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Working Paper No. 69
2024

Governance and Local
Development Institute



UNIVERSITY OF
GOTHENBURG

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With thanks to Bob Allen, Lisa Blaydes, Kate Casey, Verena Fetscher, Adriane Fresh, Tyler Goodspeed, Anna Gryzmala-Busse, Jacob Hariri, Torben Iversen, Saumitra Jha, Dmitrii Kofanov, Melissa Lee, Johannes Lindvall, Shelley Liu, Kevin O'Rourke, Christopher Paik, Giuliana Pardelli, Leonid Peisakhin, Thomas Piketty, Henry Thomson, and Nina Weber for useful discussions, audiences at APSA 2022, APSA 2023, ASREC 2023, GLD Work in Progress Workshop, Historical Political Economy Working Group 2022, MPSA 2023, NYU Abu Dhabi, Irish Quantitative History Workshop 2023 at Trinity College Dublin, Paris School of Economics, and the Virtual Historical Political Economy Workshop, and to Cormac O'Grada, Alan Fernihough, Soeren Henn, Paul Manzor, and Michael Murphy for data access.

Abstract

Shifts in land ownership affect not only its concentration among individuals but, by changing the identity of the local economic elite, its distribution among groups. We study how the group identity of local elites shapes the supply of local public goods over time. Between 1652-9, a third of Ireland's land was expropriated from Irish Catholic elites. Leveraging the lottery-based allocation of this land to different English Protestant recipients, we find significant and persistent local variation in the extent of land ultimately owned by Protestants. Drawing on rich local data spanning nearly two centuries, we find that public goods, such as schools and workhouses, became scarcer and more exclusionary in areas more intensively redistributed to the Protestant minority. Broader economic outcomes, however, show only muted differences. The results underscore how the distributive consequences of inequality between groups vary from those of inequality between individuals.

The study of inequality has been central to the social sciences for more than half a century (Gerschenkron, 1967; Kuznets, 1955; Moore, 1966). While scholars continue to debate the drivers of contemporary inequality (Piketty, 2014), there is widespread recognition that high levels of land inequality limited historical political and economic development (Easterly, 2007; Engerman and Sokoloff, 1994; Frankema, 2010; Neves et al., 2016). Politically, greater land inequality inhibited democratization by providing elites with the resources and incentives to quash redistributive reforms (Acemoglu and Robinson, 2009; Ansell and Samuels, 2015; Boix, 2003; Ziblatt, 2008). Economically, landed elites, with fortunes tied to the agrarian economy, resisted industrialization by opposing policies that would increase the mobility of their workforce (Banerjee and Iyer, 2005; Bowles, 1978). The relationship between land inequality and the supply of local public goods is, accordingly, typically grounded in the economic calculus of a small agrarian elite coordinating to limit citizens' human capital acquisition (Baten and Juif, 2014; Galor and Moav, 2009; Rueschemeyer et al., 1992).

However, shocks to landownership—such as those induced by conquest, colonization, or revolution—shift the distribution of land among societal *groups* (whether religious, ethnic, or national) as well as its concentration among *individuals*. While classic studies assume elites' behavior is determined by the individual-level concentration of land, recent work underscores the economic consequences of group-level inequality (Alesina et al., 2016; Baldwin and Huber, 2010). We argue that this distinction poses both theoretical and empirical challenges. Theoretically, group-level inequality operates primarily by changing local elites' *identity*, and hence the levels and excludability of their expenditure preferences. We suggest that, under conditions of minority rule and a weak central state, increased group-level inequality should reduce the aggregate supply of local public goods. These

observable implications overlap with, but theoretically confound, those of increased individual-level concentration. Empirically, group- and individual-level inequality are highly correlated in most empirical settings (see, for illustration, Figure A1). This implies a thorny inferential challenge in isolating the distributive impact of group, but *not* individual, inequality on public goods provision.

We draw out the implications of this theoretical distinction by studying the Cromwellian Settlement in Ireland. Characterized as “the most epic and monumental transformation of Irish life, property and landscape that the island has ever known” (Smyth, 2006, 196), the Settlement followed a brutal war of conquest (1649-1653), culminating in the expropriation of two-thirds of the land of Ireland’s Catholic gentry and its redistribution to English Protestants, while leaving non-landowners comparatively untouched (O’Leary, 2019). We leverage lotteries held in 1654 to randomly divide baronies in ten counties—comprising a quarter of Ireland’s total land mass—between the New Model Army soldiers who fought in the war and the wealthy merchants and politicians (the “Adventurers”) who funded it. Studying this lottery using fine-grained historical data, we find substantial variation in the claimants’ propensity to take up their land: by 1670, areas assigned to the Army were more likely to be Protestant-owned, while Adventurer-assigned areas were more likely to remain Catholic-owned. However, owing to features of the redistribution process, we find null effects on measures of individual-level land *concentration*.¹

We examine the long-run consequences of this exogenous variation in the group identity of local elites for the supply of local public goods. First, consistent with the claims of historians who have long argued the Cromwellian Settlement had persistent effects on landownership (Pomfret, 1930;

¹This is because, as we show, large Catholic landowners were more likely to retain their land in Adventurer-assigned areas, while a relatively small number of Protestant settlers accumulated substantial landholdings in Army-assigned areas. Tenants remained overwhelmingly Catholic across Ireland.

Prendergast, 1870), we find that areas assigned to the Army were more likely to retain Protestant landlords nearly two centuries later. Second, digitizing facility-level historical sources relating to a range of local public goods—schools, health facilities, workhouses, and carceral facilities—on the eve of the Great Famine (1845-9), we find that public goods are overall scarcer in areas assigned to the Army, where landlords were more likely to be Protestant. Our results are consistent with persistent variation in elites’ exclusionary expenditure preferences, with the most striking reductions appearing for public goods that were both funded by elites and were more likely to benefit the Catholic majority. For example, we find evidence of fewer schools overall in Army-assigned baronies, especially those funded by elites, and a greater share of low-quality informal schools. For health facilities, we find more muted effects, likely due to the shared benefits of these facilities for local elites (Cassell, 1997). In turn, we find lower levels of investment for both workhouses and nominally rehabilitative small-scale prisons (“bridewells”), each of which has been argued to signal redistribution toward the majority Catholic poor (Carroll-Burke, 2000; Solar, 1995). Our results are consistent with heightened Protestant elite discrimination against poorer Catholic citizens in Army-assigned baronies.

Canonical accounts of land inequality, focused implicitly on the extent of its concentration among a small elite, imply that observed reductions in local public goods are instead due to elites’ strategic incentives to maintain the dominance of the agricultural sector and prevent industrial transitions (Bowles, 1978; Galor and Moav, 2009; Rueschemeyer et al., 1992). However, we find no relationship between our variation in local elite identity and measures of either agricultural employment or private agricultural investments; moreover, we find only limited evidence of a relationship between

Army assignment and population levels, or loss, during the Great Famine. These muted effects on local economic structure highlight the distinct mechanisms linking inequality between groups, versus individuals, to local public goods provision.

While our empirical case leverages a specific historical event to isolate the effects of group-level inequality in landownership, the resulting insights are applicable to a broader set of agrarian contexts with cross-cutting societal cleavages. This applies, most obviously, to settler colonies where land was redistributed from indigenous to foreign landowners (Alvaredo, 2021; McNamee, 2022; Young, 1994). Other salient examples include large-scale expropriations of religious land, as took place in settings including England (Heldring et al., 2021), France (Finley et al., 2021), Mexico (Fallaw, 2013), and China (Yang, 2011). And, while we focus on a case of minority rule, our framework similarly implies that populist land reform—as in South Africa or Zimbabwe with the expropriation of white-owned land (Lahiff and Li, 2012; Shaw, 2003), India as stratified by caste (Besley et al., 2016), or Algeria against French landowners (Smith, 1975)—shapes public goods provision by changing the *identity* as well as the *number* of landowners.

This paper makes three contributions. First, we contribute to the literature on land inequality and local development. Conceptually, the group identity of landed elites is an often overlooked channel in such studies (Acemoglu, Reed and Robinson, 2014; Banerjee and Iyer, 2005; Engerman and Sokoloff, 1994; Moore, 1966). Our results underscore the importance of understanding the expenditure preferences of landed elites toward an out-group defined by their lower economic status *and* a cross-cutting group identity. Our exposition of the distinct impact of these levels of inequality, whether group or individual, sheds light on conflicting results linking land inequality with public

goods provision (Albertus and Popescu, 2020; Galor and Moav, 2009; Gerring et al., 2015; Lee, 2023).

Second, a broader literature underscores the economic consequences of group-level inequality (Alesina et al., 2016; Baldwin and Huber, 2010). However, the salience of such group divides is typically a confounded artifact of distinct state-building processes (Pardelli and Kustov, 2022; Singh and vom Hau, 2016). While our results echo prior results linking group-level inequality with aggregate reductions in public goods provision (Anderson, 2011; Deshpande, 2000; Kyriacou, 2013), our research design allows us to tease out distinct observable implications across *types* of local public good, as well as broader economic outcomes, while holding fixed individual-level measures of inequality.

Last, we add to the literature on settler colonialism, both in Ireland and more broadly. Building on generations of Irish historical scholarship (Canny, 2021; Connell, 1950; O’Leary, 2019), we offer perhaps the most comprehensive empirical analysis of the lasting impact of the Cromwellian Settlement—long argued to be responsible for Ireland’s subsequent economic deficiencies (Mokyr, 1983). Our unusually broad set of original and highly disaggregated data sources elucidates how one channel, the identity of local elites, had strikingly persistent effects. This channel suggests that settler colonialism shaped local development through changes in local social structure, as well as national institutional change (Acemoglu, Gallego and Robinson, 2014; Lechler and McNamee, 2018; Pepinsky, 2016; Pierskalla et al., 2019).

1 Inequality, Identity, and Local Public Goods

We begin with the simple observation that economic inequality is defined by the allocation of resources between *individuals*, as well as across *groups*. In agrarian economies, where land is the dominant factor of production, shifts in inequality can be induced by changes in the number or concentration of landowners, their group identity, or both. In Figure 1, we consider a stylized administrative unit where citizens are either of economic status L (owning land) or N (not owning land). We assume the presence of a cross-cutting group affiliation: for example religion, caste, ethnicity, or nationality, which we represent with the designation of A or B , and that B is the minority group.

Figure 1a depicts an initial distribution of land in which members of the two groups are equally likely to own land (i.e., $P(L|A) = P(L|B)$), we consider two possible ways of reallocating land. First, in Figure 1b, reallocation might shift individual-level inequality such that $P(L)$ falls while still $P(L|A) = P(L|B)$. In this setting, landholding has become more concentrated at the *individual* level (with the same total population, fewer people own land), but *group* inequality has stayed the same (the proportions of A and B among the landowners and non-landowners is unchanged). Alternatively, Figure 1c presents a scenario in which group-level inequality has shifted such that $P(L|A) \neq P(L|B)$, while individual-level inequality ($P(L)$) stays fixed. In this case, the overall ratio of tenants to landlords has remained the same, but that same ratio *within groups* has changed.²

Both Figures 1b and 1c present ideal cases. We would expect most real-world cases to include a combination of changes in individual and group-level inequality. While we expect these two forms

²Figure 1c indicates a setting where $P(L|A) < P(L|B)$, which is particularly relevant for our substantive focus on a case of settler colonialism; if instead $P(L|A) > P(L|B)$, this would be consistent with populist land reforms.

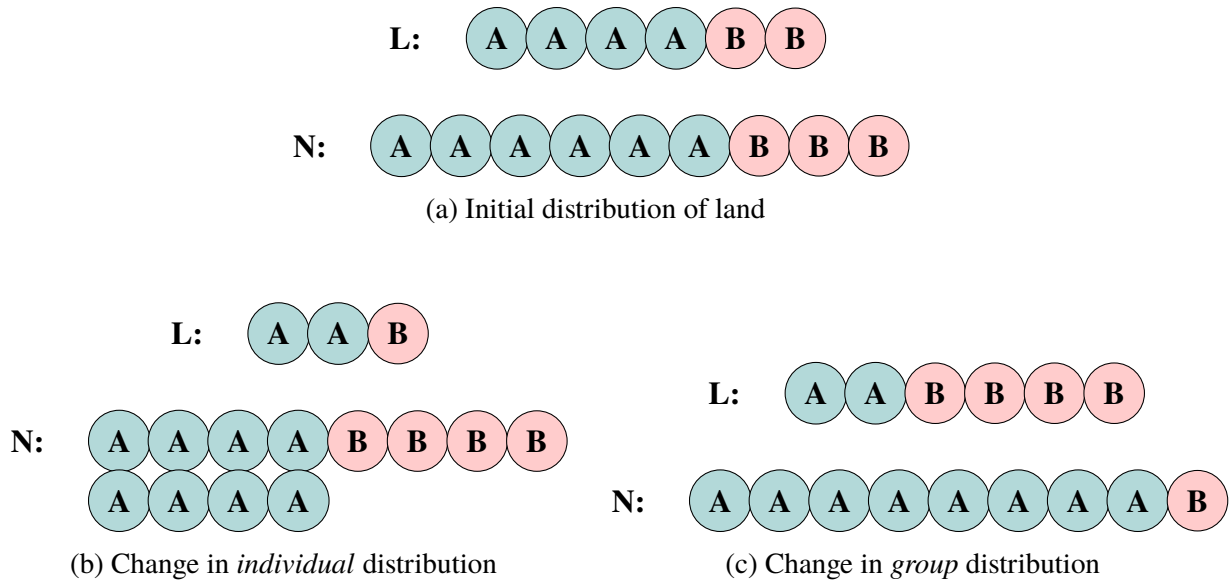


Figure 1: Shifts in land inequality between individuals and groups

of inequality to affect long-run outcomes through distinct theoretical channels, as we discuss below, parsing between these channels is difficult because of their real-world association. While empirical work on economic inequality suggests group-level inequality potentially matters more for local development than individual-level inequality (Alesina et al., 2016; Baldwin and Huber, 2010), work on land inequality typically implicitly focuses on Figure 1b, i.e., shifts in *concentration*, rather than Figure 1c. Ubiquitous measures, the Gini coefficient for example, assess the population owning land or its distribution between landowners, without considering differences across societal groups (Bauluz et al., 2020; Deininger and Squire, 1998; Erickson and Vollrath, 2004; Frankema, 2010).

1.1 Group-Level Inequality and Local Public Goods

Three mechanisms connect shifts in the group-level distribution of land (Figure 1c) with public goods outcomes. Most importantly, changes in group-based land inequality affect the *identity* of the

local economic elite (in the above, *B* rather than *A*) who, in the absence of a strong central state, are likely to shoulder significant responsibility for the supply of local public goods. Where groups have different preferences over the level and mix of local expenditures, we should expect differences in the public goods provision.

These different preferences might arise in part because of *intrinsic* differences due to cultural variation in the prioritization of different welfare-relevant outcomes (Desmet et al., 2017). Group status (majority or minority) also generates *instrumental* differences in preferences. Under minority rule, we might anticipate more excludable, targeted investments to ensure benefits accrue to the minority in-group rather than the majority out-group (Fernández and Levy, 2008). This distributive bias is grounded in the ethnic diversity literature, which explores both taste and network-based reasons to prioritize expenditures that benefit one's in-group (Habyarimana et al., 2007; Huber and Suryanarayan, 2016; Pardelli and Kustov, 2022). In-group links between the local elite and minority non-landowners, which simultaneously facilitate sanctioning, might additionally render them more responsive to their needs (Bhavnani and Lee, 2018).

Second, variation in the identity of the local elite implies potential variation in their linkages to the central state, conditional on whether this is controlled by group *A* or *B*. Significant land transfers are likely to align the identity of the *local* elite with that of *national* elites. Increased 'upward' linkages might shape the ability of local elites to extract resources for their communities or the incentives of the national government to distribute resources downwards (Kustov and Pardelli, 2018; Lee, 2023). The extent to which this potentially increased resource access translates into

greater supply is likely conditioned by the extent to which local public infrastructure is supplied nationally rather than locally (Baldwin, 2016).

Third, shifts in the group-level distribution of land affect social cohesion by shaping the extent to which group affiliation (A or B) becomes predictive of economic status (L or N). At low levels, increased horizontal differentiation inhibits local cooperation and prosocial behavior, which might be needed to coproduce local public goods (Baldassarri and Abascal, 2020; Ostrom, 1996). At the extreme, the politicization of such differentiation can prompt social unrest or even civil conflict (Cederman et al., 2011). If local elites are able to coordinate, such social unrest is likely induce repression (Albertus et al., 2018; Thomson, 2016).

