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

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Abstract

Land titling is expected to expand credit by making land pledgeable, but isolating this collateral channel empirically is difficult. We utilize English enclosures from 1750–1830 as a laboratory: privatization of "common waste" created newly mortgageable land, in contrast with "open-field" enclosures which largely reorganized already titled arable land. A stylized model with endogenous default predicts that an influx of newly pledgeable waste land lowers equilibrium collateral requirements, generating a local credit expansion but an increase in bankruptcies. Using a newly digitized universe of personal bankruptcies from the London Gazette, we find that the enclosure of common waste led to higher bankruptcies, particularly in industrial areas and during downturns. Bankruptcies are concentrated among industrial occupations with tight cash-flow cycles. In contrast, enclosures of open-field reduce bankruptcies. The results clarify a key collateral channel through which property reforms can deepen credit while increasing defaults.

Keywords: Land Privatization, Enclosures, Collateral Constraints, Financial Development, Bankruptcy, Industrial Revolution.

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

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1 Introduction

Land privatization, or *titling*, is widely regarded as a cornerstone of development policy. The hope is that by assigning secure and transferable property rights, titling will improve allocational efficiency, strengthen incentives to invest, and ultimately raise productivity and income. A central mechanism emphasized in both theory and policy discussions is financial: titled land can be pledged as collateral, potentially expanding access to credit and relaxing borrowing constraints.[1]

But despite its prominence, this collateral-based channel remains relatively less well understood empirically due to numerous identification challenges. For instance, formal titles may not fully eliminate expropriation risk, weakening the link between legal ownership and collateral value. Titling reforms also frequently coincide with changes in agricultural technology or land use, making it difficult to disentangle financial effects from productivity or agglomeration forces. Moreover, beneficiaries are often households with limited access to formal finance, which can prevent newly titled land from translating into meaningful changes in borrowing behavior.

This paper studies the financial effects of land titling in a setting that largely avoids these confounding factors. We first show that the land reforms in England between 1750 and 1830 provide an ideal laboratory to disentangle the collateral channel of land reform from other channels. A unique feature of this setting is that land enclosures during this time were of two distinct types: *open-field* enclosures, which primarily reorganized existing rights and facilitated more efficient cultivation; and *waste enclosure*, which constituted a genuine privatization event where land that had previously been ineligible as collateral became mortgageable for the first time. A simple endogenous default model shows how such an influx of collateral can lead to an equilibrium easing of credit conditions, resulting in higher credit volume and a rise in defaults. To evaluate these predictions empirically, we next utilize a newly digitized dataset of the universe of personal bankruptcies published in the *London Gazette*. Our headline result shows that, consistent with the model predictions, the enclosure of 1,000 acres of waste raises bankruptcies by about 1 percent in the first year and 2 percent in the second year, peaking at a total increase of 4.1 percent three years after enclosure.

Our analysis starts with a review of the critical institutional features of England during 1750-1830, which allows us to study the financial channels of land reform. During this period, property rights were already secure (Clark, 1996), agricultural land was titled, and credit markets (though fragmented) were active. Enclosure beneficiaries were typically established landholders rather than marginal households, and formal lending relied heavily on collateral. At the same time, England maintained binding statutory usury

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

ceilings, preventing lenders from pricing risk through interest rates and instead inducing competition through collateral requirements. The key institutional feature that makes this setting especially informative is the structure of landholding prior to enclosure. Before enclosure, most manors operated under an open-field system in which arable land was divided into narrow strips cultivated under communal rotation rules. In addition, some landowners held customary, non-exclusive rights over extensive areas of common waste, including moors, heaths, marshes, and rough pasture. These waste lands provided valuable resources for grazing, fuel gathering, and materials extraction, yet they could not be excluded, sold independently, or pledged as collateral. While arable strips were owned and transferable, common waste lay outside the collateralizable asset base.

Enclosure transformed this institutional landscape. Through private agreements or Acts of Parliament, enclosure consolidated scattered arable strips into compact holdings and, crucially, subdivided common waste into individually bounded and alienable parcels.[2] These two components of enclosure had distinct economic implications. Enclosure of arable open fields primarily reorganized existing rights and facilitated more efficient cultivation via economies of scale and agglomeration (McCloskey, 1989). In contrast, the enclosure of waste constituted a genuine privatization event: land that had previously been ineligible as collateral became mortgageable for the first time. Because open-field enclosure and waste enclosure occurred within the same legal, financial, and macroeconomic environment, they permit a direct comparison between reforms that plausibly operate through productivity channels and reforms that primarily expand the stock of pledgeable assets. Thus, waste enclosure is particularly well-suited for isolating the financial mechanism of titling.

Next, to better study the mechanisms underlying the financial effects of land titling, we develop a stylized dynamic model with endogenous default that incorporates the key historical and institutional features of the period. Heterogeneous entrepreneurs finance production subject to a cash-in-advance constraint, and borrowing requires intermediation. Because interest rates are fixed at a binding usury ceiling, financial intermediaries compete over lending volumes by setting collateral requirements that are proportional to loan size. Commitment is limited, and default entails forfeiture of posted collateral to the intermediary. Posting collateral is itself costly for entrepreneurs, and intermediaries cannot condition contracts on borrower characteristics. As a result, collateral requirements are not sufficient to fully eliminate default: in equilibrium, some entrepreneurs borrow and repay, while others borrow and endogenously default.

Within this environment, an expansion in collateralizable land reduces collateral posting costs for a subset of firms, increasing their borrowing and repayment. The resulting rise in aggregate repayments puts downward pressure on equilibrium collateral require-

[2]Between 1750 and 1830, approximately 5.9 million acres (about 18 percent of England's land area) were enclosed, largely through Parliamentary Acts; see Turner (1984).

ments. This general-equilibrium decline in required collateral eases borrowing conditions economy-wide, expands credit, and increases default incentives for marginal borrowers. The model therefore predicts that land titling can generate a credit expansion accompanied by a rise in defaults in equilibrium.

We evaluate these predictions using a newly digitized universe of personal bankruptcies published in the *London Gazette*. Because publication was mandatory under the 1705 Bankruptcy Act, the data capture the complete set of bankruptcy events, constituting around 51,000 cases between 1750 and 1830. We merge these records with the full set of 1,600 Parliamentary enclosure acts that awarded title to common waste during the same period. Using a Poisson local projections (Jorda, 2005) model, 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. Because of lengthy and unpredictable administrative procedures, the acceptance or rejection of petitions by Parliament and the timing of an enclosure award were effectively independent of local credit conditions. Our headline result shows that the enclosure of 1,000 acres of waste raises bankruptcies by about 1 percent in the first year and 2 percent in the second year, peaking at a total increase of 4.1 percent three years after enclosure. Consistent with the model, the effect of enclosure is more pronounced during periods of heightened geopolitical risk and in highly industrialized counties, where financial needs and project risks were greater.

Another prediction of the model is that bankruptcies should be more responsive to enclosures during downturns when productivity is lower. To examine this, we exploit regional weather variation captured by the width of tree rings in England during the sample period, where narrower rings indicate less favorable growing conditions and lower agricultural yields. Interacting this measure with land enclosures, we find that the financial effects are amplified during economic downturns. When waste enclosures occur under adverse conditions, the associated rise in bankruptcies is substantially larger.

We also study the reaction of bankruptcies to open-field enclosures. Because open-field enclosures reorganized arable land but did not create new collateral, our model implies that, to the extent these reforms improved cultivation efficiency, bankruptcies should fall. Consistent with this logic, when we repeat the analysis using open-field enclosures, we find a decline in bankruptcies.

An additional contribution of the paper is to document which groups account for the increase in defaults. Using detailed occupational information from bankruptcy notices, we show that the post-enclosure increase is driven by industrial workers and artisans with tight cash-flow cycles and high working-capital needs. In contrast, agricultural occupations and textile workers exhibit little systematic response. This pattern is not consistent with explanations based solely on declining agricultural livelihoods or adverse real shocks.

Our study offers valuable insights into several strands of existing literature. From

a historical perspective, we make a novel contribution by foregrounding the financial dimension of land enclosures; this aspect 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.

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 allows us to isolate the 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 reforms occurred among a relatively wealthier population.

Finally, our work is also related to a rich tradition in the macroeconomic literature considering the role of factor misallocation such as 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). 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.

2 Institutional Details: England 1750-1830

This section documents the institutional and economic background for our analysis. A central theme is that England's fragmented financial system relied heavily on the use of collateral in the operation of credit markets during this time; land, in particular, served as high-quality collateral. This was due to regulations, such as binding usury ceilings, and the laws surrounding bankruptcy proceedings, which favored mortgageable real prop-

erty. Parliamentary enclosure of waste land with common-use rights interacted with this environment by creating newly privatized, individually titled, and collateralizable assets.

2.1 England's Financial Landscape

England's financial markets during 1750-1830 were deeply segmented and institutionally distorted. Although the "Glorious Revolution" of 1688 improved the state's ability to borrow (Dickson, 1967; North and Weingast, 1989), private credit markets remained thin, localized, and weakly integrated. The banking system was concentrated in London and dominated by the Bank of England, while much of the country relied on small banks and informal lenders operating with limited capital and fragile access to liquidity (Pressnell, 1956; Calomiris and Haber, 2015; Temin and Voth, 2013; Hodgson, 2021; Turner, 2014). Typical bank capital was around £10,000, and only a few institutions reached balance sheets near £500,000 (Pressnell, 1956; Gent, 2016). Outside London, "country banks" proliferated to fill local credit gaps, expanding from fewer than a dozen in the 1750s to over 700 by 1810 (Pressnell, 1956, p. 127), yet remained undercapitalized, dependent on London agents, and highly exposed to liquidity shocks.

These structural weaknesses were reinforced by legal privileges granted to the Bank of England in 1697, 1707, and 1708, which restricted joint-stock banking and concentrated note issuance in London, limiting banks' ability to scale or diversify geographically. At the same time, the usury ceiling capped interest rates on private loans while exempting government borrowing, diverting savings into public debt, and preventing lenders from pricing risk, which made long-term or high-risk lending unattractive (Calomiris and Haber, 2015, p. 96).

Credit could be assembled from multiple sources (local bankers, London agents, merchants, and wholesalers), but access depended heavily on reputation, networks, and collateral, giving well-connected merchants and landowners far greater financial resilience, mainly during periods of stress, than wage earners or small proprietors who faced sharply limited options (Hoppit, 1987; Casson, 1993; Wilson, 1995; Chapman, 1979).

As a result, private credit was used primarily as short-term working capital. Many businesses operated on thin margins and required credit to purchase inputs before receiving payment for finished goods. Even solvent firms could collapse quickly (Hoppit, 1987), and failures in manufacturing often reflected liquidity shortages rather than asset insufficiency (Hudson, 1986, p. 203). Lenders, therefore, focused on short maturities and demanded strong collateral (Joslin, 1954; Hodgson, 2021; Turner, 1981).[3] Borrowers able to pledge land or other durable assets could often refinance or roll over debts, whereas those without mortgageable property faced sharply constrained access to substan-

[3]The difficulties faced by the Boulton and Watt enterprise provide one example: despite the founders' reputation, the firm experienced persistent liquidity shortages and struggled to secure sufficient long-term finance for steam-engine development (Roll, 1968, p. 79).

tial credit. This asymmetry was reinforced by the legal regime, which granted priority to mortgagees and excluded mortgaged land from the bankruptcy estate (Hoppit, 1987, pp. 49, 59).[4]

The legal treatment of assets under English bankruptcy law played a central role in shaping these outcomes. Mortgagees on real property enjoyed priority over most other creditors, and mortgaged land typically lay outside the bankruptcy estate, so that only the debtor's equity of redemption vested in the assignees (Hoppit, 1987, pp. 49, 59). By contrast, movable assets, such as tools, machinery, inventories, and stock, were fully seizable and formed the core of the bankruptcy estate. This distinction made land uniquely valuable as collateral, both by protecting lenders' claims and by allowing indebted borrowers to retain operational control in times of financial distress.

The contrast between Samuel Oldknow and Henry Cort illustrates how this legal hierarchy shaped survival prospects during periods of credit strain. Oldknow, a leading cotton manufacturer of the 1780s and 1790s, financed his expansion by repeatedly mortgaging estates in Stockport and Mellor. As liquidity tightened in the mid-1790s, his debts became unsustainable. However, because his obligations were secured on land, his financiers were able to assume effective control while leaving Oldknow in place as resident manager. Cort, by contrast, was an ironmaster and former navy agent who relied on insider finance tied to his role as a Navy contractor, drawing on advances from the Navy Pay Office rather than on land-backed mortgages. After the death of his principal financier in 1789, the Crown asserted priority over misapplied public funds; Cort's works were seized, and he was declared bankrupt. His plant and patents proved weak security relative to landed collateral in the financial environment of the period (Ashton, 1924; Hunt, 1890).

2.2 Bankruptcy Law

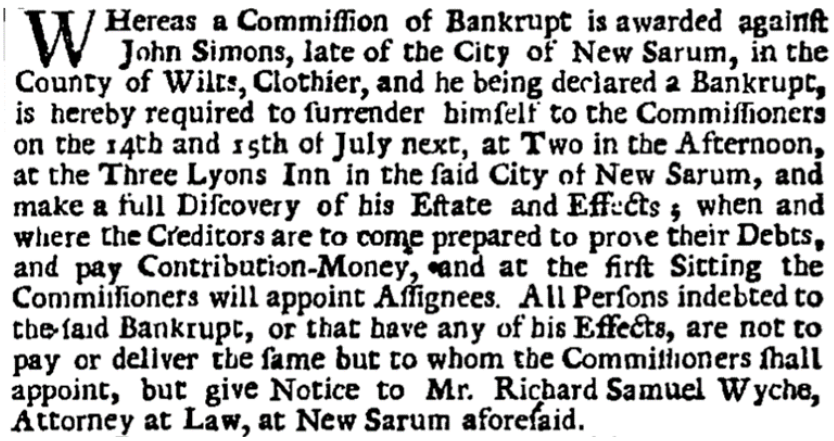
When borrowers were unable to avoid formal default, English bankruptcy law applied and could entail severe legal and personal consequences. During the period under study, bankruptcy procedure was governed primarily by the Bankruptcy Act of 1705 (4 Anne c. 17), which standardized proceedings and required public announcement in the *London Gazette*. The Act established a collective process for creditor coordination but offered limited protection to debtors, placing primary emphasis on the recovery and distribution of assets.[5]

[4]Both Hodgson (2021) and Joslin (1954, p. 170) document the growing centrality of mortgages in eighteenth-century lending. Drawing on archival ledgers, Gent (2016) and Temin and Voth (2013) show that London goldsmith banks relied extensively on collateralized lending secured by mortgages on landed estates: at Hoare's Bank, "money lent on mortgage, bond, etc" formed the bulk of longer-term lending between 1778 and 1797 (p. 101), while at Goslings Bank roughly half of total assets in 1796 were mortgage-secured (p. 106). Turner (1981, pp. 243-244) finds that large landowners consistently used mortgages as "a secure method of raising a loan."

[5]The first Bankruptcy Act of 1542 (34 & 35 Hen. 8 c. 4) created procedures for the collective seizure and liquidation of a bankrupt's estate. The 1571 Act (13 Eliz. I c. 7) restricted eligibility to merchants and "other persons using or exercising the trade of merchandise," which was broad enough to encompass

Bankruptcy proceedings were initiated by a creditor's petition to the Lord Chancellor, who appointed Commissioners to verify statutory eligibility. Upon approval, a Commission of Bankruptcy was issued and publicly announced. Once declared bankrupt, the debtor's estate vested in assignees, who were responsible for collecting assets, examining claims, and distributing dividends among creditors.[6]

Figure 1 provides an example of a bankruptcy notice published in the *Gazette*.



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: Bankruptcy Notice in the *London Gazette*

Notes: John Simons, a clothier from the City of New Sarum (Wiltshire), was declared bankrupt on 6 June 1732. The notice specifies the time and place of his appearance before the commissioners and the meetings for creditors to prove their debts. Source: *The Gazette* (London Gazette), 6 June 1732, Issue 7098, p. 2.

Under the 1705 Act, bankruptcy also carried severe personal and social consequences. Although compliant bankrupts could, in principle, obtain a discharge, discharge was conditional on full cooperation, the surrender of all eligible assets, and creditor consent. Debtors who failed to meet these conditions remained liable to imprisonment for debt under parallel legal regimes governing insolvent debtors. Bankruptcy thus did not provide automatic protection from imprisonment, nor did it shield the bankrupt from reputational damage, exclusion from credit networks, or effective removal from commercial life. Formal insolvency, therefore, represented a last resort, particularly for borrowers lacking mortgageable assets.

A well-known illustration is the imprisonment of John Dickens (the father of the author Charles Dickens) in 1824 under the Insolvent Debtors Acts (Slater, 2011, pp. 28–34). Despite the existence of bankruptcy procedures following the 1705 Act, Dickens

many traders, shopkeepers, and artisans. The Bankruptcy Act of 1705 (4 Anne c. 17) standardized procedure and required the publication of bankruptcy notices in the *London Gazette*. This institutional framework remained largely intact until 1831, when the office of bankruptcy commissioner was abolished, and estate administration was transferred to the courts.

[6]Bankruptcies often involved substantial creditor coordination: 549 cases from 1710-1714 list 8,424 individual creditors, or about 16 per case, with more than 100 cases involving over 20 creditors (Carlos et al., 2019, Table 2).

lacked sufficient assets to satisfy creditors or negotiate refinancing and was confined in the Marshalsea debtors' prison.

2.3 The Enclosure of Waste

Parliamentary enclosure was a statutory process that transformed customary and communal usage rights into standardized and alienable parcels. Between 1750 and 1830, roughly 5.9 million acres (about 18% of England's land area) were enclosed, with Parliamentary acts dominating the process (Turner, 1980, pp. 66, 81). Given the strong enforcement of land rights in England by this period (Clark, 1996), enclosure did not primarily affect security of tenure. Instead, the main economic significance of enclosures lay in changing the legal status and pledgeability of land, particularly waste previously held under common-use rights (Pressnell, 1956; Habakkuk, 1965; Hodgson, 2017; Bogart and Richardson, 2009).

