

# The Deep Roots of Rebellion: Evidence from the Irish Revolution\*

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## Abstract

This paper studies how cultural norms shaped by negative historical shocks can explain conflicts in the long-run. Exploiting a unique dataset constructed from historical archives, we test whether the Irish Famine (1845-1850), one of the most lethal starvation in history, changed political attitudes and contributed to the Irish Revolution (1913-1921). First, we investigate the determinants of joining the rebellion movement on the basis of the 1911 Irish Census and the official lists of rebels. We find that rebels are more likely to be male, young, catholic and literate. Second, we explore whether the famine played a role in the probability of joining rebellion activities. Controlling for the level of economic development and other potential concurring factors, we provide evidence in support of the famine's inter-generational legacy of rebellion.

**JEL classification:** Z10, F51, N53, N44.

**Keywords:** conflict, cultural values, inter generational transmission, Great Famine, Irish revolution.

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# 1 Introduction

Conflicts are one of the tipping points in the history of humanity: they modify borders and change the institutional assets of countries and the life of generations of individuals.<sup>1</sup> Over the past decades, a large number of contributions in the political science and economics literature have investigated the origins of social unrest and conflict. Different significant factors are considered as potential drivers, such as economic conditions, inequality, political exclusion, ethnic and religious fractionalization, and natural resources.<sup>2</sup>

The aim of this paper is to study how cultural values modified by negative historical shocks can explain conflicts in the long-run. Our study is based on the link between two Irish events which have marked the history of Europe in the 19th and 20th centuries: the Great Irish Famine, one of the most lethal events in the history of humanity which affected Ireland during the period 1845-1850, and the revolution against the British rule (1913-1921), which led to the Anglo-Irish treaty and the constitution of the Irish Free State in 1921. Supported by historical insights, we hypothesize that the Great Famine shaped cultural norms which eventually fuelled the fire against the ruler of the country at the time, i.e. the British government.

We construct a unique data set which allows us to investigate the consequences of the famine in a long-run perspective. To do so, we proceed in several steps. First, we consider a large set of individual and household characteristics for the entire population, as derived from the 1911 Irish Census. The data set provides a formidable source of information at individual and household level shortly before the start of the Irish revolutionary era. Second, we make use of the list of rebels, as provided by the Irish Military Archives, and match it with the 1911 Irish Census. This allows us to investigate the *individual* characteristics of those who joined the movement of independence. To the best of our knowledge, this is the first study that can shed light on the determinants of the individual participation in a rebellion on the basis of census data and official lists of rebels. Next, we gather a

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<sup>1</sup>A relevant aspect of rebellions is their negative role on economic growth (Persson and Tabellini (2006)) and the potential conflict traps, characterized by long cycles of violence and economic downturns (Collier et al. (2003)).

<sup>2</sup>Among different contributions, Smith (1776) and Marx (1843) underline a relationship between the role of religious authorities and social unrest, while Acemoglu and Robinson (2006) consider as additional factor the importance of elites; using an instrumental variable approach, Blattman and Miguel (2010) and Miguel, Satyanath, and Sergenti (2004) show that economic downturns are strongly positively related to civil conflicts; Caselli, Morelli, and Rohner (2015) underline the role played by geographical resources, trust and the distance to other population; Ponticelli and Voth (2012) relate politically motivated violence to governmental austerity; finally, Chaney (2013) provides historical evidence relating the floods of the Nile to political unrest. Finally, Gleditsch (2009) studies how regional civil conflicts can spread in greater areas.

set of diverse measures of the severity of the famine at county level, on the basis of potato production and population movements. Finally, we collect detailed historical data on the Irish socio-economic and institutional set-up during the 19th century, which provide us with a very informative picture of Ireland before and after the Famine.

The structure of our dataset allows us to shed light on the relationship between the transmission of cultural values and conflict. Over the last few years, several economic studies have investigated the impact of cultural values on both social characteristics and economic performances of individuals and countries. We contribute to this growing literature, which analyses how historical shocks can shape cultural behavior and growth trajectories in a long-run perspective.<sup>3</sup> Exploiting both historical and contemporaneous case studies, several scholars provide different explanations on how some specific political values can be persistent over time. More precisely, research focuses attention on three particular mechanisms.<sup>4</sup> The first one is based on a framework used in innovation theory: similarly to improvement of products, the culture of rebellion can spread in a specific geographical area when people socially interact and exchange ideas (Glaeser, Sacerdote, and Scheinkman (1996)) and these effects can be persistent over a long time. For example, Guiso, Sapienza, and Zingales (2009 and 2016) show that trust and development of Italian cities depend on historical factors, such as previous conflicts. Similarly, Jha (2013) finds that interethnic medieval trade has still a legacy in trust in South Asian cities. Voigtlaender and Voth (2012) provide evidence for this theory by showing a causal local continuity between the anti-Semitism, provoked by the Black Death during the Middle Ages, to the arrival of the Nazi party in Germany about six centuries later. More recently, Fouka and Voth (2016) show that the tough debate between German and Greek politicians on the Euro area resuscitated historical memories. In particular, a strong reduction of sales of German cars is associated to the Greek areas affected by German reprisals during World War II. A second mechanism, which is supported by genetic studies (Cavalli-Sforza and Feldman (1981)), is related to the long-run inter-generational transmission of individuals' behavior. In order to test this mechanism, it is important to distinguish between the parental transmission of values from other influences generated by the

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<sup>3</sup>Weber (1930) was the first to analyse the connection between culture and growth, in his study on the impact of the protestant ethic on the societal development in the 17th century in Norther Europe. Nunn (2009) provides a review of the most relevant research papers on cultural transmission in economics.

<sup>4</sup>Other social sciences has studied cultural transmission. For example, in anthropology Assmann (2009) introduces four different types of "memories", i.e. individual, social, political, and cultural, which follow similar mechanisms if compared to the ones defined by economists.

environment surrounding the individuals.<sup>5</sup> In the case of conflicts, Bisin and Verdier (1998) provide evidence of the role of a paternalistic transmission of culture and inter-generational persistence of bad sentiments against the government. In addition, Grosjean (2014) associates the higher rates of homicide in the Southern States of the United States with the persistent culture of honor of the first Scots-Irish settlers during the 18th century. Finally, a third potential mechanism combines cultural transmissions with other social and economic factors: Tabellini (2008) underlines the importance of weak institutions in favoring conflict, while Doepke and Zilibotti (2015) highlight that parents select which cultural traits should be transmitted for providing a better situation in the economic environment.

Given different insights provided by several historians (e.g., Ó Grada (1999 and 2009)), famine episodes are ideal candidates for studying the above-mentioned mechanisms in the long run.<sup>6</sup> The Irish Famine, caused by the diffusion of a potato blight, was one of the biggest tragedies of modern history. Over the period 1845-1850, about 1 million died due to starvation and related diseases, while around 1 million emigrated, mainly to North America (Ó Grada (1989)). Relief was provided by Westminster in the form of public works, workhouses and eventually by Irish-run soup kitchens. However, the general consensus among historians and critics at the time was that “*relief [was] being too little, too slow, too conditional and cut off too soon*” (Ó Grada 2009). Although the demographic impact was immediate, the historical evidence suggests that politically-motivated rebellion smouldered under the surface for several years. We can identify two reasons for this delay. First, although the relationship between starvation and property crime is positive and clear, the impact of famines on other types of violence is not as clear-cut. According to Ó Grada (2009), during the years of the Irish Famine non-violent offences against property increased substantially, while other violent crimes, such as assassination or wounding, did not change. Similarly, during the Russian famine, the initial political rebellions (Sorokin, 1975) against political institutions were soon replaced by indifference and resignation, due to the long period of starvation and physical deterioration (Ó Grada (2009)).<sup>7</sup> Second, changes of law enforcement and institutional settings introduced by the British government together with the

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<sup>5</sup>Algan and Cahuc (2010) underline the importance of trust values inherited by parents of second generation immigrants on economic growth.

<sup>6</sup>Empirical evidence based on China’s Great Famine (1959-1961) and collected by Meng and Qian (2009) shows that the famine had also a physical impact on the health of the first descendants of survivors, i.e. in-utero and early childhood, affecting different characteristics such as weight, height, and both educational and labour outcomes.

<sup>7</sup>A similar example can be found in Acemoglu, Johnson, and Robinson (2001)’s example on colonies, where a negative historical shock is the one which shapes institutions in the long-run

outbreak of the Great War fuelled the spreading of rebellion in Ireland (Kenealy (2002)).

