Land Reforms in Developing Financial Markets: Lessons from England's Land Enclosures 1750-1830*

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Abstract

Land privatization, or "titling," is a cornerstone of development policy. While titling is typically thought to improve allocational efficiency, its impact on financial markets remains less understood. We study the financial role of titling by leveraging an ideal institutional setting in 1750 – 1830 England, in which land with common use rights was gradually privatized.Informed by key institutional and financial features in England during this time, we develop a theory of the nexus between titling reforms, credit market access, and the use of land as collateral. Using a novel database of personal defaults, we find that titling land with common use rights *raises* local bankruptcies, a key prediction of our model. The effect is especially pronounced in industrialized regions and during downturns, highlighting that local economic conditions are pivotal in determining the financial effect of land reforms.

Keywords: Land Privatization, Land Titling, Enclosures, Collateral Constraints, Credit Markets, Financial Development, Bankruptcy, Industrial Revolution, Economic History, Misallocation, Financial Frictions, Business Cycles.

JEL Codes: E44, G21, G33, K11, N13, N23, O11, O16, O43, Q15.

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1 Introduction

Land privatization, or *titling*, is regarded as a critical reform for developing economies because it can improve resource allocation and stimulate economic growth. In theory, titling should increase landowners' incentives to invest in their land, both by securing future returns and by expanding access to credit markets through the ability to pledge land as collateral. While some empirical studies have found support for a financial role of titling, the extent to which this collateral-based mechanism operates depends critically on institutional features such as the security of property rights and the development of financial markets.[1]

Identifying the financial effects of land titling is difficult because reforms usually coincide with at least one of three confounding factors. First, property-right enforcement is often weak, so newly issued titles do not fully eliminate expropriation risk. Second, titling reforms for arable land can also alter agricultural technology or factor use, blurring collateral effects with productivity effects or agglomeration. Third, the beneficiaries are usually poorer households with low financial literacy and limited trust in formal institutions, that might not participate in credit markets. Any of these channels can shift credit outcomes, making it hard to isolate the collateral-based mechanism from other forces.

Eighteenth-century England provides a rare laboratory in which none of these obstacles bind: property rights were well enforced; the waste land we study had little direct value in cultivation; and recipients were relatively wealthy landed individuals. This paper formalizes how enclosures affected financial markets indicating that enclosures should make credit more available and raise bankruptcies. Leveraging these insights, we digitize the complete universe of bankruptcy notices published in the London Gazette (around 51,000 cases) and merge them with all Parliamentary *enclosure* acts from 1750–1830 (1,600 acts). A Poisson local-projections design shows that granting title to 1,000 acres of waste land raises county-level bankruptcies by 1.1 percent in the first year and 2.0 percent in the second, with no pre-trend. The magnitudes are consistent with the collateral-competition mechanism developed in our model.

Enclosure was a legal process by which customary or communal rights to land were extinguished and replaced with exclusive, individualized ownership. Between 1750 and 1830, approximately 5.9 million acres (about 18 percent of England's land area) were enclosed, largely through Acts of Parliament (Turner 1984). Importantly, property rights were broadly secure in England at this time (Clark 1996) implying that expropriation risk was not a concern. Enclosures changed the feudal nature of landholding rights facilitating the broader use of land as collateral within a financial system dominated by secured lending due to legal and structural frictions (Hodgson 2017, p.6).

We exploit a unique feature of titling reforms during this period and focus on a subset

[1] See e.g., Feder et al. (1988), de Soto (2000), Deininger (2003), Feder and Feeny (1991), Besley (1995), Deininger and Chamorro (2004), Besley and Ghatak (2010), Galiani and Schargrodsky (2010), and Manysheva (2022).

of enclosures involving non-agricultural land known as *common waste*: uncultivated terrain such as moorlands, heaths, marshes, and steep hillsides. Unlike *common fields*, which were used for agricultural production but had limited passage rights and functioned more like private property, waste was common land with usage rights to all the village farmers who used it mainly to graze animals, gather fuel, or cut turf (Clark and Clark 2001). Enclosure abolished these rights and transferred ownership to private individuals.

Unlike many titling reforms in developing economies, the beneficiaries of waste enclosures were relatively wealthy and more likely to participate in formal credit markets. Moreover, the enclosure of waste during this period was sizable, covering about 4 percent of England's land area. By increasing the stock of available collateral, the enclosure of waste had the potential to alter credit allocation under the prevailing institutional constraints. By focusing on the titling of waste rather than on agricultural land, we isolate its effect on credit access.

We begin our analysis with a deep historical overview of the economic and financial conditions in which these land reforms took place. We highlight a number of key institutional features which are crucial for understanding the financial effects of land reforms. First, land enclosures involved a convoluted approval processes, beginning with a petition filed by the owners of at least seventy five percent of the land in the perish as measured by value. following which, these petitions underwent a parliamentary approval process that took years making their approval and importantly the timing thereof as good as random. Second, despite its lack of agricultural use, waste land was valuable, as a source of raw materials and pasture land and where used for these purposes prior to enclosure by members of the community. Third, finance was dearly needed but much constrained. Financial markets were relatively active at this time, but their functioning was impeded by usury laws, lending by quasi-banks, and people often raising funds from multiple sources simultaneously. Fourth, lending often involved collateral and land (including waste) was frequently used as collateral. Finally, bankruptcy laws were strict sometimes with dire personal consequences and no separation between personal and corporate entities. All these factors taken together imply that securing a land enclosure grant was a valuable way to obtain collateralizable assets and improve one's standing in the local financial market.

To understand the mechanisms underlying the financial effects of land titling, we embed these key historical and institutional features into a stylized dynamic endogenous default model. Heterogeneous entrepreneurs hire factors of production given a cash-in-advance constraint. Borrowing is costly and requires intermediation, and due to the prevailing institutions, the interest rate is capped at the legally-binding usury rate. Instead, financial intermediaries compete with each other over lending volume by requiring borrowers to post collateral as a function of the loan amount. Commitment in this economy is limited, and default by the entrepreneur entails forfeiture of the collateral to the bank. Crucially, posting collateral is also costly for the entrepreneurs. Because intermediaries cannot perfectly

observe borrower characteristics, the required collateral is not sufficient to fully prevent the endogenous default of some entrepreneurs. Thus, in equilibrium some entrepreneurs continuously borrow and produce, while others endogenously default.

Introducing enclosures of waste in this environment implies that some entrepreneurs now face a lower collateral posting cost, increasing their overall desire to borrow. This raises their continuation value and makes overall default risk per-pound-loaned lower. Thus, enclosures induce the financial sector to compete over a larger volume of lending and reduce the equilibrium collateral requirements. However, by raising market access overall, enclosures ultimately increase the incentives to default for entrepreneurs who did not see a decline in their collateral posting costs. We show that under general conditions, this equilibrium effect implies a *rise* in the total number of defaults.

We proceed to empirically evaluate our theory. To do so, we construct a novel panel database of ancient English counties between 1750-1830, combining information on enclosure acts with newly digitized data on bankruptcy events.[2] We construct this novel bankruptcy dataset by digitizing the public notices published in the *London Gazette*. Our dataset includes the universe of bankruptcies as all bankruptcy notices were mandated to be published in the *London Gazette* by the 1705 Bankruptcy Act. The resulting dataset provides details on the location and occupation of the bankrupt individuals, and includes over sixty thousand cases.

We combine our bankruptcy data with the full set of approximately 1,600 Parliamentary acts that gradually enclosed waste in England, each establishing property rights over specific plots of land. Using a Poisson local projections model à la Jorda (2005), we assess the effect of land enclosures on bankruptcies. Our results can be given a causal interpretation based on features of the historical enclosure process: both the acceptance or rejection of petitions by Parliament, and the timing of an enclosure award (due to the lengthy and often unpredictable administrative procedure) were effectively independent of local credit conditions. Our headline result demonstrates that the enclosure of 1k acres of land is associated with a local rise in bankruptcies in the county of 1.1% within the first year and 2.0% in the second year following the enclosure. We show that this result is robust to various specifications and find no evidence of pre-trends.

An important mechanism in our model is that waste enclosures increase credit market access and overall borrowing in the local areas affected by the enclosures. While our findings using our digitized bankruptcy data are consistent with this interpretation, additional credit market data is extremely limited; thus, direct tests of this model mechanism are difficult. Instead, to provide further validation of our model-based interpretation, we test several corollaries of our theory.

Our model implies that we should observe stronger effects of enclosures on bankruptcies

[2]Given the scarcity of systematic local banking data (Pressnell 1956, p.322), bankruptcies serve as a critical indicator of financial conditions in this period.

when risk and competition in the financial sector are higher. Both the rise in risk (geopolitical and industrial) and the increase in regional banking competition are secular trends during our sample; consistent with our model predictions, we show that the effect of enclosures on bankruptcies is indeed more pronounced during the latter half of our sample, from 1793 onward; these years include a rise in geopolitical tensions with the coming of the Napoleonic wars and higher degrees of industrialization. Moreover, we see the largest impact in highly industrialized counties, precisely where financial needs and project risks are greatest.

Another prediction of our model is that bankruptcies should be more responsive to enclosures in downturns when productivity is lower. To this end, we leverage regional weather variation captured by the width of tree rings in England during our sample period (specifically, narrower rings indicate that growth conditions were less favorable, implying lower agricultural yields). Interacting this shock series for agricultural yields with land enclosures, we find that the financial effects are amplified during economic downturns. Consistent with our theory, when waste enclosures occur during adverse economic conditions, we find a substantially larger rise in bankruptcies.

While this paper is primarily concerned with the financial role of land enclosures, privatized land is also a factor of production that is likely to generate real economic effects in addition to the financial ones. To explore this real effect and further validate our financial interpretation of the effects of waste enclosures, we repeat our empirical analysis using open field enclosures instead. Open field enclosures were acts in which the organization of land plots within an estate was altered to allow farmers to work contiguous or adjacent plots instead of disjointed ones. Unlike waste enclosure, open field enclosures yield an immediate real effect in the opposite direction, generating a decline in bankruptcies following an enclosure act. This finding is consistent with our model and further substantiates the financial nature of the effect observed for waste enclosures.

Related literature. Our study offers valuable insights into several strands of existing literature. From a historical perspective, it makes a novel contribution by foregrounding the financial dimension of land enclosures—an aspect that remains understudied despite its importance to England's industrialization. This is in contrast to most existing research, which focuses on the impact of enclosures on agricultural productivity (e.g., McCloskey 1989; Allen 1992; Heldring et al. 2022) or on its broad economic outcomes (e.g., Bogart and Richardson 2009). By doing so, we shed new light on the financial pressures and insolvency risks tied to the enclosure of waste—an aspect largely overlooked in studies of England's industrial transformation.

We also contribute to the literature examining the effect of titling reforms on access to credit, particularly in the presence of inefficient enforcement of debt contracts. Several studies have provided evidence supporting the existence of a positive effect of land titling

on credit supply (e.g. Feder, Onchan, Chalamwong, and Hongladarom 1988, Feder and Feeny 1991, Besley 1995, Deininger and Chamorro 2004, Besley and Ghatak 2010, Galiani and Schargrodsky 2010). However, many of these studies focus on low-income countries; environments with a near-total reliance on agriculture; or institutional settings in which formal land titling and registration still do not necessarily translate into secure tenure in practice. As discussed in Manysheva (2022), all of these frictions make it difficult to identify the impact on credit markets. Our setting is uniquely suited to isolate the access to credit channel by focusing solely on the privatization of non-agricultural land with common use rights, in a context where property rights are already secured and in which the land titling reforms occurred amongst a relatively wealthier population.

Our empirical work leverages the surprising timing in which land titles were granted to examine their effects on the local credit market. Our results provide evidence that titling improve financial market access, and show how this effect is stronger during downturns and in more industrial settings, consistent with our theoretical mechanism. The results offer valuable lessons for implementing future land reforms in developing countries demonstrating how the exact timing of the reform relative to the local business cycle, the phase of industrialization, and the stage of financial development can alter its ultimate effects on developing economies.

Our work is also related to a rich tradition in the macroeconomic literature considering the role of factor misallocation à la Restuccia and Rogerson (2008) and Hsieh and Klenow (2009) in accounting for cross-country differences in economic development. In particular, several studies analyze the role of collateral requirements for entrepreneurs in generating such a misallocation of resources (e.g., Buera and Shin 2013, Moll 2014, Manysheva 2022, Morazzoni and Sy 2022, Goraya 2023, Albuquerque and Ifergane 2024). These studies typically conceptualize collateral requirements using an exogenous collateral constraint as in the seminal contributions of Evans and Jovanovic (1989) and Kiyotaki and Moore (1997). By contrast, our model and institutional setting jointly present a context where the collateral requirements, and the constraints faced by the entrepreneurs themselves, arise endogenously as equilibrium outcomes. We thus add to this theoretical literature by developing a framework which can capture the key dynamics when intermediaries compete over collateral, due to institutional frictions such as usury laws.

The remainder of the paper proceeds as follows. Section 2 outlines the institutional context of our study. Section 3 develops our theoretical framework and derives key main testable predictions. Section 4 describes our database and empirical analysis. The final section concludes.

2 Institutional Setting: England 1750-1830

This section provides an overview of the historical and institutional details that are critical for our analysis. We describe the enclosure process of both *open fields* and *waste*, and discuss the economic conditions and financial systems which were in operation during 1750-1830 England. We establish a number of key facts. First, the procedural and arbitrary factors that shaped the legal process of enclosure made the timing of its approval effectively random, even though the decision to initiate the process clearly reflected local economic and financial conditions. Second, land enclosures were awarded to relatively wealthy landowners with existing secure property rights. Third, waste land, the focus of our study, was typically unfit for cultivation, yet held significant value for its various alternative uses. Fourth, financial markets were fragmented and constrained by restrictions and regulations, including binding usury limits, and by weak debt enforcement, making secured lending predominant and land (including waste) a common form of collateral. Finally, borrowers could raise funds from multiple lenders, and debtors who failed to meet their obligations could be declared insolvent and subjected to formal bankruptcy proceedings under the law.

2.1 Land Enclosure in England, 1750–1830

Land enclosures took place in England throughout the Middle Ages and the early modern period. While the term "enclosure" (or *inclosure*) literally refers to the fencing or hedging of land to create a physical boundary between "one person's land and that of his neighbors" (Turner, 1980, p. 16), in practice, it referred to a legal process that transformed long-established rights over land.

The decision to initiate enclosure clearly reflected local economic and financial conditions, as it typically began with an initiative by landowners, who sought to reorganize property rights to improve their profitability and control over land. Nevertheless, the legal procedure by which an enclosure award was ultimately granted was complex, lengthy, and shaped by numerous procedural and arbitrary factors. As a result, the timing of final approval can be reasonably regarded as effectively exogenous.

Once sufficient agreement had been reached among the holders of the majority of land, a petition for an enclosure act was submitted to Parliament. Petitions could either be accepted or refused.[3] In cases of parliamentary approval, commissioners were appointed to oversee the surveying, reallocation, and distribution of the enclosed land. It was during this main phase—the detailed implementation of the enclosure—that the greatest procedural difficulties often arose. Commissioners faced scrutiny, opposition, local disputes, claims,

[3] According to Mingay (1997), 22 percent of all enclosure bills between 1750 and 1815 were withdrawn before facing any parliamentary opposition, and many more must have been deliberated without agreement even to advance the bill. Moreover, Neeson (1993) notes that 14 percent of private bills that did reach Parliament failed between 1715 and 1774 (p. 275).

and appeals, all of which could cause substantial delays and alter outcomes. These administrative complexities further contributed to the arbitrariness of the timing, making the interval between initiation and final award highly unpredictable.

As Mingay (1997) emphasizes, "The bringing of the Bill to Parliament was not the start, but a stage marking the end of a preliminary period of negotiations between the parties involved, a period that might be relatively brief, occupying a year or two, or quite protracted, where there were serious difficulties in reaching agreement" (pp. 20–21).

The enclosed land was primarily allocated to relatively wealthy landowners who already held secure property rights. The process itself required substantial financial resources, as landholders needed to bear the considerable administrative and legal costs associated with Parliamentary fees for drafting and passing the bill, Commissioners' fees and expenses, as well as costs of fencing, hedging, and setting out new roads. Moreover, these costs often forced smallholders, who had previously enjoyed common usage rights, to sell their newly allotted plots, leading to an increasing concentration of landownership among larger proprietors (Turner 1980, pp. 113–116; Mingay 1997, pp. 98–100).

This study focuses on the years 1750–1830, a period in which "the greatest aerial change in the shortest comparable time span" occurred (Turner, 1980, p. 16). It concentrates on Parliamentary acts or awards of enclosure, which accounted for the major share of land enclosures during this period. Following Turner (1980), we focus on enclosures after 1750, when Parliamentary acts more reliably reflected the actual timing of land enclosure, whereas earlier acts often legalized or recorded enclosures that had already taken place informally.

The distribution of enclosures was not uniform: about 40 percent were enacted between 1760 and 1780, and a similar proportion during the Napoleonic Wars (1793–1815). In total, land enclosures transformed the legal status of approximately 5.8 million acres of land (23,876.5 km^2) by 1830, about 18 percent of the total area of England.[4]

Notably, a very large proportion of Parliamentary enclosures involved commons and waste lands, while most open fields had already been enclosed prior to the eighteenth century (Chapman, 1987; Turner, 1980).

