish, we identify the k closest parishes. In our baseline estimates, we set $k = 350$, and we vary k in the appendix. This area is intended to capture the area from which MPs would be selected to serve on the committee for a petitioning parish. For example, if a parish is near a constituency boundary, the committee would likely consist of MPs from both the constituency the parish is in, as well as the neighboring constituency. If a parish instead was in the heart of a large county constituency, the committee was typically staffed with the county constituency representatives as well as MPs from nearby boroughs within the constituency.¹³ This way, the bandwidth k identifies the likely composition of a committee, whether it was actually formed or not. We discuss an example that builds intuition below.
2. For parishes within k , leaving out the petitioning parish itself, we compute the fraction of petitions that were successful. If a parish petitioned twice, first unsuccessfully and subsequently successfully, we include it in this computation twice. To compute the instrument in the same way for enclosing parishes and parishes that never enclose, we compute this measure using enclosures over our entire sample period.

Figure 3 contains three maps that provide intuition for the construction of the instrument for the parish of *Meldreth* in Cambridgeshire. The figure superimposed between subfigure (a) and (b) shows a bounding box to situate the case study within England. The extent of this box is the full extent of subfigures (a) and (b).

In subfigure (a) we show the extent of k . Note that k spills into several neighboring constituencies, such as Bedfordshire and Hertfordshire county constituencies, and Cambridge and Huntingdon borough constituencies. This reflects our assertion that MPs from these constituencies were likely to be on the committee for Meldreth should it petition. In subfigure (b) we shade parishes within k by enclosure status.

¹³Note that we drop parishes that are in such boroughs from our dataset, and the construction of our instrument does not take passed or failed enclosures from boroughs into account. It is still the case that rural parishes likely had MPs from nearby boroughs on the committees judging their petition.

Parishes in white never petitioned. Parishes in light gray successfully petitioned. Parishes in dark gray petitioned, but their petition failed at least once. We construct the value of our instrument for Meldreth by dividing the number of successful petitions by the total number of petitions within k .

Meldreth did in fact petition for enclosure on December 16, 1812. Although we cannot know the full composition of its committee, when a Bill was first assigned to a committee or when an MP returned with a Bill to the Commons, names of individuals were sometimes recorded in the Journal of the House of Commons. In the case of Meldreth for instance, after the petition was delivered, Lord Francis Osborne (MP for Cambridgeshire) and Lord Charles Manners (the second MP for Cambridgeshire) were charged to prepare the Bill for Parliamentary scrutiny and were made part of the enclosure committee. Later on, Thomas Brand (MP for Hertfordshire), who was a committee member, reported that the standing orders had been complied with. Hertfordshire is indicated in subfigure (b). Hertfordshire borders on Cambridgeshire, and Meldreth is close to their border. After a challenge to the petition due to some lands that were interspersed with neighboring parishes, the Bill was reported to have complied with all standing orders on June 3rd 1813.

5.6 Challenges to identification

The most obvious challenge to identification is that, conditional on our covariates, parish unobservables 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.¹⁴ 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 addresses these concerns in principle by omitting the petitioning parish. Nevertheless, we provide a large number of balance checks below which support our assertion that parish characteristics are uncorrelated with our instrument.

In addition, the leave-one-out mean for Parliamentary enclosure passing may correlate with the probability that other Private Bills pass. This concern is likely to be muted because most other legislation

¹⁴For 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.

that passed in Parliament was national legislation such as the Corn Laws, and was uniformly implemented throughout the country, involving all MPs. Enclosure, instead, was local legislation subject to the Private Bill procedure and often involves only a small number of MPs. Other Private Bills that passed between 1750 and 1830 had mostly to do with divorce, naturalization, and estate disputes. Only 1% of Private Bills were Bills that were about other local economic issues, such as drainage.¹⁵ That said, some local Bills on drainage and the construction of turnpike roads were not submitted through the private Bill procedure but were nevertheless judged by a committee of local MPs in a process very similar to enclosure Bills. We do not think that this is a concern for us however because turnpikes often stretched over several counties and boroughs and the committee of involved MPs was therefore both larger and quite different than for an individual enclosure Bill. Some Bills that were not private Bills nevertheless were passed through the Private Bill procedure. Some drainage Bills are not submitted as a Private Bill but were nevertheless processed in the Private Bill procedure. In the Appendix we control for whether a turnpike passed through a parish and whether drainage was in operation, and find that this does not explain our results.

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 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 a case for its plausibility.

Table 3 reports results from several estimates of Equation 1, where we replace enclosure with our instrument as the right-hand side variable of interest. We use several pre-determined variables as outcome variables. We 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. Column (3) studies potential productivity measured by the agricultural suitability for growing wheat, as computed by the Food and Agricultural Organization, and column (4) uses total population in 1525, measured from the Lay Subsidies. Next, we study whether MPs or members of the nobility lived in a parish in 1700, before the start of our study period. We report standardized coefficients. On all measures, we find balance in the

¹⁵The Private Bill calendar can be found online at <https://www.legislation.gov.uk/changes/chron-tables/private> (accessed September 2021). In total, there are 6,414 Bills that passed in this period. Of these, 53% were enclosure Bills. 42% were Bills for estate inheritance, divorce, or naturalization. 1% were Bills to do with infrastructure, such as drainage and turnpike Bills.

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.

5.8 Estimation Framework

We model the economic effects of enclosure as follows:

$$Y = \beta_1 E + X\beta_2 + V \quad (2)$$

Where Y is an observed outcome, E is an indicator for Parliamentary enclosure, X is a vector of other variables potentially related to Y and V is a disturbance term. It will be useful to express our treatment effect of interest in two ways. As in our OLS estimates, we are interested in the treatment effect of Parliamentary enclosure. In Equation 2 this effect is captured by β_1 . We now also express Equation 2 in terms of potential outcomes. Let $Y(0)$ denote the potential value of Y in the absence of Parliamentary enclosure and $Y(1)$ denote the potential value of Y in the presence of Parliamentary enclosure. Both $Y(0)$ and $Y(1)$ are random variables. We can then re-express Equation 2 as:

$$Y = Y(0) + (Y(1) - Y(0))E = \beta_1 E + X\beta_2 + V \quad (3)$$

With $\beta_1 \equiv Y(1) - Y(0)$ and $V \equiv Y(0) - \beta_2 X$. This re-expression does not change the economic interpretation of any quantities from equation 2, β_1 still captures the treatment effect and V still represents the disturbance term. Under the assumption that $Y(0), Y(1) \perp\!\!\!\perp E|X$, our OLS estimate of β_1 identifies $E[Y(1) - Y(0)]$, or the Average Treatment Effect (ATE) (Angrist and Pischke, 2008, Chapter 2.3).¹⁶

The fundamental problem we face is selection into treatment based on unobservables: Parishes that enclosed informally stood to gain less from Parliamentary enclosure than unenclosed parishes. A standard way of modelling such selection, following Roy (1951), is to suppose the existence of a latent index U . We observe the decision of petition for enclosure if:

$$E = 1\{f(Z) - U \geq 0\} \quad (4)$$

Here Z captures observable factors that influence the decisions to enclose. Importantly, we assume that $Z = (\tilde{Z}, X)$, which includes both X and an excluded instrument \tilde{Z} . f is an unknown function. With such

¹⁶The difference between $Y(0), Y(1) \perp\!\!\!\perp E|X$ and $Cov(enclosed, \epsilon|X, s) = 0$ is notational only.

a conceptualization, parishes with a single landlord stand to gain very little, and the unobserved index for such parishes takes a very high value. This index is often referred to as the ‘resistance’ to treatment (Brinch et al., 2017). In this terminology, parishes that stood to gain little from Parliamentary enclosure resist treatment, and have high values of U .