1.2 Empirical Implications

These three channels imply particular conditions under which increased group-based land inequality reduces the aggregate supply of local public goods. These conditions are satisfied in the extreme by cases of settler colonialism, but also in a broader set of cases where a minority group owns a disproportionate share of land and where the state is weak. In such cases, a higher share of landowners coming from the minority group renders their instrumental expenditure preferences more exclusionary. Additionally, social cohesion will be undermined by heightened horizontal differentiation. Both of these channels imply a decreased supply of local public goods. Cutting against this are the ambiguous effects of elites' intrinsic preferences and their improved central state linkages; however, conditional on the weakness of the central state, we expect these channels to be overwhelmed by the other two.

The strength of these different channels is also likely to vary across public goods categories. Intrinsic expenditure preferences center on specific forms of local public goods prioritized by *B*. For example, a significant literature considers the economic consequences of Protestants' emphasis on education to promote unmediated engagement with the Bible (Becker and Woessmann, 2009; Woodberry, 2012). Instrumental preferences are shaped by the relative group-level incidence of benefits. Excludability increases elites' instrumental preferences for particular public goods, such as religious schooling, which are unlikely to undermine the minority group's privileged status (Anderson et al., 2015; Suryanarayan, 2017). Redistribution that benefits the (lower economic status) majority group, such as social welfare, is inhibited (Benabou, 2000), while expenditures with less stratified benefits—such as public health, due to the local externalities of disease (Aidt et al., 2010; Franck and Rainer, 2012)—is less likely to be affected. Finally, different public goods vary in their national, versus local, supply—for example, more capital-intensive investments, like hospitals and prisons, were centralized in Europe well before education (Ansell and Lindvall, 2021). Whether the supply of these more nationally controlled investments changes depends on the countervailing effects of local elites' heightened central state linkages versus the negative effects of reduced social cohesion.

Importantly, accounts of individual-level land concentration (Figure 1b) generate empirical predictions that group-level inequality (Figure 1c) does not. As *individual*-level inequality increases, a smaller elite—regardless of identity considerations—becomes better able to coordinate to resist redistributive pressures and coerce citizens (Acemoglu, Reed and Robinson, 2014; Albertus et al., 2018; Olson, 2009). Instrumentally, where elite wealth was tied to the persistence of the agricultural

sector and threatened by industrial transitions (Moore, 1966; Boix, 2003; Ziblatt, 2008), they reduced investments in public goods promoting the human capital and mobility of their workforce (Bowles, 1978; Galor and Moav, 2009; Rueschemeyer et al., 1992).³ While individual-level land inequality impacts the local economy through a greater reliance on labor-repressive agriculture, our channels relating to group-level inequality generate no such expectation. Analyzing both local public goods provision *and* economic conditions may offer additional leverage on the operative mechanisms in a given context.

1.3 Persistence and Scope

Our theoretical framework rests on two broad scope conditions. First, given the importance of land in pre-industrial societies, our theory does not extend to modern, industrial economies, or pre-modern societies that did not rely on agriculture. Second, our theory applies when group-level identities are both salient and do not perfectly correlate with economic status. While classic contributions, such as Moore (1966), implicitly assume economic status is the primary determinant of local elites' behavior, our framework is most applicable to divided societies with cross-cutting cleavages, and especially to cases of minority rule.

For the theorized effects of group-level inequality to persist, two conditions must be met. First, allocations of land between groups must be, consistent with previous scholarship that land allocation patterns can persist for centuries (Bleakley and Ferrie, 2014; Dell, 2010), “sticky.” While this is condition is potentially consistent with the efforts of local elites to resist reform, in other cases, the

³In the cases where increased individual-level inequality has been found to promote the supply of local public goods, this rests on the ability and incentives of especially large individual landowners to supply benefits (Banerjee and Somanathan, 2007; Dell, 2010; Lee, 2023).

freer transfer and consolidation of land might erode such inequalities over time. Second, it requires that group divisions remain relatively calcified, due either to limited migration or assimilation. On the one hand, group-level geographical sorting would *erode* between-group inequalities at the local level. On the other, assimilation between *A* and *B* over time would attenuate the impact of these divisions.

2 The Cromwellian Settlement

The interdependence between the salience of group divisions and distinct state-building processes renders it challenging to parse the effects of group-level inequality alone (Pardelli and Kustov, 2022; Singh and vom Hau, 2016). In this section we introduce our empirical case, colonial Ireland, where features of the expropriation of Catholic land under the Cromwellian Settlement allow us to tease out the long-run consequences of group-level inequality in landownership for the supply of local public goods.

2.1 The 1641 Rebellion

In 1641, the growing political and economic influence of Protestant planters in Ireland triggered a series of rebellions (O’Leary, 2019, 172-178). In response, Charles I and the Parliaments of England and Scotland agreed to raise an army to reinvade Ireland. Funds were raised under the *Adventurers’ Act* (1642), so called because this set of 1,500 wealthy merchants and politicians “ventured” their capital to fund the military intervention (Brown, 2020). In exchange for their support, the Adventurers were promised land to be expropriated from Catholic landowners in Ireland

after a successful military campaign (Bottigheimer, 1971). The invasion was delayed by the outbreak of the English Civil War but, in 1649, an army led by Oliver Cromwell quelled the rebellion. Midway through the conflict, as it became increasingly clear that Parliament lacked the funds to pay the invading army, more than 30,000 soldiers were promised arrears in the form of smaller landholdings, also to be apportioned after the conflict. After a protracted and bloody conflict, the last Catholics surrendered in 1653.

2.2 Expropriation and Redistribution of Land

The *Act of Settlement* (1652) and the *Act of Satisfaction* (1653) reallocated the nominal ownership of nearly all the land in Ireland across four claimant categories: the Army, the Adventurers, the English state, and dispossessed Catholic elites. Figure 2 depicts these assignments, which we return to below.⁴ Nearly all Catholic landowners were liable to have their lands confiscated and to be forcibly transported to the impoverished western province of Connacht. Expropriated land was then to be redistributed to the Adventurers and Army soldiers owed arrears (Prendergast, 1870). Recognizing the need for an agricultural labor force, non-landowners were left relatively untouched (Canny, 2001; Ó Siochrú et al., 2018).

The magnitude of the debts owed to the Army and Adventurers, combined with uncertainty about ownership, dramatically slowed the reallocation of land. A series of land surveys sought to fill this informational void, culminating with William Petty's cartographic "Down Survey" of 1655-8, which mapped all townlands (median area 2 km²) eligible for expropriation. By 1659, essentially

⁴Appendix B.1 discusses the characteristics of areas assigned to the different claimant categories.

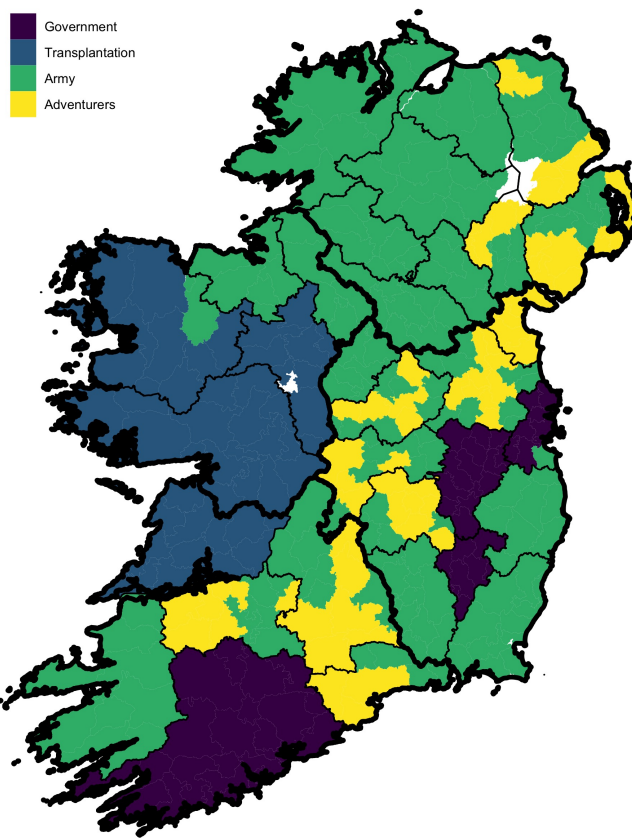


Figure 2: Assignment of Land to Different Claimant Categories under the Cromwellian Settlement
Notes: See Table A1 for sources. Thick borders indicate province; thin borders indicate county.

all the land within the areas allocated to the Army and the Adventurers had been assigned to an individual within each claimant category.

The actual settlement process, i.e., the take-up of expropriated land, was implemented in concert with the restoration of Charles II in 1660. Despite the hopes of Irish Catholics that Charles would nullify the expropriation, the *Act of Settlement* (1662) defined landownership as existing in 1659 to be the basis of future claims. However, recognizing not all Catholic elites to have been complicit in the 1641 rebellion, Catholic landowners found to be “innocent” by a court of claims could buy their

old land from its new owner. Later, as a further concession under the *Act of Explanation* (1665), a broader set of Catholic landowners were permitted to regain portions of their estates. The lengthy resolution of the land redistribution process meant many Protestant claimants resold the rights to their new land on the private market. As a result, some Catholic landowners were able to recover significant portions of their pre-conflict landholdings, even in territories where all land had been *nominally* confiscated in 1652 (Ohlmeyer, 2012).

2.3 Descriptive Evidence on Land Redistribution

By 1670, the Cromwellian Settlement had dramatically reconfigured landholdings across Ireland: Catholic landownership fell from 50% to 20%, constituting “the single largest shift in land ownership anywhere in Europe (and possibly beyond) during the early modern period” (Ó Siochrú et al., 2018, 606). Reflecting the extreme degree of inequality between religious groups in landownership relative to their population, the incomplete *Pender’s Census* of 1659 reports 87% of *households* as being Irish rather than English (Smyth, 2002). We use a contemporary digitization of the *Books of Survey and Distribution*, georeferenced and spatially linked to the Down Survey, to characterize the extent of this land redistribution (Ó Siochrú et al., 2013). These data include the names, religion, and holdings of all landowners both before (1641) and after (1670) the Settlement.

In Figure 3, we plot the distribution of land owned by Protestants before and after the Cromwellian Settlement across parishes. While English landholding had already shaped Ireland’s landscape by 1641, a significant amount of land was still owned by Catholics, particularly outside of the northern Ulster province and “The Pale,” a coastal enclave of English administration around Dublin. The

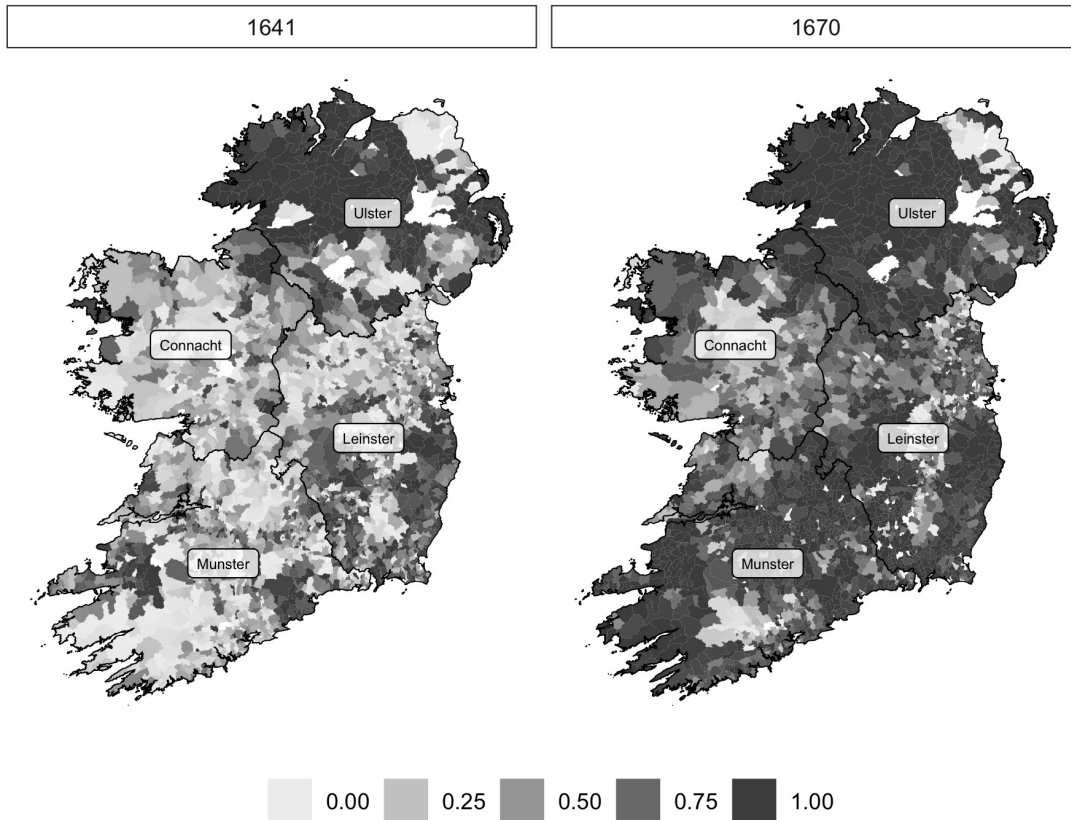


Figure 3: Share of Land Owned by Protestants, 1641-70

vast majority of the changes in landownership were in the provinces of Munster (in the south) and Leinster (in the east). Less change occurred in Connacht in the west (as dispossessed Catholic landowners were transplanted there) and Ulster (where more land was already settled by Protestants and thus not subject to redistribution).

3 Short-Run Effects on Landownership

The massive redistribution of land from Catholics to Protestants between 1641 and 1670 transformed the identity of the local elite amongst an overwhelmingly Irish Catholic population. Importantly,

there was substantial local-level variation in the extent of this redistribution. We next describe how the lottery-based assignment of land to Army versus Adventurer claimants provides an exogenous source of variation in this *intensity* of redistribution, before describing our data sources and estimating strategy.

3.0.1 Barony-Level Land Lottery

Two details of the land *allocation* process are worth emphasizing. First, ten of Ireland’s thirty-two counties were to be split between the Army and Adventurers. The decision to split counties reflected two considerations: first, “the planting of the soldiers in the same counties with the Adventurers was thought to offer some encouragement to the latter [to settle], who would know that able-bodied soldiers lay close at hand” in the likely event of future rebellions (Bottigheimer, 1971, 130-31); second, “the planners refused to allow Adventurers from individual English regions to cluster together in Ireland” (Hirst, 2012, 225). Ultimately, the English state considered that dividing these counties would help form a more stable Protestant plantation than had previously been achieved outside of Ulster (Lenihan, 2014; McCabe, 2005).

Within the ten split counties, a lottery was used to evenly allocate baronies (the third-lowest administrative unit) to either the Army or Adventurers: “In the interest of impartiality, [...] a lottery was held on 24 January 1654 to determine which baronies of each county would constitute the soldiers’ half and which baronies the Adventurers’ half” (Bottigheimer, 1971, 143). The division of land at this level was necessitated by the state’s lack of granular information. At this point, only the crude barony-level “Gross Survey” of 1653 was available to provide estimates of the distribution of profitable land (Larcom, 1851). Having assigned baronies to either claimant type, the Adventurers

and Army were to then—amongst themselves—decide how to apportion land parcels within their assigned baronies to specific individuals. The lottery-based assignment of baronies to the Army or Adventurers is depicted in Figure 2. Counties split between the two claimant types are found across three of Ireland’s four provinces and together comprise around a quarter of Ireland’s total land mass.⁵

A second important consideration is that it is unlikely these two claimant types ultimately settled their allotted land at the same rates. As described above, the allocation of land to specific individuals was protracted. The absence of granular information on ownership and land quality necessitated the implementation of the Down Survey, completed in 1658—sixteen years after land had been promised to the Adventurers, fifteen years after the promise to compensate soldiers with land, and five years after the end of the conflict. In addition, the process of Catholic land *expropriation* presented enduring uncertainties. As previously noted, some Catholic landowners were able to recover their holdings through legal means or informal payments. Historical evidence indicates that “most [soldiers] sold out at a discount to their officers or to existing New English settlers” (Hirst, 2012, 225). The Adventurers, on the other hand, may have also been willing to negotiate with Catholic elites, given their primarily financial motivations and general lack of direct engagement in the prior conflict (Bottigheimer, 1971; Brown, 2020; Canny, 2021).

⁵The ten split counties are Antrim, Armagh, and Down in Ulster; Offaly (King’s), Meath, Laois (Queen’s), and Westmeath in Leinster; and Limerick, Tipperary, and Waterford in Munster. Additional counties were reserved exclusively for either the Adventurers or Army in the event that insufficient profitable land was ultimately available in these ten counties (see Figure 2).

3.1 Research Design

Leveraging this lottery-based assignment of baronies, we more formally test for variation in the subsequent religious identity of landowners in the short-run following the Cromwellian Settlement.