Before enclosure, most manors operated under an open-field system. As illustrated in the plan of a typical medieval manor in Figure 2, large arable fields were divided into narrow strips cultivated in rotation and governed by communal rules. In addition to dispersed strips, some landowners exercised customary but non-exclusive rights over common land, including "waste" land (moorlands, heaths, marshes, and rough pasture) used for grazing, gathering fuel, cutting turf, or extracting clay, gravel, or stone (Mingay, 1997). These lands could not be excluded, sold independently, or pledged as collateral.

The economic implications of enclosure differed markedly across land categories. Open-field enclosure mainly reorganized existing holdings by consolidating dispersed strips and rationalizing crop rotations (McCloskey, 1989; Heldring et al., 2022). By contrast, the enclosure of waste constituted a genuine act of privatization. Land previously governed by common use-rights was converted into legally defined, exclusive parcels that could be freely transferred and used as collateral.

The implementation of enclosure followed a formal parliamentary procedure. Large proprietors typically initiated the process by coordinating local agreement and petitioning Parliament. Even after a private bill was introduced, survey disputes, procedural frictions, and legislative backlogs could delay final awards for many years.[7] Once a bill succeeded, Parliament appointed commissioners who valued lands and common-right usages, laid out roads and drains, resolved disputes, and drafted the final award, which vested title to newly defined parcels and extinguished prior common rights (Turner, 1980; Tate and Turner, 1978).

Harome, a township in the North Riding of Yorkshire, provides a clear illustration.

[7] Many petitions never reached this stage: approximately 14% of private bills presented to Parliament between 1715 and 1774 were rejected (Neeson, 1993, p. 275). For others, the appearance of the bill in Parliament "was not the start, but a stage marking the end of a preliminary period of negotiations between the parties involved" (Mingay, 1997, p. 20).

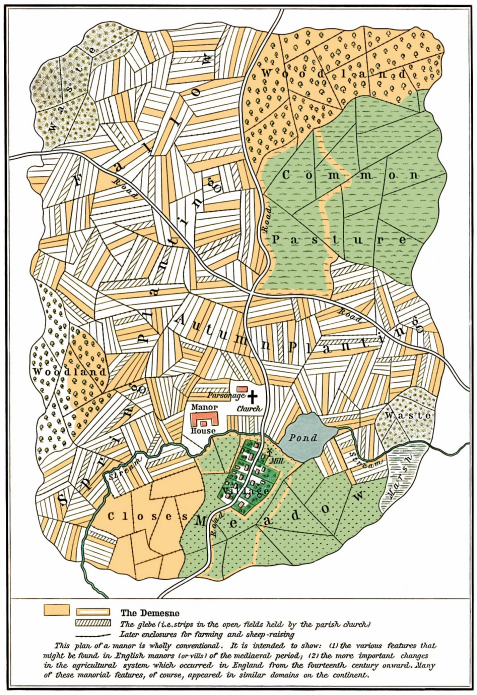


Figure 2: Typical Features of an English Medieval Manor

Notes: Generic plan of a medieval manor illustrating various features, such as the manor house, church, common pasture, woodland and waste, open fields (autumn, spring, meadow), woodland, a mill, and a pond. The mustard-colored plots are part of the lord's own land, the demesne. Source: Sheperd, William R., Historical Atlas. New York: Henry Holt and Company, 1911.

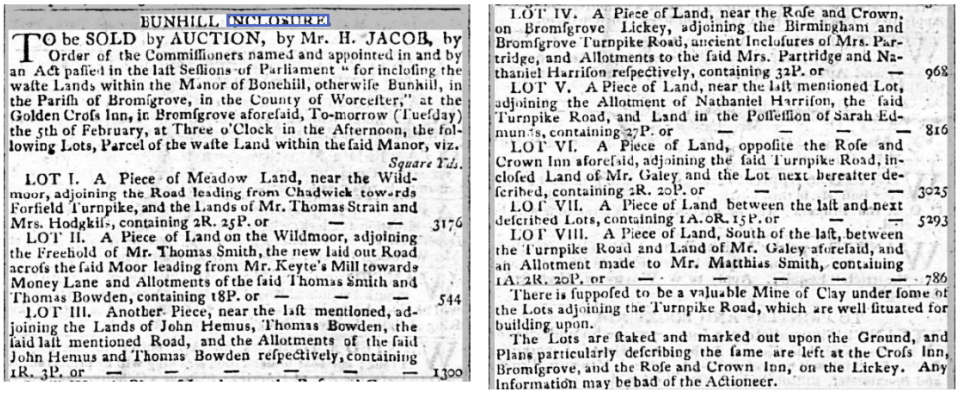
The 1782 estate plan (Figure 3, left) shows scattered strips across four open fields, while Riccal Moor remained wholly unenclosed. The Parliamentary enclosure of 1806 divided Riccal Moor into bounded allotments with straight, regular boundaries (Figure 3, right). These allotments were legally vested, transferable, and eligible for mortgage, transforming previously inalienable common land into standardized property (Falkingham, 2022).

Enclosed waste often retained substantial value through grazing rights, fuel extraction, material deposits, or conversion into arable land following drainage investments. Crucially, once allotted, such land entered formal land markets. The commercial treatment of enclosed waste is evident in contemporary newspaper advertisements. Figure 4 reproduces a February 1811 notice published in the *Aris's Birmingham Gazette* announcing the auction of several parcels newly created under a recent Enclosure Act. The notice emphasizes their asset characteristics, including the presence of a "valuable mine of clay" and their suitability for building, illustrating how formerly inalienable common land quickly became transferable and market-priced property.

The financial consequences followed quickly. Enclosure awards frequently authorized borrowing against allotments, and landowners commonly mortgaged both expected and newly vested parcels to finance surveys, fencing, drainage, and commissioners' fees (Min-

Figure 3: Enclosure of Waste Land

Notes: Left (1782): Harome's four open fields (Hall Garth, Green Syke, Owman, and Heads) appear as long, narrow strips typical of the open-field system. The area circled in red marks Riccal Moor (Harome Common), an unenclosed tract of waste used for grazing and fuel gathering. Right (1830): The same area after Parliamentary enclosure. Riccal Moor has been divided into individually bounded allotments with straight, regular boundaries. New roads and drainage lines reflect the planned layout of enclosure, and several new outlying farmsteads have been established. Source: Falkingham (2022).



BUNHILL INCLOSURE.

TO be SOLD by AUCTION, by Mr. H. JACOB, by Order of the Commiſſioners named and appointed in and by an Act paſſed in the laſt Seſſions of Parliament "for incloſing the waſte Lands within the Manor of Bonehill, otherwiſe Bunhill, in the Pariſh of Bromſgrove, in the County of Worceſter," at the Golden Croſs Inn, in Bromſgrove aforeſaid, To-morrow (Tueſday) the 5th of February, at Three o'Clock in the Afternoon, the following Lots, Parcel of the waſte Land within the ſaid Manor, viz.

Square Yds.

LOT I. A Piece of Meadow Land, near the Wildmoor, adjoining the Road leading from Chadwick towards Forfield Turnpike, and the Lands of Mr. Thomas Strain and Mrs. Hodgkiſs, containing 2R. 25P. or — — — 3176

LOT II. A Piece of Land on the Wildmoor, adjoining the Freehold of Mr. Thomas Smith, the new laid out Road acroſs the ſaid Moor leading from Mr. Keyte's Mill towards Money Lane and Allotments of the ſaid Thomas Smith and Thomas Bowden, containing 18P. or — — — — 544

LOT III. Another Piece, near the laſt mentioned, adjoining the Lands of John Hemus, Thomas Bowden, the ſaid laſt mentioned Road, and the Allotments of the ſaid John Hemus and Thomas Bowden reſpectively, containing 1R. 3P. or — — — — — — 1300

LOT IV. A Piece of Land, near the Roſe and Crown, on Bromſgrove Lickey, adjoining the Birmingham and Bromſgrove Turnpike Road, ancient Incloſures of Mrs. Partridge, and Allotments to the ſaid Mrs. Partridge and Nathaniel Harriſon reſpectively, containing 32P. or — 968

LOT V. A Piece of Land, near the laſt mentioned Lot, adjoining the Allotment of Nathaniel Harriſon, the ſaid Turnpike Road, and Land in the Poſſeſſion of Sarah Edmunds, containing 27P. or — — — — — 816

LOT VI. A Piece of Land, oppoſite the Roſe and Crown Inn aforeſaid, adjoining the ſaid Turnpike Road, incloſed Land of Mr. Galey and the Lot next hereafter deſcribed, containing 2R. 20P. or — — — 3025

LOT VII. A Piece of Land between the laſt and next deſcribed Lots, containing 1A. 0R. 15P. or — — 5293

LOT VIII. A Piece of Land, South of the laſt, between the Turnpike Road and Land of Mr. Galey aforeſaid, and an Allotment made to Mr. Matthias Smith, containing 1A. 2R. 20P. or — — — — — — 786

There is ſuppoſed to be a valuable Mine of Clay under ſome of the Lots adjoining the Turnpike Road, which are well ſituated for building upon.

The Lots are ſtaked and marked out upon the Ground, and Plans particularly deſcribing the ſame are left at the Croſs Inn, Bromſgrove, and the Roſe and Crown Inn, on the Lickey. Any Information may be had of the Actioneer.

Figure 4: Auction Notice for Enclosed Waste Allotments

Notes: Contemporary advertisement for the sale of waste-land allotments created by the Bunhill Enclosure Act. Lots are described with boundaries and uses, including clay deposits, showing how enclosed waste immediately entered the land market. Source: *Aris's Birmingham Gazette*, 4 February 1811.

gay, 1963, pp. 97–98).[8]

[8]Case studies from Lancashire and Somerset document extensive post-award leasing, sales, and mortgaging of waste allotments (Rogers, 1993; Williams, 1972; Buchanan, 1982). Award clauses and deed series often explicitly permitted mortgages of "lands allotted by the Enclosure Award," including waste parcels; see Pressnell (1956, pp. 349–355) and Mingay (1963, pp. 97–98). Surveying, fencing, legal fees,

Country banks appear to have located branches strategically near farming districts undergoing enclosure (Pressnell, 1956, pp. 349–355), consistent with increased demand for land-secured lending. This spatial reallocation of credit suggests that enclosure not only altered property rights but also reshaped local financial activity.

In a financial system in which mortgagees enjoyed legal priority and mortgaged land lay largely outside the bankruptcy estate, converting customary waste into titled property expanded the economy's effective collateral base. Enclosure, therefore, altered not only agricultural organization but also borrowing capacity and the distribution of financial resilience across firms and households.

3 Theoretical Framework

The institutional setting described in Section 2 suggests that 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 a "many-to-many" relationship between lenders and borrowers; and competition for funds is imperfect and fragmented.

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; but 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 high-quality collateralizable assets. Ultimately, the model yields empirically testable predictions that will be evaluated in the next sections of the paper.

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

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

and road-making costs were charged to allottees; smaller right-holders frequently sold or mortgaged their allotments to meet these charges, contributing to post-enclosure concentration of ownership (Turner, 1980, pp. 113–116); Mingay (1997, pp. 98–100).

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.[9] 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 the usury ceiling). 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 a cost $c_{i,t}\gamma(g_{i,t})$ to post collateral. 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 implies significant increases in costs. The cost parameter $c_{i,t}$ captures the fact that these costs differ across firms. Aggregate collateral $g_{i,t}$ posted by firm i is

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

Note that $\theta > 1$, so that collateral aggregation is convex. The CES assumption captures firms' limited ability to substitute borrowing across different lenders, reflecting the fragmentation of 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, θ can be interpreted narrowly as bank market power, or more generally as the risk-bearing capacity of intermediaries: higher θ implies more market power, or lower risk-bearing capacity.

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 ($D_{i,t}(j) = 0$), collateral $g_{i,t}(j)$ is returned 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 collateral $g_{i,t}(j)$.

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. Firms that have defaulted on any bank previously enter autarky and earn A each period. Appendix A contains the full characterization of the firm problem in Lemma 1 (and all proofs).

[9] 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 $z_{i,t}$.

Banks. Banks $j \in [0,1]$ are risk-neutral and maximize expected profits. The loan rate $1+r$ is exogenous, and lending is financed 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 to 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 $\ell_{i,t}(j)$ to firm i, firm i posts collateral $g_{i,t}(j) = \eta_t(j)\ell_{i,t}(j)$. We assume unit pricing: banks cannot condition on firm type or total borrowing. The bank earns $(1+r)\ell_{i,t}(j)$ if firm i repays $(D_{i,t}(j)=0)$, or keeps the collateral $g_{i,t}(j)$ otherwise $(D_{i,t}(j)=1)$. Per-period profits of bank j are

$$\Pi_t^B(j) = \int_i \left[\mathbf{1}(D_{i,t}(j)=0)\,(1+r) + \mathbf{1}(D_{i,t}(j)=1)\eta_t(j) - \left(1+r^{rf}\right)\right]\ell_{i,t}(j)\,\mathrm{d}i\,. \tag{4}$$

The bank problem is characterized in Appendix A, Lemma 2.

3.1 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*

$$\eta_t = \theta\left[\left(1+r^{rf}\right) - \left(r - r^{rf}\right)\frac{G_t^R}{G_t^D}\right], \tag{5}$$

where $G_t^R \equiv \int_i \mathbf{1}(D_{i,t}=0)g_{i,t}\,\mathrm{d}i$ *and* $G_t^D \equiv \int_i \mathbf{1}(D_{i,t}=1)g_{i,t}\,\mathrm{d}i$ *are aggregate collateral posted by firms repaying and defaulting, respectively. Taking this as given, the firm problem can be written recursively as*

$$\mathcal{W}_{i,t} = \max_{D_{i,t}} \quad \mathbf{1}(D_{i,t}=0)\mathcal{W}_{i,t}^R + \mathbf{1}(D_{i,t}=1)\mathcal{W}_{i,t}^D, \tag{6}$$

where $\mathcal{W}_{i,t}^R, \mathcal{W}_{i,t}^D$ *are the value to firm* i *of planned repayment or default, respectively, defined in* (A5) *and* (A6)*. The optimal production decisions when planning to repay or default satisfy*

$$z_{i,t}f'\left(v_{i,t}^R\right) - c_{i,t}\eta_t\gamma'\left(\eta_t v_{i,t}^R\right) = (1-q_{i,t})(1+r) + q_{i,t}\eta_t, \tag{7}$$

$$z_{i,t}f'\left(v_{i,t}^D\right) - c_{i,t}\eta_t\gamma'\left(\eta_t v_{i,t}^D\right) = \eta_t. \tag{8}$$

The results from Prop. 1 allow for some general observations. First, from the bank optimality conditions (5), we see 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 over the bank's marginal cost of lending.

Further, from the concavity of the production function $f(\cdot)$ and convexity of the cost function $\gamma(\cdot)$, the firm optimality conditions (7) and (8) imply 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, these comparative statics carry over to firms that *ex-ante* plan on defaulting, such that they will borrow more.

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's 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 the firm problem into a repeated static problem, which greatly simplifies the analysis below. The regularity assumption (2) is weaker and not necessary, but it guarantees that the firm default decision is well-behaved and rules out unnecessary cases to consider.

The following Proposition characterizes the firm's default decision.

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

$$\frac{\partial \bar{c}}{\partial \eta} \propto v^D_{i,t} > 0. \tag{9}$$

Prop. 2 characterizes the cutoff value $\bar{c}_{i,t}$, which governs whether a firm will default as a function of the collateral costs $c_{i,t}$ that 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.

Additionally, the result in (9) 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.

3.2 Model Predictions: Land Enclosures

Given the results in Prop. 2, we can 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 aggregate loan amounts by $V_t^R \equiv \int_i \mathbf{1}(D_{i,t} = 0) v_{i,t}^R \, \mathrm{d}i$ and $V_t^D \equiv \int_i \mathbf{1}(D_{i,t} = 1) v_{i,t}^D \, \mathrm{d}i$, where we separate by (*ex-ante*) repayment or default. Similarly, define the mass of firms in each of these groups as $\mu_t^R \equiv \int_i \mathbf{1}(D_{i,t} = 0) \, \mathrm{d}i$ and $\mu_t^D \equiv \int_i \mathbf{1}(D_{i,t} = 1) \, \mathrm{d}i$. Our experiment consists of selecting a subset of repaying incumbent firms $i : D_{i,t} = 0$, who benefit from the enclosure, which reduces 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 (7) 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_t^R, 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 (5), we see that this puts downward pressure on required collateral η_t since V_t^D and V_t^R are proportional to G_t^D and G_t^R respectively. Thus, (9) in Prop. 2 gives us the following hypothesis:

Hypothesis 1. Following waste enclosure, the number of defaulting firms will *increase*.

The intuition for our model prediction is as follows. 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, banks are willing to provide cheaper credit, putting downward pressure on required collateral η_t. This reduction, in turn, increases the default incentives of firms that were closer to the default threshold, bringing about a rise in (endogenous) defaults.[10]

[10]Note that while the number of defaulting firms increases, the total amount of aggregate repayments increases, which supports the overall higher lending volume. Additionally, improved credit market access implies that more productive firms are able to borrow and produce more; on the other hand, the defaulting firms are (all else equal) less productive. While a full dynamic welfare analysis is beyond the scope of our paper, the model implication that bankruptcies increase does not imply that the collateral channel of land enclosure is harmful.

4 Empirical Analysis

This section empirically evaluates our theory on the interaction of land enclosures and credit markets. We begin by describing our newly digitized bankruptcy database. We leverage this unique database, merged with data on Parliamentary enclosure awards at the county-year level, to study how enclosures affect local bankruptcies by exploiting temporal and regional variation in the data. Using panel local-projections, we confirm our key theoretical prediction: the enclosure of waste is associated with a rise in local bankruptcies, and that this rise is robust.