5.8.1 Estimating the LATE of Parliamentary enclosure

A natural choice for $f(Z)$ is a linear function in Z . In such cases we obtain a standard linear (first stage) probability model (Vytlačil, 2002):

$$enclosed_p = \gamma_0 + \gamma_1 \tilde{z}_p + \gamma_2' X_p + s + \epsilon_p \quad (5)$$

We measure E by $enclosed_p$, which again equals one if parish p is enclosed by Parliament at any point between 1750 and 1830. We include the same covariates X_p and fixed effects s as before. Here \tilde{z}_p is our instrument. We use this first stage together with the following second stage:

$$y_p = \beta_0 + \beta_1 enclosed_p + \beta_2' X_p + s + v_p \quad (6)$$

As before in equation 1, we relate an outcome y in parish p to Parliamentary enclosure through the same covariates X_p as before, fixed effects s , and an indicator $enclosed_p$. Our coefficient of interest is $\hat{\beta}_1$, the measured effect of being enclosed. We estimate the system of equations 5 and 6 using Two Stage Least Squares. Similar to our OLS results, we report both heteroskedasticity robust standard errors and Conley (1999) standard errors correcting for arbitrary two-dimensional spatial correlation. Studying such models, Imbens and Angrist (1994) showed that with a binary instrument and a binary endogenous variable, instrumental variable analysis identifies a Local Average Treatment Effect. This is the treatment effect for the subset of parishes that consider petitioning for enclosure and for whom the instrument may influence that decision. These parishes are referred to as the ‘compliers’. Other parishes, like the ones with one landlord, that stood to gain very little from enclosure, are more likely to be ‘never takers’ as they are unlikely to petition for enclosure no matter what value the instrument takes.¹⁷

5.8.2 Estimating the MTEs of Parliamentary enclosure

An extensive literature has taken a different approach than the literature focused on potential outcomes and LATEs. Heckman (1979) first used an instrument to explicitly control for selection on observables of

¹⁷In a model with covariates, Angrist and Imbens (1995) show that with covariates estimating the LATE involves saturating X_p . However as Angrist and Pischke (2008) note, this is undesirable in practice and instrumental variable estimation including both the instrument and covariates linearly is often a good approximation.

the form captured in Equation 4. Subsequent contributions have focused on estimating treatment effects by different *levels* of U . The object of interest in such exercises is a function relating a treatment effect of interest, $Y(1) - Y(0)$, and U . The treatment effects recovered from such a function for a specific level of $U = u$ are referred to as ‘marginal treatment effects’ (Björklund and Moffitt, 1987; Heckman, 1997; Heckman and Vytlacil, 1999, 2005, 2007; Brinch et al., 2017). The main advantage of this alternative approach for our purposes is that we can re-estimate the ATE, the *estimand* of our OLS exercises, and the LATE, the estimand of our IV exercises, as weighted averages of the MTEs. By using our instrument to ‘control’ for selection and recovering both the ATE and LATE we study whether selection into treatment is indeed responsible for the small estimated treatment effects that we found so far.

In sum, we have three different parameters of interest: the Average Treatment Effect (ATE) $E[Y(1) - Y(0)]$, which our previous OLS estimates captured (conditional on identifying assumptions, we return to this below), the Local Average Treatment Effect (LATE) $E[Y(1) - Y(0)|\text{complier}]$, which our Two Stage Least Squares estimator estimates, and a function defining Marginal Treatment Effects (MTEs) $E[Y(1) - Y(0)|U]$ which we further discuss in section 7.

6 Two Stage Least Squares Results

In this section we use our identification strategy to estimate the LATE of Parliamentary enclosure and we find that it is associated with increases in agricultural productivity and land inequality. However, our OLS estimates are significantly smaller than the estimated effects in this section. If our instrumental variable estimates are closer to the true effect of Parliamentary enclosure, this would explain the large contemporary push towards enclosure, would explain why enclosure was so widespread despite its large costs. Yet, with Two Stage Least Squares analyses there may be many reasons for such a difference in estimated effects. We estimate MTEs in section 7 to show that 75% to 78% of the difference between the estimated effects using OLS and IV is that our 2SLS estimates capture the LATE for compliers, and downweight those parishes that do not stand to gain anything from enclosure.

In Table 4 we report our 2SLS implementation of equations 6 and 5. As with our OLS results, we begin with $\ln(\text{Wheat Yield})$ as our outcome variable, and we vary the inclusion of covariates. Columns (1) and (2) in this table therefore mimic columns (1) and (2) of Table 2.

Panel I reports estimates of Equation 6, panel II provides estimates of Equation 5, and panel III reports reduced form estimates. In panel II, we find a positive and significant first stage. Increasing the leave-one-out pass rate of nearby enclosure Bills from zero to one results in a 58% to 77% increase in the probability of being enclosed. Using Conley standard errors with a spatial cutoff of about 70km we find first stage F-stats

of 13.27 to 24.88. These F-statistics are our most conservative measure of the strength of the first stage. Using either heteroskedasticity robust standard errors or different distance cutoffs when computing these F-statistics leads to significant increases. We report results with different distance cutoffs in the Appendix. These estimates support the informativeness assumption of our instrument and provide evidence that our instrument is strong enough for our second stage estimates to be credible.

Panel I reports the 2SLS estimates corresponding to these first stages. In columns (1) and (2) we study agricultural yield. Column (1) present results controlling for fixed effects only and column (2) presents our main result for agricultural yield, including our full set of covariates. We find a positive and significant effect of enclosure on the natural log of wheat yield. The combined results in panels I and II, column (2), are corroborated by our result in Panel III, column (2), which shows a positive and significant correlation between our instrument and $\ln(\text{Wheat Yield})$. The estimated effect of Parliamentary enclosure on agricultural yield in column (2), 0.44 (Conley s.e. 0.15) is interpretable as a percentage change. Therefore, enclosing through Parliament is associated with 44% higher yields. 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 per acre (Allen, 2005). The gain in yield associated with enclosure is therefore approximately half that of the accumulated gain over the preceding 450 years.

In columns (3) and (4) we study land inequality. In column (3) we only control for covariates, and in column (4) we present our main result. We find that the effect of enclosure on land inequality is equal to 0.25, relative to a mean of 0.74. This result is significant at the 1% level using either stringent Conley standard errors or heteroskedasticity robust standard errors. As before, the reduced form results in Panel III are in line with this finding. Taken together, the estimates in this section show a significant effect of Parliamentary on agricultural yield and land inequality. Subject to the exclusion restriction, these results are interpretable as causal.