The casual link between the Irish Famine and revolutionary episodes against the British government has been highlighted by a few studies on the Irish identity in the United States. Among others, Foster (2015) analyses the role of transmission of values among generations during the Rebellion. While Miller (1993) identifies the Famine as the main ingredient of nationalism, Lee (2007) underlines that the intergenerational transmission of memory of the Great Hunger is used by the Irish-born emigrants with their American-born children as an explanation for "*why they found themselves where they were*". Whelehan (2012) also makes an explicit association between the two Irish events, writing that "*[i]ntergenerational transmission of Famine memories became a means of preserving visceral opposition and hostility toward British rule in Ireland and of efficiently mobilising the political and economic resources of the diaspora to advance the goal of an Irish republic*". Our empirical results provide evidence in support of the famine's inter-generational legacy of rebellion: we show a strong relationship between the extent of the famine and the probability of participating in rebellion activities two generations afterwards. Our results are robust even when controlling for the level of economic development and other potential concurring factors. In addition, robustness checks based on instrumental variable techniques also confirm our results.

We also contribute to the understanding of the individual determinants of joining a rebellion against political institutions. In the literature there are only few contributions exploiting micro level data (e.g., Krueger (2015 and 2007) and Humphreys and Weinstein (2008)): despite these remarkable examples of detailed datasets, investigating the characteristics of rebels is a challenging task. Rebels are a hidden population, which, by its very own feature, is difficult to identify in a systematic way. The wealth of historical data that has been recently made available allows the identification of insurgents' characteristics and shed light on the factors affecting the decision to rebel. We find that rebels are more likely to be male, young, catholic and coming from larger families. Unlike the findings by Humphreys and Weinstein (2008), we also provide evidence that individuals participating in rebellion activities are more likely to be literate.

The rest of the paper is structured as follows. Section 2 provides an overview of the two most important historical events which affected Ireland since the 19th century, i.e. the Great Famine and the Irish revolution. Section 3 describes the different sources and displays the structure of our dataset. Section 4 introduces the empirical strategies adopted. Section 5 shows the results from our different

econometric strategies. Finally, Section 6 concludes.

## 2 Historical Events shaping Ireland

### 2.1 The Great Irish Famine (1845-1850)

After the Columbian voyages, the introduction of the potato from the Americas had several social and economic consequences for the rest of the world. Given the nutritional properties of this tuberous staple and the possibility to obtain a large amount of caloric intake in a relatively small amount of land, the potato was easily spread all over Europe (Langer (1963) and McNeill (1999)). Economic studies have highlighted the causal role of the introduction of potato on growth: Mokyr (1981) finds a positive effect of the introduction of potato cultivations on population growth in Irish counties in 1845, Nunn and Qian (2011) extend this finding and estimate that about one-quarter of the Old World population and urbanization between the 18th and the 20th century occurred because of the potato. The potato played an important role for setting the living standard of the Irish population: introduced in the country in the 16th century (McNeill (1949)), over the centuries it became the main staple for the Irish population due to its nutritional content and the relative ease of cultivation in the Irish climate (Ó Grada (1993)). It is estimated that by the 1830s, one third of the Irish population depended on the potato (in particular, the lumpers variety) for 90% of their food intake (Feehanan (2012)).

The potato blight that led to the Great Irish Famine was caused by the *Phytophthora infestans*. It is suspected to have originated from Mexico (Goss et al. (2014)), and was transported to Europe via potatoes. It struck much of Europe and was observed in Belgium, France, Germany, and eventually England, Scotland and Ireland (Ó Grada (1989 and 1994) and Kenealy (2002)). The epidemic was most severe in Ireland, particularly due to the widespread planting of potato and favourable weather conditions.<sup>8</sup> The pathogen spreads through spores released by an infected plant. Indeed, the blight can be highly contagious, with estimates of 300,000 spores per day being produced by each lesion on a potato leaf (Agrios (2005)). Initial infection of strains of blight results from infected tubers being planted. Infected potato tubers will produce zoospores, which can move through the potato

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<sup>8</sup>The particular strain of blight that hit Ireland is known as HERB-1, is currently extinct, and is more closely related to old strains of blight than modern ones (Yoshida (2013) et al., 2013).

plant transmitting *Phytophthora infestans* to their foliage (Johnson (2010)). Once they are present on foliage they can then be transmitted by water or air. Spores can spread by water either by being washed into the soil of nearby potato plants due to rain, or alternatively by being splashed onto adjacent plants, again due to rain (Agrios (2005)). Infection can also spread from tuber to tuber in the presence of moist soil, both from one tuber to another within the same plant and from one plant's tuber to another plant's tuber (Olanya et al. (2009)). As to travelling by air, changes in humidity and temperature help spores detach from potato plant leaves (Xiang and Judelson (2014)), and spores can remain infectious providing they are not exposed to solar radiation (Mizubuti, Aylor, and Fry (2000)). Realistically for blight to spread significant distances it needs to do so by air. Once soils have spores present within them they can remain infective to potato tubers for between 15 to 77 days (Andrivon (1995)).

Failures of potato crops were not uncommon in Ireland in the pre-Famine period. However, none of the previous episodes had reached a similar scale and for such a prolonged period of time.<sup>9</sup> The blight broke out in Ireland in 1845, when about one third of the potato crop was destroyed by the *Phytophthora* (Ó Grada (2006)). Excess mortality was rather contained in that year, even in the counties which were subsequently more affected by the famine (Ó Gráda (1994)).<sup>10</sup> The following year was characterised by an almost complete failure of the potato crop, due to an unusually damp summer. In 1847 the extent of the blight was minimal, but due to the limited availability of seed potatoes from the previous year, the total yields were low, while yields per acre stood high. It was the high yield per acre of 1847 that led the poor and farmers to further plant potatoes in 1848. However, once again, the *Phytophthora* hit badly and the crop failed almost completely. The blight appeared again, but to a lesser extent, in 1849 and, in some areas, in 1850 as well (Goodspeed (2016)). The excess mortality was particularly high over the winter and spring of 1846-47 (Ó Grada (2006)), once even the livestock holdings, used as buffer stock, had been exhausted. Excess mortality persisted until 1851. The famine claimed one million deaths over the period 1845 and 1851, while one million people emigrated, mainly to North America, out of a population of 8.5 million people (Ó Grada (1989 and 1994)). Given the spread of the potato, as the main, if not the only, staple, the famine hit primarily the poor and farmers. It is estimated that the daily intake of potatoes for most of the year