There were two main types of enclosures. The first was the enclosure of *common fields* (also called *open fields*), which reorganized existing rights over scattered strips of arable land into larger, consolidated plots held in severalty (i.e., individually owned).[5]

The second type of enclosure, which is the primary focus of this study, was the enclosure of *commons and waste*. This type of enclosure abolished all forms of customary usage

[4]For the distribution of enclosures, see Turner (1980), p. 66; for the total area enclosed, see Turner (1980), p. 81, Table 11. All Parliamentary acts and awards are documented in Tate and Turner (1978). Another important form of enclosure, dominant before 1700, was conducted under common law through "enclosures by agreement," whereby landowners agreed unanimously to enclose parts or all of the land.

[5]In the open fields system, farmers' strips of land were scattered and unfenced, and land use decisions—such as crop selection and the timing of fallow periods—had to be made collectively. Cooperation in cultivation and animal husbandry was necessary, and lords' demesne strips were often interspersed among those of tenants.

rights on non-arable land, including woods, meadows, pastures, and various types of open land referred to by contemporaries as *waste*. According to Mingay (1997), waste typically consisted of "small areas of stony or rocky ground together with more extensive stretches of heathland, moors and bogs, as well as barren mountains and steep hillsides" (pp. 8–9). Although waste land was not generally suited for intensive cultivation, it was highly valued for alternative uses, such as sparse grazing, fuel gathering (peat, turves), and extraction of building materials like clay, gravel, and stone.

The relevant distinction between these two types of enclosures is crucial. The enclosure of waste and commons primarily created newly privatized land, increasing the stock of land available for use as collateral. In contrast, enclosures of open fields mainly reorganized arable land to increase its agricultural productivity (Heldring et al., 2022). Importantly, the enforcement of property rights in England during this period was already strong (Clark, 1996). Thus, enclosures did not fundamentally alter the security of landholding but instead transformed the feudal nature of land rights, enabling more extensive use of land as collateral for entrepreneurial finance (Pressnell, 1956; Habakkuk, 1965; Hodgson, 2017; Bogart and Richardson, 2009).

2.2 The Value of Enclosed Waste

While waste was not usually used for intensive cultivation prior to its enclosure, it was essential for farmers who drew much value from its use for grazing as well as for materials used for fuel, building, and fertilizing. Its value varied according to its potential uses, and in many cases waste was either sold or leased after the enclosure award. In some cases, its use could also be converted to agricultural cultivation. We provide historical evidence in two well-documented cases.

First, in the township of Croston in southwest Lancashire, which had the highest concentration of large landed estates in the county and was the location of considerable waste land, "the value of the waste land to people at every level is unmistakable" (Rogers, 1993, p.145).[6] The township consisted of about 1,200 acres of formerly enclosed manor and demesne lands (i.e., land directly owned by a lord or a king), and a further 800 acres of open waste known as *Croston Finney*, which was enclosed in 1725. According to Rogers (1993), the value of enclosing this type of land was the potential of increasing the returns of the owners through leasing it out; thus, although some proprietary claims over the wasteland were acknowledged, it was also conditioned by an insistence on customary use rights by villagers (p. 146-8). The enclosed waste in Croston was highly valued (estimated at £1.5 per acre of high-quality land, 50 percent higher than the value of the waste that was enclosed before 1725). The land was not turned over to intensive cultivation but was highly valued for grazing and remained so

[6]While Lancashire was mainly studied in the context of its industrialization, it featured a rich and diverse agricultural landscape, stretching from the flat plains of West Lancashire and the rolling vales of the Kibble Valley, to the fertile fields of the Fylde and the serene, pastoral uplands in the far north.

until the turn of the nineteenth century (p.148). Based on evidence of estate leases, completed by 1735 at the latest, many small landholders sold their land following the enclosure (p. 151, Table 2).

Similarly, evidence from Somerset, where extensive areas of waste were enclosed during the eighteenth and nineteenth centuries (13.8 percent of the county), shows that waste was highly valued (Williams, 1972; Buchanan, 1982). The value of the waste land can be inferred from the Parliamentary enclosure awards that survived (1770-1830) and documented sales of land for financing the enclosure.[7] Buchanan (1982) shows that the value depended on the land's quality, land use suitability (e.g., cultivation, grazing, or construction), and expected enclosure costs.

The privatization and valuation of formerly common lands thus formed a crucial backdrop to patterns of credit and secured lending in eighteenth-century England.

2.3 Financial Market Fragmentation

The underlying mechanism through which land titling affected financial outcomes in our study cannot be understood in isolation from the broader financial environment in which land enclosures occurred. This section Major inefficiencies characterized credit markets during the eighteenth century, including fragmented banking structures, statutory interest rate ceilings, limited liquidity, and weak debt enforcement.

Despite the institutional changes brought about by the Glorious Revolution of 1688, England's financial system remained fragmented and constrained well into the nineteenth century. While the Revolution significantly strengthened the government's capacity to borrow (Dickson, 1967; North and Weingast, 1989), its impact on private credit markets remains debated. Some scholars argue that private credit markets saw only minimal improvements or even experienced negative effects (*e.g.,* Clark, 1996; Temin and Hans-Joachim, 2008).

By the mid-eighteenth century, the financial system was organized into a "three-tiered structure": the Bank of England (BoE), established in 1694 to manage public debt; London banks, which concentrated private financial activity; and country banks, which emerged outside the capital to meet growing regional credit demands (Pressnell, 1956, p. 75). Complementing this formal system was a diverse and influential informal sector of wealthy traders, aristocrats, merchants, scriveners, and goldsmiths, who provided credit services beyond formal regulatory frameworks.

The government granted the BoE special privileges, including favorable lending terms to the state. Legislation passed in 1697, 1707, and 1708 consolidated the BoE's monopoly on note issuance and restricted other banks to small partnerships, effectively limiting their ability to scale. As a result, banking outside London remained underdeveloped, geographi-

[7] The land was sold in a public auction after the commissioners inspected the land, assessed its quality and situation on the advice of a surveyor, and arranged a mortgage (Buchanan, 1982, p. 114).

cally fragmented, and structurally weak (Calomiris and Haber, 2015; Temin and Voth, 2013; Hodgson, 2021; Turner, 2014).[8]

In response to unmet credit needs, *country banks* proliferated, growing from fewer than a dozen in the 1750s to over 700 by 1810 (Pressnell, 1956, p. 127). However, these banks were typically undercapitalized, vulnerable to liquidity shocks, reliant on London agents, and highly localized. Their liabilities (bank notes) were relatively insecure and prone to loss of confidence during financial crises.[9]

Further compounding market fragmentation, regulatory distortions impeded the efficient functioning of private credit markets. Chief among these was the usury law, which imposed binding ceilings on interest rates for private lending while exempting government borrowing. This asymmetry placed private banks at a disadvantage in attracting capital and constrained their ability to price risk appropriately. Unable to offer higher interest rates to compensate for risk, banks were discouraged from issuing long-term or high-risk loans (Calomiris and Haber, 2015, p. 96).

As a result, lenders tightened collateral requirements: access to credit became increasingly dependent on the availability of secure collateral, particularly land. Landowners, entrepreneurs, and farmers seeking credit were typically required to pledge tangible assets, and secured lending became the predominant mechanism for longer-term borrowing. A notable illustration of the difficulties of unsecured borrowing is the Boulton and Watt enterprise, which, despite the strong reputation of its founders, faced persistent liquidity shortages and struggled to secure adequate funding for the development of James Watt's steam engine (Roll, 1968, p. 79).

Beyond interest rate ceilings, the broader institutional framework prioritized public borrowing, with significant consequences for private access to credit. Quinn (2001) and Temin and Voth (2013) document that public borrowing absorbed a large share of available capital, tightening private credit supply. Hoppit (1987) shows that bankruptcies rose sharply during wartime and recessions, while Hudson (1986) found that failures among textile firms were often driven by liquidity shortages rather than by asset shortfalls (p. 203).

Despite systemic constraints and the tightening of collateral requirements, borrowers could still raise funds from multiple lenders. However, this multi-source borrowing took place within a fragmented and often precarious financial environment. The absence of large, geographically integrated banks meant that borrowers typically pieced together loans from a combination of regional and metropolitan lenders, each operating under their own liquidity constraints and risk assessments.

Credit remained limited for most firms, particularly as industrialization accelerated in the mid-eighteenth century (Hoppit, 1987; Casson, 1993; Wilson, 1995). Only a narrow group

[8] Despite these distortions, the BoE is known to have played a crucial role in the development of the English financial sector (see for example, Hodgson, 2017; O'Brien and Palma, 2023).

[9] The average capital of a country bank was about £10,000 by the end of the eighteenth century (Pressnell, 1956), and only a few of the largest banks reached balance sheets of £500,000 (Gent, 2016).

of well-connected entrepreneurs with access to London capital or merchant networks — and landowners able to leverage their property as collateral — could expand their businesses, while most remained small and vulnerable to collapse during economic shocks (Chapman, 1979). Thus, while multiple avenues for borrowing existed, credit access was unequal and heavily dependent on available security.

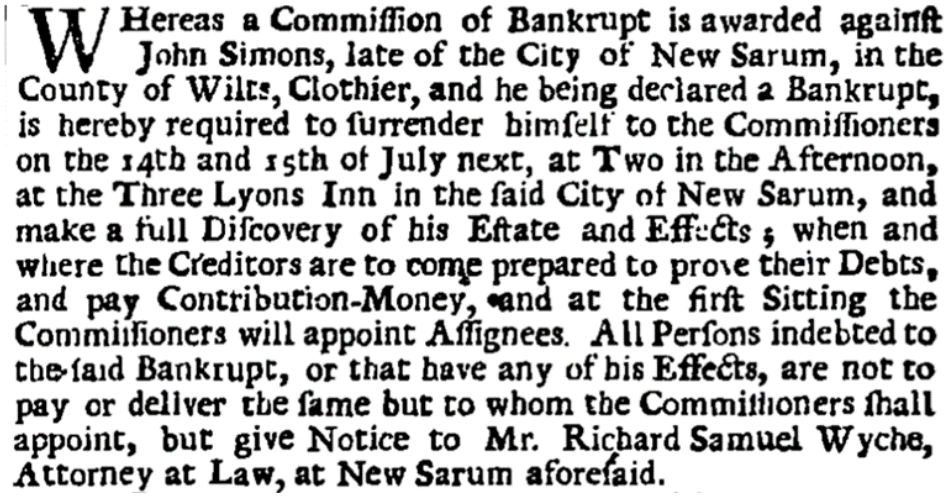
2.4 Secured Lending, Credit Access, and Bankruptcy

Within the fragmented financial environment described in Section 2.3, borrowing from banks or individuals typically required the provision of security. There is ample evidence that mortgages became a major component of financial intermediation during this period. Hodgson (2021) documents the importance of mortgages, while Joslin (1954) notes a remarkable rise in mortgage-based lending by the mid-eighteenth century (p. 170). Gent (2016), examining a large body of bank records, finds that most established goldsmith banks relied heavily on collateralized lending, secured by long-term mortgages on landed estates. At Hoare's Bank, for example, "money lent on mortgage, bond, etc." represented the majority of longer-term lending between 1778 and 1797 (p. 101), while at Goslings Bank, half of total assets in 1796 were similarly secured (p. 106). Turner (1981) likewise observes that many large landowners were chronically encumbered by mortgages, concluding that "mortgage, apparently, had become a secure method of raising a loan" (pp. 243–244).

The role of enclosed land in expanding access to mortgage credit was particularly significant. Hodgson (2021) argues that newly enclosed land became a primary form of collateral in agricultural sectors. Hudson (2002) similarly observes that a notable number of textile entrepreneurs acquired land in West Yorkshire prior to enclosure, likely for the purpose of improving access to credit (p. 97). Moreover, there is evidence that landowners often mortgaged enclosed land, including waste, to finance the enclosure process itself. Mingay (1963) notes that landowners frequently raised funds for commissioners' fees and fencing costs by mortgaging the land whose value they anticipated would rise (pp. 97–98). In fact, many enclosure acts included explicit clauses permitting landowners to mortgage enclosed land to cover enclosure costs (Pressnell, 1956, p. 350). Pressnell (1956) also finds that country banks played a role in financing enclosures, with their business locations often influenced by proximity to large farms (pp. 349–355).

Thus, although documentation from the period is partial and scattered, the evidence points toward the widespread use of land privatized through enclosure as collateral in lending relationships.

While secured lending expanded, the risks of default remained significant. By the second half of the eighteenth century, England had developed a relatively predictable legal framework for managing insolvency. Borrowers who failed to meet their obligations could be subjected to formal bankruptcy proceedings, providing creditors with a structured legal mech-



WHereas a Commiſſion of Bankrupt is awarded againſt John Simons, late of the City of New Sarum, in the County of Wilts, Clothier, and he being declared a Bankrupt, is hereby required to ſurrender himſelf to the Commiſſioners on the 14th and 15th of July next, at Two in the Afternoon, at the Three Lyons Inn in the ſaid City of New Sarum, and make a full Diſcovery of his Eſtate and Effects; when and where the Creditors are to come prepared to prove their Debts, and pay Contribution-Money, and at the firſt Sitting the Commiſſioners will appoint Aſſignees. All Perſons indebted to the ſaid Bankrupt, or that have any of his Effects, are not to pay or deliver the ſame but to whom the Commiſſioners ſhall appoint, but give Notice to Mr. Richard Samuel Wyche, Attorney at Law, at New Sarum aforeſaid.

Figure 1: Example of Bankruptcy Notice

Note: According to the notice, John Simons, a Clothier from the City of New Sarum, Wiltshire was declared bankrupt on 06/06/1732. The notice specifies the time and place in which he will be making a full discovery of his assets in the presence of the commissioners and the creditors will prove their debts. Source: Recorded in The Gazette (London Gazette). Publication date: 6 June 1732, Issue:7098, Page:2. https://www.thegazette.co.uk/London/issue/7098/page/2

anism for debt recovery.

England's bankruptcy law evolved substantially over the early modern period. The first Bankruptcy Act of 1542 (34 & 35 Hen. 8. c. 4) established procedures aimed at protecting creditors from fraudulent debtors, allowing for the seizure and liquidation of a bankrupt's assets. The 1571 Act (13 Eliz. I c. 7) restricted eligibility for bankruptcy proceedings to merchants and "other persons using or exercising the trade of merchandise"—a broad definition that encompassed many traders, shopkeepers, and artisans engaged in commerce. Later amendments, such as the 1603 Act (1 Jac. I c. 15), expanded coverage to include occupations like scriveners and others managing money on behalf of clients. This framework, limiting bankruptcy proceedings primarily to those engaged in trade or commerce, remained largely unchanged throughout the eighteenth century (Carlos et al., 2019, pp. 485–486).

Further reforms, such as the Bankruptcy Act of 1705 (4 Anne c. 17), introduced the requirement for bankruptcy notices to be published in the *London Gazette*, specifying the bankrupt's name, occupation, location, and the details of the scheduled creditor meetings. This framework remained in place until the reforms of 1831, which abolished bankruptcy commissioners, transferred estate administration to the courts, and established the office of the official assignee or receiver.

While historical bankruptcy records typically do not document the precise amount of debt that triggered insolvency, the 1624 Act established a statutory threshold of £100 (Hoppit, 1987). Moreover, records from the early eighteenth century reveal patterns consistent with broad financial exposure. Carlos et al. (2019) find that 549 bankruptcies between 1710–1714 involved 8,424 individual creditors—an average of sixteen creditors per case. Over one

hundred cases involved more than twenty creditors, and nearly twenty cases involved over sixty (p. 492, Table 2). These patterns suggest that bankruptcy often had broad ripple effects across the financial system, reinforcing the importance of secured lending and institutional mechanisms for managing default risks.

3 Theoretical Framework

Understanding the institutional features are key to making sense of the financial effects of land enclosures during this period. Given frictions in credit markets and the high reliance on secured lending, newly enclosed land had the potential to affect the equilibrium demand and supply of credit through its use as collateral. However, given the complexities of the historical setting, we first build a formal framework to clarify key transmission channels. We develop a tractable model where entrepreneurs borrow from intermediaries in order to finance their activities. The model is tailored to capture salient institutional details of the historical context: lenders face a binding usury rate; there exists "many to many" relationship between lenders and borrowers; and competition for funds is imperfect and fragmented. Thus, the use of costly collateral endogenously arises to partially overcome these frictions.

In our model, entrepreneurial activity is risky since projects may fail, but more importantly, entrepreneurs may choose to default on their debt obligations. Because financial intermediaries are constrained by usury laws, they cannot set the borrowing rate high enough to compensate for default risk. Instead, intermediaries require collateral to partially overcome the limited commitment problem on the part of borrowers.

However, from the entrepreneur's perspective, posting collateral is costly even if they do not default. Land reforms interact with this environment in part by increasing the pool of available assets to entrepreneurs which can be used as less costly collateral. Ultimately, the model yields empirically testable predictions that will be evaluated in the next sections of the paper.

3.1 Setup

Time is discrete and goes from $t = 1, \ldots, \infty$. There are two types of agents in the model: entrepreneurs (or "firms") and financial intermediaries (or "banks"). All agents are risk-neutral and maximize discounted lifetime expected profits.