4.1 Data

The empirical analysis is based on a balanced panel with historical information on 42 English counties from 1750 to 1830, comprising of 3,321 county-year observations.[11]

The main variables in the dataset are the number of bankruptcies, our primary outcome variable, and the area of enclosed waste land that was awarded, our chief policy of interest. To measure bankruptcies at the county-year level, we assembled a new, fully digitized database from all public bankruptcy notices printed in the *London Gazette*.[12] As discussed in Section 2, publication in the *Gazette* was a statutory requirement for qualifying petitions; each notice reporting the bankrupt's name, occupation, location, and the date of the declaration (see Figure 1). The resulting micro-level corpus allows us to code occupations according to the five-digit HISCO code (the Historical International Standard Classification of Occupations; van Leeuwen, Maas, and Miles 2002), geolocate places, and aggregate consistently to spatial and temporal units, enabling analyses that were previously impracticable (e.g., county-by-decade dynamics, occupational composition over time, and robustness to alternative geographic partitions).[13]

Table 1 presents summary statistics for these main variables as well as characteristics of the economic environment used in our analysis: population and sectoral composition of the workforce in each county.[14]

The average county experiences 15.3 bankruptcy events per year. However, population, enclosures, and bankruptcies all see a secular rise, as the period covered by the study

[11] The county borders in the analysis are those known as England's "ancient counties," with Yorkshire subdivided into its North, East, and West Ridings. Middlesex is included, but we exclude the observation from London, which was a major financial center with potentially different institutional structures.

[12] The dataset covers the period from 1705 (when publication in the *Gazette* became mandatory under the Bankruptcy Act 4 Anne c. 17) through 1830.

[13] Hoppit (1987) was the pioneer in assembling the first systematic counts and narrative for 1700-1800, but his series was not digitized and, for 1711-1764 (except 17 months in 1723-1724), relied on docket books compiled before final confirmation. Our series extends coverage through 1830 and is constructed entirely from London *Gazette* notices transcribed into a fully digital, machine-readable corpus.

[14] 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). County-level population figures for the years 1750, 1761-1831 come from Wrigley (2011), Table A2.7. The data is available at a decennial frequency. Linear interpolation was used for conversion to annual figures.

was one of profound social and economic transformation. The Napoleonic Wars and the financial crisis of 1793 introduced a major structural break, after which bankruptcies became noticeably more common. Importantly, bankruptcies were already occurring at the start of the eighteenth century, indicating that financial activity and the institutional framework for insolvency were well established before the beginning of our study period.

Table 1: Descriptive Statistics by Period

	1750-1769 (N=820)	1770-1789 (N=820)	1790-1809 (N=820)	1810-1830 (N=861)	All (N=3,321)
Number of bankruptcies	4.8	9.6	16.9	29.3	15.3
	(10.2)	(19.8)	(32.7)	(52.9)	(34.6)
Population (thousands)	152.6	173.9	210.1	276.7	204.9
	(99.5)	(120.5)	(161.9)	(236.9)	(171.8)
Number of waste enclosures	0.1	0.3	0.5	0.9	0.5
	(0.6)	(0.9)	(1.5)	(2.4)	(1.5)
Enclosed waste area (acres)	167.9	352.5	366.6	650.4	387.6
	(1,441.4)	(1,372.9)	(1,421.2)	(2,193.0)	(1,658.9)
Share of workers in agriculture	46.7	47.3	47.0	45.8	46.9
	(12.5)	(13.5)	(14.5)	(14.5)	(13.7)
Share of workers in the secondary sector	39.3	38.8	38.3	38.3	38.7
	(10.9)	(11.9)	(12.3)	(11.9)	(11.7)

Notes: This table reports sample means by county-year within each period; standard deviations in parentheses.

In what follows, we use the number of bankruptcy events, the bankruptcy location, and the bankrupt's occupation, between 1750 and 1830, at the county-year level. To limit cases linked to disturbances in the financial sector, we exclude bankrupts whose occupations indicate they were likely creditors or financial intermediaries (e.g., bankers, discount brokers, and goldsmiths).[15] Our baseline further excludes London, the major financial center with potentially different credit mechanisms. The resulting baseline dataset contains 50,977 individual bankruptcy records. Figure 5 panel (a) maps the distribution of bankruptcies across counties and decades. Bankruptcies are observed virtually nationwide from the start of our study period, and their frequency rises secularly over time, consistent with the expansion of financial activity and broader economic development discussed above.

The main explanatory variable is the county-year measure of enclosures of waste awarded, as measured by the area enclosed. The dataset is from Satchell et al. (2017), which contains the population of Parliamentary awards of enclosure between 1606 and 1902, including the location of the enclosed land, the year of award, the area, and the type

[15] In the HISCO code book, these appear as: 44000 ("Insurance, Real Estate, Securities or Business Services Salesmen, n.e.c."), 44100 ("Insurance, Real Estate or Securities Salesmen, n.e.c."), 44140 ("Stock Broker"), and 88050 ("Goldsmith and Silversmith").

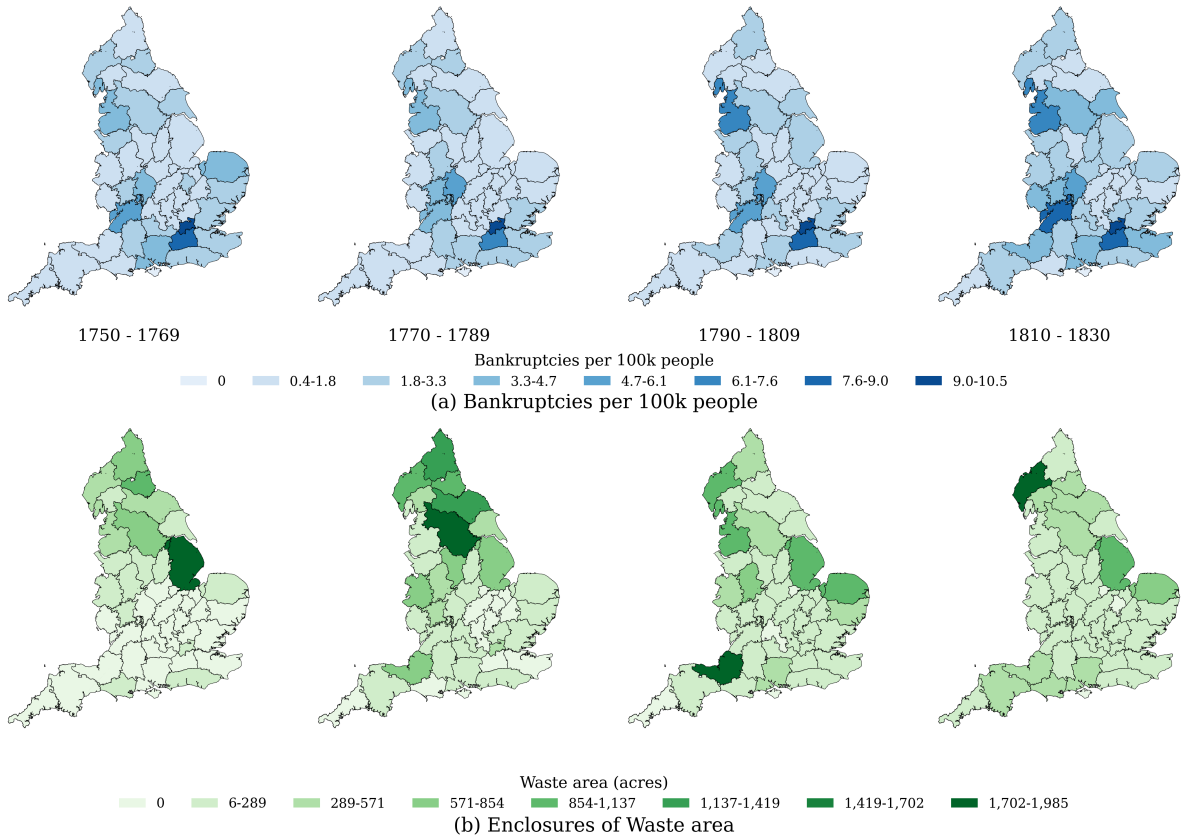


Figure 5: Bankruptcies Per Capita and Waste Enclosures Across Counties and Time

Notes: Panel (a) presents heat maps indicating the average number of bankruptcies per 100,000 persons in each ancient county of England over our study period. Panel (b) presents heat maps indicating the average area of waste enclosures awarded in every ancient county of England and its evolution over our study period.

of enclosure. Our study begins in 1750, when Parliamentary acts more reliably reflected the actual timing of land enclosure (earlier acts often legalized or recorded enclosures that had already taken place informally). Of the 4,553 acts that were awarded between 1750 and 1830, a total of 1,600 pertained to the enclosure of waste; these enclosures can be observed in panel (b) of Figure 5. The enclosure of waste was more common in the North-West, and its relative importance began to grow in 1800.[16] About 21.1% of our county-year-level observations experienced an enclosure of waste.

As discussed in Section 2.3, while the initiation of an enclosure was an endogenous choice of local landowners, the long and unpredictable Parliamentary procedure for a successful enclosure bill meant that the eventual award was effectively orthogonal to local economic conditions. Thus, in our baseline analysis we consider the timing in which the enclosure awards were granted as a source of exogenous variation. In later robustness exercises, we also directly test this assumption and find no evidence of pre-trends.

[16]See also Tables B2 and B1 in Appendix B for a summary of enclosed waste area by county and decade.

4.2 The Effect of Land Enclosures on Local Bankruptcies

We estimate the effect of a waste enclosure award in county i at time t on bankruptcies in the same county during year t and the following years. To do so, we employ a local-projections-based (Jorda, 2005) identification strategy by estimating

$$BR_{i,t+h} = \exp\left(\delta_t^h + \alpha_i^h + \beta_h ENC_{i,t} + \boldsymbol{\gamma}^h \mathbf{X}_{i,t} + \epsilon_{i,t}^h\right), \tag{10}$$

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 awarded, measured in thousands of acres. Our coefficient of interest is β_h, which corresponds to the expected percentage change in the number of bankruptcies h periods after a waste enclosure of 1,000 acres was awarded. We estimate the impulse response coefficients β_h for different horizons $h = 0, 1, \ldots, 5$. 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.[17]

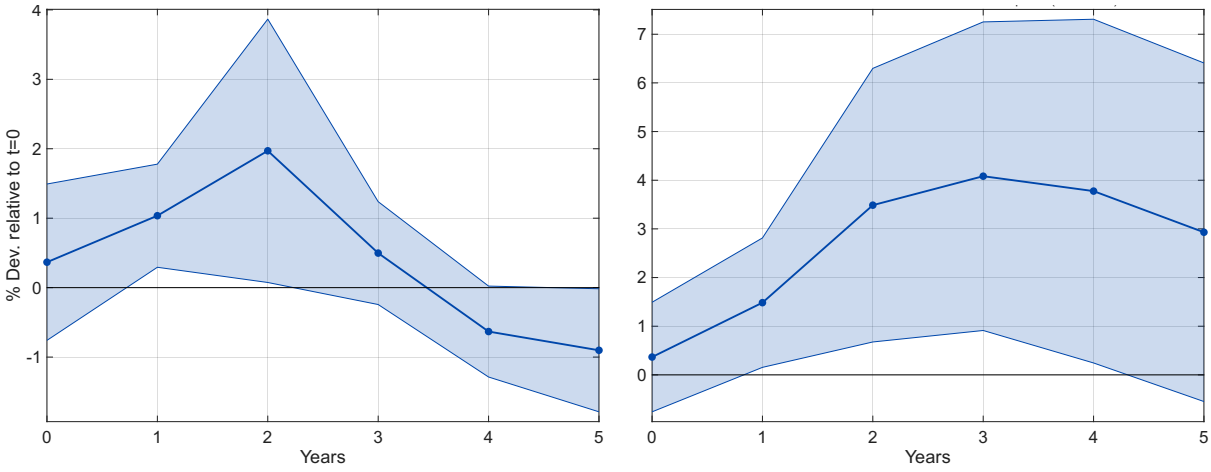
To control for common trends as well as county-invariant omitted variables, we include time and county fixed effects (δ_t^h and α_i^h, respectively). We also include a wide range of lagged variables as controls in $\mathbf{X}_{i,t}$. First, we include population to control for changes in bankruptcies resulting from shifts in population and its correlates, such as economic development. We also include lagged values of waste enclosure to control for anticipation effects arising from recent enclosure awards in that particular region. Finally, following the insights of Montiel Olea and Plagborg-Møller (2021), we control for lagged values of bankruptcies, our outcome variable, to control for serial correlation in the error term.[18] Inference is based on two-way cluster-robust standard errors (county-year), allowing for cross-sectional dependence as well as serial correlation within each county.

Figure 6 reports our baseline results. Panel (a) shows that after a waste enclosure of 1,000 acres (about 4 km^2), bankruptcies in the county increased by 1% within the first year and 2% in the second year. This increase is both statistically significant and economically meaningful. To put these numbers in perspective, conditional on any waste area being enclosed, the median area of enclosed waste is 863 acres, and the average is 1,839.1 acres, with some areas experiencing enclosures of over 20,000 acres of waste. Thus, after an average-sized waste enclosure, the county was expected to experience a 1.9% increase in bankruptcies in the first year and a 3.6% increase in the second year, in flow terms.

We find limited evidence of a concurrent increase in bankruptcy in the same year as an enclosure: the point estimate for $h = 0$ is still positive but much smaller in magnitude than later periods, and statistically insignificant. However, our results still suggest a relatively

[17] 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).

[18] In our baseline, we include four lags for all variables (besides population, for which we only include one lag, as this variable is interpolated from decennial frequency). We explore alternative lag choices in robustness exercises later in this section.



(a) Annual response (b) Cumulative response

Figure 6: The Effect of Waste Enclosures on Bankruptcies

Notes: Impulse response of bankruptcies with respect to the enclosure of waste expressed either in annual flows in panel (a), β_h from estimating equation (10), or in cumulative terms in panel (b). Shaded areas are 90% confidence intervals based on two-way (county-year) cluster-robust standard errors. Estimates are expressed in percentage changes in the number of expected bankruptcies following the enclosure of 1,000 acres.

tight link between the enclosure of waste and the following rise in local bankruptcies. Note that the rise in bankruptcies over the first two years following enclosure is consistent with the fact that lending in this period was primarily short-term and served as working capital, as explained in Section 2.

For completeness, we also report the cumulative version of equation (10), reported in panel (b) of Figure 6.[19] The results clearly show a rise in local bankruptcies in the years following enclosure. This rise peaks at 4.1% of the annual number of bankruptcy events three years after a 1,000-acre waste enclosure is awarded.

Robustness. Our finding that waste enclosures lead to a rise in local bankruptcies is robust to alternative choices. All robustness checks for this section are reported in Appendix C and are summarized in brief below.

First, our baseline results use the total enclosed area to measure enclosure intensity. However, because there were often several enclosures within the same county over the year, this approach treats identically cases with a small number of very large enclosures and cases with several smaller ones. This may be inappropriate if the size of each act matters non-linearly or through local agglomeration: a single 1,000-acre enclosure could affect conditions differently than five 200-acre enclosures. To address this, Figure C1 replicates the analysis in Figure 6 using the average area awarded per enclosure act in a

[19]Since the model is non-linear, to estimate the cumulative counterpart of equation (10) we regress $BR_{i,t|t+H} \equiv \sum_{h=0}^{H} BR_{i,t+h}$ on the same right-hand side variables as in equation (10), for each horizon H of interest. The resulting estimates represent percentage deviations from the $H+1$ years cumulative average and are thus multiplied by $H+1$ to represent deviations from annual averages.

given year instead of the total area and finds consistent results with our baseline.

Second, our results might be affected by the number of lags we choose to include when estimating equation (10). Figure C2 demonstrates that our results are not sensitive to controlling for anything from one year to six years of lagged values.

Last, to assess our interpretation of the enclosure award timing as an exogenous event, we propose and implement a pre-trend test consistent with our baseline estimation using equation (10). These tests are formally introduced in Appendix C, and the results are in Figures C3 and C4. We find no evidence of a statistically significant or economically meaningful pre-trend, regardless of the lag order chosen, which helps reassure us of the validity that the enclosure award timing was effectively exogenous.

5 Understanding the Mechanisms

This section considers the mechanisms that drive the rise in bankruptcies documented in the previous section. We begin by revisiting our model to guide the empirical analysis. Recall that the key theoretical mechanism is that land enclosures increase the supply of collateral, which, in equilibrium, eases credit market conditions and reduces the costs of default for the marginal borrower. While the historical evidence from Section 2 confirms the connection between waste enclosures and collateral, the limited financial data from this time makes it difficult to test the equilibrium channels directly. Instead, to help validate our theory-based interpretation of the results, we derive additional testable predictions: our model predicts that the rise in bankruptcies is amplified both for less productive and riskier firms; but that the effect is mitigated when intermediation frictions are larger.

We then leverage the panel dimension of our data to construct empirical proxies at both the county level as well as novel weather shock measures to test and confirm these theoretical predictions. Substantiating these predictions not only increases our confidence in the model but also provides insights into the empirical channels at work.

5.1 Heterogeneous Response: Theory

We return to the enclosure experiment considered in Section 3.2, which showed that land enclosures result in an equilibrium decline in the required collateral η_t and an *increase* in the number of defaulting firms. We now derive additional predictions by studying how $\bar{c}_{i,t}$ (the maximum value of collateral costs for which firm i will choose to repay) varies as a function of different model objects.