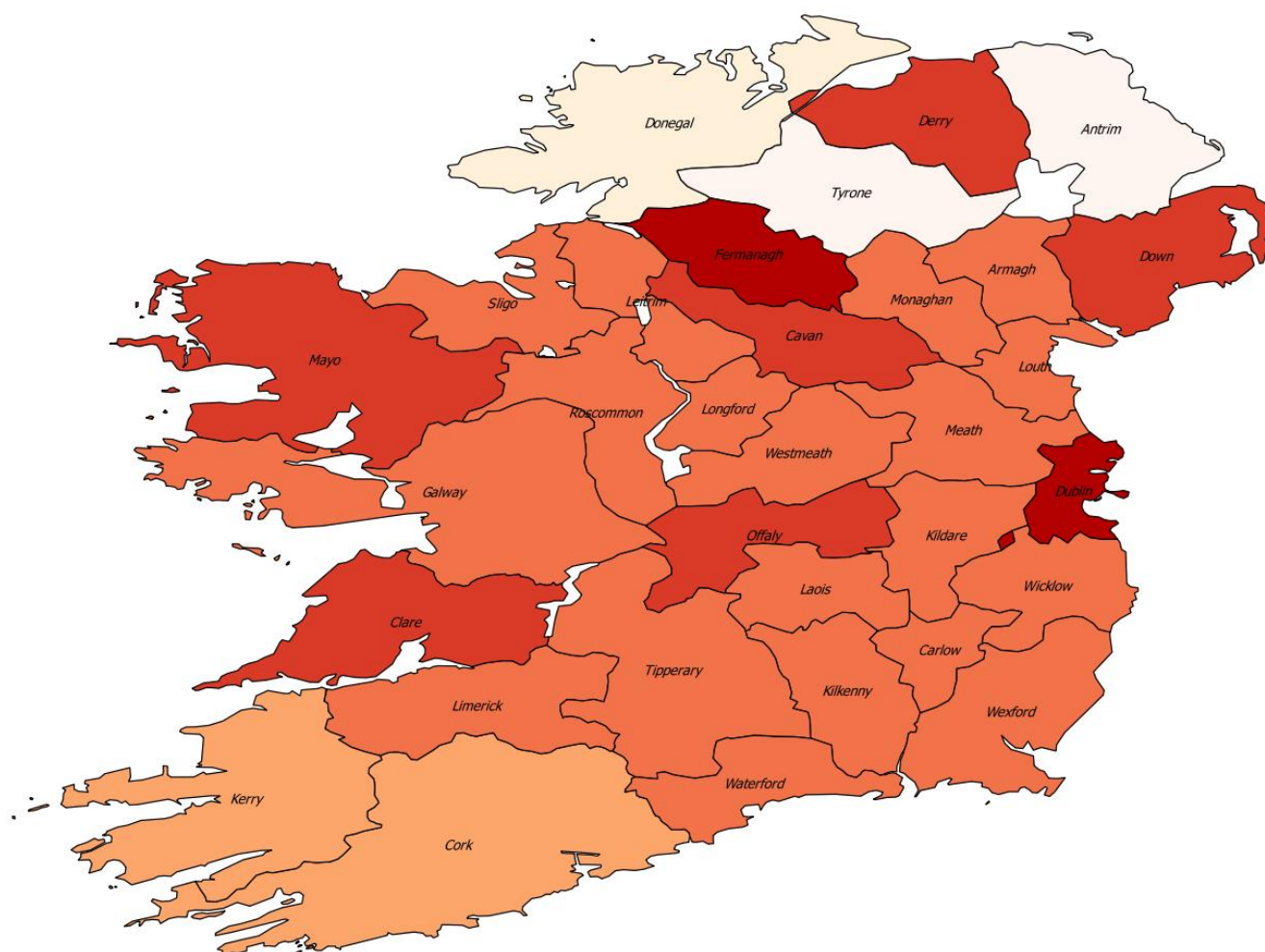
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<sup>9</sup>Feehanan (2012) reports that about thirty famines of diverse intensity had occurred over the century prior to the Great Famine.

<sup>10</sup>Clare, Cork, Kerry and Leitrim.

was about two kilos per person in the early 1840s. Although it was the main staple for the poor, potato consumption was high also among the higher social classes (Bourke (1968); Ó Grada (1989)). Mortality rates were higher for individuals above the age of 40 and for the very young (Ó Grada (1989)). There is some evidence that mortality was higher for men than for women, although the difference was likely to be minimal (Ó Grada (1994)). Figure 3 presents the extent of the potato crop failure across the thirty-two counties.<sup>11</sup> The south-west part of Ireland was less affected than the east, while there is evidence that Northern Ireland was not spared from extensive potato crop failures.

Figure 1: Extent of the Famine at county level represented according to a scale ramp. Darker shades represents more intense effect.



Source: Authors' calculations using data provided by Bourke (1959).

Rather than literal starvation, most of the deaths were due to fever or typhoid induced by the hunger, as in other cases of famines, such as in Finland in 1868. According to Kenealy (2002), the

<sup>11</sup>The extent of the potato crop failure is measured as the percentage change in the potato production between 1846 and 1845 using data from Bourke (1959).



period between 1845-1850 was characterised by riots and protests, while thefts escalated. Agitations had characterized the pre-famine period too, although the pre-1845 food riots were more local in nature and mainly related to food price increases or unfair market practices. During the Famine, food riots and disorders broke out just after harvest in 1845 and 1846, in particular in the South-West of Ireland. Later agitations were more directed to lower food prices and increase public works wages. The British response to the riots was severe, while the British press covered the episodes as an example of ingratitude of the Irish poor. As the Famine loomed on, the agitations became less and less collective movements and more individual actions against property. Towards the end of the famine, agitations ceased as prolonged undernutrition, disease and resignation emerged (Kenealy (2002)). According to Ó Grada (2009), historians and critics at the time reported that “*relief [was] being too little, too slow, too conditional and cut off too soon*”. Starting from 1847, famine relief was provided by the Poor Relief (Ireland) Act of 1838, which had established workhouses for the poor. In 1847 the highest level of admissions was reached, but more in terms of capacity than in terms of numbers seeking help (Ó Grada (1999)). Mortality rates in the workhouses were also particularly high, due not to deprivation, but to fever and other diseases such as typhus. Numbers of people in workhouses grew dramatically, while the number of individuals working in public works went from 27,000 in September 1846 to 700,000 in March 1847 (O’Grada 1994, 1999). Apart from the energy consumption from already debilitated individuals, the wage offered for public works was low in real terms, given that the potato, the cheapest staple before the famine, was no longer available. In 1847, the public works were considered a failure and replaced by the soup kitchens, according to the Poor Law Amendment Act of 1847. In the summer 1847, 3 million people were in receipt of food rations. With the introduction of the soup kitchens, the Irish were left by themselves. In the words of the Irish MP William Smith O’Brien in 1847 “*if there were a rebellion in Ireland tomorrow, they would cheerfully vote 10 or 20 millions to put it down, but what they would do to destroy life, they would not do to save it*” (Grossman (2013)).

## **2.2 The Irish Revolution (1913-1921)**

On Easter Monday April 24th 1916, about 150 armed men gathered in front of the General Post Office in Dublin and took it over. One of the leaders of what will be then known as the Easter Rising,

stepped out from the General Post Office and read the proclamation of the Irish Republic. More rebels positioned around the city. The fighting between the rebels and the British troops lasted for five days and ended with the insurgents' surrendering. The leaders of the Easter Rising were arrested and executed. The Easter Rising was the first act of what later became the war of independence against the British rule. Three main rebel groups had emerged ahead of the Easter Rising. The Irish Citizen Army, which had been set up to defend workers on strike in 1914 against the police baton; the Irish Volunteers, which had emerged as a response to the constitution of the Ulster Volunteer Force in 1913; the Irish Republican Brotherhood, a secret conspiracy seeking independence from the British.

The Irish and British histories have been intertwined over the centuries. In 1916, year of the Easter Rising, Ireland was part of the United Kingdom of Great Britain and Ireland, which had been established with the Act of Union in 1801. On three occasions the Irish Members of Parliament had tried to achieve independence via legal ways in Westminster, in order to guarantee Home Rule for Ireland, *i.e.* the set-up of a Parliament in Dublin. The first two Home Rule Bills were defeated in Westminster, while the third Home Rule Bill eventually passed in 1914, just before World War I broke out. World War I plays indeed a crucial role in Irish history and the rebellion that eventually led to the creation of the Republic of Ireland. The actual implementation of the Third Home Rule Bill was stalled by the war, with the agreement it would be implemented once the war was over. Following the Battle of the Somme and the enormous number of lost lives of British soldiers, a proposal to extend conscription to Ireland was put forward by Westminster.<sup>12</sup> An anti-conscription movement emerged in Ireland, mainly led by the political party *Sinn Fein*, while the recruitment into the organization of the Irish Volunteers soared. The Irish conscription was eventually abandoned with the entry of the United States into World War I. However, the parliamentary election that followed the end of World War I saw the strong victory of the *Sinn Fein* in Ireland. The elected *Sinn Fein* MPs refused to take their seats in Westminster and set up the *Dail Eireann* (Irish Parliament), a shadow Irish government and started issuing Republic bonds.