Firms. When in operation, a firm i has access to a productive technology which produces revenue

$$y_{i,t} = z_{i,t} f(v_{i,t}), \tag{1}$$

where $z_{i,t}$ is productivity and $f(\cdot)$ is a concave production function with $f(0) = 0, f'(v) > 0, f''(v) < 0$ (identical across firms). Production depends on variable inputs $v_{i,t}$, which firms must borrow in advance.[10] Firms borrow from differentiated banks $j \in [0,1]$, so that $v_{i,t} = \int_0^1 \ell_{i,t}(j)\,\mathrm{d}j$, where $\ell_{i,t}(j)$ is the loan amount of firm i from bank j (in measure $\mathrm{d}j$).

Each bank charges the same gross rate $1+r$ (which is fixed and exogenous due to regulations). However, firms must post collateral $g_{i,t}(j)$ at each bank from which they borrow. Banks require each firm to post collateral equal to a fraction of the firm's loan amount: $g_{i,t}(j) = \eta_t(j)\ell_{i,t}(j)$. Firms take as given the required collateral fraction $\eta_t(j)$ across banks (the bank problem is described below).

Posting collateral is costly: firms must pay cost $c_{i,t}\gamma(g_{i,t})$ to post collateral, where $g_{i,t}$ is a CES function of all borrowing across banks:

$$g_{i,t} \equiv \left[\int_0^1 g_{i,t}(j)^{\theta}\,\mathrm{d}j\right]^{\frac{1}{\theta}}. \tag{2}$$

Note that $\theta > 1$; thus, collateral aggregation is a convex function. The cost function $\gamma(\cdot)$ satisfies $\gamma(0) = 0, \gamma'(g) > 0, \gamma''(g) > 0$ (identical across firms). The convexity of the cost function $\gamma(\cdot)$ captures the idea that, due to contracting frictions, posting larger amounts of collateral imply significant increases in costs. The cost parameter $c_{i,t}$ captures the fact that these costs differ across firms.[11]

The CES assumption captures firms' limited ability to freely substitute borrowing across different lenders, reflecting historical realities such as relationship banking, geographic constraints, or reputation-based lending prevalent in the English financial system at the time. A higher value of θ implies that firms find it more difficult to substitute borrowing across banks. Thus, $\theta > 1$ can be interpreted narrowly as bank market power: higher θ implies more market power. More generally, θ can be interpreted as the overall sophistication or risk-bearing capacity of the financial intermediation sector (broadly defined).

CES aggregation implies

$$g_{i,t}(j) = \left(\frac{\eta_t(j)}{\eta_t}\right)^{\frac{1}{1-\theta}} g_{i,t} \implies v_{i,t} = \int_0^1 \frac{1}{\eta_t(j)}\left(\frac{\eta_t(j)}{\eta_t}\right)^{\frac{1}{1-\theta}} \mathrm{d}j\, g_{i,t}, \tag{3}$$

where $\eta_t \equiv \left[\int_0^1 \eta_t(j)^{\frac{\theta}{1-\theta}}\,\mathrm{d}j\right]^{\frac{1-\theta}{\theta}}$. Since $\theta > 1$, we have $-\infty < \frac{1}{1-\theta} < 0$. Thus we have that demand for bank j loans is lower whenever the collateral fraction $\eta_t(j)$ is higher.

If the firm i repays bank j at the end of period t ($D_{i,t}(j) = 0$), its collateral $g_{i,t}(j)$ is re-

[10] For simplicity, we normalize the price of output and inputs to 1. This is without loss of generality as we can define (1) in terms of revenue and normalize $z_{i,t}$.

[11] Another alternative approach is to instead assume some loss between the promised collateral and the delivered collateral (or a difference between the value of the collateral to the firm vs the bank). This would not meaningfully change the firm or bank problem, so long as the banks can require different amounts of collateral as a function of the expected collateral loss.

turned and it pays the bank $(1+r)\ell_{i,t}(j)$. Otherwise, if the firm declares bankruptcy and defaults ($D_{i,t}(j)=1$), then the firm does not pay the bank but loses its collateral $g_{i,t}(j)$. Thus at the end of period t, firm i pays bank j

$$\psi_{i,t}(j) \equiv \left[\mathbf{1}(D_{i,t}(j)=0)(1+r)+\mathbf{1}(D_{i,t}(j)=1)\eta_t(j)\right]\ell_{i,t}(j).$$

The firm can always choose to default. Additionally, even if the firm wishes to repay, with probability $q_{i,t}$ the firm fails and is forced to default. If the firm has defaulted on any bank in any previous period, it enters autarky and earns A each period. The following Lemma characterizes the firm problem.

Lemma 1 (Firm Problem)**.** *Firm i chooses inputs $v_{i,t}$ and makes default decisions $D_{i,t}(j) = D_{i,t}(j') \equiv D_{i,t}$ in order to maximize lifetime discounted expected profits, given by*

$$\mathcal{W}_{i,t} \equiv \max_{\{v_{i,t+k},D_{i,t+k}\}_{k=0}^{\infty}} \mathrm{E}_t \sum_{k=0}^{\infty} \beta^k \Pi_{i,t+k}(v_{i,t+k}). \tag{4}$$

If $D_{i,t}=1$ for any t, then $\Pi_{i,t+k}=A\ \forall k>0$. Otherwise,

$$\mathrm{E}_t\,\Pi_{i,t}(v_{i,t}) = z_{i,t}f(v_{i,t}) - c_{i,t}\gamma(g_{i,t}) - \begin{cases} (1-q_{i,t})(1+r)v_{i,t} + q_{i,t}\tilde{\eta}_t g_{i,t} & \text{if } D_{i,t}=0 \\ \tilde{\eta}_t g_{i,t} & \text{if } D_{i,t}=1 \end{cases}, \tag{5}$$

where $\tilde{\eta}_t \equiv \int_0^1 \left(\frac{\eta_t(j)}{\eta_t}\right)^{\frac{1}{1-\theta}} \mathrm{d}j$ is a function of the dispersion of collateral requirements, and $g_{i,t}$ is given by (3).

Banks. Banks $j \in [0,1]$ are risk-neutral and maximize expected per-period profits. The loan rate $1+r$ is exogenous, but firms compete monopolistically over collateral (as described above in the firm problem). Banks finance their lending at the risk-free rate $1+r^{rf}$.

While banks are unable to change the rate at which they lend, each bank can require borrowers post collateral equal to a fraction of the loan amount. In particular, bank j chooses the collateral fraction $\eta_t(j)$ such that when lending to $\ell_{i,t}(j)$ to firm i, firm i posts collateral $g_{i,t}(j)=\eta_t(j)\ell_{i,t}(j)$. We assume that the collateral demanded is restricted to be a linear function of loan amount, and in particular cannot condition on firm type. If firm i repays bank j ($D_{i,t}(j)=0$), then the bank earns $(1+r)\ell_{i,t}(j)$. If firm i defaults ($D_{i,t}(j)=1$), the bank keeps the collateral $g_{i,t}(j)$. Thus, per-period profits of bank j are

$$\Pi_t(j) = \int_i \left[\mathbf{1}(D_{i,t}(j)=0)(1+r)\ell_{i,t}(j) + \mathbf{1}(D_{i,t}(j)=1)g_{i,t}(j)\,\mathrm{d}i - (1+r^{rf})\ell_{i,t}(j)\right]\mathrm{d}i\,. \tag{6}$$

Banks take the CES demand (3) as given. The following Lemma characterizes the bank problem.

Lemma 2 (Bank Problem.)**.** *Bank j solve the following per-period problem:*

$$\max_{\eta_t(j)} (1+r)\frac{1}{\eta_t(j)}\left(\frac{\eta_t(j)}{\eta_t}\right)^{\frac{1}{1-\theta}} G_t^R + \left(\frac{\eta_t(j)}{\eta_t}\right)^{\frac{1}{1-\theta}} G_t^D - (1+r^{rf})\frac{1}{\eta_t(j)}\left(\frac{\eta_t(j)}{\eta_t}\right)^{\frac{1}{1-\theta}} G_t, \tag{7}$$

taking as given the collateral index η_t and aggregate posted collateral by firm repayments:

$$G_t^R \equiv \int_i \mathbf{1}(D_{i,t}=0) g_{i,t}\,\mathrm{d}i\,, \tag{8}$$

$$G_t^D \equiv \int_i \mathbf{1}(D_{i,t}=1) g_{i,t}\,\mathrm{d}i\,, \tag{9}$$

and $G_t \equiv \int_i g_{i,t}\,\mathrm{d}i = G_t^R + G_t^D$.

3.2 Equilibrium

We focus on a symmetric equilibrium in which all banks choose $\eta_t(j) = \eta_t(j') \equiv \eta_t$. The following Proposition characterizes the equilibrium of the model.

Proposition 1 (Symmetric Equilibrium)**.** *The aggregate collateral index is given by*

$$\eta_t = \theta\left[(1+r^{rf}) - (r-r^{rf})\frac{G_t^R}{G_t^D}\right]. \tag{10}$$

Taking this as given, the firm problem can be written recursively as

$$\mathcal{W}_t = \max_{D_{i,t}} \quad \mathbf{1}(D_{i,t}=0)\mathcal{W}_t^R + \mathbf{1}(D_{i,t}=1)\mathcal{W}_t^D, \tag{11}$$

$$\begin{aligned}\mathcal{W}_t^R = \max_{v_{i,t}^R} \quad & z_{i,t} f(v_{i,t}^R) - c_{i,t}\gamma(\eta_t v_{i,t}^R) \\ & + (1-q_{i,t})\left[\beta \mathrm{E}_t[\mathcal{W}_{t+1}] - (1+r)v_{i,t}^R\right] + q_{i,t}\left[\frac{\beta}{1-\beta}A - \eta_t v_{i,t}^R\right],\end{aligned} \tag{12}$$

$$\mathcal{W}_t^D = \max_{v_{i,t}^D} \quad z_{i,t} f(v_{i,t}^D) - c_{i,t}\gamma(\eta_t v_{i,t}^D) + \left[\frac{\beta}{1-\beta}A - \eta_t v_{i,t}^D\right], \tag{13}$$

and the optimal production decisions when planning to repay or default satisfy

$$z_{i,t} f'(v_{i,t}^R) - c_{i,t}\eta_t\gamma'(\eta_t v_{i,t}^R) = (1-q_{i,t})(1+r) + q_{i,t}\eta_t, \tag{14}$$

$$z_{i,t} f'(v_{i,t}^D) - c_{i,t}\eta_t\gamma'(\eta_t v_{i,t}^D) = \eta_t. \tag{15}$$

The results from Prop. 1 allow for some general observations. First, from the bank optimality conditions (10), we see that that market power implies that banks can extract high collateral even when default rates are small (recall $\theta > 1$). Thus, banks can operate even with a small spread between the (exogenous) loan rate r and the risk-free rate r^{rf}. Similarly to standard models of monopolistic competition, η_t, which functions as the equilibrium price,

is set at a markup θ from the banks marginal cost of lending. To illustrate, suppose the banks expect all loans to be defaulted upon, the collateral requirement would be $\theta \times \left(1 + r^{rf}\right)$ which is a markup over their marginal cost $1 + r^{rf}$. Repayments reduce the bank's marginal cost, so much so, that at the limit where everyone repays their loans, the banks might even require a negative collateral fraction to induce borrowers to borrow from them.

Further, from the concavity of the production function $f(\cdot)$ and the convexity of the cost function $\gamma(\cdot)$, we can immediately see from the firm optimality conditions (14) and (15) that, all else equal, firms will borrow (and produce) more if they are more productive (larger $z_{i,t}$); if they face lower collateral costs (smaller $c_{i,t}$); or if they are less risky (lower $q_{i,t}$). Additionally, we can also immediately see that firms who *ex-ante* plan on defaulting will borrow (and produce more).[12]

However, without further structure, Prop. 1 does not allow us to say much about characterizing the endogenous default decision of a given firm. In order to better understand the firm default decision, we make the following assumptions:

(1) *Persistent firm characteristics:* $z_{i,t} \approx \mathrm{E}_t\, z_{i,t+1}$, $q_{i,t} \approx \mathrm{E}_t\, q_{i,t+1}$, and $c_{i,t} \approx \mathrm{E}_t\, c_{i,t+1}$.

(2) *Regularity conditions:* the support of the distribution of idiosyncratic firm characteristics $\{z_{i,t}, q_{i,t}, c_{i,t}\}$ are such that $(1-\beta(1-q_{i,t}))\gamma(\eta_t v^D_{i,t}) < \gamma(\eta_t v^R_{i,t})$; and for any $\{z_{i,t}, q_{i,t}\}$, firm i will always choose to repay if $c_{i,t} = 0$.

Assumption (1) is a strong assumption, but implies $\eta_t \approx \mathrm{E}_t \eta_{t+1}$ and $\mathcal{W}_{i,t} \approx E_t \mathcal{W}_{i,t+1}$. This transforms equations (11)-(13) into a repeated static problem, which greatly simplifies the analysis below. The regularity assumption (2) is weaker and not necessary, but guarantees that the firm default decision is well-behaved and rules out unnecessary cases to consider.

The following Proposition characterizes the firm default decision.

Proposition 2 (Endogenous Default)**.** *Under assumptions (1)-(2), there is a unique value of* $c_{i,t}$ *denoted by* $\bar{c}_{i,t} \equiv \bar{c}\left(\eta_t, z_{i,t}, q_{i,t}\right)$ *such that*

$$\mathcal{W}^D_{i,t} > \mathcal{W}^R_{i,t} \iff c_{i,t} > \bar{c}_{i,t}.$$

There exist values $\check{q}, \check{c}, \check{\beta}$ *such that* $0 \le q_{i,t} < \check{q}, 0 \le c_{i,t} < \check{c}, \check{\beta} < \beta < 1$ *implies*

$$\frac{\partial \bar{c}}{\partial \eta} \propto v^D_{i,t} > 0, \tag{16}$$

$$\frac{\partial \bar{c}}{\partial z} \propto \frac{v^R_{i,t}}{\gamma(\eta_t v^R_{i,t})} > 0, \tag{17}$$

$$\frac{\partial \bar{c}}{\partial q} \propto A - z_{i,t}\left(f(v^R_{i,t}) - f'(v^R_{i,t})\, v^R_{i,t}\right) < 0, \tag{18}$$

[12] We assume the equilibrium collateral fraction $\eta_t < 1+r$ (i.e., the required collateral fraction does not exceed the gross repayment of the loan).

and

$$\frac{\partial^2 \bar{c}}{\partial \eta^2} \propto -\frac{2v_{i,t}^D v_{i,t}^R \gamma'(\eta_t v_{i,t}^R)}{\gamma(\eta_t v_{i,t}^R)} + \frac{1}{z_{i,t} f''(v_{i,t}^R)} < 0, \tag{19}$$

$$\frac{\partial^2 \bar{c}}{\partial \eta \partial z} \propto -\frac{v_{i,t}^R f(v_{i,t}^R) \gamma'(\eta_t v_{i,t}^R)}{\gamma(\eta_t v_{i,t}^R)^2} < 0, \tag{20}$$

$$\frac{\partial^2 \bar{c}}{\partial \eta \partial q} \propto v_{i,t}^R \left[z_{i,t} \left(f(v_{i,t}^R) - f'(v_{i,t}^R) v_{i,t}^R \right) - A \right] > 0. \tag{21}$$

Prop. 2 characterizes the cutoff value $\bar{c}_{i,t}$, which governs whether a firm will default or not as a function of the collateral costs $c_{i,t}$ which they face. If costs are above this threshold, the firm endogenously chooses to default; otherwise, the firm repays. The intuition is simple: all else equal, firms which face a higher cost of posting collateral will produce less, which implies a lower continuation value of repaying and producing.

The next set of results in Prop. 2 study how this cutoff value varies across firms. The result in (16) shows that when the required collateral fraction η_t is higher, this cutoff value increases. In other words, when firms are required to post more collateral, all else equal they find choosing to default less appealing. While it is obvious that the value of defaulting is lower when firms stand to lose more collateral, a higher required collateral fraction also implies that production is less appealing when $c_{i,t} \neq 0$. However, as long as $c_{i,t}$ is not too large, the former effect dominates and the threshold for defaulting increases when the required collateral η_t increases.

The next result in (17) shows that the default threshold also increases in firm productivity. It is clear that when a firm is more productive, the value of operating is higher, and thus the continuation value of repaying is higher. However, even defaulting firms will borrow and produce more when productivity is high. Prop. 2 shows that, so long as firms put a high effective weight on the future (that is, β is high enough and $q_{i,t}$ is low enough), the former effect dominates and the threshold for defaulting increases when productivity $z_{i,t}$ increases.

The result in (18) studies how the default threshold varies as a function of firm riskiness. Firm riskiness does not affect the value of defaulting. However, firm riskiness reduces the effective discount factor of the firm (since a risky firm is more likely to be forced into autarky), and thus reduces the continuation value of repaying for the firm. Thus, the default threshold is lower when firm riskiness $q_{i,t}$ is high.

The final set of results in Prop. 2 shows how the transmission of an increase in the required collateral to the default decision varies as a function of firm characteristics. Unlike the first-order effects, the second-order effects are not always intuitive and are more sensitive to the parameterization of the model. When the required collateral fraction η_t is already high, result (19) shows that the effect of further increases in required collateral on the default threshold is dampened. This is easy to understand when considering a hypothetical case where $\eta_t \approx 1 + r$ (i.e., the required collateral fraction is nearly as large as the gross repayment

of the loan). In this case, it is clear from (14) and (15) that firms will make nearly identical production decisions whether they plan on repaying or defaulting. Further increases in the required collateral fraction will thus have only minor effects on the *ex-ante* borrowing decision of defaulting firms. Thus, when required collateral η_t is high, further increases in η_t will only lead to modest increases in the default threshold.