Proposition 3 (Endogenous Default Comparative Statics)**.** *Under the same assumptions*

as Prop. 2, there exist values $\check{q}, \check{c}, \check{\beta}$ *such that* $0 \leq q_{i,t} < \check{q}, 0 \leq c_{i,t} < \check{c}, \check{\beta} < \beta < 1$ *implies*

$$\frac{\partial \bar{c}}{\partial z} \propto \frac{v_{i,t}^R}{\gamma(\eta_t v_{i,t}^R)} > 0, \tag{11}$$

$$\frac{\partial \bar{c}}{\partial q} \propto A - z_{i,t}\left(f(v_{i,t}^R) - f'(v_{i,t}^R)v_{i,t}^R\right) < 0, \tag{12}$$

and

$$\frac{\partial^2 \bar{c}}{\partial \eta^2} \propto -\frac{2v_{i,t}^D v_{i,t}^R \gamma'(\eta_t v_{i,t}^R)}{\gamma(\eta_t v_{i,t}^R)} + \frac{1}{z_{i,t} f''(v_{i,t}^R)} < 0, \tag{13}$$

$$\frac{\partial^2 \bar{c}}{\partial \eta \partial q} \propto v_{i,t}^R\left[z_{i,t}\left(f(v_{i,t}^R) - f'(v_{i,t}^R)v_{i,t}^R\right) - A\right] > 0, \tag{14}$$

$$\frac{\partial^2 \bar{c}}{\partial \eta \partial z} \propto -\frac{v_{i,t}^R f(v_{i,t}^R)\gamma'(\eta_t v_{i,t}^R)}{\gamma(\eta_t v_{i,t}^R)^2} < 0. \tag{15}$$

In Prop. 3, we first study how the cutoff value varies as a function of firm productivity or riskiness. The first result in (11) shows that the default threshold increases in firm productivity. It is clear that when a firm is more productive, the value of operating (and thus the continuation value of repaying) is higher. However, defaulting firms also borrow more when productivity is high. Prop. 3 shows that, so long as firms put a high effective weight on the future (i.e., β is high enough and $q_{i,t}$ is low enough), the former effect dominates and the threshold for defaulting increases with productivity $z_{i,t}$.

The result in (12) demonstrates how the default threshold varies as a function of firm riskiness $q_{i,t}$. Firm riskiness indirectly reduces the effective discount factor of the firm (since a risky firm is more likely to be forced into autarky). Thus, the continuation value of repaying is lower, and so the default threshold is lower when firm riskiness $q_{i,t}$ is high.

The final set of results in Prop. 3 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 less intuitive and more sensitive to parameterization. When required collateral η_t is high, result (13) shows that the effect on the default threshold of further increases in η_t is dampened. This is easy to understand when considering a limiting case where $\eta_t \to 1 + r$ (i.e., the required collateral is nearly as large as the gross repayment of the loan). In this case, it is clear 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 only modestly increases the default threshold. Thus, following land enclosures which decrease η_t and increase firm defaults, the model predicts:

Hypothesis 2. The increase in defaults is *mitigated* when bank market power is large.

Result (14) shows that for riskier firms, the default threshold is more responsive to

increases in required collateral. Higher risk implies that firms effectively discount the future more aggressively; thus, the decline in the continuation value of repaying firms (due to collateral posting costs) following increases in required collateral is dampened. Since higher risk does not directly affect the decisions of defaulting firms, increased riskiness $q_{i,t}$ amplifies the effect that changes in η_t have on the default threshold. Thus:

Hypothesis 3. The increase in defaults is *amplified* for riskier firms.

Finally, result (15) shows that for very productive firms, the default threshold is less responsive to increases in required collateral. Recall from the discussion of (11) that increased productivity increases both the value repaying as well as the value of defaulting; but that the former dominates when the effective weight on the future is large. However, the costs of posting collateral imply that even repaying firms produce less when required collateral increases. For repaying firms, this reduces the entire stream of future expected profits, and thus the reduction is larger for firms that 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 are mitigated for productive firms. Thus, following land enclosures, the model predicts:

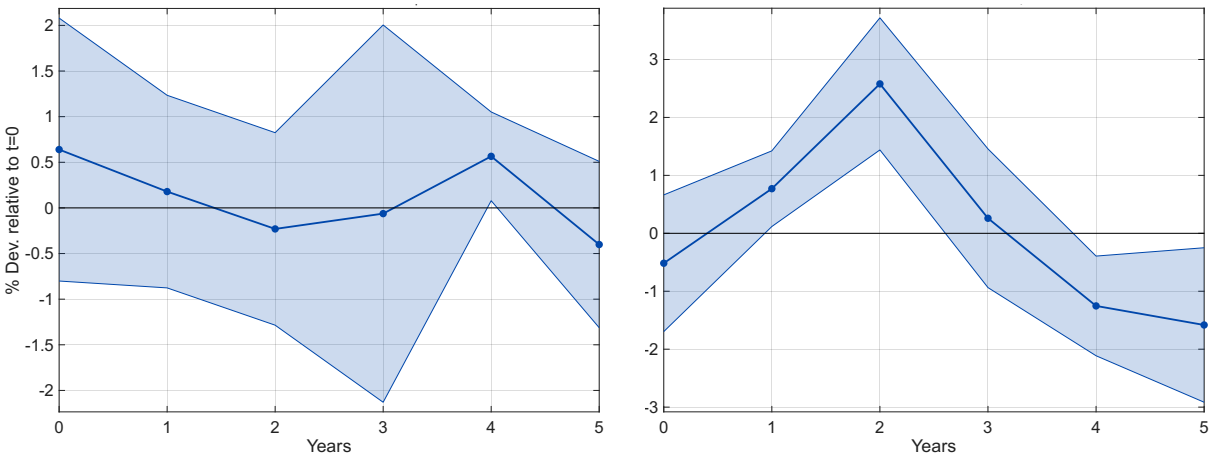
Hypothesis 4. The increase in defaults is *mitigated* for more productive firms.

5.2 Heterogeneous Response: Empirical Analysis

We next leverage the panel dimension of our database to utilize time and regional variation in local characteristics to construct empirical proxies for Hypotheses 2-4.

The crisis of 1793. As a basic first pass, we conduct a simple sample splitting exercise. The period 1750-1830 witnessed rapid industrial development, which expanded investment opportunities and heightened the inherent risk associated with business ventures. As Hoppit (1987) argues, the crisis of 1793 marked a decisive turning point. The sudden collapse of paper credit and the widespread rush for liquidity led to a sharp increase in bankruptcies and revealed substantial commercial uncertainty. This episode is also widely viewed as a major disruption to British credit markets (Pressnell, 1956). The outbreak of war with France further intensified these pressures by increasing geopolitical risk and diverting funds towards government borrowing (O'Brien and Palma, 2023). At the same time, the rapid expansion of country banks in the 1790s increased competition in local credit markets. Consistent with the model, we therefore expect the effects of waste enclosures on bankruptcies to be stronger after 1793, when both banking competition (Hypothesis 2) and exposure to risk were higher (Hypothesis 3).

To test this prediction, panels (a) and (b) of Figure 7 repeat our baseline analysis from



(a) 1750-1792 (b) 1793-1830

Figure 7: The Effect of Land Enclosures on Bankruptcies Before and After 1793

Notes: The solid lines report values of β_h from estimating equation (10) for two separate time periods: 1750-1792 in panel (a), 1793-1830 in panel (b). Shaded areas are 90% confidence intervals based on two-way (county-year) cluster-robust standard errors. Estimates are expressed in percentage changes in the number of expected bankruptcies following the enclosure of 1,000 acres.

Figure 6, but split the sample into the years 1750-1792 and 1793-1830, respectively. Consistent with our theory, Figure 7 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. Our sample period is one where industrialization picks up pace substantially. Hypothesis 3 predicts that the rise in the idiosyncratic risk associated with new technologies and techniques should amplify the effect of enclosures on bankruptcies. 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:

$$BR_{i,t+h} = \exp\left(\delta_t^h + \alpha_i^h + \left[\beta_h + \beta_h^+ \mathbf{1}_{i,t}^+ + \beta_h^- \mathbf{1}_{i,t}^-\right] ENC_{i,t} + \boldsymbol{\gamma}^h \mathbf{X}_{i,t} + \epsilon_{i,t}^h\right), \tag{16}$$

where $\mathbf{1}_{i,t}^+$ and $\mathbf{1}_{i,t}^-$ denote a county-time exposure dummy that takes the value of one if various industrialization exposure measures are high or low, respectively. In our main results, we define "high" and "low" using terciles, but we explore robustness to alternative thresholds in Appendix D. This flexible strategy allows us to pick up factors that amplify or dampen the response of bankruptcies to the enclosure award. As in our baseline analysis, the control vector $\mathbf{X}_{i,t}$ includes lagged values of population, lagged values of the number of bankruptcies, and lagged values of enclosures; we additionally include lagged values of the exposure dummies.

Figure 8 summarizes the key insights from this analysis. For ease of presentation, we report the annualized cumulative effect of waste enclosures on bankruptcies from the year

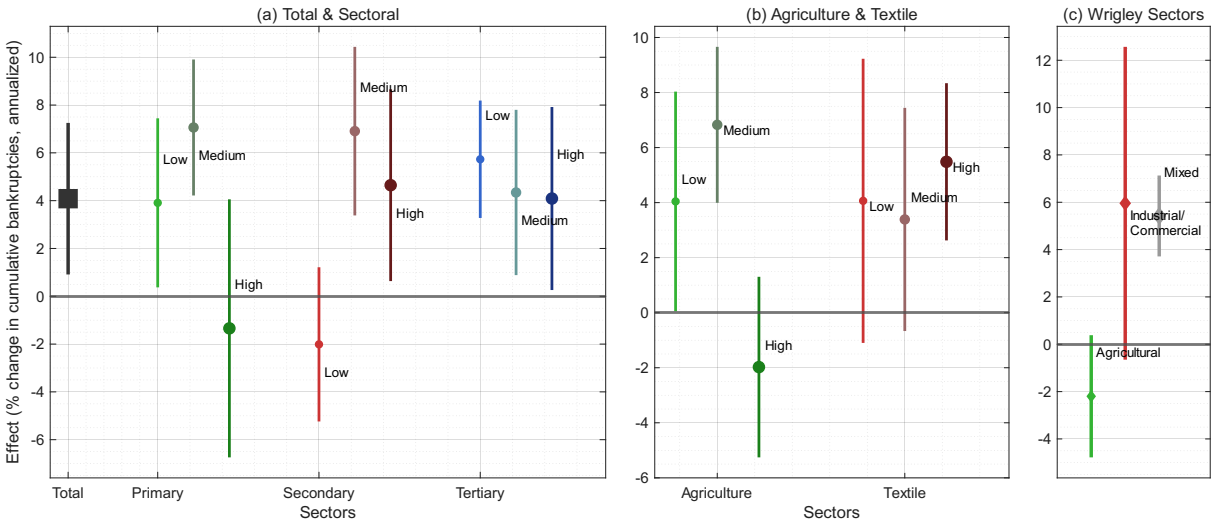


Figure 8: Exposure to Industrialization

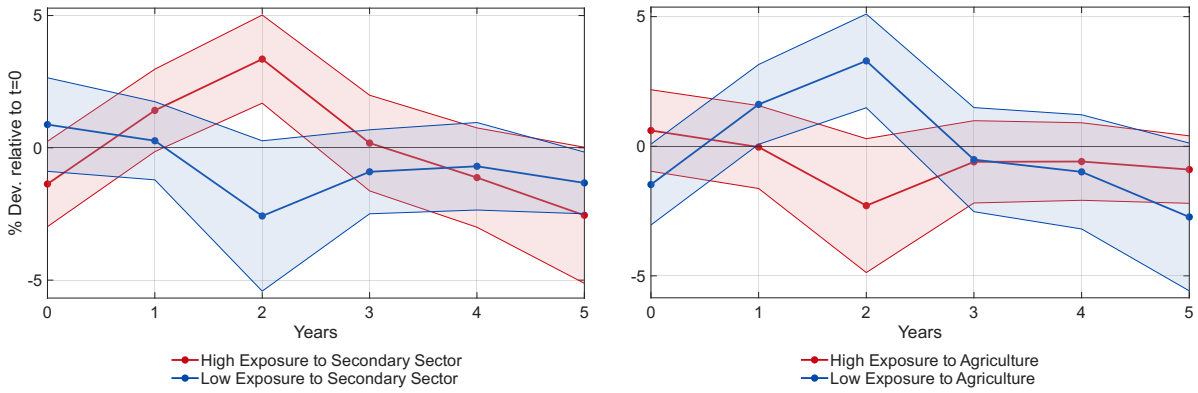
Notes: This figure reports impulse responses estimated via the cumulative counterpart of equation (16) using the sum of bankruptcies at time zero to three years post enclosure. Each point estimate is the cumulative impulse response to enclosure within each exposure group. Each panel reports estimates using separate exposure variables indicated in the title. Vertical lines are 90% confidence intervals based on two-way (county-year) cluster-robust standard errors.

of enclosure and up to the third year afterwards. Panel (a) reports how this effect varies according to the share of the workforce engaged in the primary, secondary, and tertiary sectors, respectively.[20] The effect is strongest where the workforce is concentrated in the secondary sector, suggesting that engagement in industry is driving the observed response. In contrast, we find no significant effects in places with high primary-sector intensity or low secondary-sector intensity (and if anything, the point estimates are negative, though small in magnitude).

To better connect these findings to the industrial activities in the period, we repeat this exercise in panel (b) of Figure 8, but this time using narrower sectoral definitions for the workforce, namely agriculture and textiles. The rise in bankruptcies post-enclosure award is associated with a high engagement of the local workforce in the textile industry and a low engagement in agriculture. To further validate our findings, we also utilize the time-invariant county classifications from Wrigley (2007), which categorize counties into industrial or commercial, agricultural, and mixed categories, to conduct a similar analysis. The findings in panel (c) support the claim that exposure to industrialization drives the effect.

To verify that we are capturing the total effect rather than just its timing, we also estimate equation (16) in flow terms for a subset of exposure variables. The results in Figure 9 present a clear image: counties experiencing low exposure to agriculture or high exposure to the secondary sector are precisely those in which waste enclosures had the

[20]Primary, secondary, and tertiary sectors refer to agriculture and mining; industry; and services, respectively.



(a) Secondary Sector (b) Agriculture

Figure 9: Exposure to Agriculture and Secondary Sectors

Notes: This figure reports impulse responses estimated via equation (16) using the total area of waste area enclosures. Impulse responses are presented as the total effect of enclosures on bankruptcies within each exposure group. Each panel reports estimates using separate exposure variables indicated in the title. Shaded areas are 90% confidence intervals based on two-way (county-year) cluster-robust standard errors. Estimates are expressed in percentage changes in the number of expected bankruptcies following the enclosure of 1,000 acres.

strongest effects. Bankruptcies peak at around 3.4% two years after the enclosure of 1,000 acres of waste (compared with the 2% estimate from Figure 6).

Business cycle risk. In order to test Hypothesis 4, we next turn to measures of business cycle risk exposure. As in standard real business cycle models, we can think of business cycle fluctuations as changes in firm productivity. Hypothesis 4 indicates that if firms are less productive, the effect of waste enclosures on bankruptcies should be amplified. Thus, we next construct a measure of exogenous fluctuations in real activity at the country-year level, and use this exposure measure when estimating (16).

To obtain such a measure, we use 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, their annual growth patterns can be used to trace changes in historical climate conditions and agricultural productivity. Years with wider rings indicate favorable growing conditions, while narrow rings indicate drought, poor soil quality, or other stressors. The series used in our study comes from different sampling locations corresponding to four climate regions in England, which we match to counties based on their relevant climate region.[22]

[21]The tree ring growth index chronologies are constructed from samples taken from trees in various locations. They are located in the International Tree-Ring Data Bank (ITRDB) and managed by the World Data Service for Paleoclimatology, and are available here: https://www.ncei.noaa.gov/products/paleoclimatology/tree-ring.

[22]The samples are from the areas surrounding of Bath (information available 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.

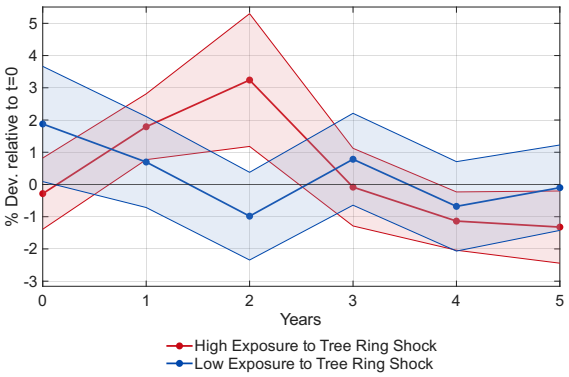


Figure 10: Exposure to Weather Shocks

Notes: This figure reports impulse responses estimated via equation (16), 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. The shock is constructed so that high exposure indicates unfavorable weather conditions. Shaded areas are 90% confidence intervals based on two-way (county-year) cluster-robust standard errors. Estimates are expressed in percentage changes in the number of expected bankruptcies following the enclosure of 1,000 acres.

We use this tree-ring series to construct a new weather-shock variable as follows. We fit an ARMA model to each tree-ring series in each locality, and extract the residuals as our weather shock variable (see Appendix E for details). The advantages of this approach are threefold. First, the shock series exhibits cross-sectional and temporal variation. Second, our approach reduces the dimensionality of multiple climate variables and indicates the degree to which agricultural conditions were favorable at that location and time. Finally, our approach allows us to flexibly capture expectations for agricultural conditions in each locality.

Using the specification in equation (16), we investigate how differential exposure to weather shocks may alter the impact of waste enclosures on bankruptcies. We find that following waste enclosures, high exposure to adverse agricultural conditions leads to an amplified response in bankruptcies (the red line in Figure 10). To the extent that high exposure to our weather shock measure indicates times when firm productivity is low, this finding is consistent with our theoretical Hypothesis 4. More generally, these results suggest that privatizing land during bad times has a stronger impact on the local credit market than doing so during a boom.