The rebellion against the British escalated in 1919, with the Irish rebels, now under the Irish Republican Army name, conducting ambushes and attacks to British Barracks all over the country (Killeen (2007)). It was a local type of rebellion, based on guerrilla tactics. As of 1920, 675 British barracks had been attacked in just over a year. The rebellion continued until 1921, when the Anglo-Irish

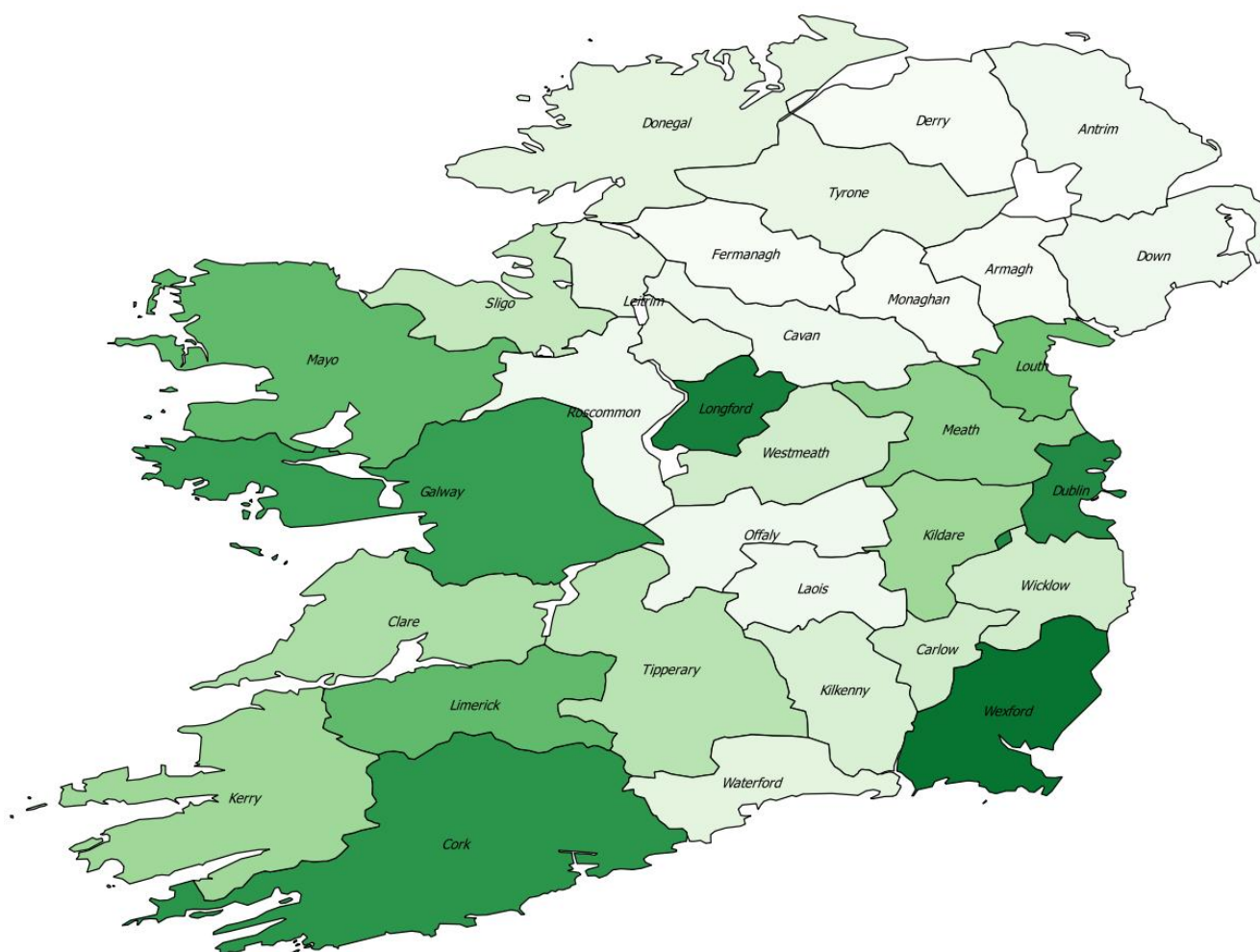
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<sup>12</sup>About 20,000 British soldiers lost their lives on the first day of the Battle of the Somme (July 1st 1916).

Treaty, the truce that split the Irish counties between Northern Ireland and the Irish Free State, was signed.

Figure 2 visually presents the county of birth of the Irish rebels. Although the majority of rebels were born in Dublin county, many of them originated from the western (Galway, Mayo) and southern counties (Cork, Wexford).

Figure 2: Geographical dispersion of Irish Rebels (in absolute numbers) according to a scale ramp. Darker shades represents a higher number of rebels.



Source: Authors' calculations using data described in Section 3.

### 3 Data

Our first data source is the 1911 Irish Census, which has been recently digitized by the Irish National Archives. The Census provides extraordinary information, at individual and household level, of the Irish society at the turn of the 20th century. For each household member, the Census records the

name, gender, age, county of birth, relation to the household head, religion, literacy, knowledge of Irish, occupation and type of disability (if any).<sup>13</sup> Furthermore, the Census contains very precise information on the location and the quality of dwellings. Overall, the 1911 Census consists of 4,384,519 observations, across the thirty-two Irish counties.

The second source of data is the Irish Military Archives. In 1923, the Irish Parliament (*Oireachtas of Saorstát Éireann*) passed a legislation which granted a pension to all veterans or widows and children of deceased veterans who had participated in the Easter Rising and the War of Independence. Moreover, veterans involved in military activities during the Easter Rising were awarded a medal (the 1916 Medal).<sup>14</sup> We identify the rebels on the basis of the list of pension and medal recipients, which has been recently digitized and made available by the Military Archives. In addition, we countercheck the veterans' names with secondary sources of information about Irish rebels ( Foster (2015) and Connell (2015)). For each veteran, the list provides information about the date of birth and the place of residence at the time of the pension or medal application.<sup>15</sup> In order to obtain more information about the demographic background of rebels, we match the list of veterans with the 1911 Irish Census. This is hardly an easy task, given the frequency of some Irish surnames. Matching relies on three principles: complete name (first and last name), age and place of residence in 1911. Given the evidence on age rounding on census forms, we allow a two-year margin around the age reported in the Census. We match 709 rebels, thus achieving a matching rate of about 17%. Matching the veterans' list with the 1911 Census allows us to investigate the determinants of the decision to participate in the rebellion.

Next, we collect information on the extent of the famine and construct two measures of the famine. First, we measure the famine in terms of the potato crop failure, i.e. the percentage change in potato production between 1845 and 1846. Second, we consider the percentage change in potato production between 1844 and 1846. Information on potato production and potato cultivation at county level relies on the statistical work by Bourke (1959).

The geographical coordinates of cities and the borders of Irish counties and related geographical information during the 19th and 20th centuries are extracted from several geographical information

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<sup>13</sup><http://www.census.nationalarchives.ie/>

<sup>14</sup>The Irish Department of Defence has looked after the examination and granting of medal claims by dependants since 1943.

<sup>15</sup>In a few cases, the veterans report more than one address of residence.

system (GIS, henceforth) files obtained by the EURATLAS dataset (Nuessli (2011)). We also consider some proxies for measuring the agricultural amenities of the different counties. For doing so, we exploit the data contained in the 2002 Food and Agriculture Organization (FAO, henceforth) database on Global Agro-Ecological Zones.<sup>16</sup> This database summarizes the potential of cultivation of crops all over the world collecting information on both climatic and land characteristics of cell measured 0.5 degrees by 0.5 degrees, which is about 56 km by 56 km. The higher is the value of this index the higher is the production potentially provided by the crop. Using GIS map and exploiting the political borders, we construct two measures taking the average of potential land provided by the FAO database.<sup>17</sup> The first one considers the potential of cereal production of cereal, the second one the potato production.

Furthermore, we consider seasonal data on temperatures and precipitations according to Luterbacher et al.(2004) and Pauling et al.(2004) and adjusted by the Climate Research Unit of the University of the East Anglia.<sup>18</sup> More precisely, we consider spring and summer for the years 1844, 1845, and 1846. Being these data available with a gridded structure on a 0.5 resolution, we construct our data set in the following way: first, we consider the point in the middle of each grid; second, we interpolate the values for each season using the GIS surface inverse distance weighting tools; finally, always using the GIS tools, we compute the average temperature per county.

Finally, we collect information on violences and rebellion during the previous two centuries from several historical sources: data on the 1798 rebellion are taken from Cantwell (2011). In addition, we have information on violence episodes during the years 1879-1892 (Land War) on the basis of the work of Fitzpatrick (1978).

## 4 Econometric specifications

We investigate the determinants of taking part in the rebellion and the role of the famine on the probability of becoming a rebel. We follow the approach by Krueger (2015) and we estimate the

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<sup>16</sup><http://www.fao.org/nr/gaez/about-data-portal/en/>

<sup>17</sup>For a more detailed description of the FAO dataset and its potential use in economic studies, see Nunn and Qian (2011).