Result (20) shows that for very productive firms, the default threshold is less responsive to increases in required collateral. Recall from the discussion of (17) that increased productivity increases both the value repaying (through the usual continuation channels) as well as the value of defaulting (as defaulting firms borrow and produce more); and that the former dominates when the effective weight on the future is large. However, increases in required collateral cause firms to borrow and produce less (even if the firm will repay, due to the costs of posting collateral). For repaying firms, this reduces the entire stream of future expected profits, and thus the reduction is larger for firms which do not heavily discount future production opportunities. Thus, for the same reason that increased productivity $z_{i,t}$ pushes out the default threshold, the effects of increased required collateral η_t on the default threshold is mitigated for productive firms.

Finally, result (21) shows that for riskier firms, the default threshold is more responsive to increases in required collateral. Recall from the discussion above that increases in required collateral reduce the continuation value of repaying firms (due to collateral posting costs). However, higher risk implies that firms effectively discount the future more aggressively; thus, this channel is dampened. Moreover, higher risk does not affect the decisions the firms makes when choosing to default. Thus, increased riskiness $q_{i,t}$ amplifies the effect that increased required collateral η_t has on the default threshold.

3.3 Model Predictions: Land Enclosures

We consider what happens in the model when a subset of firms face an exogenous decline in the cost of posting collateral. In particular, we are not only interested in the reaction of firms who enjoy the reduction in collateral costs but also the firms which do not receive the reduction.

Formally, denote the (*ex-ante*) repayment and default sets as $\mathscr{R}_t \equiv \left\{i : \mathscr{W}_{i,t} = \mathscr{W}^R_{i,t}\right\}$ and $\mathscr{D}_t \equiv \left\{i : \mathscr{W}_{i,t} = \mathscr{W}^D_{i,t}\right\}$, respectively. The aggregate loan amounts by (*ex-ante*) repayment or default are given by $V^R_t \equiv \int_{i\in\mathscr{R}_t} v^R_{i,t}\,\mathrm{d}i$ and $V^D_t \equiv \int_{i\in\mathscr{D}_t} v^D_{i,t}\,\mathrm{d}i$. Finally, define the mass of firms in each of these groups as $\mu^R_t \equiv \int_{i\in\mathscr{R}_t}\mathrm{d}i$ and $\mu^D_t \equiv \int_{i\in\mathscr{D}_t}\mathrm{d}i$.

Our experiment consists of selecting a subset of incumbent firms $i \in \mathscr{R}_t$, who benefited from the enclosure, and reducing their collateral costs to $\tilde{c}_{i,t} < c_{i,t}$, while leaving the collateral costs of other firms unchanged. It is easy to see from (14) that such firms increase their borrowing; and from Prop. 2, such firms will continue to endogenously choose to repay. Thus, keeping the aggregate collateral fraction η_t fixed, we have an increase in V^R_t, but

no change in V_t^D or fractions μ_t^R, μ_t^D. Of course, because aggregate repayments V_t^R have changed, the optimality conditions of the bank problem have changed as well. In particular, from (10), we see that this puts downward pressure on required collateral η_t.

Thus, the comparative statics in Prop. 2 lead to the following predictions:

(1) Following the enclosure, the total number of defaulting firms will *increase*.

(2) The increase in defaults is *mitigated* for more productive firms.

(3) The increase in defaults is *mitigated* when required collateral is high; in particular, mitigation occurs when financial intermediary market power is large.

(4) The increase in defaults is *amplified* for riskier firms.

The mechanisms underpinning these comparative statics are straightforward. Land enclosures increase loan demand primarily from firms with higher continuation values, for whom the gains from repaying loans are substantial. Thus, the average unit borrowed in this economy is more likely to be repaid and is therefore safer from the bank's perspective. As a result, bank are willing to provide cheaper credit or reduce η_t. This reduction, in turn, increases the default incentives of firms that were closer to the default threshold, manifesting in a rise in (endogenous) defaults and a higher lending volume. This prediction implies that an observed rise in local bankruptcies following enclosure acts can serve as an empirical proxy for improved local credit market access. With these theoretical predictions clearly in place, we next proceed to the empirical analysis, beginning with the construction of our database.

4 Empirical Analysis

This section empirically evaluates our theory on the role of land enclosures in affecting the level of defaults. Our key theoretical prediction, given in Proposition 2, indicates that the enclosure of waste can lead to equilibrium increases in defaults. Our empirical analysis is based on our newly digitized bankruptcy database, described in section 4.1. Combined with data on Parliamentary enclosure awards at the county-year level, we study how land titling affect local bankruptcies by exploiting temporal and regional variation in the data. Section 4.2 establishes the basic fact that waste enclosures increase bankruptcies. In section 4.3, we proceed to substantiate the predictions of our model by demonstrating that the data is also consistent with additional implications of our theory. Namely, we demonstrate how productivity-enhancing reforms do not generate the same effects as waste enclosures; we show that the effects are stronger in riskier and more competitive periods; and finally, we illustrate how exposure to risk, both industrial and geopolitical, and to the adverse business cycles amplifies our baseline effect. Appendix B studies the robustness of our analysis to several methodological choices and threats and will be referred to in this section.

4.1 Data: Main Variables

Our empirical analysis is based on a balanced panel, containing historical information on 42 English counties between 1750 and 1830. Our panel includes 3,321 county-year observations.[13] The main variables in the dataset are the number of bankruptcies, our main outcome variable, and the extent of land enclosures, our main explanatory variable.

Table 1 presents summary statistics for the main variables used in our analysis.

Table 1: Descriptive Statistics by Period

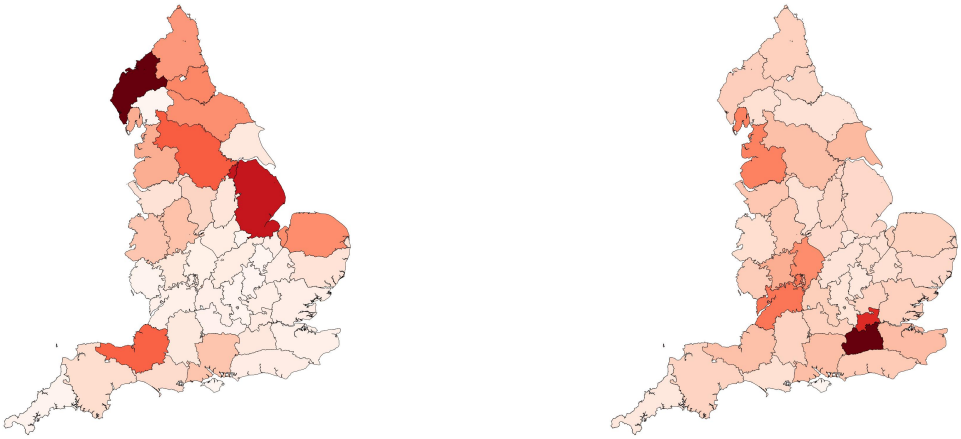
	All (N=3,321)	Year < 1793 (N=1,763)	Year ≥ 1793 (N=1,558)
Number of bankruptcies	15.43	7.59	24.30
	(34.97)	(17.12)	(46.12)
Population (thousands)	202.22	164.80	243.59
	(183.44)	(115.13)	(230.12)
Number of waste enclosures	0.48	0.24	0.76
	(1.54)	(0.76)	(2.06)
Enclosed waste area (1k acres)	387.64	254.55	538.23
	(1658.86)	(1368.82)	(1924.74)
Share of workers in agriculture	46.86	47.02	46.59
	(13.66)	(13.11)	(14.54)
Share of workers in the secondary sector	38.74	39.00	38.30
	(11.73)	(11.46)	(12.16)

Note: This table reports the sample averages of each variable in by county and year. Standard deviations are reported in parenthesis.

Bankruptcies Our main outcome variable is the county-year level number of bankruptcies. For this purpose, we constructed a newly digitized dataset containing all the information specified in the public bankruptcy notices that were published in the English *London Gazette* between the years 1705 and 1830 (the bankrupt's name, occupation, location, and the details of the scheduled creditor meetings). Bankruptcy postings were mandated by the 1705 Bankruptcy Act after a person was declared bankrupt. The digitized dataset contains the main information that appears in the notice, including, the name of the bankrupt, his occupation (sometimes more than one occupation is mentioned), location, and the date in which he was declared bankrupt (see example in Figure 1).[14] In the analysis we use the

[13] The county borders in the analysis are those known as England's "ancient counties," with Yorkshire subdivided into its North, East and West Ridings.

[14] Julian Hoppit has already collected and analyzed the information about bankruptcies in England and published his findings in a book entitled, "Risk and Failure in English Business 1700-1800" (Hoppit (1987)). However, the data he used ends in 1800 plus it has never been digitized. In addition, Hoppit used docket



(a) Waste Enclosures (b) Bankruptcies Per Capita

Figure 2: Bankruptcies and enclosures in England 1750–1830

Note: The figure presents on each panel a heat map indicating the level of the title variable by ancient counties of England.

information from notices published between 1750-1830, including their number, location and the occupation of the bankrupt. We omit the observations from London, which was a central financial center and remain with 51,251 individual bankruptcy records.

The geographical distribution of bankruptcies is depicted in Figure 2b. As can be observed, London (which makes part of the ancient county of Middlesex) had a major number of bankruptcies, but had no land enclosures (Figure 2a) and is therefore omitted from the analysis.

It is important to note that a bankruptcy in the dataset appears in the year in which the legal proceedings end and the debtor was eventually declared bankrupt. This implies that the actual bankruptcy took place sometime before. We estimate this lag to be one year.

Land enclosure Awards The main explanatory variable is the county-year level enclosure of waste (area in acres and alternatively, the number of acts). It comes from the digital data compiled by Satchell et al. (2017), which contains the population of Parliamentary awards of enclosure between 1606 and 1902, including the location of the enclosed land, year of award, area, and type of enclosure. We begin in 1750, when Parliamentary acts more reliably reflected the actual timing of land enclosure, whereas earlier acts often legalized or recorded enclosures that had already taken place informally. Of the 4,691 acts that were awarded between 1750 and 1830, 1,600 were of waste (56 percent), these enclosures can be observed in Figure 2a. The enclosure of waste was more common in the North-West and its relative importance began to grow in 1800 (see Table B.2). About 20.6% of our county-year-level

books for the years 1711-1764 (besides 17 months between 1723-1724), which provide an approximation of the true number of bankruptcies, thus, not all bankruptcy petitions were confirmed by the authorities as true bankruptcies (Hoppit (1987)), p. 44).

observations experienced an enclosure of waste. As discussed in section 2.1, we perceive the timing in which the enclosure awards were granted as a source of exogenous variation.

4.2 The Effect of Land Enclosures on Local Bankruptcies

Using the data described in the previous section, we estimate the effect of an approval of an enclosure of waste in county i at time t on bankruptcies in the same county during the following years. To do so, we employ a local-projections-based (Jorda, 2005) identification strategy by estimating the following equation

$$BR_{i,t+h} = \exp\left(\delta_t^h + \alpha_i^h + \beta_h ENC_{i,t} + \boldsymbol{\gamma^h} X_{i,t} + \epsilon_{i,t}^h\right), \tag{22}$$

where $BR_{i,t}$ denotes the number of bankruptcies in county i at year t, $ENC_{i,t}$ denotes the total area of waste enclosures granted measured in thousands of acres. Our coefficient of interest is β_h, which corresponds to the expected change in the number of bankruptcies h periods in after a waste enclosure of of 1k acres was approved by parliament. We estimate the impulse response coefficients β_h for different horizons $h = 0, 1, \ldots, 5$.

To control for nationwide common trends as well as county-invariant omitted variables we include time and county fixed effects (δ_t^h and α_i^h, correspondingly) we also include a wide range of controls in $X_{i,t}$. First, we control for population $pop_{i,t-1}$, i.e., the population one year before to enclosure approval to control for changes in bankruptcies resulting from shifts in population and its correlates such as economic development.[15] We further control for $l = 4$ lagged values of $ENC_{i,t}$ to control for anticipation effects arising from recent enclosure approvals in that particular region. We also control for $l = 4$ lagged values of $BR_{i,t}$ to control for local financial cycles and any persistence in outcome. All inference is done using double clustered standard errors at the county and year level. Note that double clustering takes care of cross-sectional dependence in the error term as well as serial correlation within each county.

Because our dependent variable is an aggregate count variable at the county level, we employ Poisson regressions throughout and interpret β_h in percentage change terms. Poisson regressions are commonly used in the analysis of count processes and produce a consistent estimate of the mean effect even when the true data generating process is not Poisson (Wooldridge 1999). We also leverage the insights of Montiel Olea and Plagborg-Møller (2021) and control for a large number of lags for the outcome variable, thus purging the error term

[15] County population in 1750 varied between a minimum of about 117 thousand people and 5 million people (in London) and a minimum of about 190 thousand and 17 million in 1830. County-level population figures for the years 1761-1801 come from Wrigley (2007), Table 5, p.54; for 1751 from Deane and Cole (1967), table 24; the 1811-1831 are uncorrected census figures from Mitchell (1988) (Dean and Cole made minor corrections to these figures to include members of the armed forces), table 8 The data is available at a decennial frequency. Linear interpolation was used for conversion to annual figures.

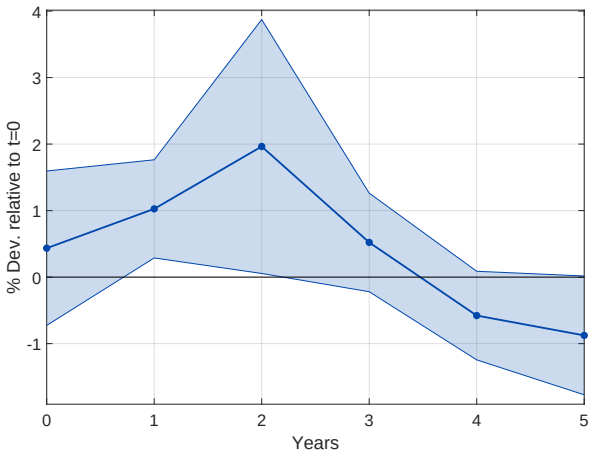


Figure 3: The Effect of Waste Enclosures on Bankruptcies

Note: The solid line reports values of β_h from estimating equation (22). Shaded areas indicate 90% confidence intervals where inference is based on doubly clustered standard errors at the county and year levels. Estimates are expressed in percentage changes in the number of expected bankruptcies due to an enclosure of 1k acres.

from serial correlation, up to an autocorrelation of order l.[16]

Figure 3 reports our baseline results. We find that after a waste enclosure of 1k acres was granted, bankruptcies in the county increased by 1.1% within the first year and 2.0% in the second year following enclosure approval. This increase is both statistically significant and economically meaningful. To put these numbers in perspective, the median area of enclosed waste area is 863 acres, and the mean is 1,839 acres, with some areas experiencing enclosures of over 20,000 acres of waste.[17] Thus, conditional on experiencing an average-sized waste enclosure grant, the county was expected to experience an increase of 2.0% in bankruptcies in the first year and a 3.7% rise in bankruptcies in the second year following the enclosure.

Robustness Checks. Figure 3 establishes that waste enclosures lead to a rise in local bankruptcies. Several choices we made in the analysis might affect this result. First, we used the total enclosed area to measure enclosure intensity. It is conceivable that non-linear valuations or agglomeration effects might lead a single enclosure of 1k acres to affect economic conditions differently than five enclosures with a total area of 1k acres in the same county. Figure B.1 replicates the analysis in Figure 3 using the average area granted instead of the total area and finds consistent results. Second, our results might be affected by the number of lags we choose to include in estimating equation (22). Appendix B.2 demonstrates that our results are not sensitive to controlling for anything from one year and up to six years of lagged values. Finally, to assess our interpretation of the enclosure timing as an exogenous event,

[16] Our baseline includes $l = 4$ lags, but all results in this section are not sensitive to this choice. Using different lag orders ranging between $l = 1,\ldots 6$ yields similar results; see Appendix B.2. Only one population lag is included in all regressions, as the county-level population is available at a decennial frequency. Linear interpolation is used for conversion.

[17] For more detailed enclosure area and acts statistics see Appendix Tables B.1 and B.2.

we propose and implement a pre-trend test consistent with our baseline estimation using equation (22) and find no evidence of a statistically significant pre-trend, validating our assumption that enclosure grant timing was exogenous. These tests are formally introduced and presented in Appendix B.2.