3.1.1 Data

To assess the effects of lottery assignment on landowner identity, we draw on highly disaggregated data derived from the Down Survey and Books of Survey and Distribution as digitized by Ó Siochrú *et al.* (2013). Aggregating from the townland to the parish-level (as defined during this period, with an average area of 25 km²) to match the resolution of our subsequent outcome measures, we consider measures for (1) the proportion of land owned by Catholics and Protestants in 1641 and 1670; (2) the change in these proportions between 1641 and 1670; (3) the proportion of land recorded as being owned by the same family in both years. Underscoring the extraordinary extent of aggregate land redistribution between these years, Figure A4 plots the distribution of each of these measures across the full country. We also consider analogous measures of individual-level land *concentration*, which we introduce in more detail below. We describe our various data sources in more detail in Appendix A.

3.1.2 Estimation

To define our “analysis sample” within the ten split counties, we record information on the assignment of baronies to the Army or Adventurers using a set of historical sources (see Table A1). Within these baronies and counties, however, not all land was eligible to be redistributed—most importantly, high pre-existing levels of Protestant settlement in Ulster rendered much of its land exempt from

expropriation (see Appendix B.1). Within the set of lottery-assigned baronies, we therefore exclude all 49 parishes where *no* townlands were eligible for redistribution (see Figure A3 for the distribution of eligible land by parish).⁶ This restriction leaves us with an analysis sample of 794 parishes nested within 90 baronies in 10 counties. Table A2 compares parishes in the analysis sample with those across the rest of the country.

Our empirical strategy requires that the assignment of baronies *within* the 10 split counties to different claimant categories was indeed as-if random in 1654, as the historical record suggests (Larcom, 1851; Prendergast, 1870). To assess the “success” of this randomization, we conduct balance tests on predetermined outcomes defined at the parish-level. We assess balance on: (1) pre-Settlement patterns of land ownership in 1641; (2) climactic suitability for agricultural production overall and for particular crops;⁷ (3) the frequency of particular Irish stems in townland names, indicating the historical presence of geographical features and natural resources (Nash, 1999);⁸ and (4) a set of predetermined geographical characteristics.

We present results of these balance tests in Table 1. Columns 2 and 3 present the mean of each variable in parishes in the areas assigned to Adventurers and the Army, respectively. Column 4 formally tests these differences by regressing the outcome on the treatment indicator for assignment to the Army with county fixed effects (given the county-stratified nature of the baronial lottery), with

⁶We define a townland as being ineligible for redistribution if, in 1641: (1) its owner is recorded as being either “Protestant” or “Unforfeited” with no specific name; (2) its owner is recorded as the Protestant Church or Trinity College Dublin; (3) it comprised a Commons, Bog, or Mountain with no owner indicated.

⁷Using the Caloric Suitability Index from Galor and Özak (2016), we assess overall levels of caloric suitability as well as the caloric yield of Ireland’s largest agricultural outputs later in time, comprising the potato, barley, oats, and wheat (Porter, 1850).

⁸For example, the word “derry” in a townland name, such as in “Edenderry”, signifies oak trees in Irish; “ard” signifies a high point; “carrick” signifies rocks; “down” signifies a fortified structure; “knock” signifies a hill; and “kil” signifies a church.

p -values provided in Column 5. No differences are statistically significantly different, consistent with an essentially random allocation of baronies between the claimant types.⁹

We then estimate our main results using the following specification:

$$y_{pbt} = \beta \text{Army}_b + \eta_c + \epsilon_{pbt}, \quad (1)$$

where outcome y in parish p in barony b in year t is regressed onto an indicator Army_b for whether that parish was in a barony assigned to Army claimants in 1654. We add county fixed effects (η_c) since the assignment of baronies was effectively stratified at this level. To improve precision, we also use specifications controlling for a vector of predetermined covariates (\mathbf{X}_{pb}) selected by cross-validated LASSO following [Belloni et al. \(2014\)](#).¹⁰ Standard errors are clustered at the barony, while the spatially uncorrelated nature of treatment assignment alleviates concerns regarding inference in such designs ([Kelly, 2019](#)). Given the plausibility of its exogenous assignment, β identifies the causal effect of assigning areas to Army versus Adventurerclaimants.

3.2 Effects of Barony-Level Assignment on Landownership

In Panel A of Table 2, we estimate effects of lottery assignment on the proportion of land in a parish owned by Protestants in 1670. The coefficients indicate that the exogenous assignment of a barony

⁹The share of land owned by Protestants was slightly greater in Adventurer baronies (44%) than Army baronies (37%). As we discuss in more detail in Appendix B.2, we expect that this is due to 1641 religious affiliations being recorded *after* the Settlement; some scholars raise concerns with the accuracy of this retrospective data (but not the 1670 data) ([McKenny, 1995](#)).

¹⁰The superset of all potential covariates, \mathbf{X}_{pb}^+ , consists of all predetermined variables in Table 1 and their interactions with province dummies. From this high-dimensional superset, \mathbf{X}_{pb} is defined as the union of all covariates (or interactions) selected by LASSO when (1) Army_b is predicted by \mathbf{X}_{pb}^+ ; (2) y_{pb} is predicted by Army_b and \mathbf{X}_{pb}^+ .

Table 1: Balance on Predetermined Covariates

(1)	μ_{Adv}	μ_{Army}	β	p -value
	(2)	(3)	(4)	(5)
Landownership in 1641				
Share missing landowner	0.01	0.02	0.00	[0.39]
Share shared ownership	0.06	0.05	-0.01	[0.38]
Share Protestant landowner	0.44	0.37	-0.05	[0.16]
Share top 10% landowners	0.47	0.43	-0.02	[0.57]
Share top 5% landowners	0.34	0.29	-0.03	[0.44]
Share top 1% landowners	0.12	0.12	-0.02	[0.39]
HHI (landowner)	0.44	0.43	-0.03	[0.21]
HHI (religion)	0.71	0.71	-0.02	[0.31]
Number of landowners	5.90	6.00	0.20	[0.56]
Townland names				
Name: Down	0.01	0.01	0.00	[0.92]
Name: Derry	0.01	0.01	0.00	[0.94]
Name: Ard	0.03	0.02	0.00	[0.60]
Name: Carrick	0.01	0.01	0.00	[0.51]
Name: Knock	0.03	0.03	0.00	[0.56]
Name: Kil	0.08	0.11	0.02	[0.23]
Caloric Suitability				
CSI: Pre-1500	1342.72	1325.90	32.19	[0.19]
CSI: Post-1500	825.24	814.13	17.56	[0.20]
CSI: Potatoes	3580.98	3568.80	22.57	[0.63]
CSI: Wheat	13496.74	13172.74	98.15	[0.52]
CSI: Oats	5547.82	5490.35	47.52	[0.40]
CSI: Barley	13745.11	13445.36	170.61	[0.36]
Geographical features				
Share of profitable land	0.92	0.93	0.02	[0.19]
Down Survey localities	10.42	10.57	0.57	[0.59]
Average area of Down Survey localities (km ²)	2.91	2.95	-0.17	[0.60]
Total area (km ²)	24.71	24.66	-0.38	[0.90]
Longitude	-7.27	-7.49	0.03	[0.61]
Latitude	53.30	53.11	0.02	[0.57]
Distance to Dublin (km)	152.65	168.41	-4.75	[0.35]
Distance to coast (km)	35.11	39.07	2.00	[0.41]
Elevation (m)	81.96	93.69	6.74	[0.24]
Total profitable land (plantation acres)	2235.29	2427.08	246.36	[0.36]

See Appendix A.2 for variable descriptions. All predetermined covariates observed at the parish-level. Column (2) presents mean of parishes in Adventurer-assigned baronies; (3) presents mean of parishes in Army-assigned baronies; (4) presents coefficient from regressing outcome onto an indicator for a barony being assigned to the Army and county fixed effects; (5) presents p -values from that regression with standard errors clustered at the barony-level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

to Army claimants in the 1650s increases the proportion of land in that barony owned by Protestants in 1670 by around 5 percentage points (pp) ($p < 0.05$), from 79% to 84%. This estimate is stable, but more precise, with the inclusion of predetermined covariates (Column 2). In Columns 3 and 4 we find that assignment to the Army induces an *increase* in Protestant landownership between 1641 and 1670, equivalent to between 6 and 11 pp ($p < 0.01$). Finally, in Columns 5 and 6, we find that parishes in baronies assigned to Army claimants are between 5 and 8 pp more likely to have a different landowner family recorded in 1670 compared to 1641 ($p < 0.01$), indicating a greater overall rate of land turnover. The standardized effect sizes for each of these outcomes range between 0.17 and 0.33 standard deviations relative to levels observed in baronies assigned to the Adventurers.

Panel B indicates that the barony assignment did not meaningfully affect land *concentration*. In Columns 1 and 2, we find no treatment effects on the share of land owned by ‘major landowners’ in parishes within Army-assigned baronies, which we define as those landowners with landholdings in the top 5% of the distribution across the whole country in 1670.¹¹ In Columns 3 and 4, we find little evidence of effects on a Herfindahl Index of land concentration defined at the parish-level. In Columns 5 and 6, we similarly find minimal effects on the number of distinct landowners in each parish. These null effects are reinforced by the high correlations between land concentration we observe within a given county before and after the Settlement (see Figure A5).

We interpret these null effects in light of our above discussion, such that (1) the protracted resolution of land claims led many Army soldiers to sell their land to their officers or new Protestant settlers, who then became significant landowners themselves, while (2) more land in Adventurer-assigned areas, who often had little interest in settling in Ireland, was sold back to pre-existing

¹¹See Table A5 for different definitions of a ‘major’ landowner.

Table 2: Effects on Landownership in 1670

	Share Protestant		Change Protestant		Different family	
A. Identity of landowner	(1)	(2)	(3)	(4)	(5)	(6)
Army	0.054** (0.026)	0.052*** (0.017)	0.113*** (0.036)	0.062*** (0.017)	0.080*** (0.030)	0.052** (0.021)
Controls	×	✓	×	✓	×	✓
Adv. Mean	0.79	0.79	0.33	0.33	0.64	0.64
Adv. SD	0.32	0.32	0.34	0.34	0.38	0.38
Observations	794	794	794	794	794	794
	Major landowner		Landholding HHI		Number of landowners	
B. Land concentration	(1)	(2)	(3)	(4)	(5)	(6)
Army	0.000 (0.033)	0.022 (0.022)	-0.019 (0.017)	0.006 (0.011)	0.037 (0.046)	-0.002 (0.023)
Controls	×	✓	×	✓	×	✓
Adv. Mean	0.33	0.33	0.40	0.40	1.91	1.91
Adv. SD	0.35	0.35	0.22	0.22	0.52	0.52
Observations	794	794	794	794	794	794

Dependent variables: Panel A: Share of land in parish owned by Protestants; Change in share of land in parish owned by Protestants 1641-70; Share of land in parish owned by a different family (based on surname) in 1670 relative to 1641. Panel B: Share of land in parish owned by a landowner in the top 5% of landowners nationwide; Herfindahl-Hirschman Index of individual landownership in parish; Log+1 Number of landowners in parish.

All specifications are estimated using OLS with county-level fixed effects using Equation (1). Even-indexed columns add LASSO-selected predetermined covariates. Standard errors clustered at the barony-level in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Catholic landowners. To explore these mechanisms more directly, we first linked the names of landowners in 1670 with the names of all 1,500 Adventurers and 2,200 Army officers from Cromwell's New Model Army involved in the Irish conflict. Assignment to the Army is associated with an 11 to 18 (4 to 6) percentage point higher (lower) likelihood of a landowners' name matching an Army officer (Adventurer). These results underscore the striking amount of land accumulated by officers from their subordinates, as well as the limited propensity of Adventurers to take up their land (Lenihan, 2014). Second, we find that major landowners *as defined in 1641* were more likely to retain

their land in Adventurer-assigned areas by 1670. Appendix B.2 provides a more comprehensive discussion of these analyses.

4 Long-Run Effects of Landowner Identity

While the overall intensity of redistribution was high even in Adventurer-assigned areas, the baronial lottery generates significant intensive margin variation in the ownership of land across *groups* (Protestants or Catholics) while features of the redistribution process produce null effects on individual-level landholding concentration. Motivated by a significant historical literature tracing the roots of Ireland’s developmental deficiencies to the Cromwellian Settlement (Connell, 1950; Mokyr, 1983), we next examine the long-run consequences of this exogenous variation in group landownership. We primarily focus on outcomes observed in the decades prior to the Great Famine of 1845-9. This is both because the Famine transformed Irish society, rendering post-Famine outcomes difficult to interpret (Campbell, 2009; O’Leary, 2019), as well as because far more consistent information on local public goods provision survives from these decades than the prior century. We introduce our data sources below and estimate reduced form effects using Equation (1).¹²

4.1 Persistence of Short-Run Variation

We begin by assessing whether the short-run variation in landowner identity induced by the baronial lottery persisted over time. Such persistence is not a given: a Coasean logic would imply convergence

¹²While in principle one could employ an instrumental variables design, we note that the baronial lottery represents a bundled treatment, with the religion of landowners potentially correlating with unobserved characteristics, such as education or wealth, which could independently affect outcomes. Such potential exclusion restriction violations are likely modest, but also difficult to gauge, so we restrict our attention to the reduced form effects.

(Bleakley and Ferrie, 2014), and intermarriage, migration, and religious conversion could have eroded these short-run differences over time through assimilation (Fernihough et al., 2015). However, historical evidence suggests these moderating forces would have to contend with a series of punitive laws—known collectively as the *penal laws*—that further marginalized Catholics and rendered their acquisition of new land extremely difficult. The Penal Laws effectively froze group-level landholdings as they existed at the end of the 17th century (McGrath, 1996; Campbell, 2009).

To adjudicate, we conduct two tests (discussed fully in Appendix C). First, we analyze rates of religious conversion by local elites throughout the 18th century. We find no evidence of differences across baronies in the probability of observing a Catholic converting to Protestantism (which would afford them more economic and political rights). Second, we assess cross-sectional treatment effects on landowners' religion, as inferred at a later point in time. *Griffith's Valuation* (1847-64), which recorded the names of all landlords, represents one of the few micro data sources surviving from this period (Roulston, 2020). Using a complete digitization, we record the names and geographical locations of all landlords ($n = 149,000$), and impute their religion by linking their surname to the distribution of religion by name, as recorded in the 1901 full-count census. While this imputation approach relies on relatively strong assumptions, the estimates suggest landlords were around 3 percentage points more likely to have Protestant-associated names in Army-assigned areas (see Table A6).¹³ We also consider evidence for whether the *overall population* (beyond landowners) similarly varied in its religious composition, but find only limited evidence of this. The evidence

¹³Linking the surnames of landowners in 1670 to the surnames of landlords in Griffith's Valuation in the same parish nearly 150 years later, we find that 8% of the former can be linked to the latter. This does not vary by treatment assignment, suggesting that land turnover was relatively balanced *after* the initial short-run shock.

suggests the Cromwellian Settlement had persistent effects through time on the group identity of local elites, with more muted effects among the broader population.

4.2 Effects on the Supply of Local Public Goods

Our theoretical framework posited negative aggregate effects of enduring group-level inequality on the supply of local public goods under minority rule, especially where the state is weak or absent. In our case, areas exposed to more intensive land redistribution to Protestant landlords faced a trade off. The negative consequences of Protestant elites' *instrumental* expenditure preferences as well as reduced local social cohesion, against Protestant landlords' ambiguous *intrinsic* preferences and heightened connections to the Protestant-controlled central state.

In this section, we consider evidence from a wide set of local public goods, including schools, health facilities, workhouses, and carceral facilities. Our outcomes account for the most salient categories of local public good during this period, while their breadth means we are unlikely to overlook potential expenditure substitutions. Generally speaking, contributions to many local public goods were negotiated through county “grand juries” (Crossman, 1989; Garnham, 1999). These biannual meetings, from which Catholics were typically excluded, provided an opportunity for local landowners to lobby their peers to prioritize specific outlays for the year. The diversity of public goods that we examine, however—both across and within these broader categories—provides variation in the extent of their group-level incidence and elites' role in their supply. We introduce the data and provide high-level results here, before providing additional context on the operation and funding of each local public goods category.

First, we digitize data from a census of schools conducted in 1834-5 as part of the *Commission on Public Instruction*, the first such effort in the country's history. This *Commission* listed every school in Ireland, along with its type and attendance, in an effort to understand the shortcomings of the education system and the extent of its religious segregation (O'Higgins, 2017). Second, we digitize data on health facilities, as existing in 1837. These come from an 1840 report, where we observe the type of facility and its funding information. Third, we digitize facility data on workhouses and their utilization from the 1851 National Census, where we observe the foundation date of every workhouse prior to 1845. Last, we take data on Irish prisons from an 1840 report that lists facilities by type and source of funding.