<sup>18</sup><https://crudata.uea.ac.uk/cru/projects/soap/data/recon/>

following equation:

$$Rebel_{ijd} = \alpha + \beta Famine_j + \gamma \mathbf{X}_i + \vartheta \mathbf{C}_j + \delta \mathbf{Z}_d + \epsilon_{ijd} \quad (1)$$

The dependent variable,  $Rebel_{ijd}$  is an indicator variable which takes the value 1 if individual  $i$ , born in county  $j$ , living in district electoral division  $d$ , takes part to rebellion activities and 0 otherwise. We control for a set of individual characteristics,  $\mathbf{X}_i$ , such as age, gender, literacy, occupational dummies, being catholic, marital status, whether the individual speaks Gaelic, and household size.<sup>19</sup> The variable  $Famine_j$  measures the extent of the famine in the county of origin of  $j$ . The main measure of the extent of the famine is the percentage growth rate of the potato production between 1845 and 1846. We use another alternative measure of the famine: the change in potato production between 1844 and 1846, although the data on the potato production in 1844 are not available for all the counties. The famine also led to higher emigration from the counties mostly affected. Therefore, we include in our analysis the emigration rate at the county of origin between 1851 and 1852, as measured by the Irish Emigration Database. We also control for a set of variables at county of origin level,  $\mathbf{C}_j$ , i.e. the extent of past rebellions at county level. We include a set of characteristics of the residence as of 1911 at district electoral district level, i.e. the share of males, the share of Catholics, the share of individuals aged between 25 and 40 years old and the share of individuals who can read and write. Standard errors are clustered at the county of origin level. As a first step, we estimate equation 1 as a logit model. Given the large number of observations in our dataset, taking part in rebellion activities can be considered as a statistically rare event. Therefore, as a second step, we adopt the rare events logistic estimation method, as introduced by King, Tomz, and Zeng (2003).

Table 1 presents the first set of our summary statistics. About 0.02% of the individuals in the sample are identified as rebels. The average age of individuals in the sample is 40. Just above 50% of the sample is women. About 89% of individuals can read and/or write, while about 16% can speak Gaelic. The majority of the sample is catholic (76%) and just above 40% is married in 1911. The number of adults per household is about 4. The Census also provides information about professional occupations of respondents. We consider six occupational dummies: professional, clerical, sales, service, agriculture and production. The majority of the sample is involved in agriculture (27%), followed by production (17%), services (5%) and sales (3%). In terms of geographical distribution,

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<sup>19</sup>For the purpose of the exercise we consider individuals above the age of 16 in the 1911 Census.

the majority (34%) is based in the Northern province (Ulster), followed by Leinster (27%), the eastern province, which includes Dublin. About 24% of the sample is resident in the south of the island (Munster) and the remaining 15% is the western province, Connacht. Overall, about 10% of the sample is resident in Dublin.

Table 1: Descriptive Statistics: First Part

	Mean	Median	SD	Min	Max	Obs.
<b>Individual characteristics</b>						
<i>Demographics</i>						
<i>Rebel (%)</i>	0.02	0.00	0.02	0.00	1.00	2,657,558
<i>Age</i>	40.00	37.00	17.84	16.00	82.00	2,657,558
<i>Female (%)</i>	50.74	1.00	-	0.00	1.00	2,657,558
<i>Literate (%)</i>	89.02	1.00	-	0.00	1.00	2,657,558
<i>Catholic (%)</i>	74.95	1.00	-	0.00	1.00	2,657,558
<i>Married (%)</i>	41.06	0.00	-	0.00	1.00	2,657,558
<i>Gaelic (%)</i>	16.25	0.00	-	0.00	1.00	2,657,558
<i>Household Size</i>	3.96	4.00	1.80	1.00	11.00	2,657,558
<i>Occupations</i>						
<i>Professional (%)</i>	3.80	0.00	-	0.00	1.00	2,657,558
<i>Clerical (%)</i>	1.66	0.00	-	0.00	1.00	2,657,558
<i>Sales (%)</i>	2.77	0.00	-	0.00	1.00	2,657,558
<i>Service (%)</i>	5.43	0.00	-	0.00	1.00	2,657,558
<i>Agriculture (%)</i>	27.76	0.00	-	0.00	1.00	2,657,558
<i>Production (%)</i>	16.50	0.00	-	0.00	1.00	2,657,558
<i>Location</i>						
<i>Dublin (%)</i>	9.91	0.00	-	0.00	1.00	2,657,558
<i>Leinster (%)</i>	26.01	0.00	-	0.00	1.00	2,657,558
<i>Munster (%)</i>	23.55	0.00	-	0.00	1.00	2,657,558
<i>Connacht (%)</i>	14.18	0.00	-	0.00	1.00	2,657,558
<i>Ulster (%)</i>	36.25	0.00	-	0.00	1.00	2,657,558

Table 2 presents the summary statistics of the variables at county and district electoral division level. In addition, we add the statistics related to temperature (measured in Celsius degrees), precipitations and geographical coordinates which are going to be used in the section related to the instrumental variable technique.

We control for a set of variables at county of origin level, namely the number of offences at county level linked to the local agitations which took place in 1881. For each county, we measure the number of outrages against property and the number of violent outrages as measured by Fitzpatrick (1978). We also include a variable capturing the extent of the 1798 (another prominent rebellion in the

Table 2: Descriptive Statistics: Second Part

	Mean	Median	SD	Min	Max	Obs.
<b>DED</b>						
<i>Share of men</i>	0.52	0.52	0.03	0.28	0.85	3,655
<i>Share of Catholics</i>	0.82	0.93	0.24	0.00	1.00	3,655
<i>Share of 25 – 40</i>	0.32	0.33	0.04	0.18	0.53	3,655
<i>Share of literates</i>	0.87	0.89	0.07	0.17	1.00	3,655
<b>County</b>						
<i>Famine (1846 – 1845)</i>	32.51	27.18	28.34	-33.64	112.34	32
<i>Famine (1846 – 1844)</i>	29.13	24.92	24.78	-15.42	87.39	27
<i>Violence 1881</i>	15.54	0.13	1.34	0.12	6.00	31
<i>Property 1881</i>	2.28	1.60	0.20	0.31	8.18	30
<i>Rebellion 1798</i>	216.00	54.00	453.02	1.00	2208.00	28
<i>FAO cereal</i>	3.07	3.41	19.05	-0.59	6.49	32
<i>FAO potato</i>	4.36	4.62	0.73	2.54	5.65	32
<i>Share literacy COB</i>	0.88	0.90	0.07	0.53	0.98	32
<i>Climate and Geographical Data</i>						
<i>Temperature Spring 1844</i>	5.45	5.47	0.27	4.85	6.00	32
<i>Temperature Spring 1845</i>	4.71	4.69	0.22	4.24	5.21	32
<i>Temperature Spring 1846</i>	5.46	5.49	0.26	4.88	6.00	32
<i>Temperature Summer 1844</i>	9.26	9.28	0.44	8.36	10.06	32
<i>Temperature Summer 1845</i>	9.34	9.39	0.45	8.37	10.13	32
<i>Temperature Summer 1846</i>	10.58	10.62	0.55	9.37	11.50	32
<i>Precipitation Spring 1844</i>	103.67	98.85	11.71	90.28	127.87	32
<i>Precipitation Spring 1845</i>	117.47	115.82	7.13	107.64	113.18	32
<i>Precipitation Spring 1846</i>	167.36	167.43	8.81	150.91	188.18	32
<i>Precipitation Summer 1844</i>	181.01	177.95	17.74	155.07	212.18	32
<i>Precipitation Summer 1845</i>	182.31	180.10	15.94	156.97	213.99	32
<i>Precipitation Summer 1846</i>	173.83	171.17	14.47	146.92	201.20	32
<i>Longitude</i>	5.50	7.48	10.87	9.7	53.65	32
<i>Latitude</i>	51.59	53.38	10.67	6.69	54.99	32

Anglo-Irish history) at county of origin level.