Discussion of the estimated treatment effects. Our 2SLS findings speak to the long-standing debate on the effect of enclosures on English development. We collect the main estimated effects in Table 7. For example, Allen (1992) estimates an increase of yield between 2.5% and 8.4%, depending on the dataset. This estimate is in line with our OLS estimates, at 3%. McCloskey (1989) estimates higher increases, between 10 and 13%. Turner (1980) finds higher estimates still at 26,4%. These studies make mostly cross-sectional comparisons, which, like our OLS estimates, are likely biased downwards due to the presence of informally enclosed parishes in the control group. Some contemporary estimates make more careful comparisons. As we discussed in our introduction, Arthur Young made a side-by-side comparison of two parishes and found a yield differential of 50%. The General View of Agriculture reports, cited in section 2 as well, allow before-after comparisons, and suggest yield increases of 75% (but note that this

estimate is based on a small number of parishes). Our IV estimates, at 44%, are more consistent with these latter estimates than with the more modern literature finding small effects. Subject to a very important caveat, our IV estimates resolve the problem that OLS estimates systematically underestimate the effect that Parliamentary enclosure by ensuring that comparisons between enclosed and unenclosed parishes take into account the potential productivity gains that informal enclosure brings.

The most important caveat to this conclusion is that the OLS estimates may be lower than our IV estimates for several reasons, not just negative selection into the control group and, therefore, the nature of the *estimand* (our 2SLS results estimate a LATE for the subsample of compliers whereas our OLS results estimate the ATE for all parishes). The disparity between estimates could similarly be due to measurement error or (severe) violations of the exclusion restriction underlying the IV estimates. In the next section we use advances in the literature on marginal treatment effects to show that the differences between the OLS and 2SLS results are fundamentally due to the differences in *estimands*.

7 Heterogeneous Treatment Effects

In this section we estimate heterogeneous treatment effects by unobserved resistance to the treatment, or the marginal treatment effect (MTE). This approach will allow us to decompose the difference between our OLS and IV estimates to understand that drives it. We find that selection out of Parliamentary enclosure by parishes that stood to gain little from is an important driver of the low estimated effects in our OLS exercise relative to our IV estimates.

7.1 Marginal Treatment Effects

The object of interest when estimating MTEs is $MTE(u) = E[Y(1) - Y(0)|U = u]$ where U is defined as the unobserved ‘resistance to treatment’ in Equation 4. In this section we discuss the estimation of the MTEs, largely following Brinch et al. (2017).

Normalization. The starting point in the literature is to study the *quantiles* of U rather than the (latent) values of U . Brinch et al. (2017) suggest the following normalization of equation 4:

$$f(Z) - U \geq 0 \iff p(E = 1|Z) - \tilde{U} \geq 0 \quad (7)$$

where $\tilde{U} \sim \text{Uniform}[0, 1]$. We relabel \tilde{U} as U from here on. This expression implies that a ‘propensity score’ of getting treated for a level of the instrument has to be higher than U to decide to enclose through Parliament. We denote the propensity score as $r = p(E = 1|Z)$. After this step, we redefine the marginal

treatment effects as $MTE(u) = E[Y(1) - Y(0)|U = u]$ with $U \sim \text{Uniform}[0, 1]$.

The separate approach The implementation approach we follow is called the ‘separate approach’, and starts by assuming a parametric relationship between potential outcomes and the propensity scores in two subsamples, composed of all enclosed parishes, and all unenclosed parishes.

$$E[Y(e)|X, p] = \beta_0 + \beta_1 X + \beta_2 r + \beta_3 r^2, \quad e = 0, 1 \quad (8)$$

Brinch et al. (2017) show that using the estimated *coefficients* $\hat{\beta}$ one can construct the following function:

$$E[Y(e)|X, U = u] = \hat{\gamma}_0 + \hat{\gamma}_1 X + \hat{\gamma}_2 u + \hat{\gamma}_3 u^2, \quad e = 0, 1 \quad (9)$$

Where the $\hat{\gamma}$ are known as they are constructed from the $\hat{\beta}$ s. Because we know each coefficient $\hat{\gamma}$ we can vary U between zero and one and plot the corresponding treatment effects in $Y(e)$ - U space. The MTE curve is the vertical difference of the $Y(1)$ and $Y(0)$ curves.

Implementation. In order to recover the propensity scores r we estimate a ‘first stage’ Probit model, regressing our indicator for enclosure on all covariates and our instrument. From this regression, we generate predicted values. With these predicted values we estimate Equation 8 for both unenclosed and enclosed parishes. Note that the propensity score in these equation control for selection into treatment (Heckman, 1979).

To recover Equation 9 from Equation 8 note that we can rewrite Equation 8 for enclosed parishes as $E[Y(e)|X, r] = E[Y(1)|X, r, r < U]$ using Equation 7. Integrating out r gives Equation 9. An analogous operation recovers Equation 9 for unenclosed parishes.

ATE and LATE as weighted averages of MTEs. For our purposes, the main advantage of estimating the MTEs is that Heckman and Vytlačil (2005) show that many parameters of interest can be written as a (known) weighted average of the $MTE(u)$. In particular, it is possible for us to derive both the LATE and the ATE in this framework. The ATE is simply the average of the MTE, while the LATE is a weighted average:

$$ATE = \int_0^1 MTE(u) du \quad (10)$$

$$LATE = \int_0^1 MTE(u) * weights_{LATE}(u) du \quad (11)$$

The $weights_{LATE}(u)$ rescale the MTEs to their contribution to the LATE. These weights are formally defined in Heckman and Vytlačil (2007).

Identifying assumptions. Importantly, Vytlačil (2002) shows that the identifying assumptions neces-

sary to estimate the LATE using Two Stage Least Squares and as a weighted average of MTEs are identical. We can therefore compare the estimated LATE in the previous section to the LATE estimated within the MTE framework.

In the next section we use this setup. Comparing the ATE to our OLS estimates and the LATE to our IV estimates allows us to decompose the difference between our OLS and IV estimates into the part that is due to the fact that the LATE and ATE are different *estimands* and a part that is due to other factors.

7.2 MTE Results

We now present our MTE results, starting with $\ln(\text{Wheat Yield})$ in Figure 4. In Subfigure (a) we plot several quantities of interest as a function of the resistance to treatment U . The most important one is the MTE curve, which traces out treatment effects of enclosure as a function of U . Since this curve is downward sloping, treatment effects are higher for parishes that are less likely to ‘resist’ enclosure, as we would expect. At high levels of resistance to the treatment, we suspect parishes are informally enclosed, as these parishes have no interest in formally enclosing. We can see that these parishes would have had a low treatment effect had they enclosed. We interpret this result as consistent with our hypothesis that this is because they have already captured much of the gains of enclosure. As U decreases the number of informally enclosed parishes falls. Accordingly, the treatment effect rises because the counterfactual comparison becomes Parliamentary enclosure and informal governance, rather Parliamentary enclosure and unanimous enclosure.