In Panel A of Table 3, we first consider effects on the extensive margin: whether *any* of these four kinds of local public goods are observed in a parish, as well as a standardized z-score, aggregating the four categories of public goods.¹⁴ We find that, on average, local public goods are notably scarcer in parishes that had been assigned to Army claimants nearly two centuries prior. An overall index finds a reduction in their presence equivalent to 0.20 standard deviations in the specification without controls and 0.17 sd with controls (both $p < 0.05$). Army-assigned parishes are around 6 pp less likely to have any school in 1835 ($p = 0.11$ without controls and $p < 0.05$ with controls). Effects on less common public goods are more mixed: no differences in the local presence of health facilities, substantively large (but insignificant) reductions in the presence of workhouses, and large negative effects on the presence of prisons ($p < 0.05$).¹⁵ Areas historically exposed to more intensive changes

¹⁴We do not normalize by population because the 1831 census records are incomplete. Evidence from the 1841 census suggests that overall population levels are well balanced (see below and Appendix E.3).

¹⁵The negative overall treatment effects hold, though attenuate slightly, when instead considering the number of each type of local public good, either linear or log-transformed (see Table A8).

Table 3: Long-Run Effects on Presence of Local Public Goods

A. All	Index		School		Health		Workhouse		Prison	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Army	-0.204** (0.091)	-0.168** (0.070)	-0.064 (0.039)	-0.062** (0.031)	0.003 (0.024)	0.008 (0.026)	-0.036 (0.023)	-0.019 (0.018)	-0.045*** (0.012)	-0.042*** (0.015)
Controls	×	✓	×	✓	×	✓	×	✓	×	✓
Adv. Mean	0.10	0.10	0.80	0.80	0.17	0.17	0.08	0.08	0.06	0.06
Adv. SD	1.12	1.12	0.40	0.40	0.38	0.38	0.27	0.27	0.23	0.23
Observations	794	794	794	794	794	794	794	794	794	794
B. Schools	Free		National		Hedge		Parish		Paying	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Army	-0.070** (0.030)	-0.059*** (0.020)	-0.008 (0.029)	-0.002 (0.026)	0.060 (0.048)	0.053* (0.029)	-0.001 (0.031)	0.009 (0.028)	-0.085* (0.043)	-0.086*** (0.033)
Controls	×	✓	×	✓	×	✓	×	✓	×	✓
Adv. Mean	0.12	0.12	0.17	0.17	0.24	0.24	0.19	0.19	0.70	0.70
Adv. SD	0.32	0.32	0.38	0.38	0.43	0.43	0.39	0.39	0.46	0.46
Observations	794	794	794	794	794	794	794	794	794	794
C. Health/Prisons	Dispensary		Fever hospital		Infirmary		Bridewell		Jail	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Army	0.006 (0.025)	0.014 (0.026)	-0.021** (0.009)	-0.016 (0.011)	-0.006 (0.005)	-0.006 (0.005)	-0.044*** (0.011)	-0.041*** (0.014)	-0.001 (0.006)	-0.001 (0.006)
Controls	×	✓	×	✓	×	✓	×	✓	×	✓
Adv. Mean	0.17	0.17	0.03	0.03	0.01	0.01	0.05	0.05	0.01	0.01
Adv. SD	0.38	0.38	0.17	0.17	0.09	0.09	0.22	0.22	0.09	0.09
Observations	794	794	794	794	794	794	794	794	794	794

Dependent variables: Panel A: Columns 1-2: Standardized z-score index of other columns; 3-4: Any school in parish (1835); 5-6: Any health facility in parish (1837); 7-8: Any workhouse in parish (1845); 9-10: Any prison in parish (1840). Panels B and C: Any of a given local public good category in parish.

All specifications are estimated using OLS with county-level fixed effects using Equation (1). Even-indexed columns add LASSO-selected predetermined covariates. Standard errors clustered at the barony-level in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

in the identity of local elites, fared significantly worse in the aggregate provision of local public goods.

4.2.1 Education Facilities

To evaluate if our results reflect the expenditure preferences of local elites, we assess effects across different *types* of schools. We distinguish between schools that received private or public funding from the much larger number that required payment from students (for more information, see Appendix D.1).

We begin by examining *free* and *national* schools. Free schools were relatively high-quality schools that tended to be specifically funded by local economic elites (O’Higgins, 2017; O’Brien, 2013; McCormack, 2014), providing a clear measure of support from local elites. In Columns 1-2 of Panel B, we find that free schools are 7 pp rarer in Army-assigned baronies ($p < 0.05$). National schools provided integrated education for Catholics and Protestants using a standardized curriculum, with the central government supplying a significant share of funding (O’Brien, 2013). Conceived in 1831, by 1835 we observe no difference in the incidence of these centrally-funded schools in Columns 3-4.

Fee-paying schools comprised a much larger, generally lower-quality, set of educational institutions. We distinguish between *hedge*, *parish*, and *paying* schools within this group. *Hedge* schools were the lowest-quality schools, primarily attended by Catholics (O’Higgins, 2017; McManus, 2014; O’Connell, 2011). In Columns 5-6, we find that hedge schools were modestly, but insignificantly, *more* common in Army-assigned areas. *Parish* schools were religious schools run by the Protestant Church of Ireland. In Columns 7-8, we find no difference in their incidence. Last, we define a

large number of schools simply as *paying* schools. This category reflects fee-paying schools where we observe no information on its religious association. In Columns 9-10, we find that fee-paying schools were significantly scarcer in Army-assigned areas.

These results suggest that both the presence and composition of educational facilities differed between Army and Adventurer assigned baronies, with overall fewer schools—especially those that relied on local elites for funding—and a higher proportion of more exclusionary, low-quality schools in parishes in Army assigned baronies. These results are reinforced if we instead consider the average attendance of children at different school types (see Table A9).

The consequences of more exclusionary educational investments in Army-assigned baronies are borne out by the incidence of local languages, whether English (associated with the Protestant minority) or Irish (associated with the Catholic majority). Using data from the 1841 Census to measure English literacy and barony-level estimates of the incidence of Irish speaking by cohort, as reported by Fitzgerald (1984) based on the 1881 census,¹⁶ we find evidence of increased English literacy (Table A10) and decreased rates of Irish speaking (Figure A8) in Army-assigned baronies.

4.2.2 Health Facilities

Across different types of health facility—infirmaries, dispensaries, and fever hospitals—funding relied on local taxation, as distributed by grand juries as well as private subscriptions and donations (see Cassell, 1997, 6-13). Unlike the other public goods we consider, historians suggest local elites directly benefited from these institutions. Fever hospitals sought to contain epidemics that

¹⁶For Irish speaking, we estimate the barony-level equivalent of Equation (1), regressing each cohort-level estimate as our outcome measure. Rates of Irish speaking fall dramatically across cohorts, from 41% among those born between 1801-11, to 5% among those born between 1861-71.

disproportionately afflicted the middle and upper classes (Cassell, 1997, 11),¹⁷ and “there was no limit to the number of district fever hospitals that could be established, but the method of funding...retarded their development” (Geary, 2004, 86). Dispensaries were small, outlying clinics intended to care for the poor but “many subscribers made their contributions conditional upon the willingness of the dispensary medical officer to provide free medical care for them and their families” (Cassell, 1997, 9). Finally, larger infirmaries were funded primarily by a property tax paid by tenant farmers (Cassell, 1997, 5), and was to be one per county, with their locations specified in the 1765 enabling act (Geary, 2004, 49). None of the three classes of health facility we consider, therefore, are unambiguously elite-funded, poor-serving institutions. It is perhaps unsurprising that we find null aggregate results (Table 3, Panel A) and broadly null results for the specific types of facility (Panel C, Columns 1-6). Leveraging facility-level funding information in Table A11, we find few differences aside from slightly less funding from local donations and subscriptions in Army-assigned areas.

4.2.3 Workhouses and Prisons

Finally, we consider workhouses and carceral institutions. Workhouses, established under the *Poor Relief Act* of 1838 and constructed in the early 1840s, were the government’s response to the worsening economic condition of the poorest in society. Workhouses were entirely funded by the collection of local taxes on landowners. Landlords with the largest estates, and hence paying the most taxes, were given more votes during deliberations held by local *Boards of Guardians*, which decided how to target support to the poor immediately prior to, and during, the Great Famine (Powell,

¹⁷Elites did, however, often receive care at home (Geary, 2004, 75).

1965). Initially comprised of one workhouse per *Poor Law Union*, auxiliary workhouses were often built—at the discretion of *Guardians*—due to enormous demand (Powell, 1965). As argued by Solar (1995), the provision and generosity of workhouses were a key redistributive channel in pre-Famine Ireland. Our negative (though insignificant) result on their presence in Panel A ($p = 0.12$) is then consistent with less willingness to redistribute towards the poor, while the modestly larger effects for auxiliary workhouses (see Panel A of Table A12) points to elites’ discretion as potentially being responsible.

In Columns 7-8 of Panel C of Table 3, we show that the overall reduction in the incidence of prisons owes to reductions in bridewells, rather than jails. Jails, the largest carceral institutions, were generally limited to one per county, which limited the influence of local elites. Bridewells, on the other hand, were “small town prisons” (Carroll-Burke, 2000, 48) that had, in the 18th century, aspired to “put the poor to work and teach them the habits of industry” (Carroll-Burke, 2000, 25). In spite of efforts to centralize control of the carceral system, grand juries remained the key funding agent (Carroll-Burke, 2000, 49). Leveraging facility-level funding information in Panel B of Table A12, we find overall lower funding for prisons, particularly bridewells. Given the more-discretionary nature of bridewells relative to county jails, and the role of local elites through the grand jury in allocating this expenditure, it is unsurprising we find weaker effects on the latter than the former.

4.3 Evaluating Alternative Theoretical Channels

Overall, our results provide evidence strongly consistent with reductions in the supply of local public goods being driven by variation in group-level expenditure preferences of local landed elites—both in

terms of *overall* reductions, variation *across* public good categories in terms of the incidence of their benefits, and variation *within* categories according to the extent of discretion and excludability in their targeting. In this section, we provide further evidence in line with our theoretical framework. First, we explore whether the effects of group inequality might also be operating through elites' linkages to the central state or reduced social cohesion between groups. Second, to rule out the mechanism typically associated with studies of land concentration, we explore long-run consequences for the composition of the local economy.

4.3.1 Alternative Elite Identity Pathways

First, we assess evidence relating to variation in *central state linkages*. We consider this pathway unlikely to explain reductions in the supply of local public goods, since (1) local elites in Army-assigned areas became *more similar* to those running the national government; (2) central funding for local public goods was scarce until later in the 19th century. Further, digitizing and geolocating data on the residences of all MPs across Irish parliaments between 1550 and 1800, we find no systematic differences in whether politicians came from Army or Adventurer areas (see Figure A9).

An alternative channel highlights the role of *social cohesion* that, through increased horizontal differentiation between groups, might have inhibited communities' ability to coordinate the provision of public goods. In Table A13 we find some evidence of this by drawing on a number of sources. First, we measure exposure to a major series of rebellions in 1798, which sought to overthrow the Protestant government. Following this rebellion, civilians were allowed to make claims to the government for the damages they had suffered. Drawing on an archive of all such claims, we find Army-assigned areas were more likely to be exposed to the rebellion. We also measure

proto-nationalist sentiment using the incidence of signatories to one of the first large-scale political petitions in Ireland, the *William Smith O'Brien* petition of 1848. Linking the signatories to household heads in the contemporaneous *Griffith's Valuation*, we find a modestly higher share of households supporting this nationalist cause in Army-assigned areas.¹⁸ We also evaluate participation in the Tithe Wars, between 1830-6, in which civilians protested against the forced imposition of tithes paid to the Protestant Church of Ireland by defaulting on their payments. Drawing on individual-level data, we find no effects on the incidence of recorded defaulters.

4.3.2 Economic Incentives of Local Elites

In line with theories premised on the effects of land concentration, the reduced supply of local public goods (especially schools), could be consistent with increased land inequality inducing local elites to limit citizens' human capital to hinder their mobility from agriculture to industry (Bowles, 1978; Cinnirella and Hornung, 2016; Galor and Moav, 2009; Rueschemeyer et al., 1992). Intuitively, if this were the case, Army-assigned areas should have become more rural and agricultural over time.

We test this observable implication in two ways. First, we draw on spatial data relating to a wide array of private agricultural and industrial infrastructure investments, as recorded in the first *Ordnance Survey* of 1846.¹⁹ These include both infrastructure primarily associated with industry, such as foundries, gas works, and quarries, as well as that associated with agriculture, such as windmills and lime kilns (used mainly to produce fertilizer). Assessing the presence of these

¹⁸Specifically, in the petition data we only observe the county of a given signatory. Using the universe of household heads' names recorded in the *Valuation*, we search for the share of heads who have exact name matches for a signatory and are in the correct county. We then weight these matches according to their frequency to adjust for false positives.

¹⁹While the original survey incorporated Ulster province, the modern digitization excludes all infrastructure in present-day Northern Ireland.

different types of private infrastructure as a function of the baronial lottery, we find no systematic differences, either overall or by type of infrastructure (see Table A14).

Second, we draw on parish-level data from the 1841 and 1851 censuses, which have commonly been used to measure the impact of the Great Famine of 1845-9 (Fernihough and Ó Gráda, 2022; Mokyr, 1983). Appendix E.3 provides a more detailed discussion, recognizing important measurement challenges, but we summarize our key results here. Prior to the Famine, we find few systematic differences in population levels, density, or sectoral employment, with similar shares of households employed in agriculture and manufacturing (73% and 17% respectively). We find some evidence of increased poverty in Army-assigned baronies, with a marginally higher share of households living in the very lowest quality housing. Considering population change between 1841-51 as a measure of Famine intensity (Henn and Huff, 2021), we find little evidence of differences as a function of the lottery. After the Famine, we continue to find a slightly higher share of extreme poverty but, contrasting with the implications of concentration-based accounts, marginally *less* agricultural employment.

Overall, these results are consistent with neither the strategic economic incentives of local elites attempting to prevent industrial transitions, nor with variation in linkages to the central state shaping outcomes. Our evidence of greater social unrest is consistent with heightened horizontal differentiation between groups, while our null results on Famine exposure is likely due to measurement challenges and the national rather than local drivers of the Famine (Mokyr, 1983; Solar, 2015).

5 Conclusion

The Cromwellian Settlement caused a massive upheaval of Irish society, expropriating land from Catholic landowners in an effort to transform Ireland into a colony dominated by an English Protestant minority. In Ireland, as in most colonies, the extent of expropriation and redistribution varied dramatically across localities. We show that the lottery-based assignment of land to different English claimants provided an exogenous, persistent shock to the share of land transferred to Protestants in the wake of the Settlement. This randomized allocation affected measures of group-level inequality (i.e., the share of land owned by Protestants) but *not* individual-level inequality (i.e., how much land was held by how few landowners). This natural experiment then allows us to isolate the effects of group-level inequality, which are typically confounded in studies of inequality, relating to land or otherwise.

Our theoretical framework posited that variation in landownership by groups should have direct implications for the supply of local public goods. This could operate through changes in the expenditure preferences of local elites, who often shoulder responsibility for supplying public goods, variation in their linkages to the central state, or effects on social cohesion. In cases of land redistribution towards a minority group, and where the central state plays a limited role in supplying resources, greater group-based inequality is likely to reduce the aggregate supply of local public goods and render their targeting more exclusionary.

Our analysis of an unusually rich set of granular long-run data sources—spanning nearly two centuries—is motivated by generations of historical scholarship on the long-lasting impact of the Cromwellian Settlement (Canny, 2021, 271-280). We find that, on the eve of the Great Famine, local

public goods were scarcer and more exclusionary in areas with more Protestant landlords. Our results, both *across* and *within* local public goods categories, are consistent with greater unwillingness of landed elites under minority rule to provide public goods likely to benefit the poorer religious out-group. Our more limited evidence for lasting effects of this variation for broader economic outcomes underscores how the distributive consequences of inequality between groups vary from its consequences between individuals.

These findings have significant theoretical and conceptual implications beyond Ireland and should inform future studies of inequality. Our emphasis on the distinction between levels of land inequality, individual or group, has clear implications for future studies of the historical legacies of settler colonialism. In many former colonies, the relative weakness of the colonial state meant major landowners enjoyed enormous discretion over the provision of public goods, and the close association between landownership and group identity likely exhibited comparable dynamics for the public goods provision we illustrate in Ireland. Our results also have implications for debates about the association between diversity and public goods provision. While our findings generally affirm arguments relating to the importance of group-level preferences in divided societies, our historical evidence supports the insight that contemporary associations between public goods outcomes and group affiliation likely reflect longer historical processes that jointly determined both the distribution of key economic resources, such as land, and the identity of the economic elite.