## 5 Estimation Results

The results from our specification related to the individual determinants of participating in rebellion activities are reported in Column 1 of Table 3.<sup>20</sup> In line with the findings by Humphreys and Weinstein (2008), younger and male individuals are more likely to become insurgents. Given the religious

<sup>20</sup>Note that Table 3 presents the results of the rare events logistic estimation method. The estimation results from the logit estimation method are reported in Table A1 in the Appendix and are in line with the findings in Table 3. Note that Table 3 does not report the marginal effects. Hence only the sign and the significance of the estimated coefficients will be discussed in this section



fractionalization, it is not surprising to find that Catholics are more likely to be part of the rebellion. Similarly, we find that speaking Gaelic is positively related with the probability of being a rebel. Individuals belonging to larger families are also more likely to be part of the revolt. We find a positive and statistical significant relation between being married and being an insurgent, although this coefficient becomes statistically insignificant in the more stringent specifications. Column 2 adds information about occupations: professionals are less likely to participate in the rebellion, thus highlighting a potential higher opportunity cost for them to be part of the insurgence. Individuals working in agriculture are less likely to be rebels, although this variable could be capturing location of the respondent rather than just the actual occupation. Finally, production workers are more likely to be part of the rebellion. So far we have investigated the basic demographic characteristics of rebels. The next column (column 3) introduces our variable measuring the extent of the famine, whereby higher values indicate a higher incidence of the famine. We consider the county of birth of each individual in the census and match it with our measure of the famine, as a way of measuring the cultural transmission factor of the great hunger. The estimated coefficient of the famine is positive and statistically significant. Being born in an area where the famine had been more intense increases the probability of becoming a rebel. Of course many other concurring factors might explain the strong relation between the famine and rebellion activities. We tackle these potential alternative aspects in the next columns of Table 3 and in the following table. Many authors have investigated the impact of the famine on the Irish emigration, in particular to the United States. Therefore, in column 4 we control for the extent of out-migration and include the emigration ratio, measured as the change in population between 1852 and 1851 over population in 1841. The estimated coefficient is not statistically significant, but it has a positive sign. Emigration was indeed a coping mechanism at the time of the famine. As discussed in the introduction, Lee (2007) highlights the intergenerational transmission of memory of the famine by the Irish-born emigrants in the North America. Similarly, we could hypothesize that individuals born in counties which experienced higher emigration due to the famine are then more likely to participate in rebellion activities. Column 5 explores the potential peer effects that might influence the decision to participate in the rebellion. We include a set of variables at district electoral division level of residence according to the 1911 Census, i.e. the share of men in the district, the share of Catholics, the share of individuals aged 25-40 and the share of individuals who are literate. The introduction of this set of controls does not affect the overall significance of the

main independent variable, i.e. the effect of the famine. As expected, individuals living in districts at higher prevalence of Catholics are more likely to join the rebellion. Similarly, we observe a peer effect of the age distribution at district level, as the higher the share of individuals of younger age, the higher the probability of becoming an insurgent. Finally, the last column of Table 4 includes province of residence dummies and an indicator variable capturing whether an individual is resident in Dublin in 1911. We find that individuals living in Connacht (the western province) and in Leinster (the eastern province) are more likely to be part of the rebellion. Given the high migration movements within Ireland, these variables should be interpreted more in terms of correlation rather than in terms of causal effect. For example, it could be possible that internal migration might be influenced by the decision to join the rebellion.

So far we have focused on the role played by the famine in determining the probability of joining the movement of independence. The question then is: did the famine have a direct effect on rebellion or can we identify other potential alternative mechanisms? What is the role of economic development? Could previous acts of rebellion, rather than the famine, explain the probability of participating in the movement of independence in the 20th century? Were the counties most affected by the famine poorer due to low soil quality, which is potentially linked to the extent of potato cultivation and to the extent of the famine? We tackle these issues in Table 4. Column 1 in Table 4 presents the results of a specification that includes the entire set of controls (as in column 6, Table 3) and it adds the role of soil quality at county level. We include the two FAO measures, which capture the potential of cultivation of crops on the basis of climatic and land characteristics. We focus on two crops in particular: cereals, which Ireland exported to Great Britain, and potato. A higher index indicates a higher potential crop production. Including these two measures does not affect the overall statistical significance of the famine on the probability of joining the rebellion. The estimated coefficient of the FAO index related to cereals is negative and statistically significant, hence indicating that individuals born in areas more ideal for cereal cultivation (and potentially wealthier due to cereal exports) are less likely to be insurgents. The next column investigated the role of previous acts of rebellion. Is the famine variable capturing previous revolution movements? We focus on three variables, which capture two main agitations against British rule which characterised Ireland in the 18th and 19th century. Violence 1881 and Property 1881 refer to the Land War, an agitation calling for redistribution of land from landlords to tenants. We construct two measures: the first one captures the number of acts of

violence in relation to the Land War (*Violence* 1881); the second one denotes the number of acts against property registered (*Property* 1881).<sup>21</sup>

We also include a variable capturing the extent of the revolution of 1798. Although we do observe a relationship between the probability of becoming a rebel and previous insurgence activity in the county of birth, the sign and statistical significance of the famine measure is unchanged. The famine had also a substantial economic impact, as shown by O' Rourke (1991 and 1994). Therefore, counties more affected by the potato blight were more likely to be impoverished as a result of the famine. The relation that we find between the probability of becoming a rebel and the extent of the famine in the county of origin could then be driven by economic development rather than the famine itself. In order to take into account of this possibility, column 4 of Table 4 presents a specification in which we control for the share of people who can read and write in the county of birth of the respondent. This variable would then act as a proxy for the general economic development of the county of birth. The estimated coefficient of the famine variable is still positive and statistically significant at the 1% level, while the literacy rate (*Share literacy COB*) is negative and statistically significant, i.e. showing that individuals born in counties with a lower literacy rate are more likely to join the rebellion. Finally, the last column of Table 4 provides a more stringent specification in which both the economic development proxy (literacy rate in the county of birth) and the variables measuring soil quality are included. The effect of the famine in shaping the rebellion decision is robust to this specification as well, as the estimated coefficient remains positive and statistically significant at the 1% level. We can conclude that even when controlling for the level of economic development and other potential concurring factors, there is evidence in support of the famine's inter-generational legacy of rebellion.<sup>22</sup>

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<sup>21</sup>These variables are available for a smaller number of counties, as outlined in the data description section.

<sup>22</sup>In the Appendix we report relogit regressions considering the change in potato production between 1844 and 1846, obtaining similar results.

Table 3: Relogit Estimates (First Part)

<i>Dependent variable: Rebel</i>						
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Famine</i>						
<i>Famine</i>			1.949*** (0.371)	2.134*** (0.575)	1.664*** (0.550)	1.172*** (0.307)
<i>Emigration Population</i>				0.030 (0.061)	0.005 (0.061)	0.143*** (0.049)
<i>Individual Characteristics</i>						
<i>Age</i>	-0.062*** (0.004)	-0.058*** (0.004)	-0.053*** (0.005)	-0.053*** (0.005)	-0.053*** (0.006)	-0.054*** (0.006)
<i>Female</i>	-2.391*** (0.230)	-2.602*** (0.249)	-2.519*** (0.193)	-2.518*** (0.194)	-2.450*** (0.199)	-2.409*** (0.221)
<i>Literacy</i>	0.499*** (0.162)	0.459*** (0.157)	0.442*** (0.144)	0.436*** (0.147)	0.412** (0.163)	0.413** (0.181)
<i>Catholic</i>	2.821*** (0.483)	2.961*** (0.515)	2.611*** (0.489)	2.544*** (0.459)	2.013*** (0.298)	1.754*** (0.237)
<i>Married</i>	0.351*** (0.097)	0.180** (0.087)	0.083 (0.119)	0.085 (0.120)	0.025 (0.113)	0.014 (0.103)
<i>Gaelic</i>	0.634* (0.328)	0.851*** (0.294)	1.031*** (0.303)	0.995*** (0.264)	1.143*** (0.274)	1.041*** (0.188)
<i>Family Size</i>	0.046*** (0.016)	0.048*** (0.015)	0.059*** (0.014)	0.058*** (0.013)	0.052*** (0.013)	0.050*** (0.014)
<i>Occupations</i>						
<i>Professional</i>		-0.735*** (0.178)	-0.636*** (0.241)	-0.642*** (0.242)	-0.578** (0.226)	-0.496** (0.216)
<i>Clerical</i>		0.186 (0.212)	-0.091 (0.307)	-0.089 (0.305)	-0.229 (0.266)	-0.245 (0.257)
<i>Sales</i>		-0.329 (0.260)	-0.263 (0.234)	-0.259 (0.236)	-0.322 (0.229)	-0.460** (0.212)
<i>Service</i>		-0.247 (0.349)	-0.168 (0.308)	-0.168 (0.309)	-0.180 (0.297)	-0.170 (0.281)
<i>Agriculture</i>		-0.993* (0.559)	-0.741* (0.433)	-0.747* (0.424)	-0.514 (0.380)	-0.432 (0.345)
<i>Production</i>		0.362** (0.144)	0.305* (0.178)	0.310* (0.181)	0.240 (0.163)	0.309* (0.186)
<i>County Variables</i>						
<i>Share Male</i>					0.307 (1.822)	-0.107 (2.957)
<i>Share Catholic</i>					1.885*** (0.496)	1.546*** (0.473)
<i>Share Age 25 – 40</i>					14.216*** (2.559)	12.699*** (4.529)
<i>Share Readers</i>					-0.768 (1.399)	0.306 (2.638)
<i>Location Dummies</i>						
<i>Connacht</i>						1.831*** (0.356)
<i>Leinster</i>						1.720** (0.729)
<i>Munster</i>						-0.515 (0.595)
<i>Dublin</i>						0.526 (0.711)
Number of observations: 2,394,307						

Heteroskedasticity-robust standard errors are clustered at the county level.  
Significance at 1%, 5% and 10% indicated by \*\*\*, \*\*, and \*, respectively.