Subfigure (b) contains the main results of this exercise. It plots, on the same axes, our main OLS estimate from Table 2, the corresponding ATE computed within the MTE framework (equation 10), our 2SLS estimate from Table 4, and the corresponding LATE from the MTE framework (equation 11). There are three main points to note here. First, the OLS is not equal to the ATE. This is due to selection into Parliamentary enclosure along other dimensions than the potential gain from Parliamentary enclosure. Second, the LATE is not exactly equal to the 2SLS. This is essentially an approximation error and not substantively important. We discuss it in the Appendix. Third, and most importantly, comparing lines vertically, the ATE is lower than the LATE. Within the MTE framework, it is easy to see why. The LATE downweights parishes with higher resistance and estimates the treatment effect for compliers only. We plot the LATE weights in Subfigure (a). Comparing lines vertically in Subfigure (b), we see that 75 percent of the difference between the OLS and the LATE estimates is explained by the distance between the ATE and LATE. In other words, the fact that the OLS and 2SLS estimate the treatment effect of Parliamentary for different groups of parishes explains most of the observed difference in estimated effects between them. The

rest is either explained by measurement error, selection into enclosure status that biases the OLS estimates downward, or violations of the exclusion restriction. Although the exclusion restriction is untestable, our balance checks provide intuition against the latter and we conclude that our IV exercise identifies the effect of interest of this paper.

Our argument has been that the difference between OLS and 2SLS estimates is fundamentally due to already informally enclosed parishes standing to gain little from Parliamentary enclosure, but at the same time being in the control group in the OLS analyses. We can further substantiate this point by studying potential outcomes separately. We do so in Subfigure (c) by plotting potential outcome Equation 9. We find that the potential outcome of enclosure, $Y(1)$, is essentially constant across values of U . In contrast, the potential outcome for not enclosing, $Y(0)$, is sharply upwards sloping, indicating that the heterogeneity in the treatment effect, $Y(1) - Y(0)$, is driven by heterogeneity in $Y(0)$. We interpret this finding as follows: Had parishes not enclosed, productivity depends on the degree to which informal enclosure is successful. U captures this because informally enclosed parishes resist Parliamentary enclosure. For parishes with high U , we therefore see essentially the same treatment effect under counterfactual Parliamentary enclosure as see under informal enclosure. For parishes without any informal enclosure (low U) not enclosing leads to substantially lower productivity than a counterfactual Parliamentary enclosure would bring. This results in a large difference between $Y(0)$ and $Y(1)$ and a large MTE. This means that unenclosed parishes stood to gain most from Parliamentary enclosure whereas informally enclosed parishes stood to gain little. This is, in turn, consistent with our claim that small OLS estimates are primarily driven by informally enclosed parishes. In Figure 5 we repeat this exercise for land inequality. 78 percent of the difference between the LATE and the OLS estimates of the effect of Parliamentary enclosure on inequality is explained by the difference in the ATE and the LATE. Subfigure (c) shows that for land inequality too, the untreated potential outcome is driving the result, with parishes likely to exist Parliamentary enclosure already having realized increases in inequality. These are likely the parishes that managed to enclose informally precisely because they were highly unequal to begin with which concentrated decision making power.

These MTEs estimates are consistent with our OLS estimates being underestimates of the treatment effect of Parliamentary enclosure because those parishes that stood to gain little from Parliamentary enclosure select out of this procedure. Since these parishes likely already realized the treatment effects of the rationalization of field allocation and the division of the commons, our OLS estimates are an underestimate of the true effect of Parliamentary enclosure.

8 Mechanisms

In this section we study mechanisms that may connect Parliamentary enclosure to our outcomes. We discussed the most prominent potential mechanisms in section 2. For changes in agricultural productivity, they can be grouped under innovation and coordination. When landowners are residual claimants on their investment, their incentives to innovate are greater. Similarly, not having to coordinate with others may increase agricultural output. Strip farming, for example, limited the scope to shift from arable to pasture due to shared investment in ploughs, and the larger contiguous fields necessary for pasture. Other mechanisms may also be at play. A Parliamentary enclosure act usually forced the construction of new roads or the improvement and extension of existing roads. Such infrastructure investments may separately have been conducive to trade and development. For inequality, the most plausible mechanisms suggested in the literature discuss the prohibitive costs of the implementation of Parliamentary enclosure which forced people with smaller plots to ‘sell out’. 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 Parliamentary enclosures 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 allowed us to geographically locate the patents, as they record the place of residence of the patent holders. 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, 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 parish was assessed to be poor in the tithe surveys (Kain and Prince, 2006). Table 5 presents results. We find that Parliamentary 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 concern the adoption of more effective agricultural practices, which may have been more attractive after Parliamentary enclosure because there was no longer a need to coordinate (Young, 1771). To capture this potential mechanism, we consider the planting of turnips and the act of fallowing as two basic agricultural improvements. Planting turnips or ‘nitrogen fixing’ crops like clover in between other crops like wheat, or between harvests, replenishes 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 Parliamentary enclosure improves agricultural practices because these improvements can now be chosen individually rather than necessitating coordination. This is what we find in Table 5.

We now turn to the disappearance of people with smaller claims on the commons as a mechanism driving our observed increases in land inequality. We measure this by the number of cottagers as a fraction of the total number of landowners. We identify cottagers by the description of their landholdings in the tithe records. In section 2, we discussed the case study evidence for Parliamentary enclosure which suggests that smallholders might have had to sell out due to the high costs of buying out the tithe holder and the implementation of the enclosure act, as well as loss of common rights. In Table 5, column (5), we find that Parliamentary enclosure is associated with a lower share of small landowners in a parish. This result is consistent with disappearance of small landowners and engrossing as driving our finding that Parliamentary enclosure leads to higher land inequality.

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

9 The Midlands

In an important contribution, Allen (1982) studies the English Midlands and concludes that Parliamentary enclosure did not lead to improvements 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.¹⁸

Table 6 presents four OLS estimates of equation 1 for $\ln(\text{Wheat Yield})$ and the Gini. Odd columns use our full sample and even columns subset to the Allen (1982) sample. When we look at agricultural yield 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, which do not support his findings, but when we subset to Allen’s sample, we replicate his findings. In contrast, while we find a positive effect on inequality in our sample (column (3)) we find an insignificant effect for inequality within Allen’s sample (column (4)). This may be because we

¹⁸To construct the Allen (1982) sample, we restrict to the following counties: Bedfordshire, Berkshire, Buckinghamshire, Cambridgeshire, Huntingdonshire, Leicestershire, Northamptonshire, Rutland, and Warwickshire.

measure inequality by a land value Gini, whereas Allen measures the shares of surplus accruing to different people in a parish.

10 Conclusion

The English Parliamentary 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 Parliamentary enclosures to agricultural yields and land inequality. Across about 15,000 parishes covering all of England, we compare parishes that were enclosed by Parliament to those that were not. 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 mean of the success of Parliamentary enclosure acts in an area around the parish.

We find that enclosure led to substantial increases in agricultural yield and a large increase in land inequality.