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Online Appendix

Elite Identity, Land Inequality, and Local Development: Evidence from Colonial Ireland

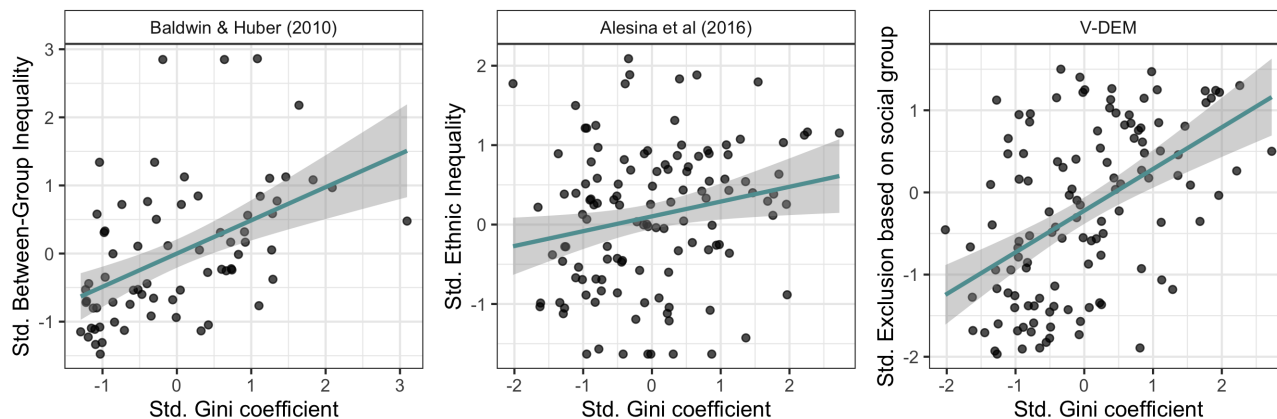
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E	Evidence on Alternative Theoretical Pathways	A20
E.1	Central State Alignment and Social Cohesion	A20
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A Data Sources and Summary

Figure A1: Cross-National Correlation between Measures of Individual and Group Inequality



Notes: Figure plots national Gini coefficient against measures of group-level economic inequality. Measures drawn from [Baldwin and Huber \(2010\)](#) (Between-group inequality); [Alesina et al. \(2016\)](#) (Ethnic inequality); V-DEM project (Exclusion from resources based on social group).

A.1 Data Sources Used Across Different Analyses

Table A1: Data sources

Source material	Where accessed	Use in paper
Research design and short-run effects		
Allocation of land across claimants	Dunlop (1913) ; Hardinge (1873) ; McKenny (1989) ; Prendergast (1870)	Figure 2
<i>Books of Survey and Distribution</i> (1675)	Ó Siochrú (2013)	Landholder identity, religion, & holdings, 1641 & 1670 (Figure 3, Table 2, Figure A4, Figure A3, Figure A5, Table 1, Table A4, Table A5)
<i>Down Survey of Ireland</i> (1655-8)	Ó Siochrú (2013)	17 th Century geographic information and maps (<i>passim</i>)
List of Adventurers from <i>Adventurers' Act</i> (1642)	Brown (2020) and Bottigheimer (1971)	<i>Adventurer Lists</i> (Table A3)
Names of Army officers in Ireland	Wanklyn (2017) (1649-63) and Dalton (1907) (1661-85)	<i>Army Lists</i> (Table A3)
Caloric Suitability Index	Galor and Özak (2016)	Table 1
Pre-1641 plantations	Moody et al. (1991) ; Stewart (1989)	Figure A2

Continued on next page

Table A1 – Continued from previous page

Source material	Where accessed	Use in paper
Long-run effects: Persistence		
<i>Primary Valuation of Ireland or Griffith's Valuation</i> (1847-1864)	askaboutireland.ie	Names of landlords and tenants (Table A6)
<i>Census for Ireland for the Year 1901</i>	IPUMS	Imputation of religion for names in <i>Griffith's Valuation</i> (Table A6)
1881 Irish Census	Fitzgerald (1984)	Share Irish-speaking (Figure A8)
<i>Catholic Qualification and Convert Rolls</i> (1700-1800)	(O'Byrne, 1981)	Conversions to Catholicism (Figures A6, A7)
Long-run effects: Local public goods		
<i>Report of the Commissioners on Public Instruction</i> (1835)	Parliamentary papers	School data from Vol. 2 (Tables 3, A9); religion data from Vol. 1 (Table A7)
<i>Abstract Return of Infirmaries, Fever Hospitals and Dispensaries in Ireland</i> (1840)	Parliamentary papers	Health facility data (Tables 3, A11)
<i>Report of the Inspectors-General on the General State of Prisons in Ireland</i> (1840)	Parliamentary papers	Carceral facility data (Tables 3, A12)
<i>Census of Ireland for the Year 1841</i> (1843)	Fernihough and Ó Gráda (2022)	1841 Literacy outcomes (Table A10); 1841 Rurality, Housing Quality, and Employment Outcomes (Panel A and C of Table A15)
<i>Census of Ireland for the Year 1851, Part VI: General Report</i> (1856)	Fernihough and Ó Gráda (2022) and Parliamentary papers	1851 Workhouses (Tables 3 and A12); 1851 Rurality, Housing Quality, and Employment Outcomes (Panel B and C of Table A15)
Evaluating alternative theoretical channels		
MP residences, 1559-1800	Parliamentary papers	Central state alignment (Figure A9)
1798 rebellion claimants and surrenders	Eneclann	Social cohesion (Table A13)
Signatories of William Smith O'Brien petition (1848)	Eneclann	Social cohesion (Table A13)
Tithe defaulters (1836)	Eneclann	Social cohesion (Table A13)
<i>Ordnance Survey of Ireland, 1824-1846</i>	osi.ie	Agricultural and industrial infrastructure (Table A14)

A.2 Descriptions for Predetermined Variables

Landownership in 1641

- *Share missing landowner*: Proportion of land with no listed owner.

- *Share shared ownership*: Proportion of land where more than one owner is listed for a townland.
- *Share Protestant landowner*: Proportion of land where owner is listed as Protestant.
- *Share top 10% landowners*: Proportion of land owned by landowners who were in the 10% of the distribution of landowners nationwide.
- *Share top 5% landowners*: Proportion of land owned by landowners who were in the 5% of the distribution of landowners nationwide.
- *Share top 1% landowners*: Proportion of land owned by landowners who were in the 1% of the distribution of landowners nationwide.
- *HHI (landowner)*: Herfindahl–Hirschman index of land concentration among unique owners of land in parish.
- *HHI (religion)*: Herfindahl–Hirschman index of inequality in religious ownership of land.
- *Number of landowners*: Number of distinct landowners.

Townland names

- *Name: Down*: Share of townlands with “Down” (fortified place) in the name.
- *Name: Ard*: Share of townlands with “Ard” (high place) in the name.
- *Name: Carrick*: Share of townlands with “Carrick” (rock) in the name.
- *Name: Knock*: Share of townlands with “Knock” (hill) in the name.
- *Name: Kil*: Share of townlands with “Kil” (church) in the name.

Caloric suitability

- *CSI: Pre-1500*: Mean potential caloric yield per hectare per year given the set of crops that are suitable for cultivation pre-1500.
- *CSI: Post-1500*: Mean potential caloric yield per hectare per year given the set of crops that are suitable for cultivation post-1500.
- *CSI: Potato*: Mean potential caloric yield per hectare per year of potato crops given medium inputs.
- *CSI: Wheat*: Mean potential caloric yield per hectare per year of wheat crops given medium inputs.
- *CSI: Oats*: Mean potential caloric yield per hectare per year of oat crops given medium inputs.
- *CSI: Barley*: Mean potential caloric yield per hectare per year of barley crops given medium inputs.

Geographical features

- *Share of profitable land*: Proportion of land recorded as being *profitable* in Down Survey.
- *Down Survey localities*: Number of distinct localities listed in Down Survey.
- *Average area of Down Survey localities (km²)*: Average area of localities listed in Down Survey.
- *Total area (km²)*: Total area of parish.
- *Longitude*: Decimal longitude of parish centroid.
- *Latitude*: Decimal longitude of parish centroid.
- *Distance to Dublin (km)*: Distance from parish centroid to Dublin.
- *Distance to coast (km)*: Distance from parish centroid to national coastline.
- *Elevation (m)*: Average elevation of townlands in parish.
- *Total profitable land (plantation acres)*: Total amount of profitable land recorded in plantation acres in Down Survey.

B Research Design: The Cromwellian Settlement

The Cromwellian Settlement accelerated and cemented Protestants' economic and political control of Ireland. Although some Catholics demonstrably retained land following the Settlement, their power was hugely diminished by the end of the 17th century. This culminated in the Williamite War of 1688-91, in which Irish Catholics supporting James II, in the hopes that his victory would see their land returned, fought against Protestants supporting William III. William's victory led to even more dramatic restrictions through the Penal Laws, which variously banned Catholics from buying Protestant land and made it harder for them to pass on their land between generations.²⁰ Legislation imposing restrictions on Catholics' property rights, education, employment, and political participation, further exacerbated disparities between the marginalized Irish Catholic majority and the English Protestant minority.

B.1 Distribution of Land Prior to the Settlement

While the Cromwellian Settlement dramatically reshaped landholding patterns in Ireland, the war that preceded it was induced by pre-existing English presence on the island. This presence – which was most pronounced in Ulster in the north and in “The Pale,” an area of English administration around Dublin – shaped subsequent opportunities for confiscation and redistribution of land after the Settlement.

In Figure A2, we present the presence of plantations that existed prior to 1641. As this map makes clear, significant portions of Ireland—especially, but not exclusively, in Ulster—were already spoken for by the time of the Settlement. This substantially curtailed the amount of expropriation and redistribution in these areas. In Figure A3, we tie these preexisting land claims more directly to our empirical strategy. This figure plots the share of land in each parish that was eligible for redistribution, which is primarily a function of preexisting Protestant landownership. As we note in the text, we omit the small set of parishes ($n = 49$) in which no land at all was eligible for redistribution from our analysis sample, and note that for the vast majority of parishes in the 10 split counties *all* land was eligible for redistribution.

In Panel A of Table A2, we provide summary statistics relating to the characteristics of parishes across the full country in areas assigned to the Adventurers, Army, Government, or Transplantation (see Figure 2 and associated discussion). Column 5 tests for the significance of aggregate differences in these characteristics. Such differences are clear across a number of characteristics. Considering pre-Settlement landownership patterns, Army areas overall have higher shares of Protestant owners (rationalized by many Army-assigned counties being in Ulster), while both Government and Transplantation areas had higher rates of land concentration. Adventurer and Army areas, overall, had higher caloric suitability for agriculture while, consistent with this, Transplantation areas were recorded as having a lower share of land profitable for agriculture.

In Panel B, we compare characteristics of the parishes ultimately included in our analysis sample (i.e., the subset of Army and Adventurer parishes in the 10 split counties with land eligible for redistribution) to all those parishes across the country not included (regardless of claimant category

²⁰The strength of enforcement of such requirements under the Penal Laws varied substantially, as noted by Childs (2007).

to which it was assigned). Column 8 tests for the significance of differences between the two. Analysis sample parishes are generally less Protestant-owned, and have substantially greater caloric suitability for agriculture, relative to the rest of the country. The geographical differences are a mechanical function of where the 10 split counties were located, which were closer to Dublin and the coast than the average of those parishes excluded from the analysis sample across the rest of the country.

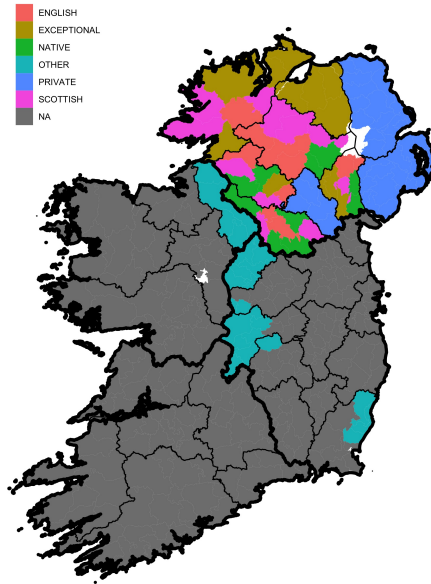


Figure A2: Presence of Plantations prior to 1641.

Sources: **English, Exceptional, Native, Scottish:** Moody & Hunter, *The Ulster Plantation, 1609-13*, Fig. 54, [Moody et al. \(1991\)](#) Vol. IX. **Other:** Clarke, *Plantations in the Reign of James I (1603-25)*, Fig. 55, [Moody et al. \(1991\)](#) Vol. IX. **Private:** [Stewart \(1989\)](#).

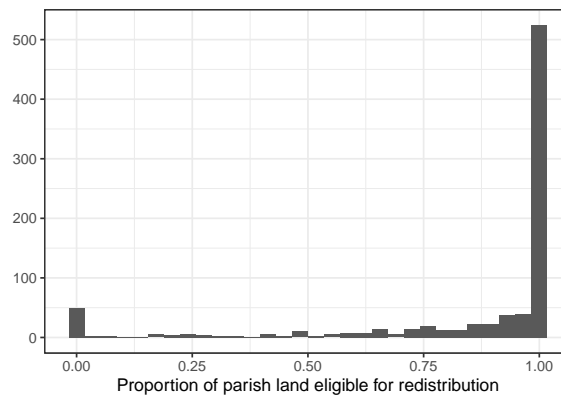


Figure A3: Share of parish land in analysis sample parishes eligible for redistribution

Table A2: Descriptive differences across areas assigned to different claimant categories

	A. Land assigned to different claimant categories					B. Analysis sample		
	Adventurers	Army	Government	Transplantation	$p(\tau_{claimants} = 0)$	Excluded	Included	$p(\tau_{included} = 0)$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Landownership in 1641								
Share missing landowner	0.02	0.01	0.03	0.08	[0.14]	0.03	0.02	[0.37]
Share shared ownership	0.06	0.03	0.03	0.04	[0.02]**	0.03	0.05	[0.03]**
Share Protestant landowner	0.45	0.62	0.39	0.35	[0.00]***	0.56	0.42	[0.00]***
Share top 10% landowners	0.39	0.44	0.50	0.47	[0.00]***	0.45	0.43	[0.74]
Share top 5% landowners	0.27	0.34	0.35	0.37	[0.00]***	0.34	0.31	[0.31]
Share top 1% landowners	0.11	0.15	0.19	0.22	[0.00]***	0.17	0.12	[0.05]
HHI (landowner)	0.45	0.46	0.44	0.33	[0.48]	0.44	0.44	[0.34]
HHI (religion)	0.72	0.72	0.71	0.69	[0.50]	0.72	0.71	[0.07]
Number of landowners	5.59	5.88	6.27	8.90	[0.19]	6.42	5.86	[0.75]
Townland names								
Name: Down	0.02	0.02	0.05	0.03	[0.01]***	0.03	0.01	[0.00]***
Name: Derry	0.01	0.01	0.00	0.01	[0.32]	0.01	0.01	[0.90]
Name: Ard	0.03	0.02	0.03	0.02	[0.00]***	0.02	0.03	[0.51]
Name: Carrick	0.01	0.01	0.01	0.00	[0.00]***	0.01	0.01	[0.17]
Name: Knock	0.03	0.02	0.05	0.04	[0.40]	0.03	0.03	[0.21]
Name: Kil	0.08	0.07	0.11	0.09	[0.16]	0.08	0.09	[0.39]
Caloric Suitability								
CSI: Pre-1500	1338.06	1242.13	1133.12	1251.07	[0.00]***	1205.32	1323.59	[0.00]***
CSI: Post-1500	823.58	764.07	704.34	766.12	[0.00]***	743.24	813.23	[0.00]***
CSI: Potatoes	3619.15	3476.46	3385.38	3367.36	[0.00]***	3430.53	3572.02	[0.00]***
CSI: Wheat	13371.34	12680.86	11889.34	12552.69	[0.00]***	12388.77	13252.05	[0.00]***
CSI: Oats	5529.08	5426.92	5009.02	5298.97	[0.00]***	5293.21	5506.31	[0.00]***
CSI: Barley	13628.66	12827.15	11878.52	12821.85	[0.00]***	12498.95	13503.01	[0.00]***
Geographical features								
Share of profitable land	0.93	0.91	0.97	0.69	[0.00]***	0.88	0.92	[0.79]
Down Survey localities	9.21	11.39	7.77	19.88	[0.13]	11.95	10.05	[0.98]
Average size of Down Survey localities (km ²)	3.90	3.99	3.52	4.12	[0.49]	3.98	3.75	[0.61]
Total area (km ²)	22.34	25.36	21.09	51.40	[0.08]*	28.28	24.45	[0.91]
Longitude	-7.29	-7.40	-7.78	-8.78	[0.00]***	-7.71	-7.38	[0.00]***
Latitude	53.21	53.24	52.45	53.39	[0.00]***	53.09	53.19	[0.00]***
Distance to Dublin (km)	154.00	172.62	199.92	282.10	[0.00]***	197.38	162.51	[0.00]***
Distance to coast (km)	31.60	28.44	23.86	25.77	[0.44]	24.26	35.93	[0.00]***
Elevation (m)	83.12	86.36	91.10	61.13	[0.01]***	81.11	89.13	[0.39]
Total profitable land (plantation acres)	1960.21	3149.93	2185.68	3051.93	[0.40]	2995.25	2225.63	[0.37]

B.2 Claimants' propensity to settle land

In the aggregate, the Cromwellian Settlement dramatically reshaped landholding patterns in Ireland. We visualize this in the text in Figure 3; Figure A4 provides another visualization of this information, emphasizing the dramatic transition that the Settlement induced by plotting the distribution of our key variables from *The Books of Survey and Distribution*, aggregated to the parish-level.