Table 4: Relogit Estimates (Second Part)

<i>Dependent variable: Rebel</i>				
	(1)	(2)	(3)	(4)
<i>Famine</i>	1.497*** (0.479)	1.599*** (0.393)	1.300*** (0.249)	1.551*** (0.443)
<i>Emigration</i> <i>Population</i>	0.198*** (0.066)	0.002 (0.068)	0.116** (0.051)	0.170** (0.074)
<i>Violence</i> 1881		-1.668 (15.291)		
<i>Property</i> 1881		30.094*** (8.725)		
<i>Claimants</i> 1798		0.001*** (0.000)		
<i>FAO Cereal</i>	-0.000** (0.000)			-0.000 (0.000)
<i>FAO Potato</i>	-0.287 (0.185)			-0.281 (0.178)
<i>Share Literacy COB</i>			-7.079*** (2.546)	-4.758* (2.542)
N. Observations	2,657,558	2,321,547	2,657,558	2,657,558

Heteroskedasticity-robust standard errors are clustered at the county level. Significance at 1%, 5% and 10% indicated by \*\*\*, \*\*, and \*, respectively. Constant added in the regression but not reported.

## 5.1 Robustness Check: Instrumental Variable Regressions

The coefficients estimated by an OLS regression of (1) could be potentially affected by biases due to two different reasons. First, the explanatory variables related to historical data, might contain measurement errors. In addition, although we introduce a certain number of regressors both at the individual and county level, a bias of the results could be induced by potential confounding factors positively related both to the impact of the famine and the probability to join the Irish rebellion movement. In order to solve these two issues, we propose an instrumental variable approach, where the instrument is the prediction of the intensity of the famine. For doing this, we refer to the scientific literature based on the dispersion of the potato blight and exploit the natural (and exogenous) drivers of the intensity of the effect of the famine.

We base our approach on two different regressions. On the first stage we estimate the effect of the famine based on the climatic and geographical characteristics of the county. More precisely, we consider the following equation:

$$\begin{aligned}
 Famine_j = \theta_0 + \sum_{i=1844}^{1846} \theta_1^i Temperature\ Spring\ i_j + \sum_{i=1844}^{1846} \theta_2^i Temperature\ Summer\ i_j + \quad (2) \\
 \sum_{i=1844}^{1846} \theta_3^i Precipitation\ Spring\ i_j + \sum_{i=1844}^{1846} \theta_4^i Precipitation\ Summer\ i_j + \\
 \theta_5 Longitude_j + \theta_6 Latitude_j + \theta_7 Longitude_j * Latitude_j + v_j
 \end{aligned}$$

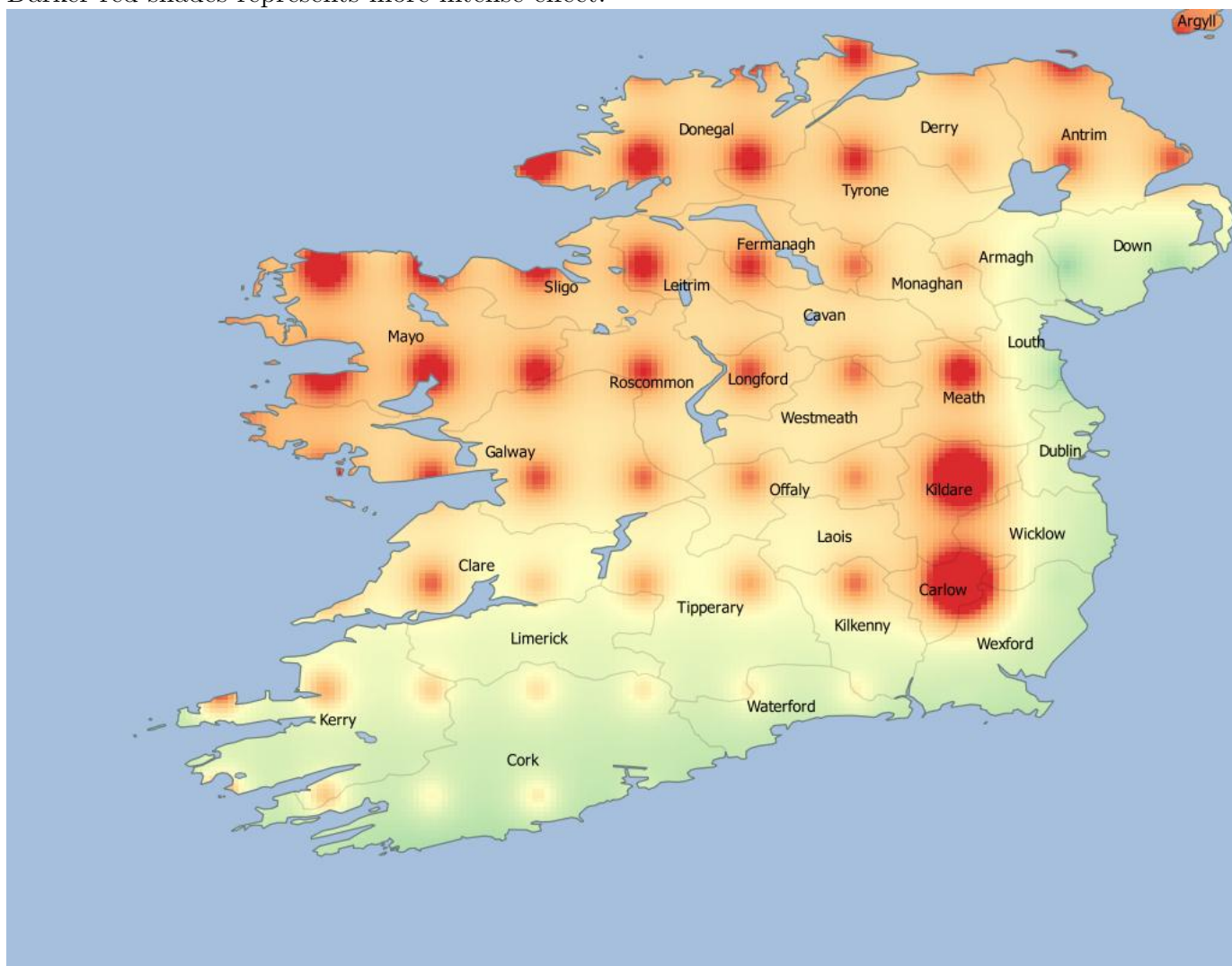
The choice of the variables are based on the scientific findings of Bourke (1964) and Bourke and Hubert (1993), which remark that humidity, temperature and wind during spring and summer are positively correlated with the intensity of the famine in Ireland. In addition, as highlighted by Zadoks and Kampmeijer (1977) and Cavalli-Sforza and Feldman (1981), the spread of the potato blight between 1845 and 1846 in Europe is a classical example of smooth and isomorphic dispersion, ruling out other type of social and human interventions.<sup>23</sup> In terms of humidity and temperature, we consider the climate data described in the previous section. Since wind data on land are not available at a precise level, we proxy them using the information on longitude and latitude and the interaction between them (see, for example, Dell (2010)).<sup>24</sup> The results of this regression are reported in Table A4 in

<sup>23</sup>Moreover, the absence of high altitudes on the Irish territories favored this type of dispersion.