Our results confirm two famous sets of hypotheses about the impact of Parliamentary enclosures which have claimed that they had large positive effects on incentives and productivity, see Young (1808) or Hardin (1968), but at the same time led to severe increases in inequality, for example Marx (1990). They reveal a fascinating political economy of the reform of property rights. Prior to 1750, even though traditional governance mechanisms were unable to allocate common resources efficiently, they could not be reformed politically because people likely anticipated the large redistributive effects. These came because upon Parliamentary enclosure some sorts of rights were much easier to confirm than others, because compensating tithe holders involved large amounts of land and because imperfections in capital markets meant that poor people were not able to benefit from any improvements in productivity. The innovation of the Parliamentary process allowed enclosure to move forward in one third of English parishes because it allowed large landowners to over-ride those who had previously blocked change.

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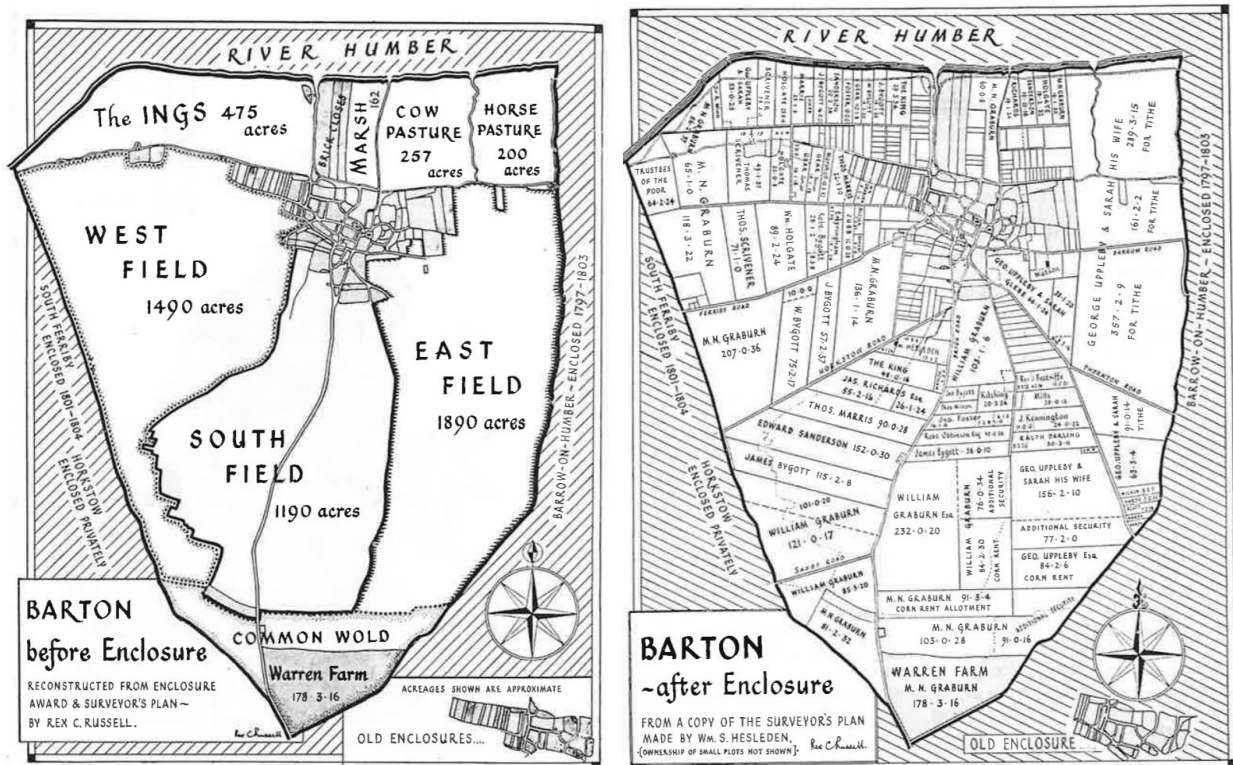
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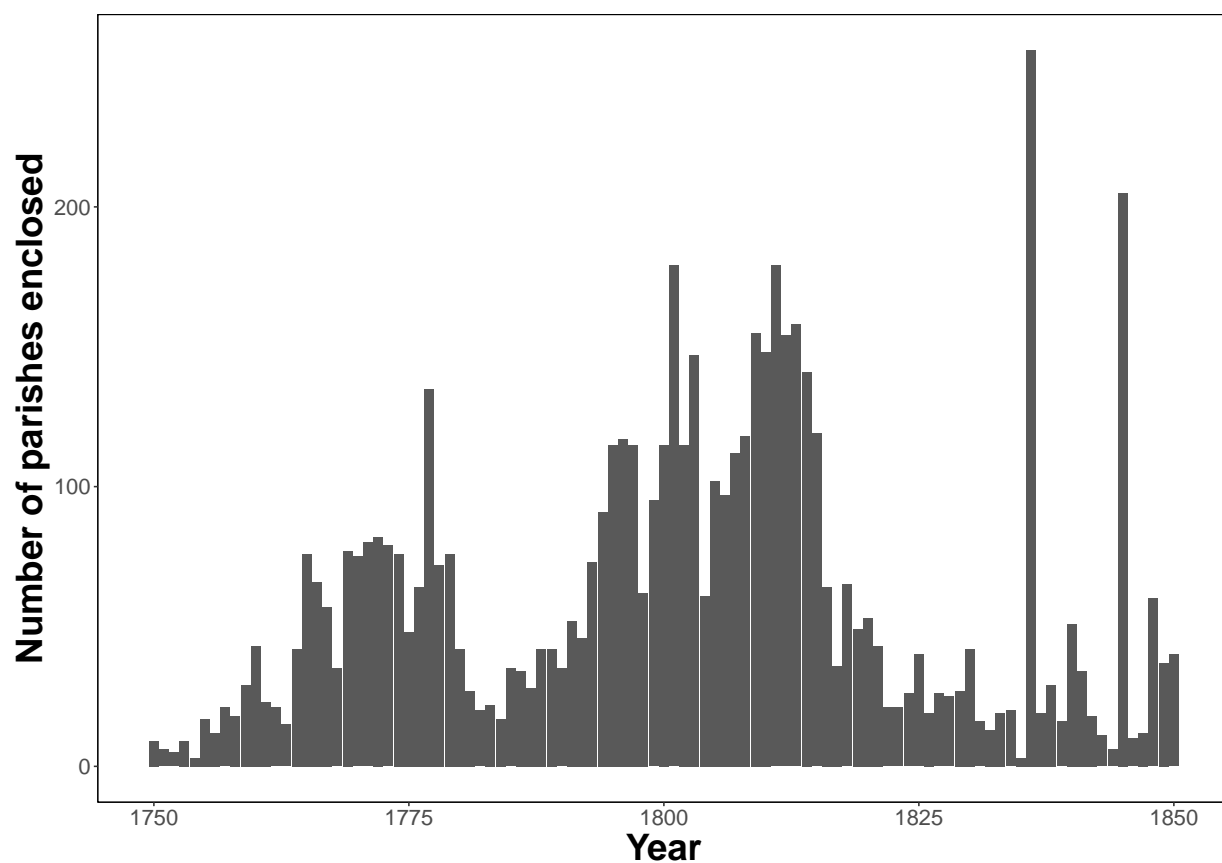
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Figure 1: ORGANIZATION OF LANDOWNERSHIP IN BARTON BEFORE AND AFTER ENCLOSURE



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 Parliamentary enclosure. Source: Mingay (1997).