6 Alternative Hypotheses

Our theory predicts that the observed rise in bankruptcies following waste enclosure is a consequence of the financial role of land and its use as collateral, i.e., a *collateral channel*. In this section, we explore alternative hypotheses.

We first consider a *productivity channel*: because land is also a factor of production, land enclosures may increase local firm productivity; through competition mechanisms,

this may explain the observed rise in bankruptcies. To assess this hypothesis, we utilize the enclosure of open fields. Unlike waste enclosures, open-field enclosures did not introduce new pledgeable assets and instead only affected the productivity of the newly enclosed land. We find that local bankruptcies actually decline following open-field enclosures, which is in line with our model predictions, but inconsistent with the productivity channel hypothesis. Namely, if waste enclosures were productivity-enhancing, we would have observed a decline in bankruptcies post-enclosure instead of an increase. To the extent that the productivity channel is present, this implies that the magnitude we attribute to the collateral channel for waste enclosures is a lower bound.

We next examine a *common-use removal channel*: waste enclosures reduced the availability of common-use agricultural materials; thus, the increase in bankruptcies may be driven by those dependent on these materials. However, we find no evidence of this channel. The occupational information in our bankruptcy data shows that the rise in bankruptcies is not present among the agricultural occupations, but rather among manufacturing and industrial occupations. Examining occupational heterogeneity more closely, we find that the rise in bankruptcies following waste enclosures is driven by occupations that rely heavily on working capital, consistent with our theory.

6.1 Productivity Channels: Open-Field Enclosures

Enclosed land is potentially a factor of production, and in particular, may increase local firm productivity. Increased productivity for the new title holder may allow them to price competitors out of the market, which could also rationalize the rise in bankruptcies we find. We label this the *productivity channel* hypothesis.

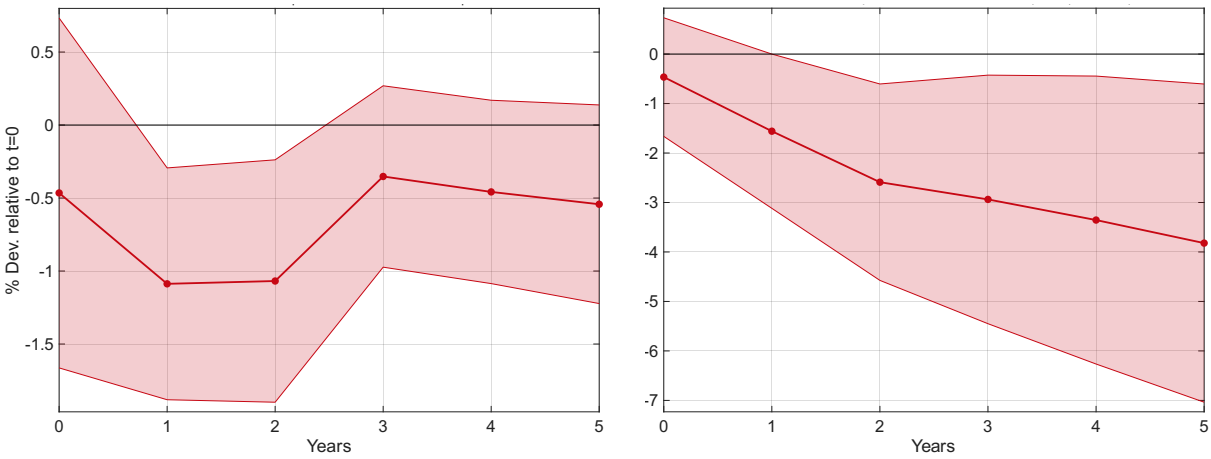
To address this alternative explanation, this section examines the enclosure of open fields, rather than waste enclosures. As discussed in Section 2, enclosure of open fields changed the nature of production within a particular region by reorganizing plot allocations and allowed farmers to exploit economies of scale and raise productivity through agglomeration effects.[23] Unlike waste enclosures, open-field enclosures did not introduce new pledgeable assets. In the context of our model, this is akin to a rise in productivity for some firms, while holding fixed the collateral costs.[24] Thus, our theory implies that by raising the productivity of some firms, open-field enclosures should reduce bankruptcies, in contrast with waste enclosures.

Figure 11 repeats the analysis in Figure 6 using open-field enclosures. We find effects of the opposite sign: open field enclosures are followed by a reduction in bankruptcies. In the first two years following the award of a 1,000-acre open-field enclosure, bankruptcies

[23] See McCloskey (1989) for a treatment of this regarding enclosures and more generally within a modern context, Adamopoulos and Restuccia (2014, 2020).

[24] See Heldring et al. (2022) for a recent empirical analysis of the effects of enclosure of open fields on land productivity.

decline by over 1% per year before returning to baseline. This effect is both statistically significant and economically meaningful; the magnitude is similar to our baseline findings following waste enclosure, but of the opposite sign.



(a) Annual response (b) Cumulative response

Figure 11: The Effect of Open Field Enclosures on Bankruptcies

Notes: Impulse response of bankruptcies with respect to the enclosure of open fields expressed either in annual flows in panel (a), β_h from estimating equation (10), or in cumulative terms in panel (b). Shaded areas are 90% confidence intervals based on two-way (county-year) cluster-robust standard errors. Estimates are expressed in percentage changes in the number of expected bankruptcies following the enclosure of 1,000 acres.

The result in Figure 11 leads us to reject the productivity channel hypothesis. Instead, the finding aligns with our theoretical framework, which predicts that the first-order effect of higher productivity is a decline in firms' incentive to default (see Prop. 3, equation (11)). Thus, the findings regarding open-field enclosures provide additional support for our financial interpretation of the effects of waste enclosures. Moreover, to the extent that waste enclosures led to a similar boost in productivity of a subset of local firms, the results in Figure 11 suggest that our baseline results therefore represent a lower bound on the collateral channel under consideration.

6.2 Common-Use Channels: Agricultural Occupation

As discussed in Section 2, the enclosure of waste took away common-use rights and thus changed the availability of waste land as a source of raw materials and pastureland for locals.[25] Thus, the rise in bankruptcies we observe may result from this change in the availability of resources for people dependent on access to these common-use lands. We label this the *common-use removal channel* hypothesis. We next use the occupational

[25]Common-use rights were formally attached to specific tenures but, in practice, access to waste land often extended beyond legal rights-holders to include cottagers and landless people through customary and informally tolerated use.

information contained in the *London Gazette* notices to examine the mechanism more directly.

We adapt our baseline empirical specification as follows. For any occupation or occupational group *occ*, we estimate:

$$BR^{occ}_{i,t|t+H} = \exp\left(\delta^{occ}_t + \alpha^{occ}_i + \beta^{occ} ENC_{i,t} + \boldsymbol{\gamma}\mathbf{X}^{occ}_{i,t} + \epsilon^{occ}_{i,t}\right). \tag{17}$$

The dependent variable $BR^{occ}_{i,t|t+H} \equiv \sum_{h=0}^{H} BR^{occ}_{i,t+h}$ is the sum of bankruptcies in occupation *occ* in the enclosure year and the following H years.[26] We include the same set of fixed effects and lagged controls as in our baseline specification: county and year fixed effects, as well as the lagged population, total bankruptcies, and enclosures of the county. We additionally include the lagged bankruptcies in occupation *occ* within county i to absorb occupation-specific shocks.

In order to classify the occupations of the bankrupt, we use the detailed information about occupations contained in the *London Gazette* notices matched to the five-digit HISCO codes. This fine-grained classification covers 1,674 occupational groups and allows us to assess directly the types of occupations most negatively affected following waste enclosures. We estimate equation (17) across all occupational groups in our data with at least 250 bankruptcy events.

Examining the estimates across occupational categories in Figure 12, we see that virtually all occupations with large coefficients are concentrated among industrial workers. In contrast to the predictions of the common-use removal channel, occupations more closely aligned with the agricultural sector tend to have small or negative point estimates, whereas manufacturing and industrial occupations show a marked increase in bankruptcies post-enclosure award. This finding aligns with the heterogeneity results in Section 5, where we show that the post-enclosure surge in bankruptcies is driven by secondary-sector exposure rather than primary-sector exposure. Taken together, these patterns indicate that the post-enclosure rise in bankruptcies as a whole is not driven by those directly affected by the loss of access to common waste.

6.3 Occupational Heterogeneity and Working Capital

Figure 12 also shows substantial heterogeneity in responses across occupations. While the pooled estimate in Section 4 implies an average increase of roughly 4% following a 1,000 acre waste enclosure, the largest occupation-specific estimates of β^{occ} from (17) range from 17% to nearly 20% (Hosiery Knitters, Shoemakers, Coach-Body Builders, and House builders). At the other end of the distribution, several occupations exhibit small or negative point estimates, though with the exception of Cloth Weavers these are

[26] Summing over multiple years is necessary because many occupational groups often contain few non-zero observations. We choose $H = 3$ years as in Section 4, but results are similar for $H \leq 5$.

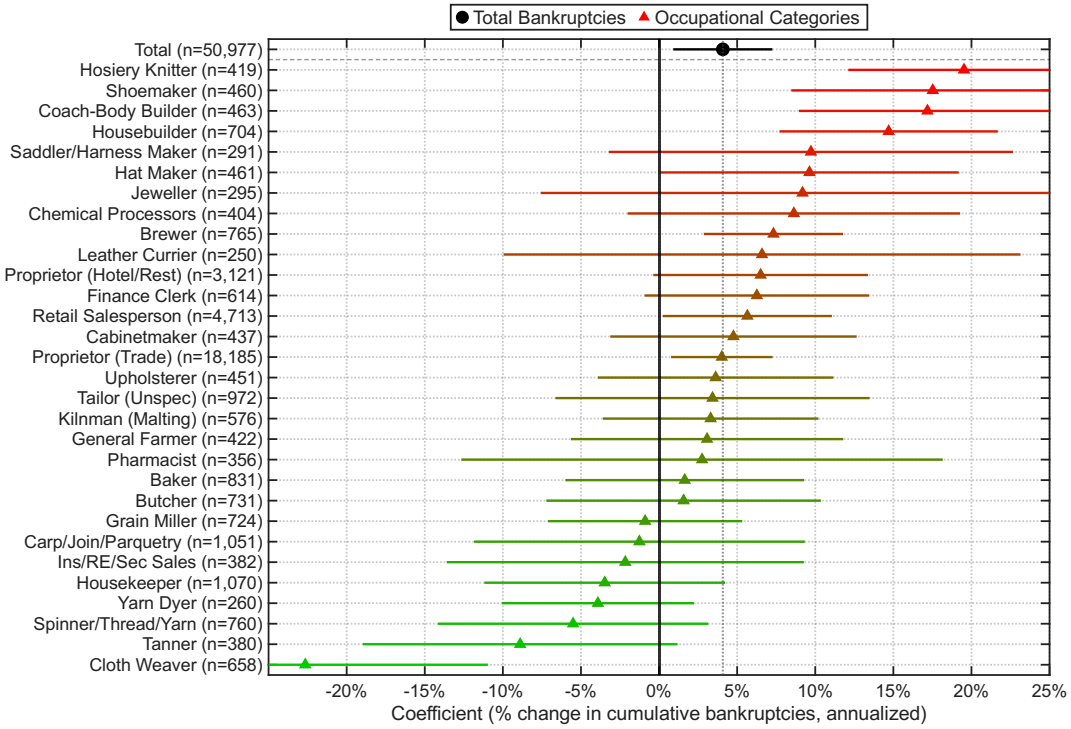


Figure 12: Occupations and the Effect of Waste Enclosures

Notes: Each marker reports estimates from equation (17), which represent percentage changes in expected bankruptcies associated with the enclosure of 1,000 acres of waste. Occupations are grouped at the five-digit HISCO level. Labels are abbreviations of the full HISCO occupations; see Appendix F for the full mapping. Groups with fewer than 250 events are excluded. Error bars are 90% confidence intervals based on two-way (county-year) cluster-robust standard errors.

statistically insignificant.

We begin by identifying which occupations display the largest and most precisely estimated responses to waste enclosure. We then use historical descriptions and data on setup costs to interpret the economic characteristics of these occupations. The pattern that emerges is that the occupations most affected are those with high dependence on working capital and limited access to collateralizable assets. These borrowers exhibit high collateral costs, thin liquidity buffers, and exposure to short-term payment risk. Such borrowers expand borrowing when credit conditions loosen, but are also more vulnerable to subsequent default. This pattern is consistent with the theoretical mechanism behind Hypothesis 1, whereby waste enclosure increases the default incentives of firms that were previously close to the default threshold.

We use Campbell (1747), *The London Tradesman*, to characterize the characteristics of the occupations with the largest estimated responses. Campbell provides detailed qualitative and quantitative descriptions of trades in mid-eighteenth-century England, including information on profitability, capital requirements, and the costs of establishing a workshop. Two overlapping but conceptually distinct patterns stand out.

Category 1: Trades with thin liquidity buffers. The first group consists of small-scale trades characterized by short working-capital cycles, in which inputs had to be financed before output was sold and earnings were often low and irregular. Occupations such as shoemakers, hosiery knitters, and bricklayers are consistently described by Campbell as highly exposed to cash-flow interruptions; as shown in Figure 12, these occupations are among those with the largest estimated responses. Shoemakers, who were by far the largest but poorest group of leather workers, are described as operating effectively hand-to-mouth: many could not "lay out more money at once than the price of the materials for a pair of shoes" (Campbell, 1747, p. 217). Similarly, bricklayer, the lowest in status of all the building occupations (i.e., bricklayer, mason, carpenter-joiner, plumber-glazier and plasterer), were often unemployed "five, if not six months in the year," leaving them chronically exposed to liquidity shortages (Campbell, 1747, p. 260). These descriptions point to trades with limited internal liquidity and high reliance on short-term credit to bridge production and payment.

Category 2: High setup-cost occupations. A second set of occupations exhibiting strong responses consists of more capital-intensive crafts, including, coach builders, saddlers, hat makers, jewellers, and chemical processors, that required substantial upfront expenditures on materials, equipment, or premises (amounts ranging up to £1,000 to £10,000). Although their average earnings could exceed those of the first group, their production structure implied significant working-capital needs and delayed revenue realization.

To document this more systematically, we match occupations in our bankruptcy data to the setup-cost information reported in Campbell (1747, pp. 331–340). Figure 13 plots the estimated β^{occ} against the median reported setup cost. The positive relationship indicates that occupations requiring larger initial outlays experienced larger post-enclosure increases in bankruptcies.

The positive association between setup costs and bankruptcy responses indicates that occupations requiring substantial upfront expenditures were especially sensitive to changes in borrowing conditions. More broadly, the occupational heterogeneity points to a common feature: the trades most affected by waste enclosure were those with high working-capital needs relative to their internal liquidity. Such firms depended heavily on short-term credit to bridge the gap between input purchases and realized revenues. When collateral constraints eased following enclosure, these firms were able to expand borrowing, but were also more exposed to default risk. While we do not observe individual borrowing contracts, this pattern aligns closely with the mechanism emphasized in our theoretical framework and supports a collateral-based interpretation of the post-enclosure rise in bankruptcies.

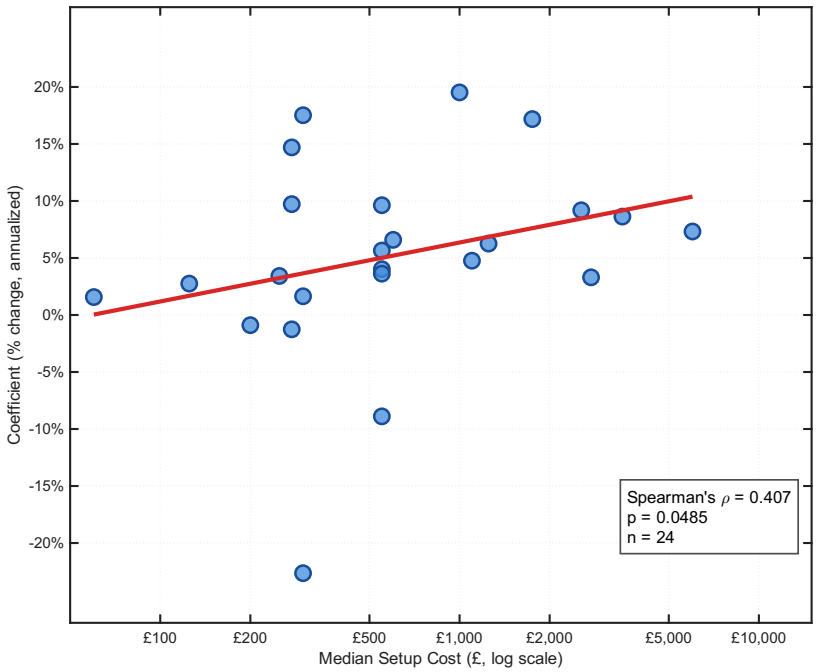


Figure 13: Setup Costs and Effect of Waste Enclosure

Notes: The vertical axis corresponds to estimated β^{occ} from equation (17), and the horizontal axis corresponds to the median setup cost based on Campbell (1747, pp. 331–340). The linear regression line is reported in red.

7 Concluding Remarks

This paper develops a theory and collects evidence on how land reforms affect credit markets through the collateral role of land. We study this mechanism in England (1750–1830), where Parliamentary enclosures took two distinct forms within the same legal and financial environment: the enclosure of common *waste* converted land into pledgeable property, while *open-field* enclosures primarily reorganized already titled arable land. This contrast provides leverage to separate collateral-driven effects from productivity-driven effects.

Our theory emphasizes an institutional wedge that is central both historically and in many contemporary credit markets: when interest rates are constrained (e.g., by binding usury ceilings), intermediaries compete partly through collateral requirements rather than through price. In such an environment, an influx of high-quality pledgeable assets reduces equilibrium collateral requirements, expanding credit while increasing default incentives for marginal borrowers. Using a newly digitized universe of personal bankruptcies published in the *London Gazette* and a county-year panel design with local projections, we find that waste enclosures are followed by a rise in county-level bankruptcies. The increase is strongest in more industrialized regions and during downturns, and is concentrated among industrial occupations with tight cash flow cycles and high working capital needs. In contrast, open-field enclosures are followed by a decline in bankruptcies, a pattern

consistent with a productivity channel and inconsistent with a pure collateral expansion.