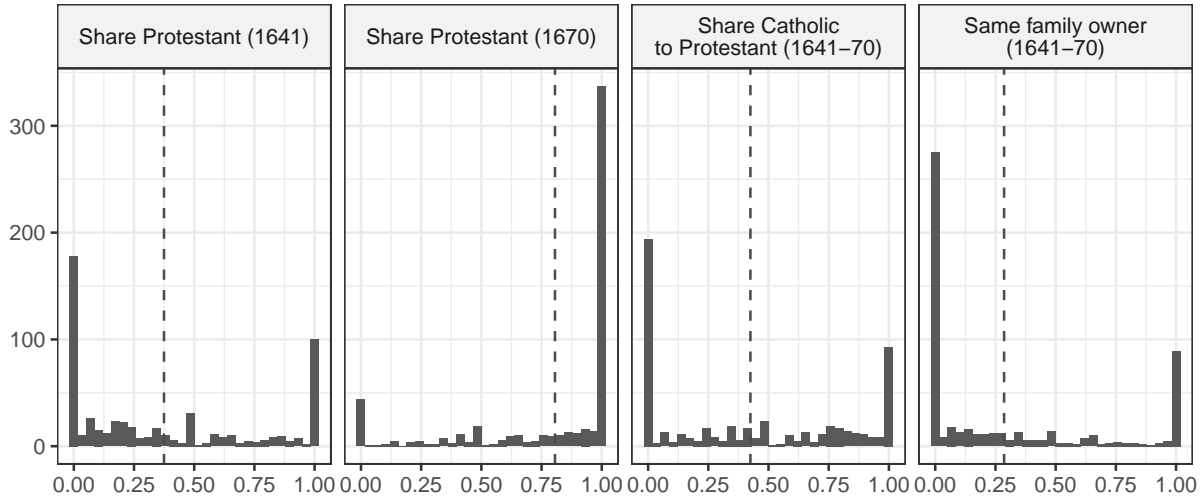


Figure A4: Distribution of short-run outcomes (average of parish-level values)

Our primary quantities of interest, however, are not in the aggregate changes, but in the differences in land settlement in Army-assigned and Adventurer-assigned areas. What produced these differences? First, we note potential sources of inaccuracy when evaluating the 1641 landownership data, where Protestants owned slightly (but insignificantly) more land in Adventurer areas than Army areas. There are two possible reasons for this. First, Catholic elites were potentially more able to convert to Protestantism as a means to retain their landholdings in these baronies at higher rates than in Army baronies (Ohlmeyer, 2012). Since the religion of the landowner we observe is fixed between 1641 and 1670, this would induce the appearance of higher rates of Protestant landowning in 1641 (our religious conversion data discussed below unfortunately only starts in 1700). Second, according to McKenny (1995), in a number of counties “it appears that the Catholic portion of land has been artificially enhanced (while the Protestant share was decreased) for the pre-1641 period. Consequently a sectarian study of the land revolution, based on the *Books of Survey and Distribution* alone, would have more Catholic ‘landowners’ losing land to Protestant outsiders than was actually the case” (184-185). Incentives to overstate the amount of Catholic land available for expropriation were likely more acute in Army-assigned areas, given the huge number of claimants, which might similarly account for this difference.

Second, the process of land *expropriation* from Catholic landowners presented enduring uncertainties. For example, due to uncertainty over whether sufficient amounts of profitable land would be uncovered in these ten counties to satisfy the huge number of Army claimants, several other counties were set aside as security for the Army (McKenny, 1989; Prendergast, 1870). Protestant landowners were liable to lose a fifth of their estates if they had allied with the Royalists during

the English Civil War, but the restoration of Charles II in 1660 effectively negated this confiscation (Hirst, 2012). Pre-existing Catholic landowners were sometimes able to recover their holdings through legal means, such as through the *Act of Settlement* (1662) or *Act of Explanation* (1665), or through informal payments. Ohlmeyer (2012) offers insight into the transactions and interactions that occurred regarding the Marquis of Antrim's estates.²¹ As she notes, for both the Army-assigned and the Adventurer-assigned baronies, "there was an immediate redistribution" after the initial allotment: "in the months following the lottery the speculators either sold or exchanged their adventures" and "the majority of Cromwell's troops were eager for cash and merely sold their debentures and went home" (Ohlmeyer, 2012, 291). She notes that, in the midst of this confusion, "Antrim was able to maintain very close links with his estates throughout the Interregnum" and, more broadly, that "Impressionistic evidence suggests that many of the Catholic peers [...] appear to have returned to their pre-war estates and developed survival strategies akin to those used by the Marquis of Antrim" (293). Lenihan (2014), in a study of County Wexford, finds that only a small share of Catholic landowners ultimately appear to have forfeited their entire estates and to have moved to take up new land in Connacht. Overall evidence on how many Catholics were transplanted to Connacht is limited, but historians suggest that agricultural workers tended to stay where they had previously resided, while only Catholic landowning elites were those forcibly transplanted (O'Hart, 1887; Ó Siochrú et al., 2018). As a result, by 1670 many of those initially allocated land had not settled it: ultimately "The new plantation failed on the gigantic scale originally envisaged. In 1670, when the estates of the Cromwellian settlers were confirmed they numbered 8,000 as against 36,000 in the original scheme" (Lenihan, 2014, 146-147).²²

Historical evidence is inconclusive as to whether the Adventurers or Army were ultimately *more* likely to settle their allocated land (Brown, 2020). Soldiers were plausibly more desperate to receive payment, given that this was for them long overdue back wages rather than an investment opportunity. Available evidence indicates that "most [soldiers] sold out at a discount to their officers or to existing New English settlers" (Hirst, 2012, 225), who then "eagerly bought up [land] from hardpressed soldiers, and at knock-down discounts" (Hirst, 2012, 224). The relationship between soldiers and their officers may have meant that they had a readily available set of Protestant buyers in the event they chose not to settle (Ohlmeyer, 2012). For Adventurers, on the other hand, "No evidence shows us how many ... actually went to Ireland and settled" (Bottigheimer, 1971, 162).

As we note above, the eventual forgiveness of some Irish Catholic (former) landholders allowed them to purchase back at least a portion of their land. This was perhaps more feasible in the case of their lands being given to Adventurers, since Army debentures were considerably smaller on average and would have required bargaining with many more individuals. The Adventurers may have also been more willing to negotiate with Catholic elites given their primarily financial motivations and general lack of direct engagement in the prior conflict (Bottigheimer, 1971; Brown, 2020). Despite this historical ambiguity, we expect that the dramatically different constituencies to whom land was

²¹Ohlmeyer (2012) notes that, while this case study "illustrates what appears to have happened on confiscated estates across the country...further cadastral studies need to be undertaken in order to confirm this" (291).

²²As we demonstrate, though the total *number* of settlers was much smaller than initially intended, this still represented a huge shift in the aggregate ownership of land by Protestants relative to Catholics since many of the new Protestant landowners came to acquire large estates.

given—the Army and the Adventurers—produced different eventual patterns of settlement across baronies within the lottery-assigned counties.

We provide novel evidence in line with this by linking the names of landowners (as observed in 1670) with lists of the names of all 1,500 Adventurers and 2,200 Army officers from the New Model Army involved in the Irish conflict (Bottigheimer, 1971; Brown, 2020; Dalton, 1907; Wanklyn, 2017). For both first and last names, we consider perfect string matches as well as phonetic matches using the soundex index, since multiple name spellings are often recorded for the same person across sources.

Table A3: Effects on identity of landowner in 1670

	Army officers		Adventurers		Either	
A. Exact name match	(1)	(2)	(3)	(4)	(5)	(6)
Army	0.108*** (0.029)	0.118*** (0.019)	-0.055*** (0.012)	-0.059*** (0.013)	0.053* (0.030)	0.056** (0.023)
Controls	×	✓	×	✓	×	✓
Adv. Mean	0.14	0.14	0.09	0.09	0.23	0.23
Adv. SD	0.25	0.25	0.20	0.20	0.32	0.32
Observations	794	794	794	794	794	794
B. Phonetic match	(1)	(2)	(3)	(4)	(5)	(6)
Army	0.186*** (0.026)	0.184*** (0.022)	-0.043** (0.017)	-0.044*** (0.015)	0.143*** (0.030)	0.124*** (0.028)
Controls	×	✓	×	✓	×	✓
Adv. Mean	0.22	0.22	0.12	0.12	0.35	0.35
Adv. SD	0.31	0.31	0.23	0.23	0.40	0.40
Observations	794	794	794	794	794	794

Dependent variables: Columns 1-2: Share of landowners in parish in 1670 matching Army officer names; 3-4: Share of landowners in parish in 1670 matching Adventurer names; 5-6: Share of landowners in parish in 1670 matching either Army officers or Adventurers. Panel A defines matches using exact string matches for first and last name; Panel B defines matches using exact matches for the phonetic soundex codes of first and last name.

All specifications are estimated using OLS with county-level fixed effects using Equation (1). Even-indexed columns add LASSO-selected predetermined covariates. Standard errors clustered at the barony-level in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A3 provides these estimates. Focusing on exact name matches in Panel A, treatment assignment increases the share of land owned by landowners in 1670 with names matching an Army officer from 14 to 25 pp ($p < 0.01$) and reduces the share matching an Adventurer from 9 to 3 pp ($p < 0.01$). Considering the share of land with names matching *either* category, treatment assignment increases this from 23 to 28 pp ($p < 0.1$). Estimates are similar, if larger in magnitude, when considering phonetic matches in Panel B—for example, the share of land matching either category increases from 35 to 49 pp ($p < 0.01$).

Table A4: Effects on share of land owned by individuals who were major landowners in 1641

	Top 10%		Top 5%		Top 1%	
	(1)	(2)	(3)	(4)	(5)	(6)
Army	-0.053* (0.031)	-0.020 (0.018)	-0.066** (0.031)	-0.043*** (0.016)	-0.012 (0.022)	-0.004 (0.012)
Controls	×	✓	×	✓	×	✓
Adv. Mean	0.27	0.27	0.22	0.22	0.09	0.09
Adv. SD	0.35	0.35	0.33	0.33	0.22	0.22
Observations	794	794	794	794	794	794

Dependent variables: Share of land in parish owned in 1670 by landowners who had been in the top 10%, 5%, 1% of landholdings nationwide in 1641.

All specifications are estimated using OLS with county-level fixed effects using Equation (1). Even-indexed columns add LASSO-selected predetermined covariates. Standard errors clustered at the barony-level in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

These results underscore the striking amount of land accumulated by officers from their subordinate soldiers, as well as the limited propensity of Adventurers to actually take up their land. Further consistent with these different patterns on the subsequent take-up of land, in Table A4 we find that ‘major landowners’ *as recorded and defined in 1641* owned a substantially lower share of land in Army-assigned baronies in 1670 relative to Adventurer-assigned baronies.

Further reinforcing the point that Army- or Adventurer-assignment did not have meaningful effects on landholding inequality is Figure A5, which shows that major landholding at the county level was quite consistent between 1641 and 1670. Moreover, Table A4 extends our in-text analyses from Panel B of Table 2 to demonstrate Army assignment was not associated with a change in the share of land in the hands of major landowners. While assignment clearly shaped patterns of land settlement and uptake, it nevertheless quite clearly did *not* shape individual-level landholding inequality.

C Mechanisms of Persistence

In the main text, we consider two tests to gauge the persistence of short-run effects on the group identity of local economic elites. First, we evaluate rates of religious conversions. Second, we assess differences in the inferred religious affiliation of landowners as observed later in time.

Until 1778, Catholic elites were permitted to renounce their religion to regain some of their lost economic and political rights; after that time, only a declaration of loyalty to the King was needed to regain certain rights (O’Byrne, 1981). Drawing on a complete digitization of the *Catholic Qualification and Convert Rolls* recording such events, we geolocate every event with a recorded location throughout the 18th century ($n = 30,000$, also see Figure A6). We then generate an indicator for whether *any* conversion by Catholic elites is observed in a given parish in a given decade and estimate treatment effects at the parish-decade. Figure A7 suggests local elites’ religious conversions

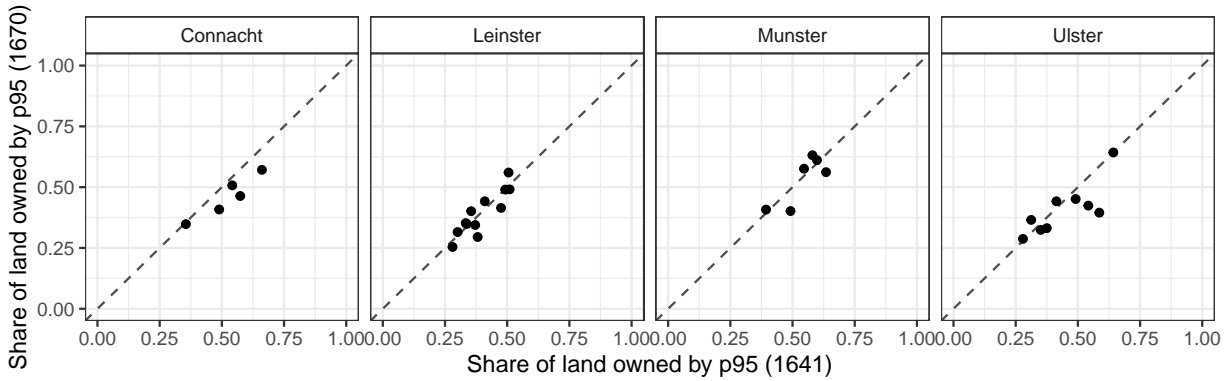


Figure A5: Share of land owned by top 5% of landowners (by total area of landholdings) in each county, 1641-70.

Table A5: Effects on share of land owned by major landowners in 1670

	Top 10%		Top 5%		Top 1%	
	(1)	(2)	(3)	(4)	(5)	(6)
Army	-0.032 (0.033)	-0.025 (0.023)	0.000 (0.033)	0.022 (0.022)	-0.001 (0.020)	-0.001 (0.014)
Controls	×	✓	×	✓	×	✓
Adv. Mean	0.45	0.45	0.33	0.33	0.12	0.12
Adv. SD	0.37	0.37	0.35	0.35	0.22	0.22
Observations	794	794	794	794	794	794

Dependent variables: Share of land in parish owned by landowners in the top 10% of the national distribution of landholdings (columns 1-2); 5% (3-4); 1% (5-6).

All specifications are estimated using OLS with county-level fixed effects using Equation (1). Even-indexed columns add LASSO-selected predetermined covariates. Standard errors clustered at the barony-level in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

did not vary over time, while the presence of modestly fewer declarations of loyalty post-1778 is potentially a function of fewer Catholic elites in Army-assigned baronies to start with.