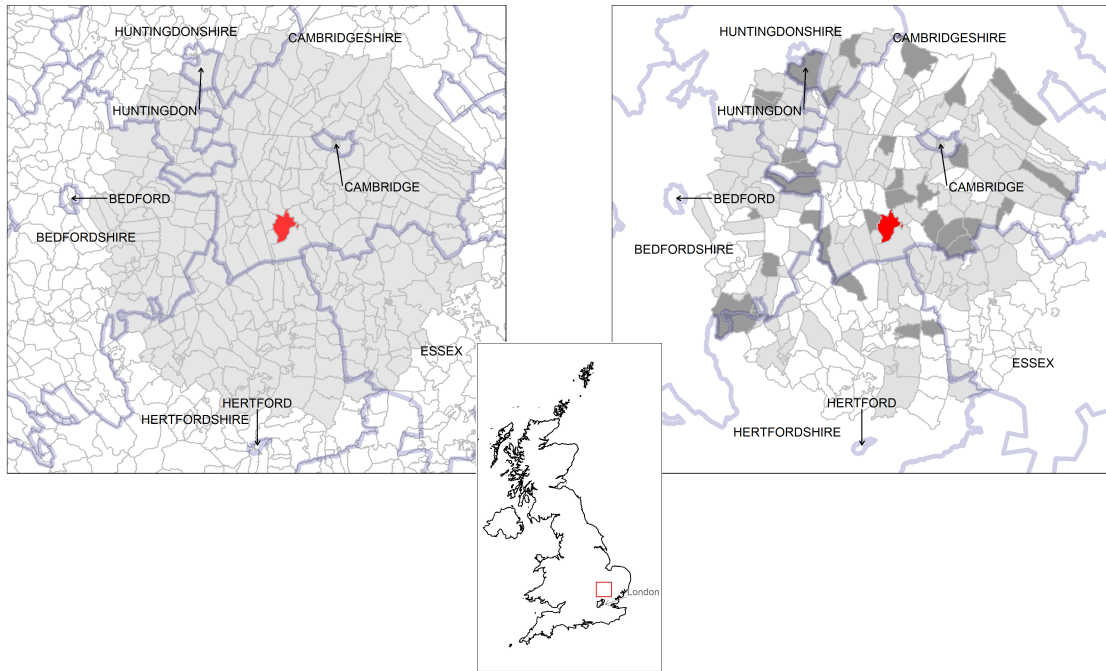
Figure 2: THE NUMBER OF ENCLOSED PARISHES, BY YEAR



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

Figure 3: INSTRUMENT CONSTRUCTION

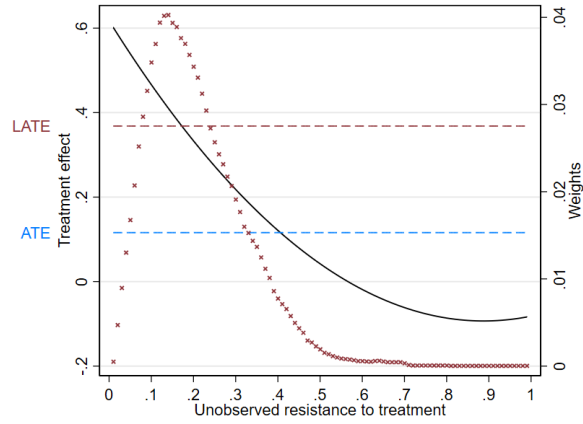
(a) Meldreth with $k = 350$ nearest neighbors (b) Neighbors by Parliamentary enclosure attempt status



Notes: Subfigure (a) shows the parish used for this case study, Meldreth, is in red. Parishes in gray are those within $k = 350$ neighbors of Meldreth. Constituency boundaries are in purple, with associated text in black. Subfigure (b) shows the parish used for this case study, Meldreth, in red. Parishes outside of $k = 350$ neighbors are omitted. Parishes in white never attempted to enclose. Parishes in light grey successfully petitioned to enclose. Parishes in dark grey failed their petition to enclose at least once. Constituency boundaries are in purple, with associated text in black. A figure depicting the location of our case study is superimposed between the two subfigures. The red bounding box is the extent of Subfigures (a) and (b).

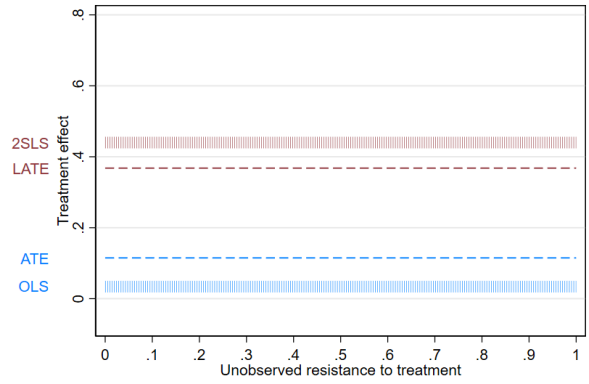
Figure 4: MARGINAL TREATMENT EFFECT FOR LN(WHEAT YIELD)

(a) MTE Curve



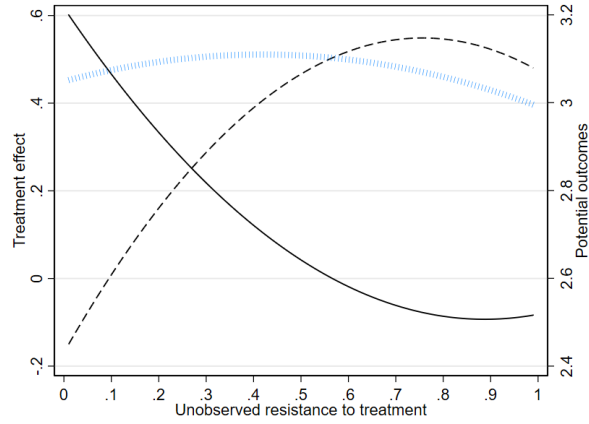
Notes: The Marginal Treatment Effect (MTE) curve traces out the treatment effect as a function of unobserved resistance to enclosure in solid black. We derive both the LATE and ATE, plotted in dashed red and dashed blue respectively, from the MTEs. The ATE is an arithmetic average of the MTE, while the LATE is a weighted average of the MTE for compliers, with the weights plotted as red crosses.

(b) 2SLS vs OLS



Notes: In the MTE framework, we derive both the LATE and the ATE. These are the horizontally dashed lines in red and blue respectively, same as above. The 2SLS estimate is plotted as the vertically dashed red line, while the OLS estimate is plotted as the vertically dashed blue line. Estimates for OLS taken from Table 2, column (2). Estimate for 2SLS taken from Table 4, column (2), panel I.