These findings highlight an important financial implication of land reforms: expanding the stock of pledgeable assets can loosen borrowing conditions in equilibrium while raising defaults. The mechanism is most relevant in settings where (i) risk-based pricing is limited, (ii) collateral is legally enforceable and salient in lending, and (iii) reforms expand the set of assets that can be credibly pledged. Our results thus speak to modern land reform implementations in contexts where credit markets rely heavily on collateral and regulatory or institutional constraints limit the ability of interest rates to fully price risk.

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A Theory Appendix

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*

$$\mathcal{W}_{i,t} \equiv \max_{\{v_{i,t+k}, D_{i,t+k}\}_{k=0}^{\infty}} \mathrm{E}_t \sum_{k=0}^{\infty} \beta^k \Pi_{i,t+k}^F. \tag{A1}$$

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

$$\mathrm{E}_t \, \Pi_{i,t}^F = z_{i,t} f(v_{i,t}) - c_{i,t}\gamma(g_{i,t}) - \begin{cases} (1-q_{i,t})(1+r)v_{i,t} + q_{i,t}\tilde{\eta}_t g_{i,t} & D_{i,t} = 0 \\ \tilde{\eta}_t g_{i,t} & D_{i,t} = 1 \end{cases}, \tag{A2}$$

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).

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

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

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

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

where the second equality 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 (A2) follows.

□

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

$$\max_{\eta_t(j)} \; \frac{(1+r)}{\eta_t(j)} \left(\frac{\eta_t(j)}{\eta_t}\right)^{\frac{1}{1-\theta}} \left[G_t^R + \eta_t(j) G_t^D - (1+r^{rf})G_t\right], \tag{A3}$$

taking as given the collateral index η_t and aggregate posted collateral by firm repayments: $G_t^R \equiv \int_i \mathbf{1}(D_{i,t}=0) g_{i,t}\,\mathrm{d}i$, $G_t^D \equiv \int_i \mathbf{1}(D_{i,t}=1) g_{i,t}\,\mathrm{d}i$, *and* $G_t \equiv \int_i g_{i,t}\,\mathrm{d}i = G_t^R + G_t^D$.

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

$$\mathrm{E}_t\left[\Pi_t^B(j)\right] = \frac{1+r}{\eta_t(j)} G_t^R(j) + G_t^D(j) - \frac{1+r^{rf}}{\eta_t(j)} G_t(j), \tag{A4}$$

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

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

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, (A4) is equal to (A3).

□

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 (5) 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

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

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, (A1) becomes

$$\mathrm{E}_t \sum_{k=0}^{\infty} \beta^k \Pi^F_{i,t+k} = \mathrm{E}_t\,\Pi^F_{i,t} + \mathrm{E}_{t+1} \sum_{k=1}^{\infty} \beta^k \Pi^F_{i,t+k} \equiv \mathrm{E}_t\,\Pi^F_{i,t} + \beta \mathcal{W}_{i,t+1}.$$

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

$$\mathrm{E}_t \sum_{k=0}^{\infty} \beta^k \Pi^F_{i,t+k} = \mathrm{E}_t\,\Pi^F_{i,t} + \mathrm{E}_{t+1} \sum_{k=1}^{\infty} \beta^k A \equiv \mathrm{E}_t\,\Pi^F_{i,t} + \frac{\beta}{1-\beta}A.$$

Thus, the value of repaying is given by

$$\begin{aligned} \mathcal{W}^R_{i,t} = \max_{v^R_{i,t}} \quad & z_{i,t}f(v^R_{i,t}) - c_{i,t}\gamma(\eta_t v^R_{i,t}) \\ & + (1-q_{i,t})\left[\beta\,\mathrm{E}_t[\mathcal{W}_{i,t+1}] - (1+r)v^R_{i,t}\right] + q_{i,t}\left[\frac{\beta}{1-\beta}A - \eta_t v^R_{i,t}\right], \end{aligned} \tag{A5}$$

and the value of (endogenously) defaulting is given by

$$\mathcal{W}^D_{i,t} = \max_{v^D_{i,t}} \quad z_{i,t}f(v^D_{i,t}) - c_{i,t}\gamma(\eta_t v^D_{i,t}) + \left[\frac{\beta}{1-\beta}A - \eta_t v^D_{i,t}\right]. \tag{A6}$$

Hence, the firm problem can be written as in (6). Differentiating with respect to $v_{i,t}$ and setting to zero gives the optimality conditions (7) and (8), 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

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

Assumption (2) implies that for $c_i = 0$, $\mathcal{W}^R_i > \mathcal{W}^D_i$. 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

$$\frac{\partial F_i}{\partial c_i} = \gamma(\eta v_i^D) - \left(\frac{1}{1-(1-q_i)\beta}\right)\gamma(\eta v_i^R), \tag{A7}$$

which is strictly negative by Assumption (2). Finally, taking $c_i \to \infty$, from (7) and (8), we have that $v_i^R \to 0, v_i^D \to 0$, and thus

$$\mathcal{W}_i^R \to q\frac{\beta}{1-\beta}A, \quad \mathcal{W}_i^D \to \frac{\beta}{1-\beta}A,$$

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 of $\bar{c}_i$ with respect to $\mathbf{x} \equiv \begin{bmatrix}\eta & z_i & q_i\end{bmatrix}^\top$

$$D_{\mathbf{x}}\bar{c}_i = -\left(\frac{\partial F_i}{\partial c_i}\right)^{-1} D_{\mathbf{x}}F_i, \tag{A8}$$

which holds in an appropriately defined neighborhood around $\{\eta, z, q\}$. Imposing the envelope theorem and evaluating the first-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 (9).

□

Proof of Proposition 3.

Proof. Recall the definition $F_i \equiv \mathcal{W}_i^R - \mathcal{W}_i^D$ from the proof of Proposition 2. From (A7), we have that $\frac{\partial F_i}{\partial c_i} \neq 0$ for all values of c_i and that second-order derivatives with respect to $\mathbf{x} \equiv \begin{bmatrix}\eta & z_i & q_i\end{bmatrix}^\top$ are well-defined. Thus, we can apply the implicit function theorem to find the hessian of $\bar{c}_i$ with respect to $\mathbf{x}$

$$H_{\mathbf{x}}\bar{c}_i = -\left(\frac{\partial F_i}{\partial c_i}\right)^{-1}\Bigg[H_{\mathbf{x}}F_i + D_{\mathbf{x}}F_i\left[D_{\mathbf{x}}\bar{c}_i\right]^\top + D_{\mathbf{x}}\bar{c}_i\left[D_{\mathbf{x}}F_i\right]^\top + \frac{\partial^2 F_i}{\partial c_i^2}D_{\mathbf{x}}\bar{c}_i\left[D_{\mathbf{x}}\bar{c}_i\right]^\top\Bigg], \tag{A9}$$

which holds in an appropriately defined neighborhood around $\{\eta, z, q\}$. Imposing the envelope theorem and evaluating the fist- and second-order derivatives in (A8) and (A9), and taking the limit as $c_i \to 0, q_i \to 0, \beta \to 1$ implies that $\frac{\partial \bar{c}}{\partial z}$ approaches (11); $\frac{\partial \bar{c}}{\partial q}$ approaches $-\infty$ at the rate in (12); $\frac{\partial^2 \bar{c}}{\partial \eta^2}$ approaches 0 from below at the rate in (13); $\frac{\partial^2 \bar{c}}{\partial \eta \partial z}$ approaches (15); and $\frac{\partial^2 \bar{c}}{\partial \eta \partial q}$ approaches $+\infty$ at the rate in (14).

□

B Additional Tables

Tables B2 and B1 report the number of enclosure acts awarded, the number of acres enclosed, and the average acres enclosed per act at the decade and county level, respectively.

Table B1: 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).

Table B2: 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	348
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.

C Empirical Robustness Checks

This appendix discusses several robustness checks to substantiate the main finding in Section 4.2, 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 of 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. We replicate the findings from Figure 6a, using the average awarded waste area enclosure per act in a given county-year observation, instead of the total area enclosed. Figure C1 reports the results of this analysis 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 even when considering agglomeration effects.

Lag order selection. Estimating Equation (10) 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 affect our results, we report in Figure C2 how our results change

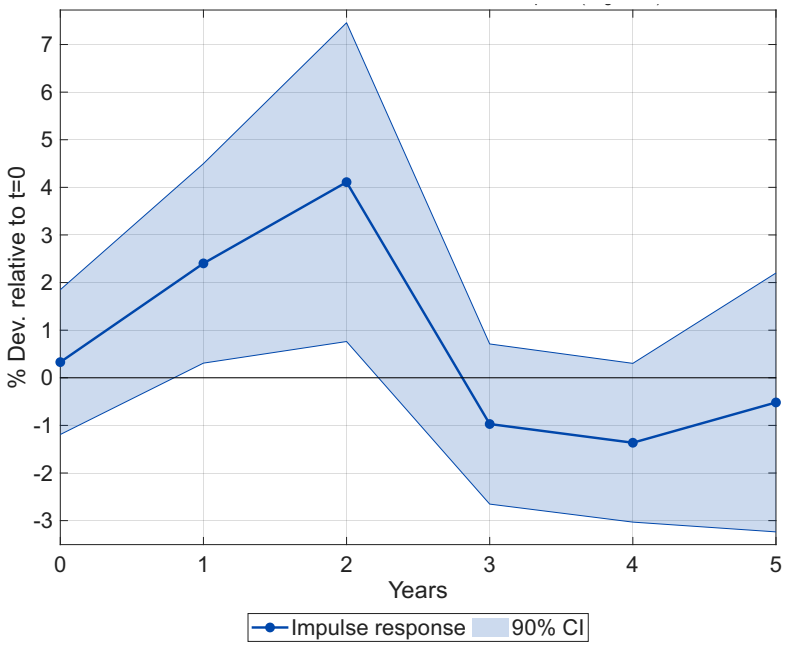

Figure C1: The Effect of Land Enclosures on Bankruptcies

Notes: This figure reports in the solid lines values of β_h from estimating Equation (10) using the average area of a waste enclosure awarded in county i at time t. Shaded areas indicate 90% confidence intervals where inference is based on two-way cluster-robust standard errors, clustered by county and year. Estimates are expressed in percentage changes in the number of expected bankruptcies due to the award of enclosures with an average size of 1,000 acres.

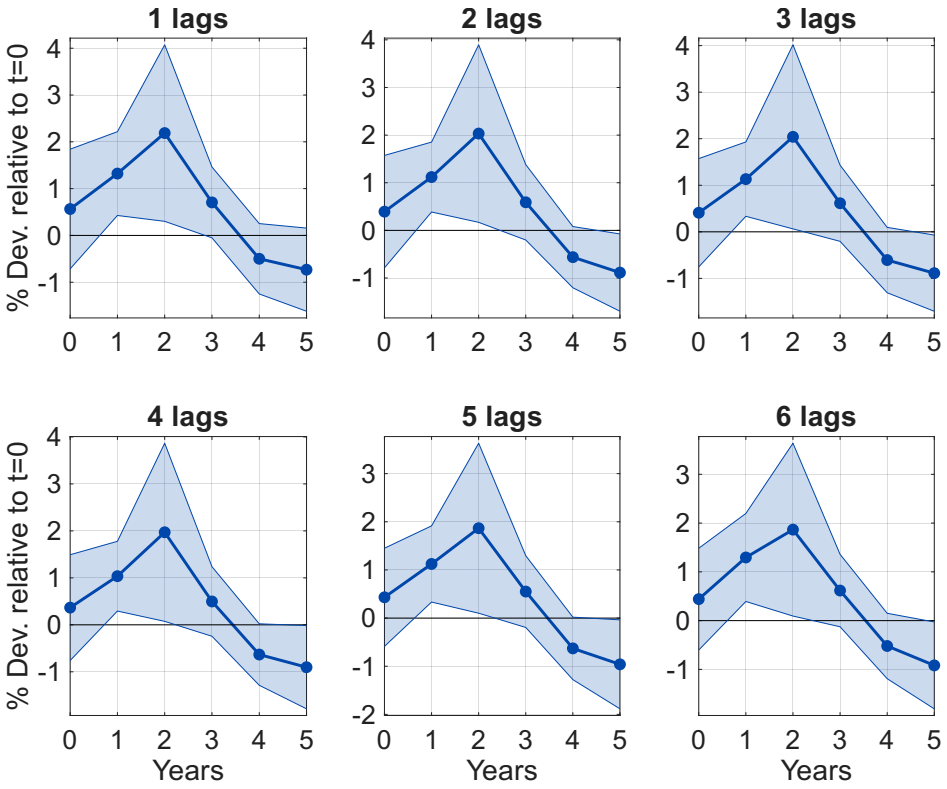

Figure C2: Impulse Response of the Effect of Waste Enclosures on Bankruptcies 1750-1830: Robustness to Lag Order Selection.

Notes: 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 (10) using data from 1750 - 1830 with a different lag order $l = 1, \ldots, 6$ for the control variables. The responses are scaled as percentage deviations from the pre-enclosure level.

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 awarded 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:

$$BR_{i,t-h} = \exp\left(\delta_t^h + \alpha_i^h + \beta_h^{pre} ENC_{i,t} + \boldsymbol{\gamma}^h \mathbf{X}_{i,t-1-h} + \epsilon_{i,t}^h\right), \tag{C1}$$

where $h \in \{-1, \ldots, -5\}$. β_h^{pre}, tells us to what extent is an enclosure at time t informative of the outcome at time $t-h$, after residualizing for the same controls as in the main specification lagged to horizon $t-h-1$ (e.g. for the effect of enclosures on bankruptcies at $t-1$ we control for four lagged values of enclosures and bankruptcies at $t-5$ up to $t-2$ and population at $t-2$). Finding a significant coefficient might challenge any causal interpretation we attribute to our baseline estimates. Figure C3 reports the results of the

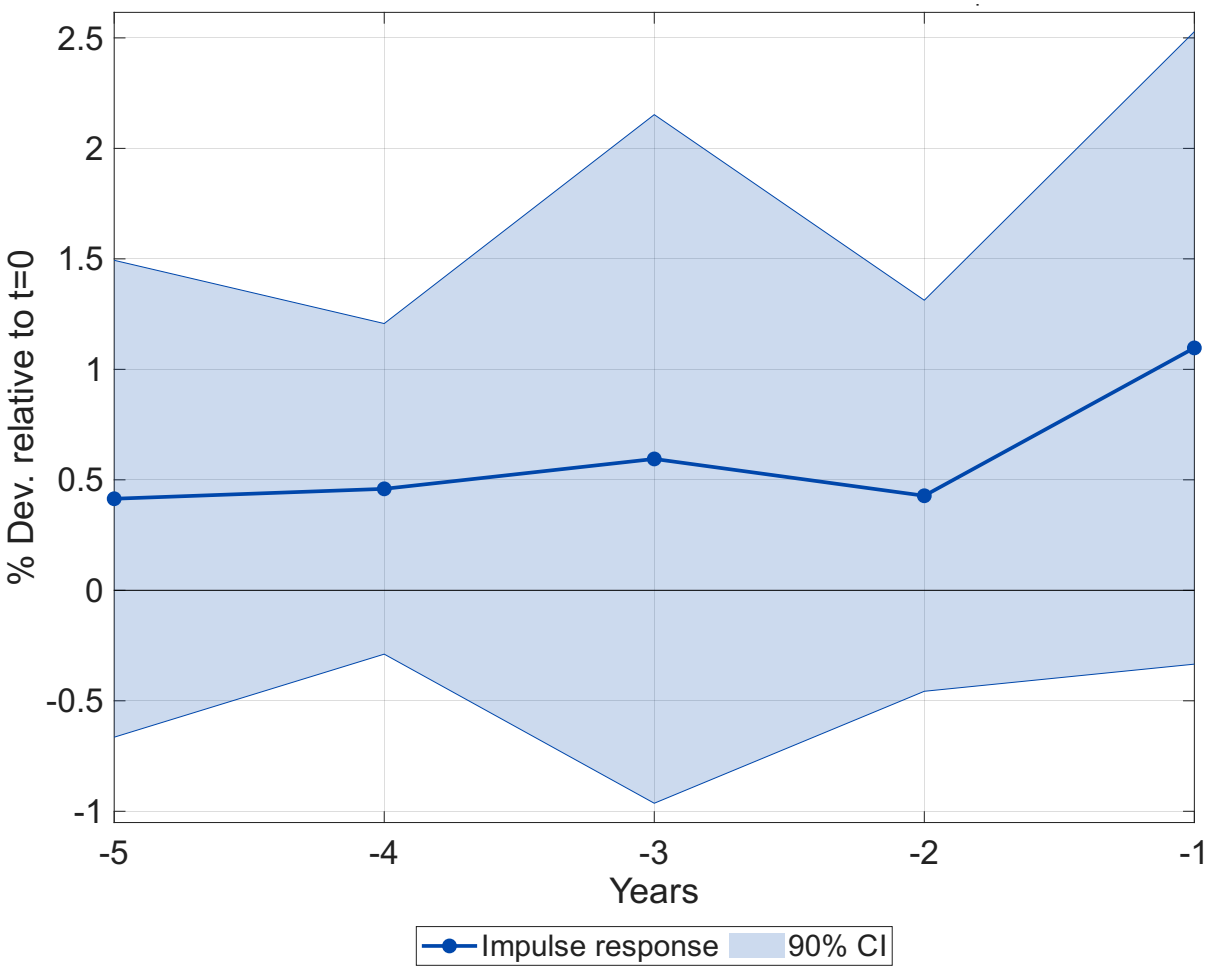

Figure C3: The Effect of Waste Enclosures on Bankruptcies: Pre-trend Test

Notes: This figure reports in the solid lines values of $\beta_h^{pretrend}$ from estimating Equation (C1) using the total area of waste enclosures awarded in county i at time t. Shaded areas indicate 90% confidence intervals where inference is based on two-way cluster-robust standard errors, clustered by county and year. Estimates are expressed in percentage changes in the number of expected bankruptcies due to an enclosure of 1,000 acres.

estimation of equation (C1), finding no evidence of a statistically significant pre-trend. To demonstrate that this result is also unaffected by the number of included lags, we re-estimate equation (C1) using values of l ranging from 1 to 6 and finding consistently no statistically significant pre-trend. This exercise is presented in Figure C4.