4.3 Mechanisms and Potential Drivers

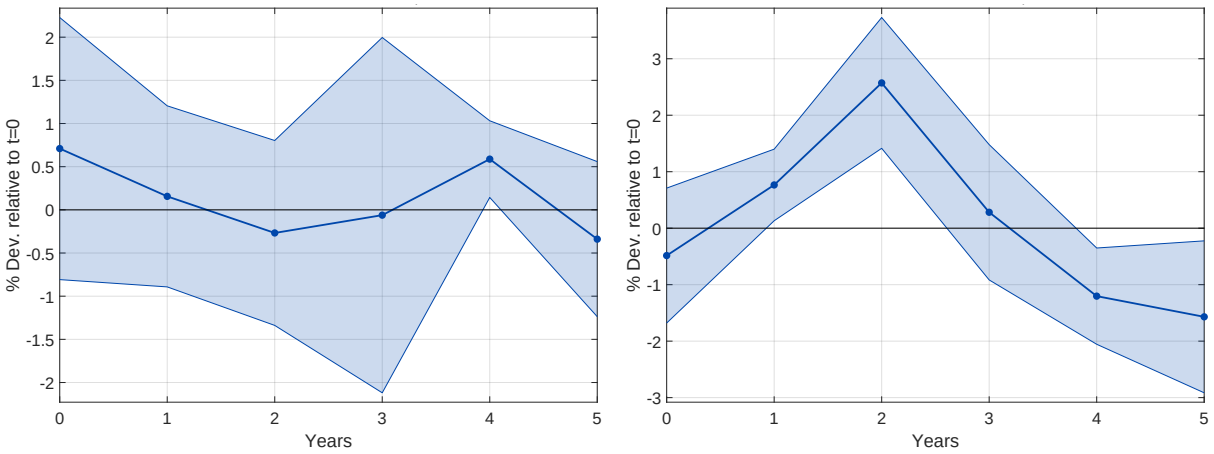
Our results thus fact establish that waste enclosures lead to a rise in local bankruptcies. According to our model, the mechanism by which such bankruptcies occur is through an increase in the supply of land used as collateral, leading to an equilibrium easing of credit market conditions. Given limited financial data at this time, it is difficult to test this model mechanism directly. Instead, to help validate our theory-based interpretation of the results, we turn our attention to additional testable predictions of our theory. Substantiating these predictions not only increases our confidence in the model, but more importantly offers insights into the empirical channels that are at work. Prop. 2 suggests that the effect of waste enclosure on bankruptcies should be stronger when risk is higher and when financial intermediation competition is stronger. A natural first step in assessing this prediction is to examine the effect of several secular trends that occurred simultaneously through our sample period.

The years of 1750-1830 saw fast-paced industrial developments which changed the available investment opportunities and increased the degree of innate risk involved with business ventures. In addition, following the 1793 crisis and the emergence of the Napoleonic wars, geopolitical risk is on the rise for the latter half of our sample. These years also saw a rapid expansion in regional banking, implying a higher degree of financial competition within counties. Thus, our theory predicts that the effects of waste enclosures on bankruptcies should be stronger during the years of 1793 onward, as these were characterized by more industrial risk, geopolitical risk, and banking competition.

To test this prediction, panels (a) and (b) of Figure 4 repeat our baseline analysis from Figure 3, but split the sample to the years 1750-1792 and 1793-1830 (respectively). Consistent with our theory, Figure 4 demonstrates that indeed the years 1793-1830 account for most of the effect of waste area enclosures on bankruptcies. In contrast, in the former part of the sample we find smaller and statistically insignificant effects.

The Role of Industrialization. To dig deeper and more explicitly into the role of industrialization, we now leverage the panel element of our database and estimate the following specification:

$$BR_{i,t+h} = \exp\left(\delta_t^h + \alpha_i^h + \left[\beta_h + \beta_h^{75+}\mathbb{I}_{i,t}^{75+} + \beta_h^{25-}\mathbb{I}_{i,t}^{25-}\right] \times ENC_{i,t} + \boldsymbol{\gamma^h} X_{i,t} + \epsilon_{i,t}^h\right), \qquad (23)$$



(a) 1750–1792 (b) 1793–1830

Figure 4: The Effect of Land Enclosures on Bankruptcies

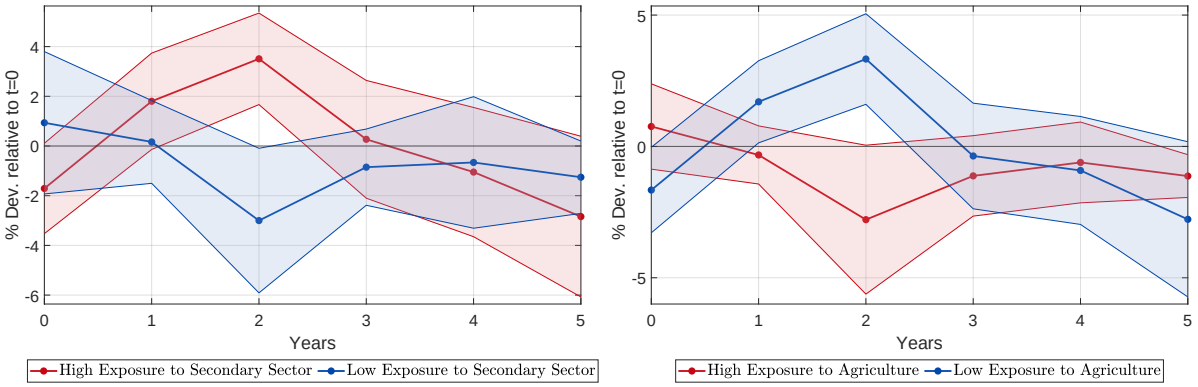
Note: The solid lines report values of β_h from estimating equation (22) for two separate time periods: 1750–1792 in panel a, 1793–1830 in panel b. Shaded areas indicate 90% confidence intervals where inference is based on doubly clustered standard errors at the county and year levels. Estimates are expressed in percentage changes in the number of expected bankruptcies due to an enclosure of 1k acres.

where $\mathbb{I}_{i,t}^{75+}$ and $\mathbb{I}_{i,t}^{25-}$ denote a county-time exposure dummy that takes the value of one if a certain exposure measure, x is above its 75^{th} or below its 25^{th} percentile correspondingly and zero otherwise. This flexible and functional-form-free strategy allows us to pick up factors that amplify or dampen the response of bankruptcies to the enclosure award.[18] Note that the effect of enclosure award on bankruptcies in the high exposure country-years is given by $\beta_h+\beta_h^{75+}$ and similarly for the low exposure country-years by $\beta_h+\beta_h^{25-}$. As before, the control vector $X_{i,t}$ includes: population at $t-1$; the number of bankruptcies $BR_{i,t}$; $l=4$ lagged values of $BR_{i,t}$ and $ENC_{i,t}$; and the exposure dummies $\mathbb{I}_{i,t}^{75+}$ and $\mathbb{I}_{i,t}^{25-}$. We again estimate impulse responses for horizons $h=0,1,\ldots,5$.

We estimate equation (23) using a set of exposure variables measuring the economic specialization of a particular county-year observation (proxied by shares of workers engaged in a sector).[19] The results in Figure 5 present a clear image. Counties and years that experienced a low exposure to agriculture and a high exposure to the secondary sector are precisely those in which waste enclosures had the strongest effects, peaking at around a 3% rise in bankruptcies two years after the enclosure of 1k acres of wasteland. To validate this finding, we also use the time-invariant county classifications from Wrigley (2007), dividing counties into industrial or commercial, agricultural, and mixed, to conduct a similar analy-

[18] There is nothing special about the 75^{th} or 25^{th} exposure cutoffs and they are chosen to create two groups that are sufficiently large to draw statistical inference. When this specification is used we report in Appendix B.3 a robustness check using the 15^{th},20^{th},25^{th},30^{th},35^{th}, and 40^{th} percentiles as the cutoff for the low exposure group and similarly the 85^{th},80^{th},75^{th},70^{th},65^{th}, and 60^{th} percentiles as the cutoff values above which and observation is classified as experiencing high exposure.

[19] The figures are from Keibek (2016), Appendix B and were interpolated into an annual frequency. West Yorkshire years: 1755, 1785 from Shaw-Taylor and Jones (2005).



(a) Secondary Sector (b) Agriculture

Figure 5: Exposure to Industrialization and the Effect of Waste Enclosures

Note: This figure reports impulse responses estimated via equation (22) using the total area of waste area enclosures. Impulse responses are presented as the total effect of enclosures on bankruptcies within each exposure group, such that estimates with high exposure are given as $\beta_h+\beta_h^{75+}$ and for low exposure as $\beta_h+\beta_h^{25-}$. Each panel reports a set of impulse responses estimated using a separate exposure variable indicated in the title. Shaded areas indicate 90% confidence intervals where inference is based on doubly clustered standard errors at the county and year levels. Estimates are expressed in percentage changes in the number of expected bankruptcies due to a new land enclosure of 1k acres.

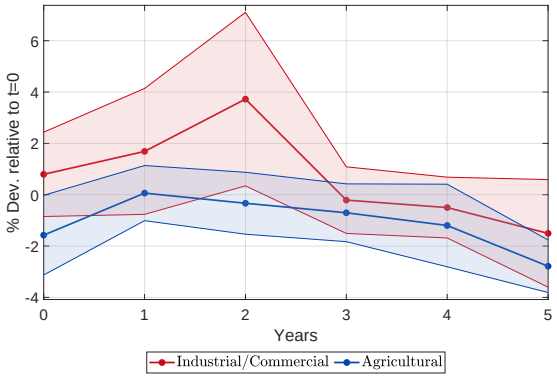


Figure 6: Exposure to Industrialization and the Effect of Waste Enclosures: Wrigley County Classification

Note: This figure reports impulse responses estimated via equation (23) using the total area of waste area enclosures in the solid lines, and defining exposure using Wrigley's classification. Shaded areas indicate 90% confidence intervals where inference is based on doubly clustered standard errors at the county and year levels. Estimates are expressed in percentage changes in the number of expected bankruptcies due to a new land enclosure of 1k acres.

sis. This analysis is presented in Figure 6, and its findings support the claim that exposure to industrialization drives the effect.[20]

[20]In Figure 6 we estimate equation (23), but with the exposure dummies given by the assignment into Wrigley's three categories.

Business Cycle Risk. Another potential channel through which the effect of waste enclosures on bankruptcies might be mediated according to our theory is the state of the real economy. We can think of business cycle fluctuations as a uniform decline in productivity for all productive units (as in standard real business cycle models). Our theory indicates that if firms are less productive, the effect of waste enclosures on bankruptcies should be amplified. To obtain a measure of exogenous fluctuations in real activity we leverage a measure of historical standardized tree ring growth series.[21] Because the width of tree rings is influenced by environmental factors like temperature, precipitation, soil moisture, and sunlight, its annual growth patterns can be used to trace changes in historical climate conditions and agricultural productivity. Years with wider rings indicate favorable growing conditions, such as abundant rainfall and moderate temperatures, while narrow rings indicate drought, poor soil quality, or other stressors like extreme temperatures or pest infestations. The series used in our study come from different sample locations corresponding to four climate regions in England. The series were matched to counties based on their relevant climate region.[22]

We use this tree ring series to construct a new weather shock variable as follows. We fit an ARMA model to each of the tree ring series in each locality, allowing us to flexibly capture the expectations for agricultural conditions in each locality.[23] We then extract the residuals from the raw tree ring series with the fitted ARMA model to yield a weather shock variable.

The resulting shock variable has several desirable characteristics. First, it exhibits cross-sectional and temporal variation. Second, it is a way to reduce the dimensionality of multiple climate variables and indicate how favorable agricultural conditions were at that place and time in an unanticipated fashion. Last, it is a continuous measure indicating differences in intensities of growth conditions and not an indicator variable. We interpret this series as a supply shock in an agricultural society, indicating surprisingly bad agricultural yields.

We again use the specification in equation (23) to study how differential exposure to weather shocks potentially change how waste enclosures affect bankruptcies. We find that following waste enclosures, high exposure to adverse agricultural conditions leads to an amplified response of bankruptcies (the red line in Figure 7). This result is consistent with the view that privatizing land during bad times has a stronger effect than doing so during a boom.

[21] The tree ring growth index chronologies are constructed from samples taken from trees in various location. They are located in the International Tree-Ring Data Bank (ITRDB) and managed by the World Data Service for Paleoclimatology manages. The samples can be downloaded from the website of the National Centers for Environmental Information (NOAA): https://www.ncei.noaa.gov/products/paleoclimatology/tree-ring.

[22] The samples are from the surroundings of Bath (information from 1754), Sheffield (from 1761), Norwich (from 1717) and Moffat in Scotland (from 1652). The climate regions are based on the Met Office, and are available here: https://www.metoffice.gov.uk/research/climate/maps-and-data/about/districts-map.

[23] All tree ring series are stationary according to an augmented Dickey-Fuller test, thus we reject models involving cointegration. We choose model parameters for each tree ring series by minimizing the Bayesian information criterion (BIC) using a parameter grid approach.

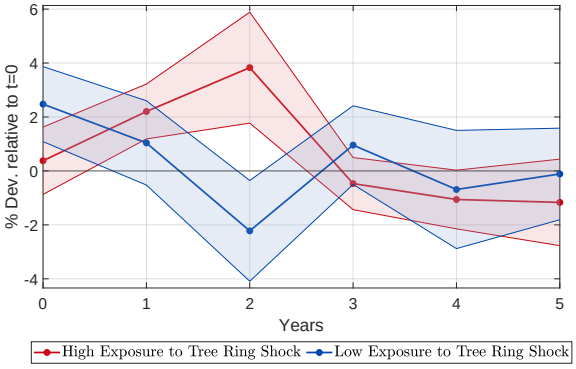


Figure 7: Exposure to Weather Shocks and the Effect of Waste Enclosures

Note: This figure reports impulse responses estimated via equation (23), and defining exposure dummies using our weather shock measure. Impulse responses are presented as the total effect of enclosures on bankruptcies within each exposure group, such that estimates with high exposure are given as $\beta_h + \beta_h^{75+}$ and for low exposure as $\beta_h + \beta_h^{25-}$. The shock is constructed such that high exposure indicates that weather conditions were unfavorable. Shaded areas indicate 90% confidence intervals where inference is based on doubly clustered standard errors at the county and year levels. Estimates are expressed in percentage changes in the number of expected bankruptcies due to a new land enclosure of 1k acres.

Financial Effects vs Real Effects. Our theory predicts that the observed rise in bankruptcies following waste enclosures in Figure 3 is a consequence of the financial role of land in reducing collateral posting costs, thus altering the resulting equilibrium of credit markets. However, because land is also a factor of production, the observed effect could emerge as a consequence of changes in the local supply for goods. To address this concern, we also examine the effect of a different type of land enclosure: the enclosure of open fields. Unlike the enclosure of waste, which can be viewed as land privatization, enclosure of open fields changed the nature of production within a certain region by reorganizing plot allocations, making them contiguous, thus allowing the farmers to exploit economies of scale and raise productivity through agglomeration effects (Adamopoulos and Restuccia (2020); Adamopoulos and Restuccia (2014)), without introducing a new pledgable asset. In the context of our model, this is akin to a rise in productivity for some firms.[24] Our theory tells us that the two type of enclosures should result in different effects on bankruptcies. Reforms open field enclosures that raise the productivity of some firms should reduce bankruptcies, while waste enclosures should increase them.

Figure 8 repeats the analysis in Figure 3 using open field enclosures. We find effects of the opposite sign: open-field enclosures are followed by a reduction in bankruptcies. This

[24] In the open fields system, farmers' strips of land were scattered and unfenced and decisions over the use of land had to be reached in common. The use of land required much cooperation in cultivation and animal husbandry, as well as in decisions of the choice of crops in the crop-rotation system, in which one field would lie fallow to prevent soil exhaustion while the other one or two were cultivated, growing different seasonal crops, such as corn, wheat, rye, barley, peas, beans and oats. The lord's demesne strips would often be scattered among those of the tenants. See Heldring et al. (2022) for a recent empirical analysis of the effects of enclosure of open fields on land productivity.

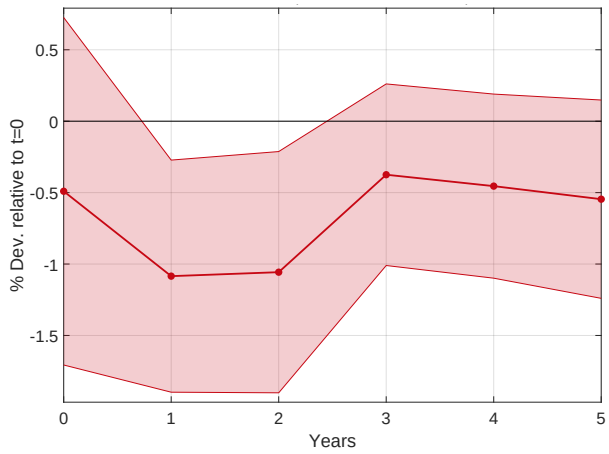


Figure 8: The Effect of Open Field Enclosures on Bankruptcies

Note: This figure reports values of β_h from estimating equation (22). Shaded areas indicate 90% confidence intervals where inference is based on doubly clustered standard errors at the county and year levels. Estimates are expressed in percentage changes in the number of expected bankruptcies due to an enclosure of 1k acres.

finding, which is consistent with our theoretical framework, lends further support to our financial interpretation of the effects of waste enclosure shocks from our baseline results.

5 Concluding Remarks

This paper proposes a theory and supporting evidence on the link between land reforms and market access. Our theory is tailored to study a historically significant case study at the height of the Industrial Revolution, a period of much change where land reforms were sizable and plentiful, allowing us to draw lessons from the past to our modern context. We demonstrate that when land is used as collateral and collateral is a margin of competition, an influx of good collateralizable assets, raising continuation values for productive incumbents, improves market access as an equilibrium effect. We leverage a unique database on personal bankruptcies to collect evidence in support of our argument, demonstrating that granting waste enclosures was followed by a rise in bankruptcies. We provide additional validating evidence that supports our theory-based interpretation of the findings and sheds new light on this historical period.