For cross-sectional evidence regarding the religious affiliation of landowners, we draw on *Griffith's Valuation* (1847-64). While providing the names and locations of all landlords in the country, however, the *Valuation* did not record their religion. To infer whether a given landlord was Protestant, we then generate a mapping from last names to the probability of that name being Protestant. This follows the idea that particular names were often more associated with more Irish (and hence Catholic) versus more English (and hence Protestant) origins (Byrne and O'Malley, 2013). Our source for this mapping comes from the full-count census of 1901, where we observe names *and* religion. We restrict the 1901 census to comprise those individuals born in one of the 10

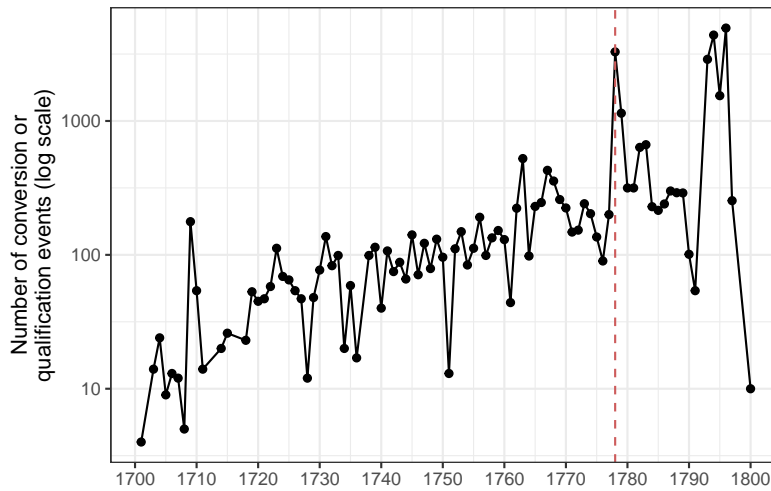


Figure A6: Number of Catholic conversion or qualification events by year (log scale)

Note: After the *Papists Act* of 1778 (dashed red line), Catholics were able to regain some economic and political rights by declaring loyalty to the King rather than renouncing their religion.

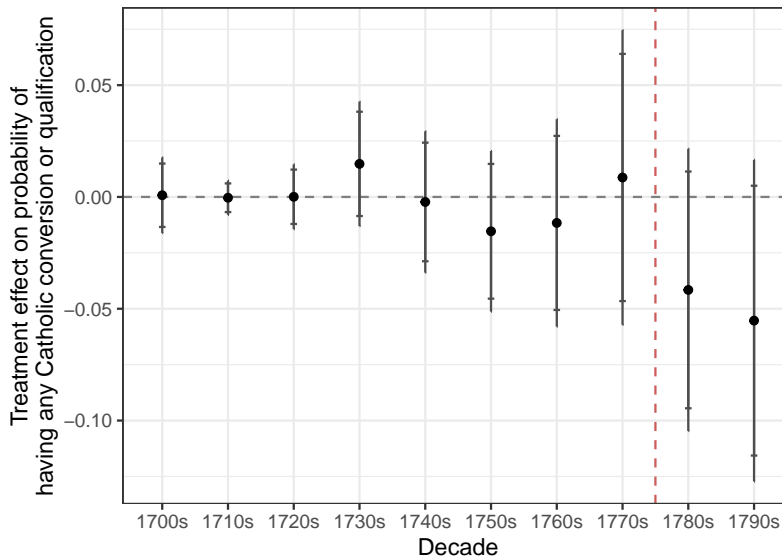


Figure A7: Probability of a Catholic conversion being observed in a given parish in a given decade

Note: After the *Papists Act* of 1778 (dashed red line), Catholics were able to regain some economic and political rights by declaring loyalty to the King rather than renouncing their religion. Figure estimates treatment effects of a parish containing any Catholic conversion event in a given decade using Equation (1). 90% and 95% confidence intervals plotted.

counties in our sample, and then compute the conditional probability of a given last name being associated with a Protestant. To deal with the concern that this mapping could have shifted over time, we do this both using the full census sample in these counties as well as only among those older than 50 years old, and hence alive at the time of *Griffith's Valuation*.

Table A6: Effects on imputed religion of landlords and tenants

	Landlord		Tenant	
	(1)	(2)	(3)	(4)
A. All 1901 census				
Army	0.025* (0.014)	0.019** (0.009)	0.006 (0.008)	0.008* (0.004)
Controls	×	✓	×	✓
Adv. Mean	0.46	0.46	0.30	0.30
Adv. SD	0.17	0.17	0.16	0.16
Observations	794	794	794	794
B. Above 50 years old in 1901 census				
Army	0.033** (0.014)	0.027*** (0.009)	0.008 (0.008)	0.010** (0.004)
Controls	×	✓	×	✓
Adv. Mean	0.44	0.44	0.28	0.28
Adv. SD	0.18	0.18	0.16	0.16
Observations	794	794	794	794

Dependent variables: Columns 1-2: Weighted share of landlords in parish with an imputed Protestant name in Griffith's Valuation; Columns 3-4: Weighted share of tenants in parish with an imputed Protestant name in Griffith's Valuation. Panel A defines the conditional probability of a given surname being Protestant using all household heads from the 1901 census; Panel B restricts to those above 50 years old and hence alive at the time of *Griffith's Valuation*.

All specifications are estimated using OLS with county-level fixed effects using Equation (1). Even-indexed columns add LASSO-selected predetermined covariates. Standard errors clustered at the barony-level in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

These conditional probabilities are then merged back into the *Griffith's* data at the last name-level, before we take the simple mean at the parish level for use in the analysis (since *Griffith's* does not record the amount of land owned by each landlord). Columns 1-2 of Table A6 provide results. In the baseline specification, using the full 1901 census for the mapping of names to religion, we find landlords in Amry assigned areas have names which are 2.5 percentage points more Protestant-associated than those in areas assigned to the Adventurers ($p < 0.1$), representing an effect size of 0.15 standard deviations. Restricting this mapping to those above 50 years old (see Panel B) increases the effect size to 3.3 percentage points ($p < 0.05$), representing an effect size of 0.18 standard deviations.

We also consider evidence for similar differences among the broader population. First, in Columns 3-4 of Table A6, we perform the same exercise using data from *Griffith's Valuation*, but

Table A7: Effects on religious composition of broader population

	Catholic		Protestant			
			Church of Ireland		Presbyterian	
	(1)	(2)	(3)	(4)	(5)	(6)
Army	-0.009 (0.017)	-0.007 (0.010)	0.000 (0.011)	0.000 (0.006)	0.008 (0.010)	0.008 (0.008)
Controls	×	✓	×	✓	×	✓
Adv. Mean	0.86	0.86	0.08	0.08	0.06	0.06
Adv. SD	0.22	0.22	0.10	0.10	0.17	0.17
Observations	794	794	794	794	794	794

Dependent variables: Columns 1-2: Share of Roman Catholic population in parish in 1834; 3-4: Share of Church of Ireland population in parish in 1834; 5-6: Share of Presbyterian population in parish in 1834. Data comes from *Commission on Public Instruction Vol. 1 (1834-5)*.

All specifications are estimated using OLS with county-level fixed effects using Equation (1). Even-indexed columns add LASSO-selected predetermined covariates. Standard errors clustered at the barony-level in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

instead restricted to the universe of *tenants* in the country. We estimate much smaller treatment effects than when applied to the landlord names, with effects inconsistently and marginally significant when we restrict the 1901 census sample. Second, we consider effects on the religious composition of parishes, drawing on the first volume of the 1835 *Commission on Public Instruction*. In Table A7, we estimate treatment effects on the share of the population that was Catholic or Protestant (whether Church of Ireland or Presbyterian). We find substantively small and insignificant reductions in the incidence of Catholicism in Army-assigned areas.

The over time balance in elites' religious conversion rates, plus the cross-sectional differences in landlords' inferred religion, strongly support the persistence of the short-run variation in the group identity of local elites. However, the evidence suggests it had far more limited effects on the broader local religious composition of citizens.

D Additional Evidence on Long-Run Public Goods Provision

D.1 Additional Detail on Education in 19th Century Ireland

The introduction of the Penal Laws following the Williamite War in 1691 would cast a long shadow over schooling in Ireland for more than two hundred years. Multiple provisions in the Penal Laws explicitly prohibited Catholics from teaching and, for more than a century, the Church of Ireland and various Evangelical associations attempted to use these legal restrictions to facilitate the conversion of Catholic children (Raftery and Relihan, 2015, 153-154). As Thomas Wyse, an early and influential Catholic reformer, and MP from Tipperary noted, "All education soon got infected with a political

Table A8: Long-run effects on presence of local public goods (Auxiliary)

	Index		Schools		Health		Workhouse		Prisons	
A. Number	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Army	-0.132* (0.075)	-0.099 (0.068)	-0.196 (0.508)	-0.240 (0.385)	-0.012 (0.038)	0.003 (0.038)	-0.039 (0.030)	-0.027 (0.024)	-0.043*** (0.013)	-0.042** (0.018)
Controls	×	✓	×	✓	×	✓	×	✓	×	✓
Adv. Mean	0.06	0.06	4.61	4.61	0.23	0.23	0.10	0.10	0.06	0.06
Adv. SD	1.09	1.09	6.16	6.16	0.57	0.57	0.37	0.37	0.25	0.25
Observations	794	794	794	794	794	794	794	794	794	794
B. Log+1	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Army	-0.154* (0.083)	-0.120* (0.068)	-0.066 (0.083)	-0.062 (0.057)	-0.005 (0.022)	0.004 (0.022)	-0.026 (0.019)	-0.017 (0.015)	-0.030*** (0.008)	-0.029** (0.012)
Controls	×	✓	×	✓	×	✓	×	✓	×	✓
Adv. Mean	0.08	0.08	1.28	1.28	0.14	0.14	0.06	0.06	0.04	0.04
Adv. SD	1.11	1.11	0.93	0.93	0.33	0.33	0.22	0.22	0.17	0.17
Observations	794	794	794	794	794	794	794	794	794	794

Panel A: Number of facilities; Panel B: Log+1 Number of facilities. Dependent variables: Columns 1-2: Standardized z-score index of other columns; 3-4: Schools in parish (1835); 5-6: Health facilities in parish (1837); 7-8: Workhouses in parish (1845); 9-10: Prisons in parish (1840).

All specifications are estimated using OLS with county-level fixed effects using Equation (1). Even-indexed columns add LASSO-selected predetermined covariates. Standard errors clustered at the barony-level in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

and sectarian spirit; it was an attack on one side, a defence on another—a battle fought in every school, under every hedge, for the minds and feelings of the country” quoted in (Lyons, 2014, 49).

By the early 1800s, it was clear that concerted efforts to use education to advance proselytization had failed spectacularly (O’Brien, 2013). Historiographers generally attribute this failure to the popularity of so-called *hedge schools*, which rapidly expanded throughout Ireland following the introduction of the Penal Laws (O’Higgins, 2017; McManus, 2014; O’Connell, 2011). As their name implies, these schools initially took place outdoors, and were led by a “teacher” who often lacked formal training, but provided instruction in reading, writing, and arithmetic in exchange for a nominal fee from local families. While the historiography of hedge schools remains contested, especially as they played such a prominent role in nationalist accounts of resistance to English control (Corcoran, 1925; Dowling, 1935), they were undoubtedly the most common school type by the early 1800s (Walsh, 2013, 8) (McCormack, 2014, 26). By this late stage, most hedge schools were no longer itinerant but held in a fixed building, albeit of often very low quality (FitzGerald, 2013, 50). Still, education in hedge schools remained rudimentary: there was no standard curriculum, system of formal training for teachers, or any systematic inspection of schools (O’Brien, 2013, 22). By 1835, the term ‘hedge school’ specifically referred to the lowest quality schools (O’Higgins, 2017).

The resilience of the hedge school is particularly remarkable given the wide variety of alternative types of schooling introduced over the course of the Protestant Ascendancy. These included *parish schools*, so-called because they were associated with the Parishes of the Church of Ireland, *free schools*, generally higher quality schools that were able to forgo fees because they were endowed by wealthy Protestants, often directly with revenues from landed estates, or *charter schools*, vocational boarding schools explicitly designed to facilitate conversion by separating children from their families. As the result of long-standing efforts by a range of different reformers, both Catholic and Protestant, national schools were introduced in 1831 (O’Brien, 2013). Because these non-denominational schools were relatively new in 1835, there are far fewer of them recorded in the census, nonetheless, they represented an important alternative to the traditional hedge school.

The connection between the Cromwellian Settlement and the subsequent supply of schools by local elites is neatly illustrated by the case of Erasmus Smith (1611-91). Smith’s father, Roger, supplied £375 as an Adventurer (where the median contribution was £139 and the mean £396) (Bottigheimer, 1971). Inheriting this entitlement to Irish land in 1653, which was prior to the specific assignment of land parcels to Adventurers, Erasmus bought up a substantial amount of land debentures from both other Adventurers and Army soldiers. By 1669, Erasmus owned more than 37,000 acres of Irish land (while remaining based in England). In exchange for the tremendous wealth accumulated by his acquisition of cheap land during the protracted redistribution process, Smith formed a trust in 1657, intended to support free education for those living on his land as tenants (Wallace, 2004). Under this trust, which still exists to this day, a number of free schools were set up to provide relatively high quality education (with instruction at least initially including a heavily Protestant focus on religious teachings).

Table A9: Effects on school attendance by type (Auxiliary)

	Free		National		Hedge		Parish		Paying	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Army	-0.270** (0.120)	-0.220** (0.088)	-0.096 (0.138)	-0.070 (0.120)	0.191 (0.195)	0.149 (0.116)	-0.022 (0.102)	0.038 (0.101)	-0.415* (0.217)	-0.422** (0.169)
Controls	×	✓	×	✓	×	✓	×	✓	×	✓
Adv. Mean	0.45	0.45	0.78	0.78	0.93	0.93	0.65	0.65	3.18	3.18
Adv. SD	1.32	1.32	1.77	1.77	1.73	1.73	1.44	1.44	2.43	2.43
Observations	794	794	794	794	794	794	794	794	794	794

Dependent variables: Columns 1-2: Log+1 children attending free schools; 3-4: Log+1 children attending national schools; 5-6: Log+1 children attending hedge schools; 7-8: Log+1 children attending parish schools; 9-10: Log+1 children attending other fee-paying schools.

All specifications are estimated using OLS with county-level fixed effects using Equation (1). Even-indexed columns add LASSO-selected predetermined covariates. Standard errors clustered at the barony-level in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A10: Effects on literacy outcomes in 1841

	Gender						Extent			
	Share literate		Male		Female		Share read only		Share read and write	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Army	0.014 (0.012)	0.011** (0.005)	0.018* (0.010)	0.015*** (0.005)	0.009 (0.014)	0.005 (0.006)	0.007 (0.007)	0.006* (0.003)	0.007 (0.007)	0.009** (0.004)
Controls	×	✓	×	✓	×	✓	×	✓	×	✓
Adv. Mean	0.51	0.51	0.57	0.57	0.44	0.44	0.22	0.22	0.29	0.29
Adv. SD	0.13	0.13	0.12	0.12	0.15	0.15	0.08	0.08	0.08	0.08
Observations	794	794	794	794	794	794	790	790	790	790

Dependent variables: Columns 1-2: Share of population who can either read or write English; 3-4: Share of men who can either read or write; 5-6: Share of women who can either read or write; 7-8: Share of population who can only read; 9-10: Share of population who can both read and write.

All specifications are estimated using OLS with county-level fixed effects using Equation (1). Even-indexed columns add LASSO-selected predetermined covariates. Standard errors clustered at the barony-level in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure A8: Effects on proportion of decennial birth cohorts speaking Irish



Notes: Estimates come from regressing barony-level decennial birth cohort estimates of the share of the population speaking Irish onto a barony-level equivalent of Equation (1). 90% and 95% confidence intervals plotted. Estimates for the oldest cohorts are noisy due to the low number of individuals surviving by the 1881 census.

D.2 Additional Evidence on Other Public Goods

Table A11: Effects on funding for health facilities

A. Total funding	All		Dispensaries		Fever hospital		Infirmaries	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Army	-0.040 (0.119)	0.030 (0.128)	0.145 (0.097)	0.191* (0.114)	0.002 (0.032)	0.017 (0.034)	0.014 (0.015)	0.013 (0.013)
Controls	×	✓	×	✓	×	✓	×	✓
Adv. Mean	0.86	0.86	0.59	0.59	0.03	0.03	0.00	0.00
Adv. SD	1.91	1.91	1.55	1.55	0.47	0.47	0.00	0.00
Observations	794	794	794	794	794	794	794	794
B. County funding	All		Dispensaries		Fever hospital		Infirmaries	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Army	-0.037 (0.108)	0.027 (0.115)	0.128 (0.086)	0.168* (0.100)	-0.000 (0.030)	0.016 (0.031)	0.013 (0.014)	0.012 (0.012)
Controls	×	✓	×	✓	×	✓	×	✓
Adv. Mean	0.77	0.77	0.53	0.53	0.03	0.03	0.00	0.00
Adv. SD	1.72	1.72	1.37	1.37	0.46	0.46	0.00	0.00
Observations	794	794	794	794	794	794	794	794
C. Subscriptions	All		Dispensaries		Fever hospital		Infirmaries	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Army	-0.126 (0.087)	-0.042 (0.101)	0.046 (0.074)	0.084 (0.091)	0.009 (0.022)	0.010 (0.025)	0.004 (0.004)	0.012 (0.012)
Controls	×	✓	×	✓	×	✓	×	✓
Adv. Mean	0.59	0.59	0.39	0.39	0.01	0.01	0.00	0.00
Adv. SD	1.49	1.49	1.21	1.21	0.25	0.25	0.00	0.00
Observations	794	794	794	794	794	794	794	794

Panel A: Log+1 total funding for a given type of health facility; Panel B: Log+1 funding from county grand jury; Panel C: Log+1 funding from local subscriptions and donations. Dependent variables: Columns 1-2: All health facilities; 3-4: Dispensaries; 5-6: Fever hospitals; 7-8: Infirmaries.