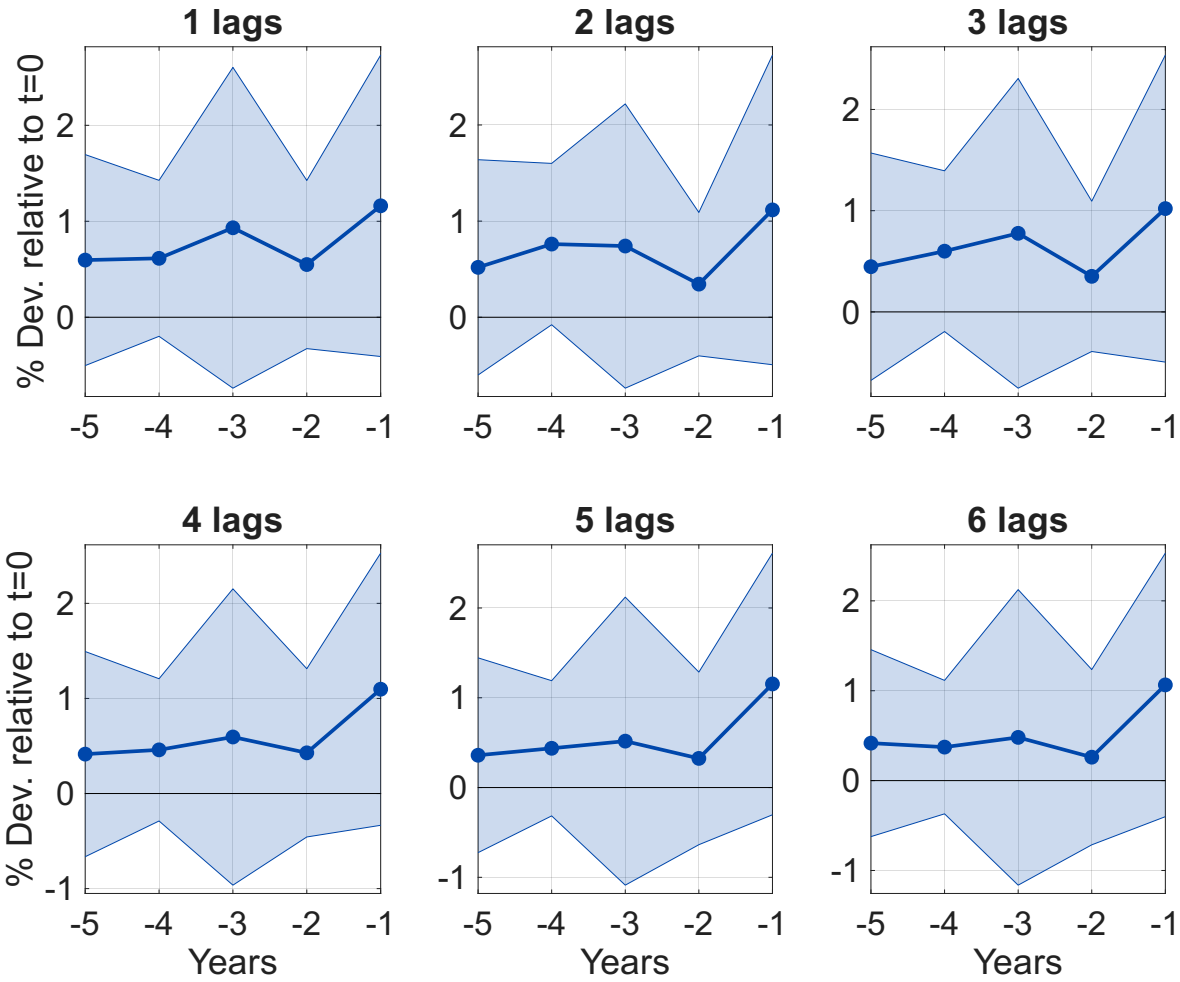

Figure C4: The Effect of Waste Enclosures on Bankruptcies: Pre-trend Test: Robustness to Lag Order Selection.

Notes: Each panel reports in the solid lines values of $\beta_h^{pretrend}$ from estimating Equation (C1) using the total area of waste enclosures awarded in county i at time t, with a different lag order $l = 1, \ldots, 6$ for the control variables. Shaded areas indicate 90% confidence intervals where inference is based on two-way cluster-robust standard errors, clustered by county and year. Estimates are expressed in percentage changes in the number of expected bankruptcies due to an enclosure of 1,000 acres.

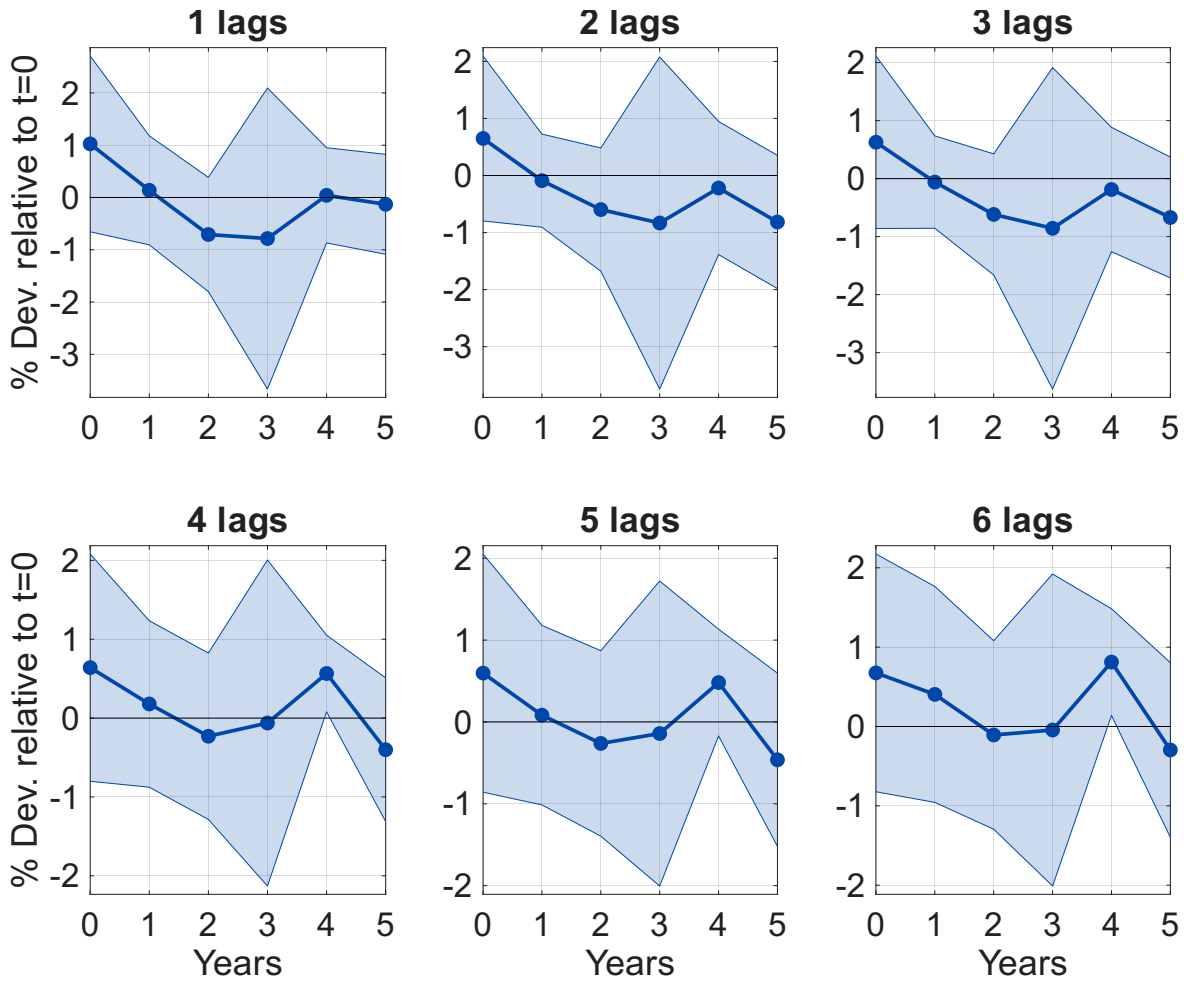

Figure D1: Impulse Response of the Effect of Waste Enclosures on Bankruptcies 1750 - 1792: Robustness to Lag Order Selection.

Notes: 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 (10) using data from 1750 - 1792, with a different lag order $l = 1, \ldots, 6$ for the control variables. The responses are scaled as percentage deviations from the pre-enclosure level.

D Robustness Checks for Section 5

Lag order selection and sample splitting. Figures D1 and D2 demonstrate that the sample splitting exercise reported in Figure 7 is also unaffected by our choice of lag order in Equation (10).

Cutoff selection for Figures 9 and 10. The specification in Equation (16) 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 denotes values above the $50 + p_x$ percentile of the exposure measure. Our baseline uses $p_x = 33$. We conduct robustness checks on all results, depending on this specification, to ensure they are not sensitive to the cutoff choice. We maintain symmetry in our robustness

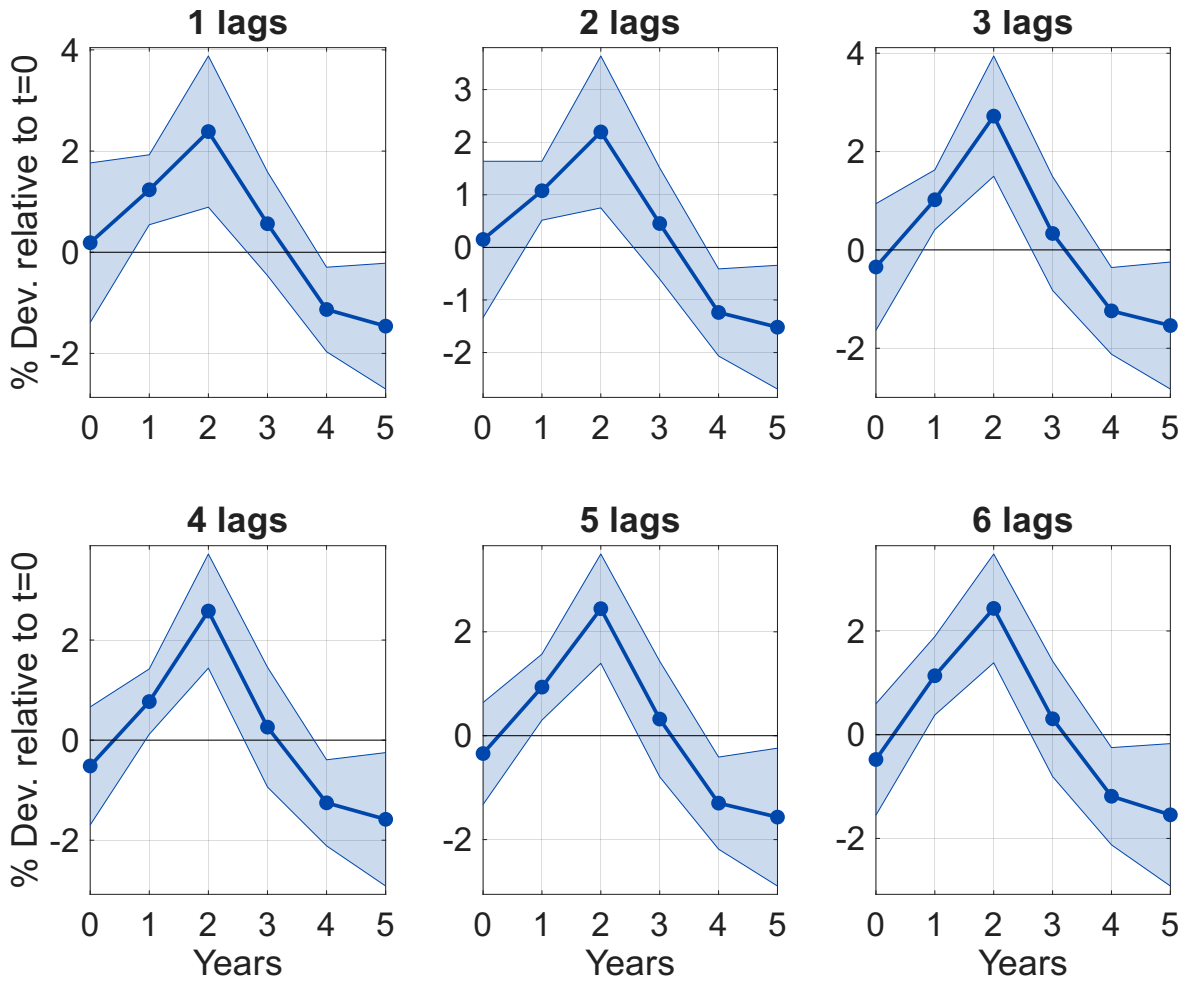

Figure D2: Impulse Response of the Effect of Waste Enclosures on Bankruptcies 1793 - 1830: Robustness to Lag Order Selection.

Notes: 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 (10) using data from 1793 - 1830, with a different lag order $l = 1, \ldots, 6$ for the control variables. The responses are scaled as percentage deviations from the pre-enclosure level.

checks and re-estimate Equation (16) using $50 - p_x$ as the 15^{th},20^{th},25^{th},30^{th},35^{th}, and 40^{th} percentiles of the exposure measure. Figures D3 and D4 demonstrate that the result in Figure 9 is robust to our cutoff choice. The effect of waste enclosure on bankruptcies is stronger in counties and years most exposed to the secondary sector and least exposed to agriculture. Figure D5 demonstrates that, as in Figure 10 of the main text, high exposure to the weather shock amplifies the effect of waste enclosures on bankruptcies.

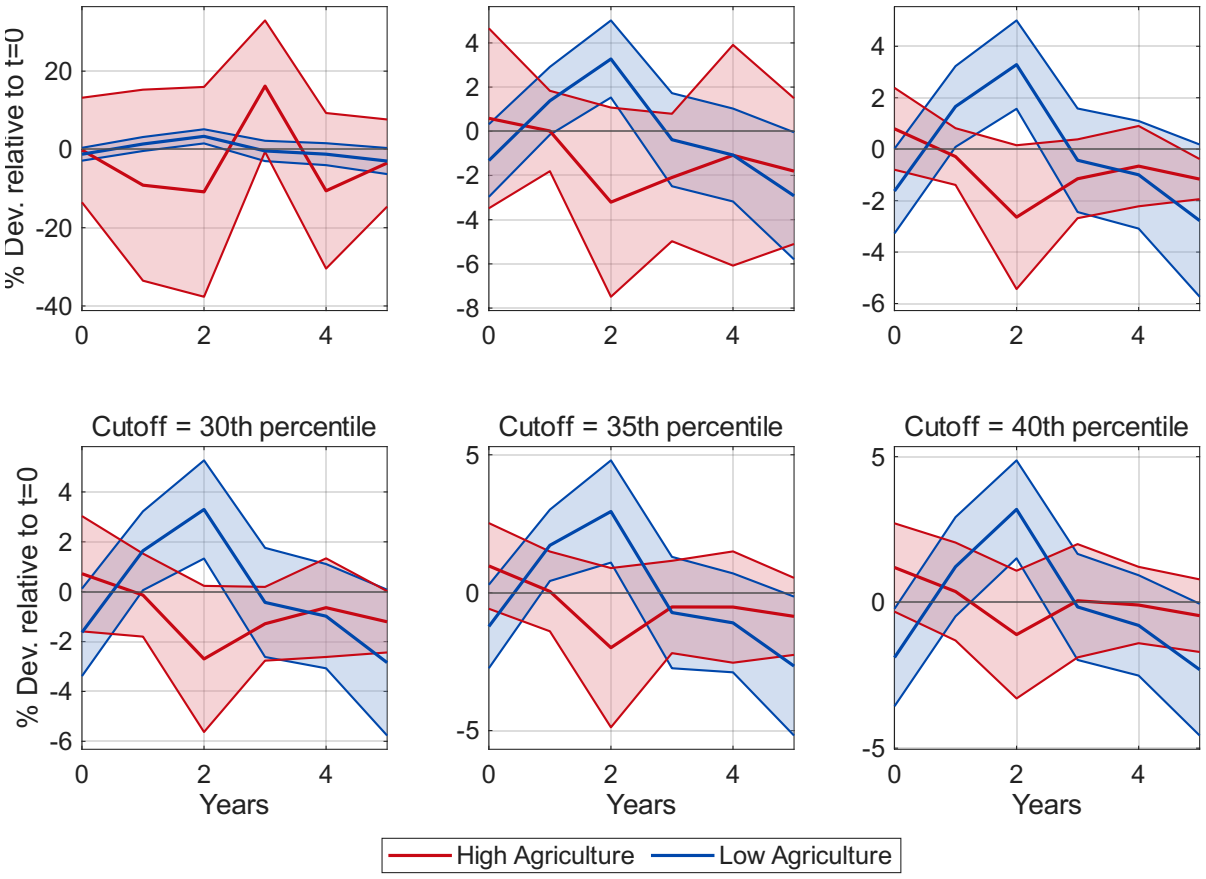

Figure D3: Agricultural Intensity and the Effect of Waste Enclosures: Robustness to Cutoff Choice

Notes: This figure reports impulse responses estimated via Equation (16) 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 (16) using the cutoff level indicated in the title for the low-exposure and high-exposure groups. The shaded area indicates 90% confidence interval, where inference is based on two-way cluster-robust standard errors, clustered by county and year. Estimates are expressed as percentage changes in the number of expected bankruptcies following a new land enclosure of 1,000 acres.