Our results offer new insights both in their time and out of it. In the context of eighteenth and nineteenth-century England, we demonstrate how granting property rights and titles on local wasteland affected financial markets and contributed to the development process during the height of the Industrial Revolution. While some alluded to this possibility, we are the first to offer evidence of this theory. These results are important since they provide a window into the workings of financial markets during a critical moment in the history of industrialization and contribute to our understanding of the economic history of the Industrial Revolution.

Examining our results with modern eyes and in the contemporary context allows our theory and results to provide several generalizable lessons on implementing land reforms. Reforms that improve land pledgeability and introduce more collateral into a frictional financial system are expected to improve market access. However, the degree of industrialization, state of the business cycle, exposure to geopolitical risk, and the degree of banking competition are all critical mediating factors that govern the effect size and underpin the reform's ultimate impact.

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Appendix A Theory Appendix

Proof of Lemma 1.

Proof. Since defaulting on any bank in period t causes the firm to enter autarky in period $t+1$, when defaulting (endogenously or exogenously) the firm will choose to default on all banks. Thus, $D_{i,t}(j) = D_{i,t}(j') \equiv D_{i,t}$. In this case, repayments aggregated across all banks are given by

$$\begin{aligned}\int_0^1 \psi_{i,t}(j)\,\mathrm{d}j &= \int_0^1 \left(\frac{\eta_t(j)}{\eta_t}\right)^{\frac{1}{1-\theta}} \mathrm{d}j\, g_{i,t} \\ &\equiv \tilde{\eta}_t g_{i,t},\end{aligned}$$

which follows from (3). If the firm does not choose to default nor fails exogenously, then repayments are

$$\begin{aligned}\int_0^1 \psi_{i,t}(j)\,\mathrm{d}j &= (1+r)\int_0^1 \ell_{i,t}(j)\,\mathrm{d}j \\ &= (1+r)\,v_{i,t},\end{aligned}$$

where the second line follows from the cash-in-advance constraint. Thus, if *ex-ante* firm i does not actively choose to default (on any bank j), the expected repayments are

$$\mathrm{E}_t \int_0^1 \psi_{i,t}(j)\,\mathrm{d}j = (1-q_{it})(1+r)\,v_{i,t} + q_{it}\tilde{\eta}_t g_{i,t}.$$

Equation (5) follows.

□

Proof of Lemma 2.

Proof. Define the total *ex-ante* collateral posted to bank j as $G_t(j) = \int_i g_{i,t}(j)\,\mathrm{d}i$; and the *ex-post* posted collateral from repaying and defaulting firms as $G_t^R(j) = \int_i \mathbf{1}(D_{i,t}(j) = 0) g_{i,t}(j)\,\mathrm{d}i$ and $G_t^D(j) = \int_i \mathbf{1}(D_{i,t}(j) = 1) g_{i,t}(j)\,\mathrm{d}i$, respectively. Since default risk is idiosyncratic, the law of large numbers implies these objects are equal to beginning of period expectations for bank j. Then we have that the expected profits of bank j are

$$\mathrm{E}_t\left[\Pi_t(j)\right] = \frac{1+r}{\eta_t(j)} G_t^R(j) + G_t^D(j) - \frac{1+r^{rf}}{\eta(j)} G_t(j), \tag{A.1}$$

where we have used the fact that $\ell_{i,t}(j) = \eta_t(j) g_{i,t}(j)$. Then from (3),

$$G_t(j) = \left(\frac{\eta_t(j)}{\eta_t}\right)^{\frac{1}{1-\theta}} \int_i g_{i,t}\,\mathrm{d}i \equiv \left(\frac{\eta_t(j)}{\eta_t}\right)^{\frac{1}{1-\theta}} G_t,$$
$$G_t^R(j) = \left(\frac{\eta_t(j)}{\eta_t}\right)^{\frac{1}{1-\theta}} \int_i \mathbf{1}(D_{i,t}(j)=0) g_{i,t}\,\mathrm{d}i \equiv \left(\frac{\eta_t(j)}{\eta_t}\right)^{\frac{1}{1-\theta}} G_t^R,$$
$$G_t^D(j) = \left(\frac{\eta_t(j)}{\eta_t}\right)^{\frac{1}{1-\theta}} \int_i \mathbf{1}(D_{i,t}(j)=1) g_{i,t}\,\mathrm{d}i \equiv \left(\frac{\eta_t(j)}{\eta_t}\right)^{\frac{1}{1-\theta}} G_t^D.$$

Since each bank is in measure $\mathrm{d}j$, we have that $\frac{\partial \eta_t}{\partial \eta_t(j)} = 0$ and $\frac{\partial g_{i,t}}{\partial \eta_t(j)} = 0$ (holding fixed $\eta_t(j')$ for all other banks $j' \neq j$). Moreover, if firm i defaults on any bank, it will also default on bank j. Thus,

$$\frac{\partial}{\partial \eta_t(j)} \Pr\left[D_{i,t}(j)=1\right] = 0.$$

Thus, bank j takes as given G_t, G_t^R, G_t^D. Hence, (A.1) is equal to (7).

□

Proof of Proposition 1.

Proof. The bank optimality conditions and a symmetric equilibrium imply

$$(1+r)G_t^R - (1+r^{rf})G_t = -\frac{1}{\theta}\eta G_t^D,$$

and (10) follows from $G_t = G_t^R + G_t^D$.

From the firm problem, a symmetric equilibrium implies $\tilde{\eta}_t = 1$ and $g_{i,t}(j) = g_{i,t} = \eta_t v_{i,t}$. Then the realized repayments of firm i are given by

$$\int_0^1 \psi_i(j)\,\mathrm{d}j = \mathbf{1}(D_{i,t}=0)(1+r)v_{i,t} + \mathbf{1}(D_{i,t}=1)\eta_t v_{i,t},$$

and the expected profits conditional on the endogenous choice of repayment is given by

$$\mathrm{E}_t \Pi_{i,t}(v_{i,t}) = z_{i,t} f(v_{i,t}) - c_{i,t}\gamma(\eta_t v_{i,t}) - \begin{cases} (1-q_{i,t})(1+r)v_{i,t} + q_{i,t}\eta_t v_{i,t} & \text{if } D_{i,t}=0 \\ \eta_t v_{i,t} & \text{if } D_{i,t}=1 \end{cases}.$$

Additionally, if the firm defaults (either exogenously or endogenously), then the firm earns A in all periods afterwards. Thus, conditional the choice of $v_{i,t}$ and on repaying, (4)

becomes

$$\begin{aligned}
&\mathrm{E}_t \sum_{k=0}^{\infty} \beta^k \Pi_{i,t+k}(v_{i,t+k}) = \Pi_{i,t}(v_{i,t}) + \mathrm{E}_{t+1} \sum_{k=1}^{\infty} \beta^k \Pi_{i,t+k}(v_{i,t+k}) \\
&\equiv \Pi_{i,t}(v_{i,t}) + \beta \mathcal{W}_{i,t+1}.
\end{aligned}$$

Conditional the choice of $v_{i,t}$ but in the case of default, we have

$$\begin{aligned}
&\mathrm{E}_t \sum_{k=0}^{\infty} \beta^k \Pi_{i,t+k}(v_{i,t+k}) = \Pi_{i,t}(v_{i,t}) + \mathrm{E}_{t+1} \sum_{k=1}^{\infty} \beta^k A \\
&\equiv \Pi_{i,t}(v_{i,t}) + \frac{\beta}{1-\beta} A.
\end{aligned}$$

Thus, the value of repaying is given by (12); the value of (endogenously) defaulting is given by (13); and the firm problem can be written as in (11). Differentiating with respect to $v_{i,t}$ and setting to zero gives the optimality conditions (14) and (15), which characterize the per-period input decisions in the case of endogenous repayment or default.

□

Proof of Proposition 2.

Proof. Assumption (1) implies that the time-invariant value functions satisfy

$$\begin{aligned}
\mathcal{W}_i^R &= \left(\frac{1}{1-(1-q_i)\beta} \right) \left(z_i f(v_i^R) - c_i \gamma(\eta v_i^R) - \left[(1-q_i)(1+r) + q_i \eta \right] v_i^R + q \frac{\beta}{1-\beta} A \right), \\
\mathcal{W}^D &= z_i f(v_i^D) - c_i \gamma(\eta v_i^D) - \eta v_i^D + \frac{\beta}{1-\beta} A.
\end{aligned}$$

Assumption (2) implies that for $c_i = 0$, $\mathcal{W}_i^R > \mathcal{W}_i^D$. The envelope theorem implies that differentiating the difference between the two value functions $F_i \equiv \mathcal{W}_i^R - \mathcal{W}_i^D$ with respect to collateral costs gives

$$\frac{\partial F_i}{\partial c_i} = \gamma(\eta v_i^D) - \left(\frac{1}{1-(1-q_i)\beta} \right) \gamma(\eta v_i^R),$$

which is strictly negative by Assumption (2). Finally, taking $c_i \to \infty$, from (14) and (15), we have that $v_i^R \to 0$, $v_i^D \to 0$, and thus

$$\begin{aligned}
\mathcal{W}_i^R &\to q \frac{\beta}{1-\beta} A, \\
\mathcal{W}_i^D &\to \frac{\beta}{1-\beta} A,
\end{aligned}$$

so in the limit, $\mathcal{W}_i^D > \mathcal{W}_i^R$. Thus there is some unique threshold $\bar{c}_i$ such that $\mathcal{W}_i^R = \mathcal{W}_i^D$ when $c_i = \bar{c}_i$, and $\mathcal{W}_i^R < \mathcal{W}_i^D$ iff $c_i > \bar{c}_i$.

Since $\frac{\partial F_i}{\partial c_i} \neq 0$ for all values of c_i, we can apply the implicit function theorem to find the gradient and hessian of $\bar{c}_i$ with respect to $\mathbf{x} \equiv \begin{bmatrix} \eta & z_i & q_i \end{bmatrix}^\top$.

$$
\begin{aligned}
D_{\mathbf{x}} \bar{c}_i &= -\left(\frac{\partial F_i}{\partial c_i}\right)^{-1} D_{\mathbf{x}} F_i, \\
H_{\mathbf{x}} \bar{c}_i &= -\left(\frac{\partial F_i}{\partial c_i}\right)^{-1} \left(H_{\mathbf{x}} F_i + D_{\mathbf{x}} F_i \left[D_{\mathbf{x}} \bar{c}_i\right]^\top + D_{\mathbf{x}} \bar{c}_i \left[D_{\mathbf{x}} F_i\right]^\top + \frac{\partial^2 F_i}{\partial c_i^2} D_{\mathbf{x}} \bar{c}_i \left[D_{\mathbf{x}} \bar{c}_i\right]^\top \right),
\end{aligned}
$$

which holds in an appropriately defined neighborhood around $\{\eta, z, q\}$. Imposing the envelope theorem and evaluating the first- and second-order derivatives above, and taking the limit as $c_i \to 0, q_i \to 0, \beta \to 1$ implies that $\frac{\partial \bar{c}}{\partial \eta}$ approaches 0 from above at the rate in (16); $\frac{\partial \bar{c}}{\partial z}$ approaches (17); $\frac{\partial \bar{c}}{\partial q}$ approaches $-\infty$ at the rate in (18); $\frac{\partial^2 \bar{c}}{\partial \eta^2}$ approaches 0 from below at the rate in (19); $\frac{\partial^2 \bar{c}}{\partial \eta \partial z}$ approaches (20); and $\frac{\partial^2 \bar{c}}{\partial \eta \partial q}$ approaches $+\infty$ at the rate in (21).

□

Appendix B Empirical Appendix

B.1 Additional Tables

Tables B.1 and B.2 report the number of enclosure acts awarded, the number of acres enclosed and the average acres enclosed per act at the county and decade level correspondingly.

B.2 Robustness Checks to Section 4.2

This appendix discusses several robustness checks to substantiate the finding presentative in Figure 3, indicating that waste area enclosures lead to a rise in bankruptcies.

Alternative Enclosure Intensity Measurement One might conjecture that due to agglomeration effects or nonlinear valuations whereby a large plot of land that is twice the size of a small plot might be worth more than twice over the small plot as it allows for larger future projects to be initiated or due to the reduction in future transaction costs in ascertaining two separate contracts for two equivalently-sized plots instead of one. Figure B.1 and demonstrates that our results are robust to that interpretation of the data and produce consistent estimates. Waste area enclosures are associated with an increase in bankruptcies.

Lag Order Selection Estimating Equation (22) requires specifying l, the lag order of the control vector. Our baseline estimates are obtained using $l = 4$. To show that this choice does not critically effect our results we report in Figure B.2 how our results change when we use values ranging from $l = 1$ to $l = 6$.

Potential Pre-Trends Another concern for our interpretation of the result is the possibility that counties where waste enclosures were granted have seen different circumstances and financial conditions, leading to increased petitioning for enclosures or to an increased likelihood of their approval. To alleviate this concern, we estimate the following complementary specification:

$$BR_{i,t-h} = \tag{B.1}$$
$$\exp\left(\delta_t^h + \alpha_i^h + \beta_h^{pretrend} ENC_{i,t} + \sum_{j=1}^{l} \beta_j^h ENC_{i,t-h-j} + \sum_{j=1}^{l} \eta_j^h (BR_{i,t-h-j}) + \pi_h pop_{i,t-h-1} + \epsilon_{i,t}^h\right),$$

where $h \in \{-1,\ldots,-5\}$. $\beta_h^{pretrend}$, tells us to what extent is an enclosure at time t informative of the outcome at time $t-h$. Finding a significant coefficient might challenge any causal interpretation we attribute to our baseline estimates. Figure B.3 reports the results of the estimation of Equation (B.1) finding no evidence of a statistically significant pretrend. To

Table B.1: Parliamentary Enclosure Acts by county

Ancient county	# Acts	Total acres enclosed	Avg. acres / act
BEDFORDSHIRE	4	952	238
BERKSHIRE	7	3,367	481
BUCKINGHAMSHIRE	6	2,091	349
CAMBRIDGESHIRE	6	7,078	1,180
CHESHIRE	36	20,674	574
CORNWALL	6	2,628	438
CUMBERLAND	84	180,568	2,150
DERBYSHIRE	65	29,566	455
DEVON	26	24,565	945
DORSET	21	25,276	1,204
DURHAM	37	73,633	1,990
ESSEX	25	7,557	302
GLOUCESTERSHIRE	14	5,088	363
HAMPSHIRE	51	39,155	768
HEREFORDSHIRE	13	2,699	208
HERTFORDSHIRE	6	7,825	1,304
HUNTINGDONSHIRE	1	511	511
KENT	23	4,375	190
LANCASHIRE	66	52,510	796
LEICESTERSHIRE	17	10,231	602
LINCOLNSHIRE	115	139,522	1,213
MIDDLESEX	11	10,925	993
NORFOLK	144	70,743	491
NORTHAMPTONSHIRE	8	9,890	1,236
NORTHUMBERLAND	43	64,314	1,496
NOTTINGHAMSHIRE	19	16,434	865
OXFORDSHIRE	15	6,725	448
RUTLAND	0	0	—
SHROPSHIRE	71	38,693	545
SOMERSET	137	94,405	689
STAFFORDSHIRE	57	41,404	726
SUFFOLK	63	20,220	321
SURREY	28	15,178	542
SUSSEX	20	8,948	447
WARWICKSHIRE	18	5,734	319
WESTMORLAND	31	34,754	1,121
WILTSHIRE	32	13,078	409
WORCESTERSHIRE	30	15,959	532
YORKSHIRE, EAST RIDING	26	13,841	532
YORKSHIRE, NORTH RIDING	79	69,598	881
YORKSHIRE, WEST RIDING	139	96,622	695

Note: This table reports enclosure statistics by ancient county.

Table B.2: Parliamentary Enclosure Acts by decade

Decade	# Acts	Total acres enclosed	Avg. acres / act
1750	27	23,925	886
1760	77	113,772	1,478
1770	159	161,510	1,016
1780	122	127,536	1,045
1790	169	129,530	766
1800	255	171,046	671
1810	464	366,478	790
1820	313	188,735	603
1830	14	4,804	343

Note: This table reports enclosure statistics by decade for decades beginning with the year in the first column (1830 is only one year).

demonstrate that this result is also unaffected by the number of included lags we re-estimate Equation (B.1) using values of l ranging from 1 to 6 and finding consistently no statistically significant pretrend. This exercise is presented in Figure B.4.