Table A12: Effects on workhouses and carceral facilities by type

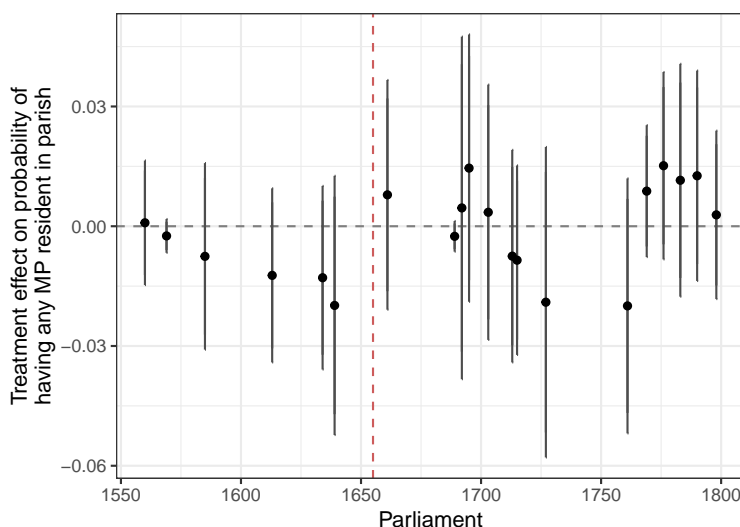
	A. Workhouses						B. Carceral facilities					
	All		Main		Auxiliary		All		Bridewells		Jails	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Army	-0.036 (0.023)	-0.021 (0.018)	-0.011 (0.014)	-0.011 (0.015)	-0.026 (0.020)	-0.011 (0.015)	-0.122** (0.056)	-0.118* (0.069)	-0.214*** (0.051)	-0.207*** (0.074)	-0.010 (0.031)	-0.011 (0.033)
Controls	×	✓	×	✓	×	✓	×	✓	×	✓	×	✓
Adv. Mean	0.08	0.08	0.05	0.05	0.05	0.05	0.20	0.20	0.23	0.23	0.04	0.04
Adv. SD	0.27	0.27	0.22	0.22	0.23	0.23	0.95	0.95	1.13	1.13	0.48	0.48
Observations	794	794	794	794	794	794	794	794	794	794	794	794

Panel A: Columns 1-2: Parish has any workhouse; 3-4: Parish has any 'main' workhouse; 5-6: Parish has any 'auxiliary' workhouse. Panel B: Columns 7-8: Log+1 total funding for prisons; 9-10: Log+1 total funding for bridewells; 11-12: Log+1 total funding for jails.

E Evidence on Alternative Theoretical Pathways

E.1 Central State Alignment and Social Cohesion

Figure A9: Effects on residence of MPs



Notes: Estimates come from regressing an indicator for a given parish being the residence of any MP in a given parliament prior to 1800 using Equation (1). 90% and 95% confidence intervals plotted.

Table A13: Effects on social unrest outcomes

	1798 rebellion				WSOB petition				Tithe defaulters			
	Any claims		Amount claimed		Any signed		Share signed		Any		Number	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Army	0.043*	0.046*	0.196	0.160	0.010	0.010	0.007	0.005**	-0.008	-0.005	-0.172	-0.146
	(0.026)	(0.024)	(0.122)	(0.114)	(0.020)	(0.014)	(0.005)	(0.002)	(0.031)	(0.024)	(0.203)	(0.147)
Controls	×	✓	×	✓	×	✓	×	✓	×	✓	×	✓
Adv. Mean	0.12	0.12	0.54	0.54	0.73	0.73	0.05	0.05	0.16	0.16	1.03	1.03
Adv. SD	0.33	0.33	1.59	1.59	0.45	0.45	0.05	0.05	0.37	0.37	2.48	2.48
Observations	794	794	794	794	794	794	794	794	794	794	794	794

Dependent variables: Columns 1-2: Any claim for damages from 1798 rebellion in parish; 3-4: Log+1 amount claimed; 5-6: Any households linked to William Smith O'Brien petition signatures; 7-8: Share of households linked to William Smith O'Brien petition signatures; 9-10: Any tithe defaulters observed; 11-12: Log+1 number of tithe defaulters observed. All specifications are estimated using OLS with county-level fixed effects using Equation (1). Even-indexed columns add LASSO-selected predetermined covariates. Standard errors clustered at the barony-level in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

E.2 Local Private Agricultural and Industrial Investments

Table A14: Long-run effects on presence of agricultural and industrial infrastructure

	Index		I. Industrial								II. Agricultural						III. Other					
			Foundry		Gas works		Quarry		Gravel pit		Mill		Windmill		Lime kiln		Sluice		Water pump		Well	
A. Any	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Army	-0.06 (0.10)	-0.01 (0.06)	-0.01 (0.01)	-0.00 (0.01)	0.00 (0.01)	-0.00 (0.02)	-0.04 (0.05)	0.00 (0.04)	0.00 (0.06)	0.04 (0.03)	-0.01 (0.04)	0.01 (0.04)	0.00 (0.01)	0.01 (0.01)	-0.04 (0.06)	-0.02 (0.02)	-0.04 (0.04)	-0.02 (0.04)	0.00 (0.02)	-0.00 (0.02)	-0.01 (0.04)	0.01 (0.03)
Adv. Mean	0.25	0.25	0.01	0.01	0.03	0.03	0.52	0.52	0.27	0.27	0.29	0.29	0.03	0.03	0.31	0.31	0.37	0.37	0.94	0.94	0.31	0.31
Adv. SD	0.93	0.93	0.10	0.10	0.18	0.18	0.50	0.50	0.44	0.44	0.45	0.45	0.18	0.18	0.46	0.46	0.48	0.48	0.23	0.23	0.46	0.46
Observations	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674
B. Number																						
Army	-0.10 (0.12)	-0.08 (0.08)	-0.01 (0.01)	-0.01 (0.01)	-0.02 (0.03)	-0.03 (0.03)	1.00 (0.87)	1.31** (0.55)	-0.54 (0.52)	-0.10 (0.16)	-0.02 (0.08)	-0.01 (0.08)	0.01 (0.03)	0.03 (0.03)	-2.09 (1.58)	-1.64*** (0.49)	-0.29 (0.22)	-0.16 (0.27)	1.49 (2.42)	0.58 (1.43)	-0.04 (0.16)	-0.13 (0.12)
Adv. Mean	0.18	0.18	0.01	0.01	0.07	0.07	2.31	2.31	1.27	1.27	0.47	0.47	0.07	0.07	3.73	3.73	1.25	1.25	17.47	17.47	0.74	0.74
Adv. SD	1.20	1.20	0.14	0.14	0.41	0.41	4.99	4.99	4.68	4.68	0.94	0.94	0.44	0.44	9.84	9.84	2.90	2.90	24.30	24.30	1.63	1.63
Observations	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674
C. Log+1																						
Army	-0.08 (0.11)	-0.04 (0.06)	-0.00 (0.00)	-0.00 (0.01)	-0.01 (0.01)	-0.01 (0.02)	0.04 (0.13)	0.11* (0.06)	-0.05 (0.10)	0.01 (0.04)	-0.01 (0.04)	0.01 (0.03)	0.01 (0.01)	0.01 (0.02)	-0.18 (0.20)	-0.14*** (0.05)	-0.08 (0.06)	-0.05 (0.05)	0.11 (0.12)	0.09 (0.07)	-0.02 (0.05)	-0.03 (0.04)
Controls	×	✓	×	✓	×	✓	×	✓	×	✓	×	✓	×	✓	×	✓	×	✓	×	✓	×	✓
Adv. Mean	0.22	0.22	0.01	0.01	0.03	0.03	0.72	0.72	0.36	0.36	0.26	0.26	0.04	0.04	0.62	0.62	0.47	0.47	2.30	2.30	0.34	0.34
Adv. SD	1.08	1.08	0.09	0.09	0.20	0.20	0.86	0.86	0.71	0.71	0.45	0.45	0.21	0.21	1.10	1.10	0.71	0.71	1.14	1.14	0.57	0.57
Observations	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674	674

Panel A: Number of infrastructure per parish; B: Any infrastructure present in parish; C: Log+1 Number of infrastructure per parish. Data taken from 1846 Ordnance Survey of Ireland.

All specifications are estimated using OLS with county-level fixed effects using Equation (1). Even-indexed columns add LASSO-selected predetermined covariates. Standard errors clustered at the barony-level in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

E.3 The Great Famine

Perhaps the most salient posited consequence of the mass expropriation and redistribution of Catholic land is to be found two centuries later, during the Great Famine of 1845-9, which resulted in the death or emigration of 20-25% of the Irish population (Cousens, 1960; Mokyr, 1983). Historians have long emphasized the importance of the Great Famine, not just as one of the seminal events in Irish history, but which through migration had significant economic and political ramifications throughout Europe, Oceania, and North America (Hatton and Williamson, 1993; Ó Gráda, 2018; Ó Gráda and O'Rourke, 1997).

Conventional accounts of the Great Famine employed Malthusian assumptions to trace the origins of the devastation to the massive expansion of the Irish population prior to the mid 1800s (Grigg, 1980). More contemporary explanations reject this deterministic account, instead highlighting the overwhelming reliance on small-scale agriculture and dependence on the potato for both sustenance and fodder for livestock (Guinnane, 1994; O'Rourke, 1994). Since the early 1950s, beginning with Connell (1950), historians have argued it is impossible to account for the devastation of the Famine without considering the long-run consequences of mass redistribution of land from Catholic to Protestant elites in the 17th century (Braa, 1997). Mokyr (1983, 212), for example, concludes his seminal work on the causes of the Famine by arguing that:

When we ask the question what, in the final analysis, was the real cause, the true “external factor” in the dismal history of pre-famine agriculture, [...] Ultimately, there is history to blame: the creation of the landlord class from British and Scottish adventurers and mercenaries, a class of parvenus and foreigners.

This connection is not empirically tested by Mokyr—and, as suggested by more recent work, appears not to have been since. Solar (2015), for example, notes that “It is very much a residual explanation, the strength of which resides in the previous dismissal of other explanations” (74).

Directly evaluating local-level variation in exposure to the Great Famine of 1845-9 constitutes a difficult measurement problem because of the absence of granular agricultural productivity data and because changes in population levels between 1841 and 1851, as most commonly used in the literature in its place, naturally conflate the mortality effects of the Famine with its equally large effects on emigration (Guinnane, 1994; Hatton and Williamson, 1993; Mokyr, 1983). Further, some have argued that any local-level variation was essentially inconsequential compared to the national-level institutional causes of the Famine, with local-level exposure essentially random (Henn and Huff, 2021; Kelly and Ó Gráda, 2015). Compounding the issue, we find that the barony-level presence of the blight, using data from Goodspeed (2016), is balanced in our sample, consistent with its ability to easily spread between small geographical areas.

Recognizing these challenges, we draw on digitized parish-level census returns from the 1841 and 1851 censuses.²³ We consider outcomes relating to demography, economic conditions, and occupational sectors both before (1841), after (1851), and the change between the two as a proxy for the impact of the Famine.

²³Data from these censuses, though often at more aggregated levels, has frequently been used to measure the impact of the Famine (Henn and Huff, 2021; Fernihough and Ó Gráda, 2022; Mokyr, 1983). We are grateful to Alan Fernihough and Cormac O'Grada for sharing their data with us (Fernihough and Ó Gráda, 2023).

Table A15: Effects on economic outcomes in 1841 and 1851

	I. Rurality						II. Housing quality						III. Sectoral employment					
	Population density		Share living in towns		Average HH size		1st/2nd class		3rd class		4th class		Agriculture		Manufacture		Other	
A. 1841	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Army	0.02 (0.05)	0.02 (0.03)	0.01 (0.01)	0.00 (0.01)	0.08* (0.05)	0.07** (0.03)	-0.00 (0.01)	-0.00 (0.01)	-0.02* (0.01)	-0.02** (0.01)	0.02 (0.01)	0.02* (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.00)	-0.01 (0.01)	-0.01* (0.00)
Controls	×		×		×		×		×		×		×		×		×	
Adv. Mean	-1.00	-1.00	0.90	0.90	5.79	5.79	0.21	0.21	0.46	0.46	0.32	0.32	0.73	0.73	0.18	0.18	0.09	0.09
Adv. SD	0.49	0.49	0.14	0.14	0.49	0.49	0.10	0.10	0.12	0.12	0.13	0.13	0.13	0.13	0.11	0.11	0.05	0.05
Observations	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794
B. 1851																		
Army	0.00 (0.05)	0.01 (0.03)	0.01 (0.01)	0.01 (0.01)	0.03 (0.04)	0.03 (0.03)	-0.00 (0.01)	0.00 (0.01)	-0.02** (0.01)	-0.02*** (0.01)	0.02** (0.01)	0.01** (0.01)	-0.01 (0.01)	-0.01* (0.01)	0.01 (0.01)	0.01* (0.01)	0.00 (0.01)	0.00 (0.00)
Controls	×		×		×		×		×		×		×		×		×	
Adv. Mean	-1.31	-1.31	0.89	0.89	5.40	5.40	0.31	0.31	0.54	0.54	0.16	0.16	0.64	0.64	0.17	0.17	0.19	0.19
Adv. SD	0.50	0.50	0.15	0.15	0.49	0.49	0.12	0.12	0.08	0.08	0.10	0.10	0.11	0.11	0.10	0.10	0.06	0.06
Observations	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794
C. Change 1841-51																		
Army	-0.01 (0.01)	-0.01 (0.01)	-0.00 (0.01)	-0.00 (0.01)	-0.00 (0.00)	-0.00 (0.00)	0.04 (0.04)	0.04 (0.03)	0.05 (0.04)	0.05 (0.04)	0.01 (0.03)	0.01 (0.02)	-0.02** (0.01)	-0.02*** (0.01)	0.05 (0.04)	0.08** (0.04)	0.33 (0.20)	0.29 (0.19)
Controls	×		×		×		×		×		×		×		×		×	
Adv. Mean	-0.26	-0.26	-0.26	-0.26	-0.03	-0.03	0.53	0.53	0.23	0.23	-0.48	-0.48	-0.12	-0.12	0.06	0.06	1.68	1.68
Adv. SD	0.11	0.11	0.11	0.11	0.03	0.03	0.40	0.40	0.38	0.38	0.38	0.38	0.10	0.10	0.49	0.49	2.11	2.11
Observations	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794

Dependent variables: Panel I: Log population density; Share of parish population living in a town; Average household size; Panel II: Share of households in 1st or 2nd class housing; 3rd class housing; 4th class housing; Panel III: Share of households working in agriculture; Share of households working in manufacturing; Share of households working in other occupation. Panel A uses parish-level outcomes from the 1841 census; Panel B uses parish-level outcomes from the 1851 census; Panel C takes the difference between the values of a given outcome in 1851 and 1841.

All specifications are estimated using OLS with county-level fixed effects using Equation (1). Even-indexed columns add LASSO-selected predetermined covariates. Standard errors clustered at the barony-level in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

We find some evidence consistent with Army-assigned areas becoming marginally poorer over time, with only minimal differences in other demographic or economic characteristics. In Panel I of Table A15, we assess demographic measures relating to population density, rurality, and household size, finding limited evidence of differences in 1841 (Panel A), 1851 (Panel B), or changes between these years (Panel C), though household sizes appear slightly larger in Army-assigned areas. In Panel II, considering economic outcomes relating to the share of households living in good quality housing, low quality housing, or extremely low quality housing, we find evidence of a higher share of households living in extremely low quality (“4th class”) housing in Army-assigned baronies, with a corresponding reduction in the share living in low quality (“3rd class”) housing both before and after the Famine. 4th class housing indicated mud-built houses with a single room, while 3rd class houses were slightly better quality mud houses, or small thatched cottages, with multiple rooms and windows. In Panel III, considering occupational sectors, we find balanced proportions of households in agricultural versus manufacturing employment in 1841 (73% and 18% respectively). We find some evidence of shifts *away* from agriculture in the wake of the Famine in 1851 and towards manufacturing employment. Overall, the evidence is then consistent with marginally worsened local development outcomes in Army-assigned areas, no evidence of a more dominant local agriculture sector, and only weak evidence of differential exposure to the Great Famine.