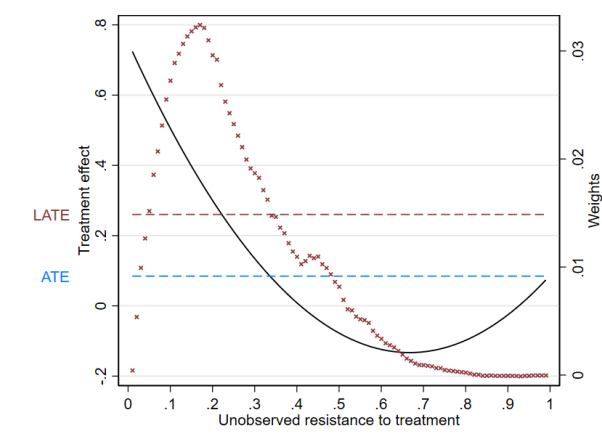
(c) Potential Outcomes



Notes: We plot the MTE curve in this figure, together with the curves for $Y(1)$ and $Y(0)$. The MTE curve is the vertical difference between these two curves.

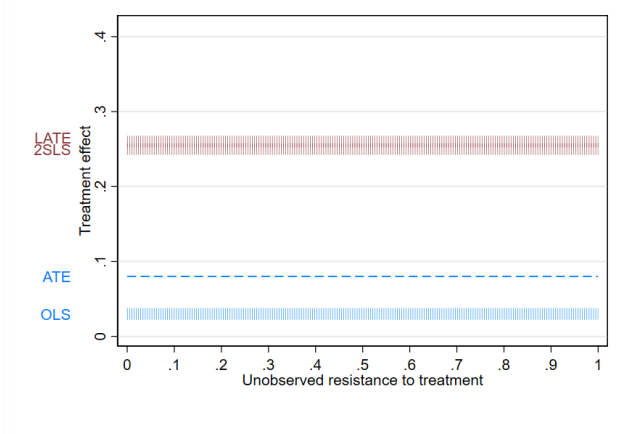
Figure 5: MARGINAL TREATMENT EFFECT FOR GINI

(a) MTE Curve



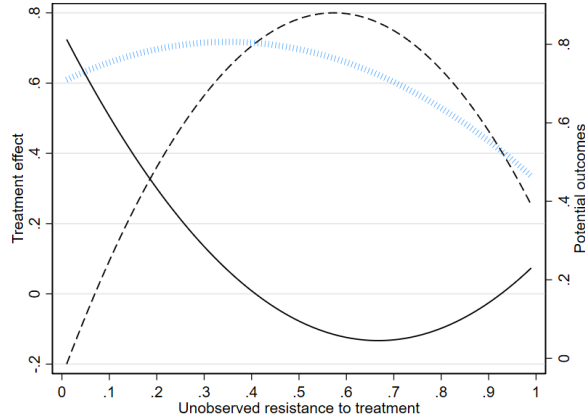
Notes: The Marginal Treatment Effect (MTE) curve traces out the treatment effect as a function of unobserved resistance to enclosure in solid black. We derive both the LATE and ATE, plotted in dashed red and dashed blue respectively, from the MTEs. The ATE is an arithmetic average of the MTE, while the LATE is a weighted average of the MTE for compliers, with the weights plotted as red crosses.

(b) 2SLS vs OLS



Notes: In the MTE framework, we derive both the LATE and the ATE. These are the horizontally dashed lines in red and blue respectively, same as above. The 2SLS estimate is plotted as the vertically dashed red line, while the OLS estimate is plotted as the vertically dashed blue line. Estimates for OLS taken from Table 2, column (4). Estimate for 2SLS taken from Table 4, column (4), panel I.

(c) Potential Outcomes



Notes: We plot the MTE curve in this figure, together with the curves for $Y(1)$ and $Y(0)$. The MTE curve is the vertical difference between these two curves.

Table 1: SUMMARY STATISTICS FOR MAIN OUTCOME VARIABLES

<i>Sample, parishes:</i>	N	ENCLOSED		UNCLOSED		difference	t-stat
		mean	sd	mean	sd		
ln(Wheat Yield) in bushels per acre	4003	3.08	0.19	3.04	0.23	0.04	5.81***
Gini (land value)	5015	0.78	0.19	0.71	0.21	0.07	12.02***

Notes: Ln(Wheat Yield) in bushels per acre is the natural log of the number of bushels of wheat per acre. Gini is a gini coefficient of the value of land owned by parishioners in the 1836 tithe returns.

Table 2: PARLIAMENTARY ENCLOSURE, AGRICULTURE, AND INEQUALITY

<i>Dependent variable:</i>	LN(WHEAT YIELD) IN BUSHELS PER ACRE		GINI (LAND VALUE)	
	(1)	(2)	(3)	(4)
Enclosed (yes/no)	0.03 (0.01) [0.007]	0.03 (0.01) [0.007]	0.04 (0.02) [0.007]	0.03 (0.01) [0.007]
Mean dep. var.	3.05	3.05	0.74	0.74
SD dep. var.	0.21	0.21	0.21	0.21
Observations	3641	3641	4446	4446
R^2	0.19	0.32	0.07	0.09
<i>Inputs:</i> fertilizer, machine use (yes/no); suitability for growing wheat	N	Y	N	N
<i>Population:</i> Total number landowners	N	N	N	Y
<i>Scale:</i> Parish area	N	Y	N	Y
<i>Geography:</i> Elevation	N	Y	N	Y
<i>Location:</i> Latitude, longitude, latitude*longitude	N	Y	N	Y
<i>Regional differences:</i> Four region, London indicators (n=5)	Y	Y	Y	Y
<i>Soil characteristics:</i> Soil type indicators (n=11)	Y	Y	Y	Y

Notes: All regressions are estimated using OLS. The unit of observation is a parish. All regression restrict to rural parishes. Ln(Wheat Yield) in bushels per acre is the natural log of the number of bushels of wheat per acre. Gini is a gini coefficient of the value of land owned by parishioners in the 1836 tithe returns. Enclosure (yes/no) is an indicator equal to one if a parish was enclosed at any point between 1750 and 1830. Conley standard errors correcting for spatial correlation are in parentheses. These use a triangular kernel with a boundary of 70km. Standard errors correcting for heteroskedasticity are in brackets.

Table 3: 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)
Leave-one-out pass rate nearby Enclosure Bills	0.005 (0.010) [0.007]	-0.004 (0.011) [0.006]	-0.004 (0.030) [0.007]	0.029 (0.020) [0.010]	0.001 (0.004) [0.004]	0.004 (0.012) [0.011]
Observations	6791	7581	13919	7581	9339	9339
R^2	0.02	0.08	0.50	0.32	0.01	0.00
<i>Scale:</i> Parish area	Y	Y	Y	Y	Y	Y
<i>Geography:</i> Elevation	Y	Y	Y	Y	Y	Y
<i>Location:</i> Latitude, longitude, latitude*longitude	Y	Y	Y	Y	Y	Y
<i>Regional differences:</i> Four region, London indicators (n=5)	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. The instrument is the leave-one-out fraction of the proposed enclosures that pass through Parliament and are enacted into law. We take the nearest k parish neighbors and compute total $\frac{\text{successful enclosures}}{\text{attempts to enclose}}$ in this range. Conley standard errors correcting for spatial correlation are in parentheses. These use a triangular kernel with a boundary of 70km. Standard errors correcting for heteroskedasticity are in brackets.