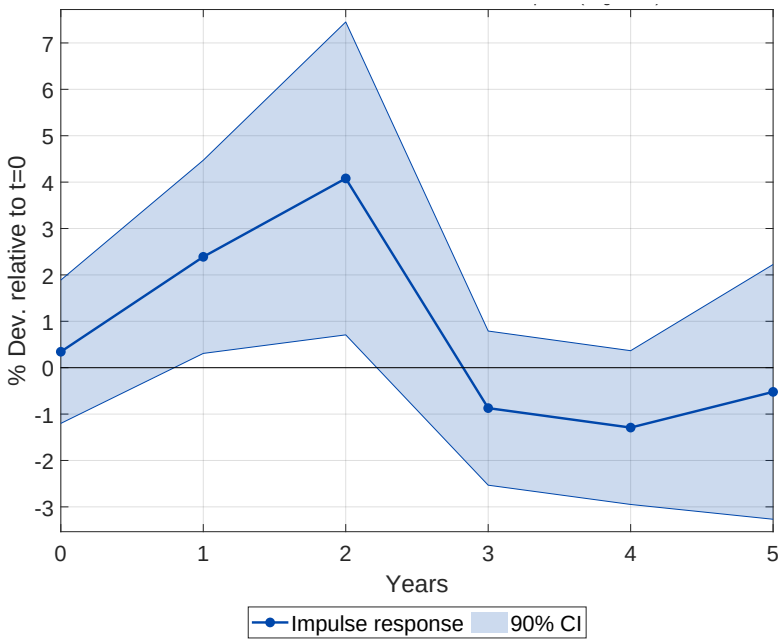

Figure B.1: The Effect of Land Enclosures on Bankruptcies

Note: This figure reports in the solid lines values of β_h from estimating Equation (22) using the average area of a waste enclosure approved in county i at time t. Shaded areas indicate 90% confidence intervals where inference is based on doubly clustered standard errors at the county and year levels. Estimates are expressed in percentage changes in the number of expected bankruptcies due to an enclosure of 1k acres.

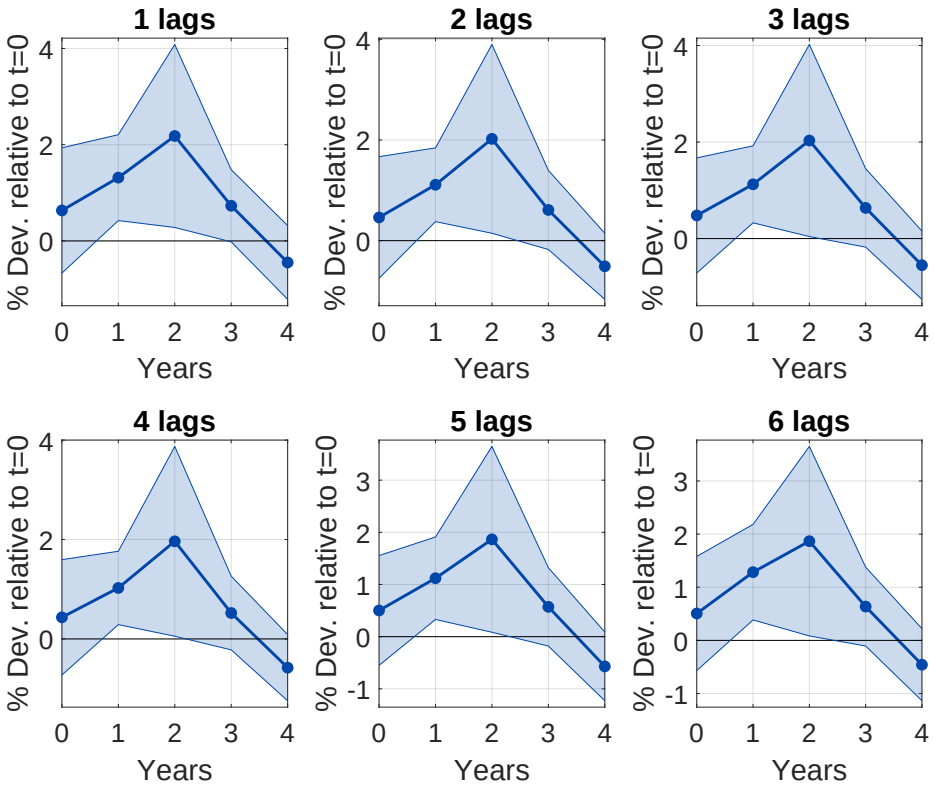

Figure B.2: Impulse Response of the Effect of Waste Enclosures on Bankruptcies 1750 - 1830: Robustness to Lag Order Selection.

Note: The figure displays impulse response estimates of bankruptcies to land enclosure shocks, with confidence intervals at the 90% level. Each panel corresponds to values of β_h from estimating Equation (22) using data from 1750 - 1830 with a different number of lagged control $l = 1,\ldots,6$. The responses are scaled as percentage deviations from the pre-enclosure level.

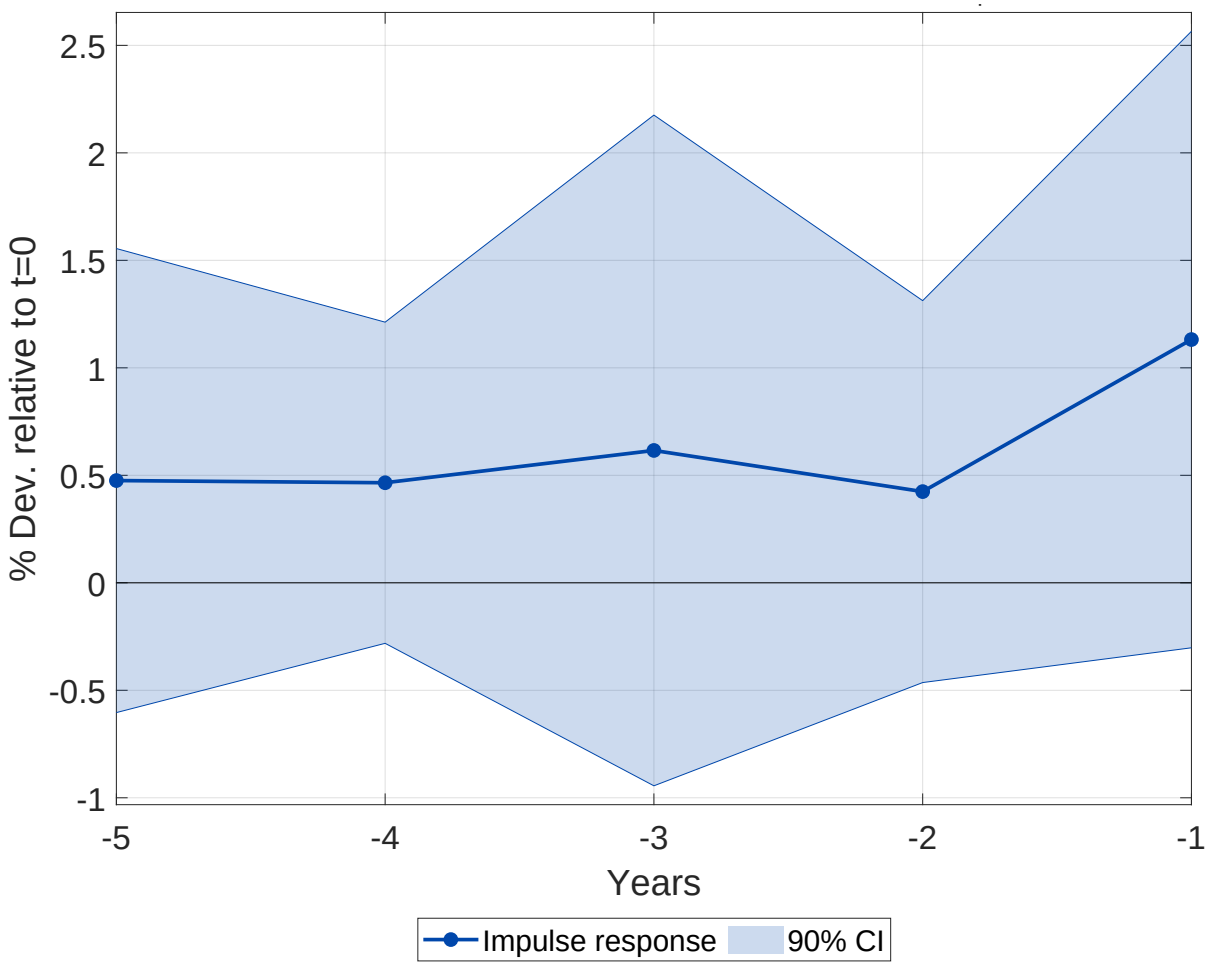

Figure B.3: The Effect of Waste Enclosures on Bankruptcies: Pretrend Test

Note: This figure reports in the solid lines values of $\beta_h^{pretrend}$ from estimating Equation (22) using the total area of waste enclosures granted in county i at time t. Shaded areas indicate 90% confidence intervals where inference is based on doubly clustered standard errors at the county and year levels. Estimates are expressed in percentage changes in the number of expected bankruptcies due to an enclosure of 1k acres.

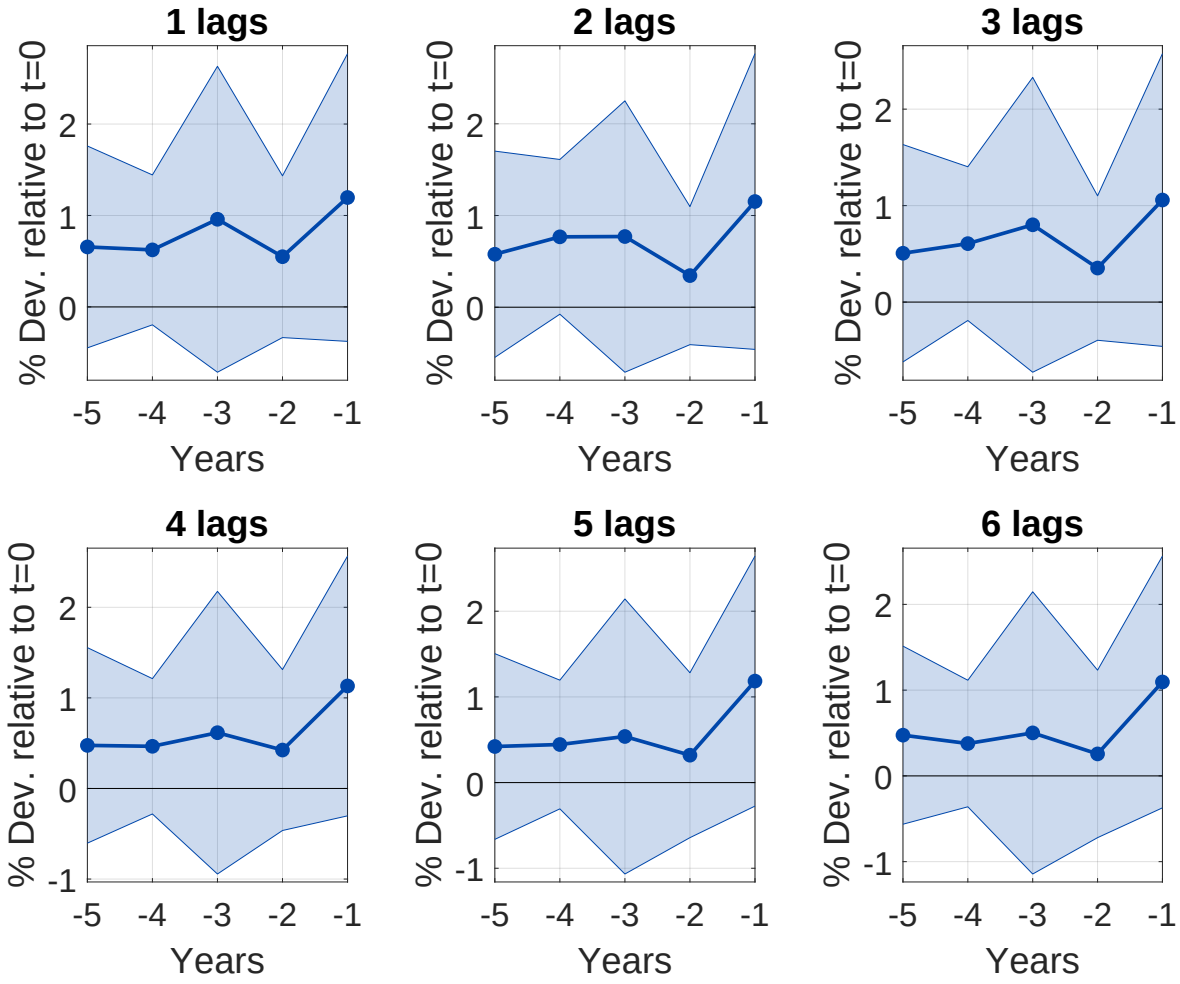

Figure B.4: The Effect of Waste Enclosures on Bankruptcies: Pretrend Test: Robustness to Lag Order Selection.

Note: The figure displays impulse response estimates of bankruptcies to land enclosure shocks, with confidence intervals at the 90% level. Each panel corresponds to values of β_h from estimating Equation (22) using data from 1793 - 1830, with a different number of lagged control $l = 1,\ldots,6$. The responses are scaled as percentage deviations from the pre-enclosure level.

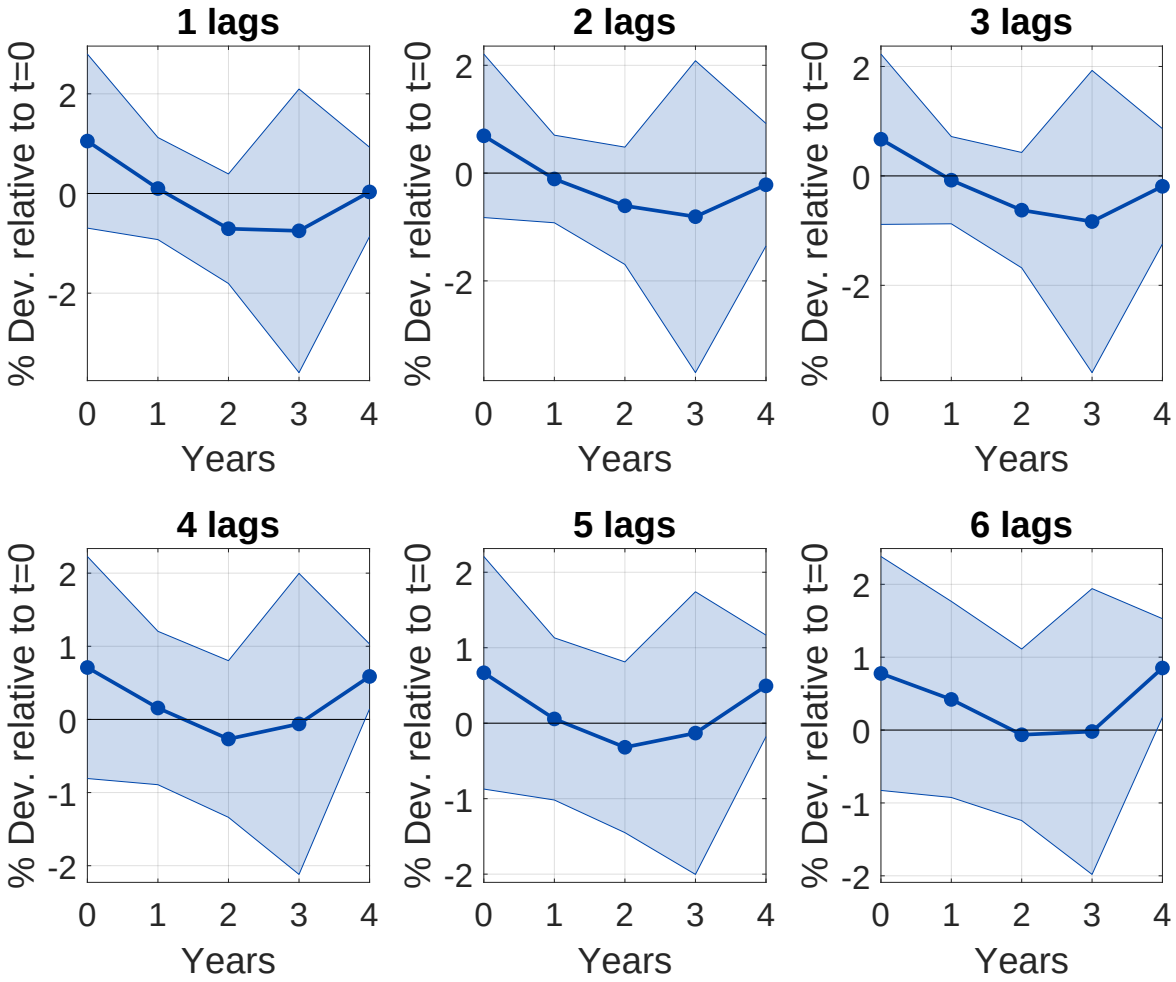

Figure B.5: Impulse Response of the Effect of Waste Enclosures on Bankruptcies 1750 - 1792: Robustness to Lag Order Selection.

Note: The figure displays impulse response estimates of bankruptcies to land enclosure shocks, with confidence intervals at the 90% level. Each panel corresponds to values of β_h from estimating Equation (22) using data from 1750 - 1792, with a different number of lagged control $l = 1, \ldots, 6$. The responses are scaled as percentage deviations from the pre-enclosure level.

B.3 Robustness Checks for Section 4.3

Lag Order Selection and Sample Splitting Figures B.5 and B.6 demonstrate that the sample splitting exercise reported in Figure 4 is also unaffected by our choice of lag order in Equation (22).