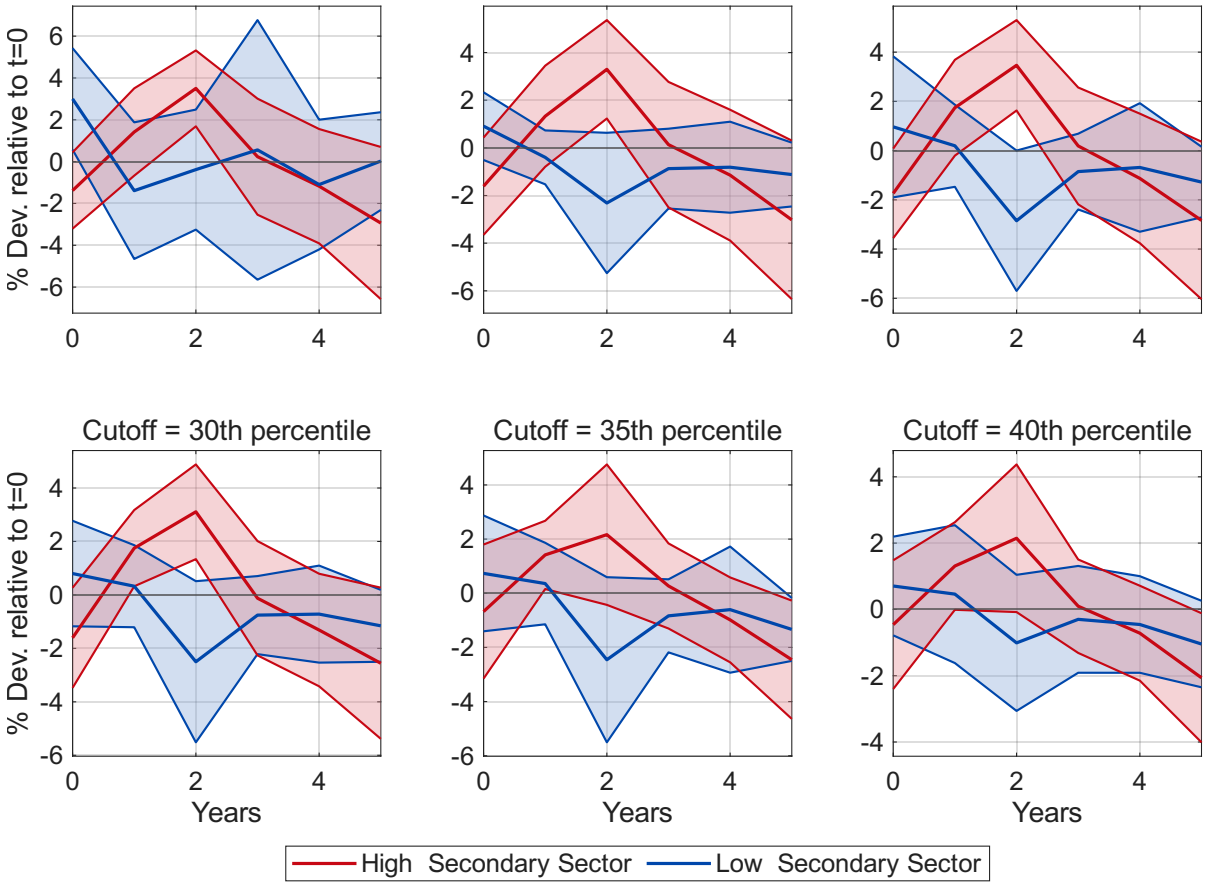

Figure D4: Secondary Sector Intensity and the Effect of Waste Enclosures: Robustness to Cutoff Choice

Notes: This figure reports impulse responses estimated via Equation (16) 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 (16) using the cutoff level indicated in the title for the low-exposure and high-exposure groups. The shaded area indicates 90% confidence interval, where inference is based on two-way cluster-robust standard errors, clustered by county and year. Estimates are expressed as percentage changes in the number of expected bankruptcies following a new land enclosure of 1,000 acres.

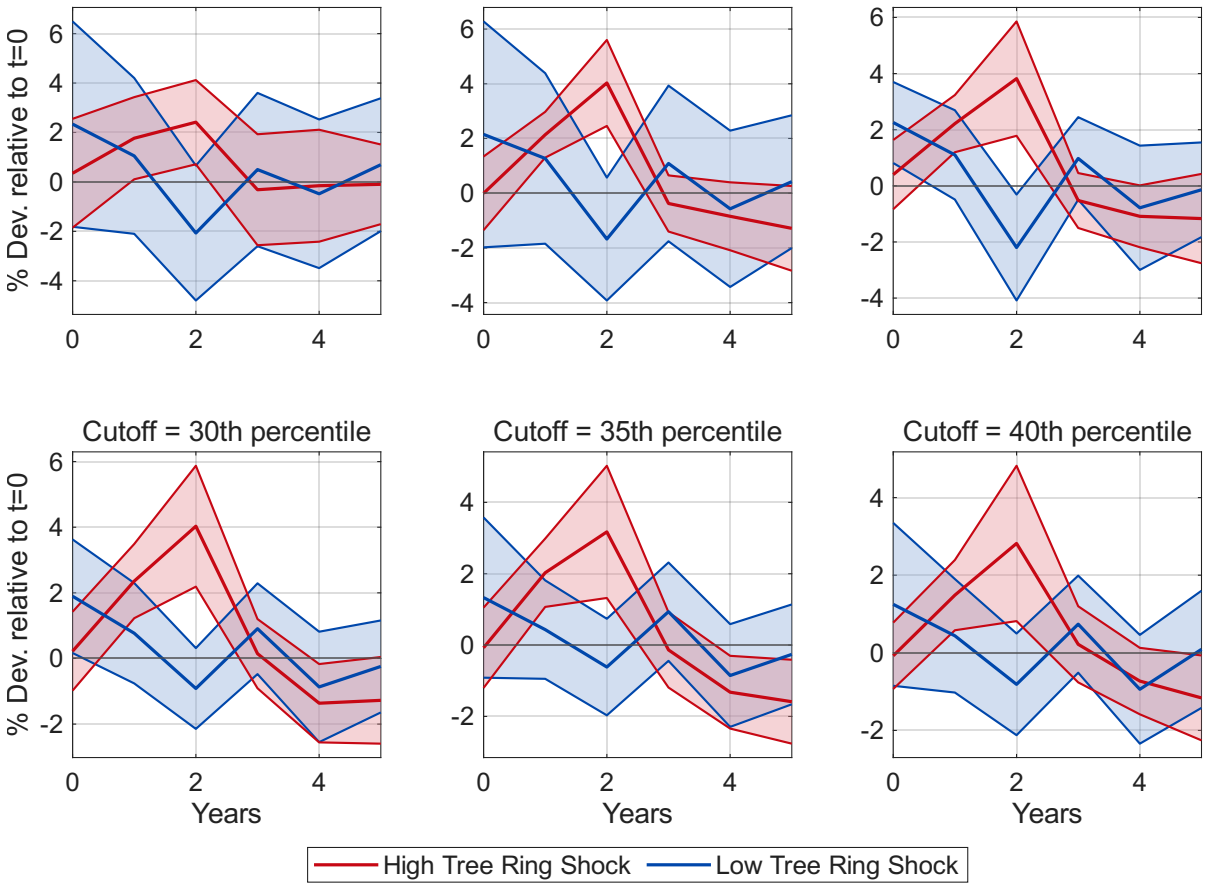

Figure D5: Exposure to Weather Shocks and the Effect of Waste Enclosures

Notes: This figure reports impulse responses estimated via Equation (16) using the total area of waste area enclosures in the solid lines. Each panel reports the results from estimating Equation (16) using the cutoff level indicated in the title for the low-exposure and high-exposure groups, based on exposure to our weather shock variable. The shock is constructed such that high exposure indicates that weather conditions were particularly unfavorable. The shaded area indicates 90% confidence interval, where inference is based on two-way cluster-robust standard errors, clustered by county and year. Estimates are expressed as percentage changes in the number of expected bankruptcies following a new land enclosure of 1,000 acres.

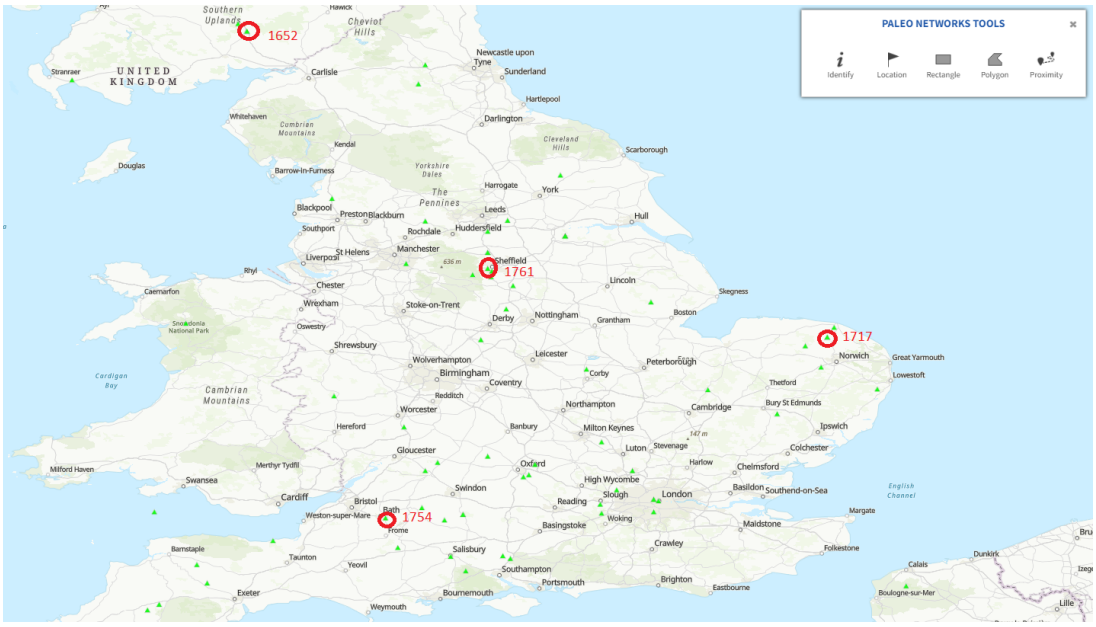

Figure E6: Tree Ring Series Locations

E Tree-Ring Shock Construction

To obtain a measure of exogenous fluctuations in real activity, we leverage a historical dataset of standardized tree-ring growth series. The tree-ring growth index chronologies are constructed from samples collected from trees in various locations. They are located in the International Tree-Ring Data Bank (ITRDB) and managed by the World Data Service for Paleoclimatology. [27] Because the width of tree rings is influenced by environmental factors like temperature, precipitation, soil moisture, and sunlight, their 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. In contrast, narrow rings indicate drought, poor soil quality, or other stressors, such as extreme temperatures or pest infestations. The series used in our study comes from different sampling locations corresponding to four climate regions in England. These series were matched to counties based on their relevant climate region. Specifically, the samples are from the surroundings of Bath (information from 1754), Sheffield (from 1761), Norwich (from 1717), and Moffat in Scotland (from 1652), and are visually depicted in Figure E6.[28]

We use these tree-ring series to construct a new weather-shock variable as follows. We fit an ARMA model to each tree-ring series in each locality, allowing us to flexibly capture expectations for agricultural conditions. Model selection was done by minimizing the Bayesian information criterion (BIC) using a parameter-grid approach. All tree-ring

[27] The samples can be downloaded from the National Centers for Environmental Information (NOAA) website: https://www.ncei.noaa.gov/products/paleoclimatology/tree-ring.

[28] The climate regions are based on the Met Office, see: https://www.metoffice.gov.uk/research/climate/maps-and-data/about/districts-map.

series are stationary according to an augmented Dickey-Fuller test; thus, we reject models that assume cointegration. We then compute forecast errors by subtracting the raw tree ring series from the expected value obtained from the fitted ARMA model, a proxy for expected weather conditions, which yields a weather-shock variable.

Formally, if the tree-ring series in county i at time t is given by $y_{i,t}$, then our weather shock $\epsilon_{i,t}^{\text{weather}} = \hat{y}_{i,t} - y_{i,t}$, where $\hat{y}_{i,t}$ is the predicted value of $y_{i,t}$. The prediction is based on an ARMA model while accounting for the regional history of $y_{i,t}$ up to time t. Note that each county i is uniquely mapped into one of the four weather regions and is thus matched to one of four series of unique realizations of $\epsilon^{\text{weather}}$ such that cross-sectional variation is between weather regions that include multiple counties each. $\epsilon^{\text{weather}}$ is constructed such that a positive value of it implies that weather conditions were below predicted levels. Thus, a high level of $\epsilon^{\text{weather}}$ implies unexpectedly adverse weather conditions.

F 5-digit HISCO Labels

Table F1: HISCO 5-digit occupations and simplified labels

Simplified label	**HISCO 5-digit occupation**	**Code**
Ship's Master	Ship's Master (Sea)	4215
General Surgeon	General Surgeon	6110
Pharmacist	Pharmacist	6710
HISCO 8715	HISCO full 8715	8715
Clerical Supervisor	Clerical Supervisor, General	22110
Housekeeper	Housekeeper (Private Service, in Hotels, or in Other Institutions)	22425
Finance Clerk	Finance Clerk	33940
Office Clerk	Office Clerk, General	39310
Proprietor (Trade)	Working Proprietor (Wholesale or Retail Trade)	41025
Proprietor (Hiring Out)	Working Proprietor (Hiring Out)	41040
Manufacturers' Agent	Manufacturers' Agent	43230
Ins/RE/Sec Sales	Insurance, Real Estate, Securities or Business Services Salesmen	44000
Auctioneer	Auctioneer	44320
Retail Salesperson	Retail Trade Salesperson	45130
Proprietor (Hotel/Rest)	Working Proprietor (Hotel and Restaurant)	51020
General Farmer	General Farmer	61110
Beef Cattle Farm Worker	Beef Cattle Farm Worker	62420
Horse Worker	Horse Worker	62460
Metal Smelt/Refine	Metal Smelting, Converting and Refining Furnacemen, Specialisation Unknown	72100
Metal Moulder/Coremaker	Metal Moulder or Coremaker, Specialisation Unknown	72500
Paper Maker (Hand)	Paper Maker (Hand)	73460
Chemical Processors	Other Chemical Processors and Related Workers	74990
Spinner/Thread/Yarn	Spinner, Thread and Yarn	75220
Weaver (Unspec)	Weaver, Specialisation Unknown	75400
Cloth Weaver	Cloth Weaver (Hand or Machine)	75432
Other Weavers	Other Weavers and Related Workers	75490
Hosiery Knitter	Hosiery knitter (Hand)	75535
Yarn Dyer	Yarn Dyer	75620
Bleach/Dye/Text Finish	Other Bleachers, Dyers and Textile Product Finishers	75690
Rope Maker	Rope Maker, General	75710
Fellmonger	Fellmonger	76125
Tanner	Tanner	76145
Leather Currier	Leather Currier	76150

Simplified label	HISCO 5-digit occupation	Code
Grain Miller	Grain Miller	77120
Sugar Processors	Other Sugar Processors and Refiners	77290
Butcher	Butcher, General	77310
Baker	Baker, General	77610
Brewer	Brewer, General	77810
Kilnman (Malting)	Kilnman (Malting)	77825
Brew/Wine/Beverage	Other Brewers, Wine and Beverage Makers	77890
Tailor (Unspec)	Tailor, Specialisation Unknown	79100
Hat Maker	Hat Maker, General	79310
Milliner	Milliner, General	79320
Leather Garment Sewer	Leather Garment Hand Sewer	79530
Upholsterer	Upholsterer or Related Worker, Specialisation Unknown	79600
Sail/Tent/Awning Maker	Sail, Tent and Awning Maker	79920
Tailor/Dress/Sew/Uph	Other Tailors, Dressmakers, Sewers, Upholsterers and Related Workers	79990
Shoemaker	Shoe-maker, General	80110
Leather Goods Maker	Leather Goods Maker, General	80310
Saddler/Harness Maker	Saddler and Harness Maker	80320
Cabinetmaker	Cabinetmaker	81120
Coach-Body Builder	Coach-Body Builder	81920
Cooper	Cooper	81930
Blacksmith	Blacksmith, General	83110
Cutler	Cutler	83915
Watch/Clock/Precision	Other Watch, Clock and Precision Instrument Makers	84290
Brazer	Brazer	87245
Jeweller	Jeweller, General	88010
Gold/Silver Smith	Goldsmith and Silversmith	88050
Potter	Potter, General	89210
Brick/Tile Kilnman	Brick and Tile Kilnman	89360
Glass/Pottery Workers	Other Glass Formers, Potters and Related Workers	89990
Printer	Printer, General	92110
Textile Printer	Textile Printer	92950
Other Painters	Other Painters	93990
Candle Maker	Candle Maker	94960
Bricklayer	Bricklayer (Construction)	95120
Stonemason	Stonemason (Construction)	95140
Wood Shipwright	Wood Shipwright	95440
Ship's Carpenter	Ship's Carpenter	95455
Carp/Join/Parquetry	Other Carpenters, Joiners and Parquetry Workers	95490

Simplified label	HISCO 5-digit occupation	Code
Housebuilder	Housebuilder, General	95910
Warehouse Porter	Warehouse Porter	97145
Seaman	Seaman, Able or Ordinary	98135
Worker (NFI)	Worker, No Further Information	99900