Table 4: THE EFFECT OF PARLIAMENTARY ENCLOSURE ON AGRICULTURAL YIELD AND INEQUALITY

<i>Dependent variable:</i>	LN(WHEAT YIELD) IN BUSHEL PER ACRE		GINI (LAND VALUE)	
	(1)	(2)	(3)	(4)
<i>Panel I: IV estimates</i>				
Enclosed (yes/no)	0.48 (0.31) [0.09]	0.44 (0.13) [0.08]	0.16 (0.08) [0.04]	0.21 (0.11) [0.05]
Mean dep. var.	3.05	3.05	0.74	0.74
SD dep. var.	0.21	0.21	0.21	0.21
Observations	3641	3641	4446	4446
<i>Panel II: first stage</i>				
<i>Dep. var.: Enclosed (yes/no)</i>				
Leave-one-out pass rate nearby Enclosure Bills	0.58 (0.16) [0.06]	0.58 (0.13) [0.06]	0.77 (0.15) [0.07]	0.67 (0.15) [0.07]
Conley F-stat on Excluded Instrument	13.27	18.32	24.88	19.03
<i>Panel III: Reduced Form</i>				
Leave-one-out pass rate nearby Enclosure Bills	0.28 (0.14) [0.04]	0.26 (0.06) [0.04]	0.12 (0.07) [0.03]	0.14 (0.07) [0.03]
<i>Inputs:</i> fertilizer, machine use (yes/no); suitability for growing wheat	N	Y	N	N
<i>Population:</i> Total number landowners	N	N	N	Y
<i>Scale:</i> Parish area	N	Y	N	Y
<i>Geography:</i> Elevation	N	Y	N	Y
<i>Location:</i> Latitude, longitude, latitude*longitude	N	Y	N	Y
<i>Regional differences:</i> Four region, London indicators (n=5)	Y	Y	Y	Y
<i>Soil characteristics:</i> Soil type indicators (n=11)	Y	Y	Y	Y

Notes: All regressions in panel I are estimated using two-stage least squares. The unit of observation is a parish. All regression restrict to rural parishes. Ln(Wheat Yield) in bushels per acre is the natural log of the number of bushels of wheat per acre. Gini is a gini coefficient of the value of land owned by parishioners in the 1836 tithe returns. Enclosed in this panel is the predicted enclosure probability from Panel II. The instrument is the leave-one-out fraction of the proposed enclosures that pass through Parliament and are enacted into law. We take the nearest k parish neighbors and compute total $\frac{\text{successful enclosures}}{\text{attempts to enclose}}$ in this range. Conley standard errors correcting for spatial correlation are in parentheses. These use a triangular kernel with a boundary of 70km. Standard errors correcting for heteroskedasticity are in brackets.

Table 5: MECHANISMS: INNOVATION, COORDINATION, AND LANDOWNERSHIP

<i>Dependent variable:</i>	Innovation		Coordination		Ownership
	Nr. Agr. PATENTS	ROAD QUALITY POOR (YES/NO)	TURNIPS GROWN (ACRES)	LANDS FALLOW (YES/NO)	COTTAGERS/ LANDLORD
	(1)	(2)	(3)	(4)	(5)
Enclosed (yes/no)	0.02 (0.01) [0.01]	-0.11 (0.04) [0.03]	0.13 (0.04) [0.04]	-0.09 (0.04) [0.03]	-0.17 (0.04) [0.03]
Observations	13920	5288	2290	5288	3180
<i>Scale:</i> Parish area	Y	Y	Y	Y	Y
<i>Geography:</i> Elevation	Y	Y	Y	Y	Y
<i>Location:</i> Latitude, longitude, latitude*longitude	Y	Y	Y	Y	Y
<i>Regional differences:</i> Four region, London indicators (n=5)	Y	Y	Y	Y	Y
<i>Soil characteristics:</i> Soil type indicators (n=11)	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. Agr. Patents is the number of agricultural patents filed by residents of a parish 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. Turnips grown (acres) is the total number of acres of turnips grown in 1831. Lands fallow (yes/no) is an indicator equal to one if a parish was recorded as leaving lands fallow. Cottagers/Landlord is the number of cottagers divided by the number of landlords. Enclosure (yes/no) is an indicator equal to one if a parish was enclosed at any point between 1750 and 1830. Conley standard errors correcting for spatial correlation are in parentheses. These use a triangular kernel with a boundary of 70km. Standard errors correcting for heteroskedasticity are in brackets.

Table 6: THE MIDLANDS

<i>Dependent variable:</i>	LN(WHEAT YIELD)		GINI	
	(1)	(2)	(3)	(4)
	Country	Midlands	Country	Midlands
Enclosed (yes/no)	0.03 (0.01) [0.007]	0.00 (0.02) [0.020]	0.03 (0.01) [0.007]	-0.04 (0.02) [0.030]
Mean dep. var.	3.05	3.12	0.74	0.71
SD dep. var.	0.21	0.15	0.21	0.26
Observations	3641	275	4446	390
R^2	0.32	0.10	0.09	0.09
<i>Field system:</i> Open fields (yes/no)	Y	Y	Y	Y
<i>Scale:</i> parish area	Y	Y	Y	Y
<i>Geography:</i> elevation, slope, region indicators (n=5)	Y	Y	Y	Y
<i>Location:</i> Dist. to London, lat, lon, lat*lon	Y	Y	Y	Y
<i>Soil characteristics:</i> soil type indicators (n=11)	Y	Y	Y	Y

Notes: All regressions are estimated using OLS. The unit of observation is a parish. All regression restrict to rural parishes. Ln(Wheat Yield) in bushels per acre is the natural log of the number of bushels of wheat per acre. Gini is a gini coefficient of the value of land owned by parishioners in the 1836 tithe returns. Enclosure (yes/no) is an indicator equal to one if a parish was enclosed at any point between 1750 and 1830. Conley standard errors correcting for spatial correlation are in parentheses. These use a triangular kernel with a boundary of 70km. Standard errors correcting for heteroskedasticity are in brackets.

Table 7: COMPARISON OF OUR ESTIMATES OF THE IMPACT OF PARLIAMENTARY ENCLOSURE TO THE LITERATURE

<i>Source:</i>	LITERATURE					THIS PAPER	
	(1) YOUNG SAMPLE (1770)	(2) ALLEN (1992)	(3) McCLOSKEY (1989)	(4) TURNER (1980)	(5) GENERAL VIEWS	(6) OLS	(7) 2SLS
Change in Wheat Yield	8.4 %	2.5%		26.4 %	75%	3.4%	43.9%
Implied Change in Productivity from Rents			10 to 13%				

Notes: This table reports estimates of the change in yield due to enclosure. The estimates in columns (1)-(4) are cross-sectional, comparing enclosed to unenclosed parishes. Column (5) is a before-after comparison in a sample of four parishes in the General Views of Agriculture from Bedfordshire, Lincolnshire and Gloucestershire. Column 1 is the Young Sample, which is the data collected by Arthur Young but was not analyzed until Allen (1992). Column 2 is Allen (1992)'s own analysis which uses 1801 data and tries to control for soil type. Column 3 is from McCloskey (1989) and reported by Boyer (1993). Column 4 is from Turner (1980) reported in Allen (1992). Column 5 is new data collected from the general views surveys, Turner (1980); McCloskey (1989); Allen (1992) in percentage terms are reported in Boyer (1993).