Cutoff Selection for Figures 5 and 7 The specification in Equation (23) requires specifying an exposure cutoff value expressed in percentile terms. The groups are defined such that low exposure denotes values below the $50 - p_x$ percentile and high exposure denote values above the $50 + p_x$ percentile of the exposure measure. Our baseline uses $p_x = 25$. We conduct robustness checks to all results hinging on this specification to see that they are not sensitive to this cutoff choice. We maintain symmetry in our robustness checks and re-estimate Equation (23) using $50 - p_x$ as the 15^{th},20^{th},25^{th},30^{th},35^{th}, and 40^{th} percentiles of

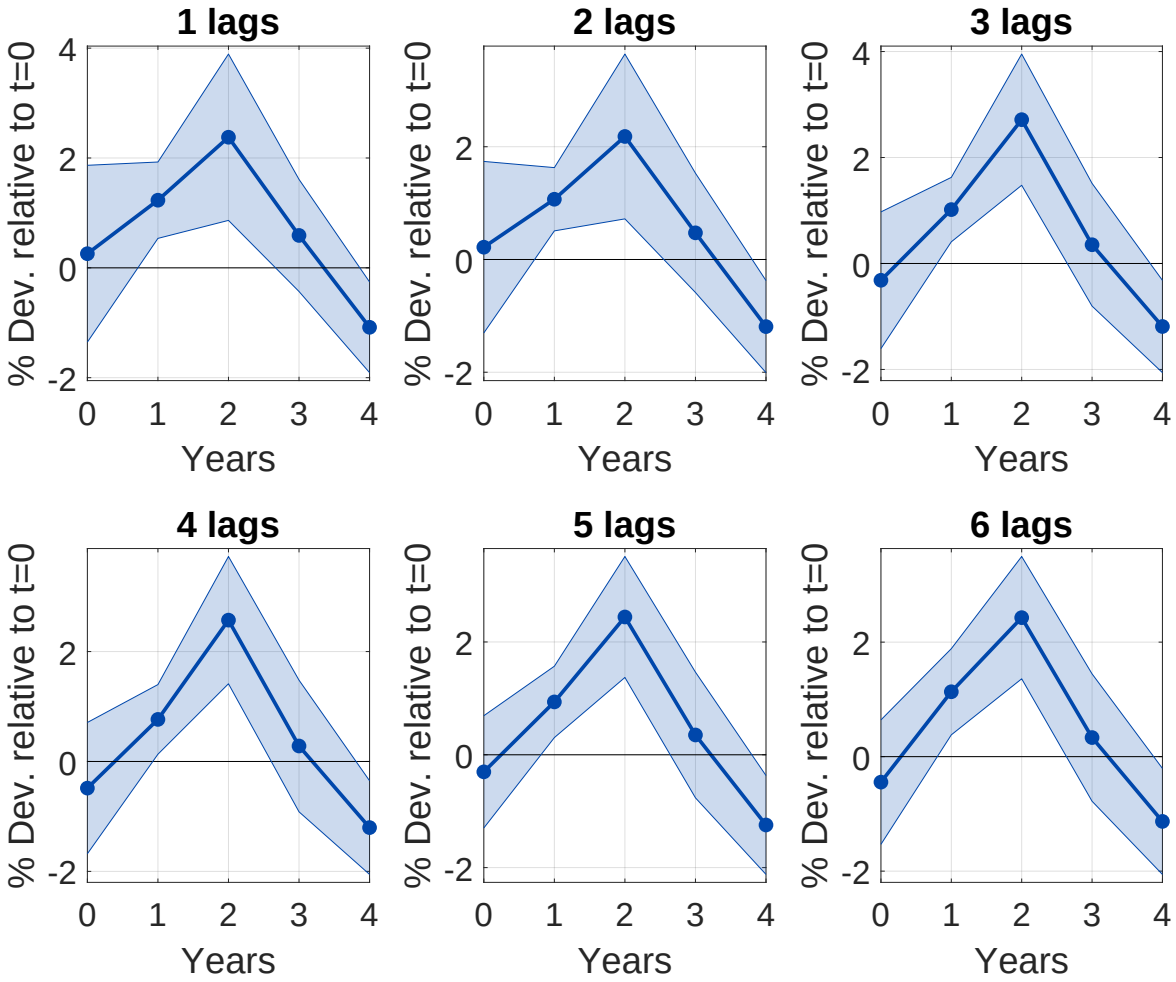

Figure B.6: Impulse Response of the Effect of Waste Enclosures on Bankruptcies 1793 - 1830: Robustness to Lag Order Selection.

Note: The figure displays impulse response estimates of bankruptcies to land enclosure shocks, with confidence intervals at the 90% level. Each panel corresponds to values of β_h from estimating Equation (22) using data from 1793 - 1830, with a different number of lagged control $l = 1, \ldots, 6$. The responses are scaled as percentage deviations from the pre-enclosure level.

the exposure measure. Figures B.7 and B.8 demonstrate that the result in Figure 5 is robust to our cutoff choice. The effect of waste enclosure on bankruptcies is stronger in counties and years that are most exposed to the secondary sector and the least exposed to agriculture. Figure B.9 demonstrates that as in Figure 7 of the main text, high exposure to the weather shock amplifies the effect of waste enclosures on bankruptcies.

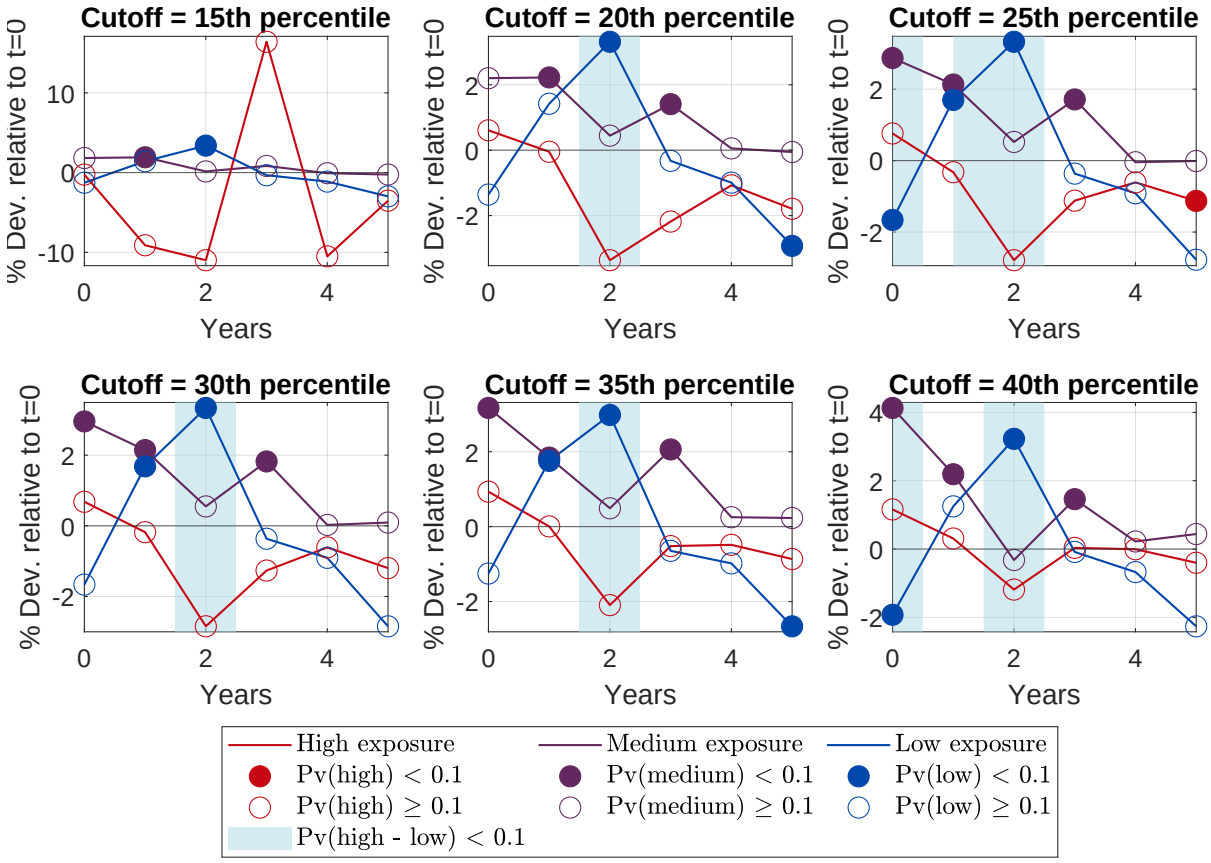

Figure B.7: Agricultural Intensity and the Effect of Waste Enclosures: Robustness to Cutoff Choice

Note: This figure reports impulse responses estimated via Equation (23) using the total area of waste area enclosures in the solid lines, and defining exposure dummies using the share of workers in a county-year observation engaged in agriculture. Each panel reports the results from estimating Equation (23) using the cutoff level indicated in the title for the low exposure and high exposure group. Full points indicate that the point estimate is statistically significant at a 90% confidence level. Shaded area indicates that the difference between the high and low exposure interaction coefficients is statistically significant at a 90% confidence level where inference is based on doubly clustered standard errors at the county and year levels. Estimates are expressed in percentage changes in the number of expected bankruptcies due to a new land enclosure of 1k acres.

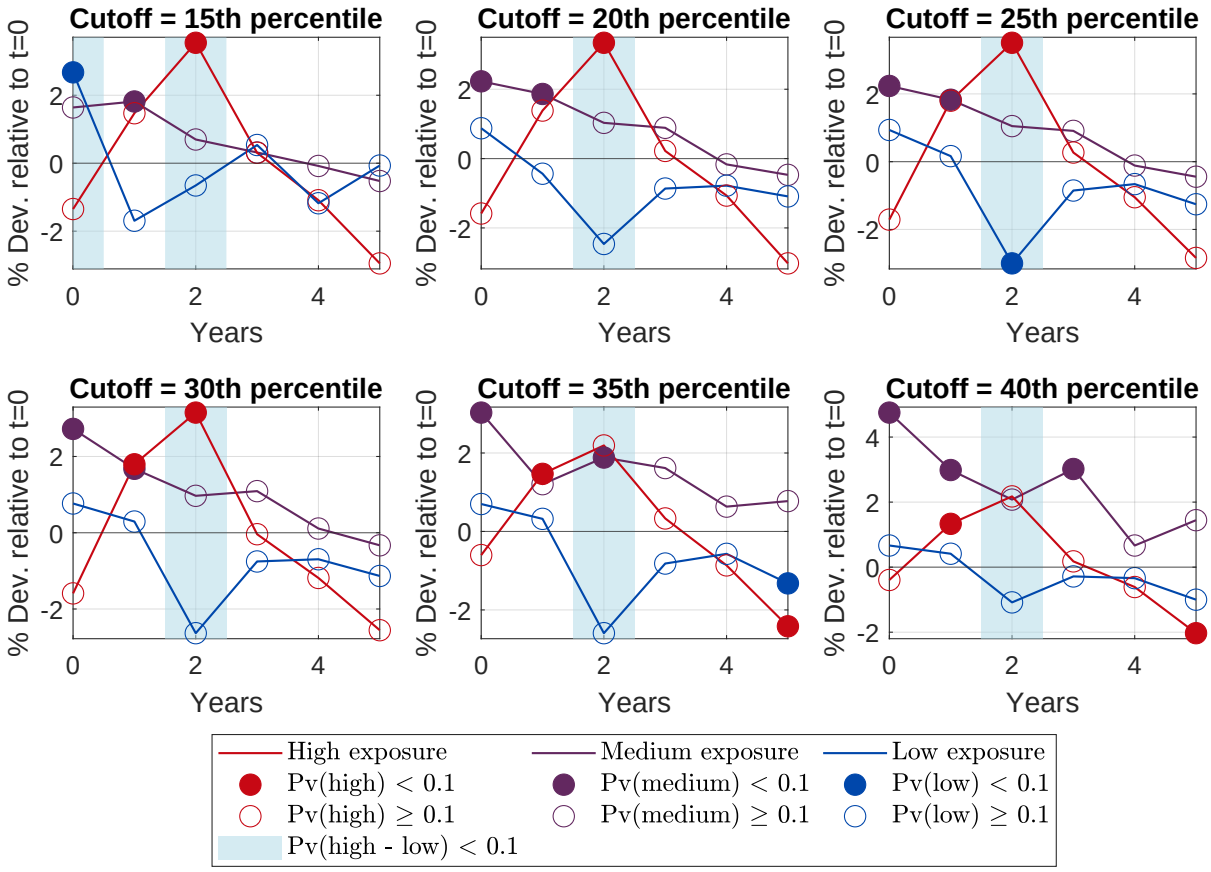

Figure B.8: Secondary Sector Intensity and the Effect of Waste Enclosures: Robustness to Cutoff Choice

Note: This figure reports impulse responses estimated via Equation (23) using the total area of waste area enclosures in the solid lines, and defining exposure dummies using the share of workers in a county-year observation engaged in the secondary sector. Each panel reports the results from estimating Equation (23) using the cutoff level indicated in the title for the low exposure and high exposure group. Full points indicate that the point estimate is statistically significant at a 90% confidence level. Shaded area indicates that the difference between the high and low exposure interaction coefficients is statistically significant at a 90% confidence level where inference is based on doubly clustered standard errors at the county and year levels. Estimates are expressed in percentage changes in the number of expected bankruptcies due to a new land enclosure of 1k acres.

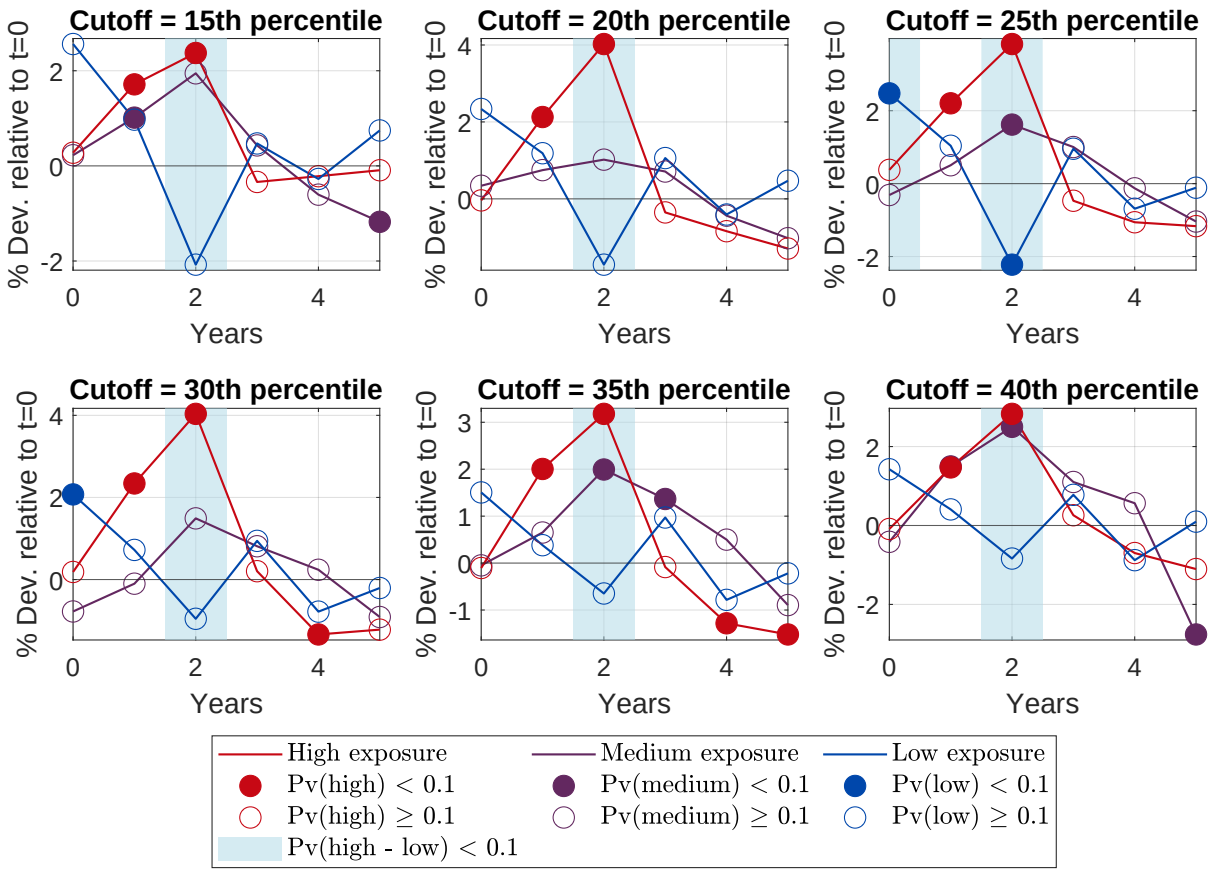

Figure B.9: Exposure to Weather Shocks and the Effect of Waste Enclosures:

Note: This figure reports impulse responses estimated via Equation (23) using the total area of waste area enclosures in the solid lines. Each panel reports the results from estimating Equation (23) using the cutoff level indicated in the title for the low exposure and high exposure group in terms of exposure to our weather shock variable. The shock is constructed such that high exposure indicates that weather conditions were particularly unfavorable. Full points indicate that the point estimate is statistically significant at a 90% confidence level. Shaded area indicates that the difference between the high and low exposure interaction coefficients is statistically significant at a 90% confidence level where inference is based on doubly clustered standard errors at the county and year levels. Estimates are expressed in percentage changes in the number of expected bankruptcies due to a new land enclosure of 1k acres.