<sup>24</sup>According to Bourke and Hubert (1993), during the period of the dispersion of the potato blight, the main wind force had a direction from the South to the North.

the Appendix. The level of the  $R^2$  of 0.54 suggest a good precision in simulating the effect of the Famine. As additional test of the quality of our results, we also construct and project the prediction of (2) based on different values of longitude and latitude<sup>25</sup> and display them in a GIS map, reported in Figure 3, which shows similar pattern displayed by the graph provided by Bourke (1964) and based on a set of historical data.<sup>26</sup> In particular, both analyses show similar discontinuities in the center of Ireland.

Figure 3: Prediction of the effect of the Famine at county level represented according to a scale ramp. Darker red shades represents more intense effect.



Source: Authors' calculations using the prediction of equation (2).

As second step, we consider the prediction of our first variable as instrument for the variable *Famine*.<sup>27</sup> We consider an instrumental probit technique since a two stage regression is not available

<sup>25</sup>Similarly to the technique used for temperature and precipitation, we construct the prediction in a gridded structure with 0.5 resolution and then we interpolate the values using the surface inverse distance weighting tools.

<sup>26</sup>To the best of our knowledge, it is not possible to replicate the above mentioned graph.

<sup>27</sup>The prediction and the actual values of *Famine* have a positive correlation of 0.88. Tests of overidentification do

for the RELOGIT. Table 5 displays the results of the IV probit. Also in this case, our findings are in line with the ones presented in Table 3 and 4.

Table 5: IV Probit Estimates

<i>Dependent variable: Rebel</i>				
	(1)	(2)	(3)	(4)
<i>Famine</i>	0.76*** (0.04)	0.71*** (0.04)	0.65*** (0.04)	0.22*** (0.05)
<i>Individual Characteristics</i>				
<i>Age</i>	-0.02*** (0.00)	-0.01*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)
<i>Female</i>	-0.66*** (0.04)	-0.70*** (0.04)	-0.69*** (0.04)	-0.69*** (0.04)
<i>Literacy</i>	0.14** (0.05)	0.14** (0.06)	0.11** (0.06)	0.11* (0.06)
<i>Catholic</i>	0.69*** (0.08)	0.71*** (0.08)	0.56*** (0.08)	0.51*** (0.08)
<i>Married</i>	0.06* (0.03)	0.02 (0.03)	0.00 (0.03)	-0.00 (0.03)
<i>Gaelic</i>	0.23*** (0.03)	0.26*** (0.03)	0.30*** (0.03)	0.31*** (0.03)
<i>Family size</i>	0.02*** (0.01)	0.02*** (0.01)	0.01** (0.01)	0.02** (0.01)
<i>Occupations</i>				
<i>Professional</i>		-0.18*** (0.07)	-0.17** (0.07)	-0.15** (0.07)
<i>Clerical</i>		0.01 (0.06)	-0.03 (0.06)	-0.05 (0.06)
<i>Sales</i>		-0.08 (0.07)	-0.12 (0.07)	-0.14* (0.07)
<i>Service</i>		-0.04 (0.07)	-0.05 (0.07)	-0.05 (0.07)
<i>Agriculture</i>		-0.24*** (0.04)	-0.17*** (0.04)	-0.15*** (0.04)
<i>Production</i>		0.10*** (0.04)	0.08** (0.04)	0.09** (0.04)
<i>County Variables</i>				
<i>FAO Cereal</i>	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00 (0.00)
<i>FAO Potato</i>	-0.13*** (0.02)	-0.13*** (0.02)	-0.15*** (0.02)	-0.01 (0.03)
<i>Share Male</i>			0.14 (0.32)	0.28 (0.32)
<i>Share Catholic</i>			0.59*** (0.10)	0.48*** (0.13)
<i>Share Age 25 – 40</i>			5.03*** (0.40)	3.68*** (0.44)
<i>Share Readers</i>			0.57*** (0.22)	0.44** (0.22)
<i>Location Variables</i>				
<i>Connacht</i>				0.43*** (0.08)
<i>Leinster</i>				0.56*** (0.08)
<i>Munster</i>				0.17** (0.08)
<i>Dublin</i>				0.23*** (0.05)
N. Observations	2,680,411			

Significance at 1%, 5% and 10% indicated by \*\*\*, \*\*, and \*, respectively. Constant added in the regression but not reported.

not suggest the direct use of the regressors in equation (2).



## 6 Conclusion

In this paper we investigated the research question on what makes a rebel from a quantitative point of view. Contributions in social sciences have remarked the impact of conflicts in the long-run growth of countries and the need of understanding their causes. Inspired by recent studies in economics on the importance of inter generational cultural transmission, we investigated whether values modified by negative historical shocks can be drivers of conflicts in the long-run.

Our original contribution exploits the information contained in a unique dataset based on Irish historical data during the first two decades of the 20th century. By combining different historical data sources, we are able to identify the individual features and determinants of those who voiced their discontent and actively participated in the movement for the independence of Ireland from Great Britain. In addition, we can test whether radical historical events matter in the decision to participate in rebellions. We analyze the inter generational transmission of rebellion generated by a large negative radical shock, the Great Irish Famine, on the probability of joining the movement of independence in Ireland during the Irish Revolution over the period 1913-1921. Taking into account other potential concurrent factors, we explore the persistence of cultural transmission in affecting participation in the Irish Revolution and study the peculiar features of politically-motivated rebels. Supported by historical insights, we provide evidence of the famine's inter-generational legacy of rebellion.

Given the use of detailed and complete dataset such as the 1911 Irish census and the results of our econometric analysis, we believe that our findings can shed some lights on the individual characteristics of insurgents and the relationship between negative historical shocks and rebellions.

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# Appendix

Table A1: Logit Estimates

<i>Dependent variable: Rebel</i>					
	(1)	(2)	(3)	(4)	(5)
<i>Famine</i>					
<i>Famine</i>			1.199*	1.379*	1.621*
<i>Emigration</i>			(0.678)	(0.819)	(0.843)
<i>Population</i>				0.044	0.006
				(0.058)	(0.057)
<i>Individual Characteristics</i>					
<i>Age</i>	-0.059*** (0.005)	-0.057*** (0.006)	-0.058*** (0.006)	-0.058*** (0.006)	-0.059*** (0.007)
<i>Female</i>	-2.230*** (0.317)	-2.284*** (0.250)	-2.294*** (0.248)	-2.284*** (0.240)	-2.226*** (0.235)
<i>Readers</i>	0.387* (0.202)	0.364* (0.213)	0.371* (0.216)	0.351 (0.219)	0.332 (0.234)
<i>Catholic</i>	3.144*** (0.653)	3.270*** (0.678)	3.169*** (0.623)	3.016*** (0.604)	2.258*** (0.561)
<i>Married</i>	0.312** (0.135)	0.201 (0.123)	0.222* (0.126)	0.224* (0.125)	0.173 (0.147)
<i>Irish</i>	0.795* (0.457)	0.955** (0.418)	0.931** (0.396)	0.871*** (0.333)	0.982** (0.404)
<i>Family Size</i>	0.053** (0.024)	0.057** (0.023)	0.059** (0.023)	0.057** (0.022)	0.046** (0.022)
<i>Occupations</i>					
<i>Professional</i>		-0.824** (0.354)	-0.842** (0.357)	-0.847** (0.355)	-0.812** (0.334)
<i>Clerical</i>		0.386 (0.299)	0.418 (0.300)	0.401 (0.303)	0.269 (0.342)
<i>Sales</i>		-0.043 (0.342)	-0.045 (0.344)	-0.031 (0.341)	-0.132 (0.366)
<i>Service</i>		0.191 (0.252)	0.198 (0.255)	0.200 (0.254)	0.160 (0.261)
<i>Agriculture</i>		-0.432 (0.447)	-0.470 (0.434)	-0.463 (0.435)	-0.334 (0.399)
<i>Production</i>		0.522*** (0.166)	0.551*** (0.171)	0.560*** (0.169)	0.497*** (0.173)
<i>County Variables</i>					
<i>Share Male</i>					0.937 (2.896)
<i>Share Catholic</i>					2.215*** (0.592)
<i>Share Age 25 – 40</i>					15.121*** (3.006)
<i>Share Readers</i>					-1.325 (1.572)
Number of observations: 2,465,948					

Heteroskedasticity-robust standard errors are clustered at the county level.  
Significance at 1%, 5% and 10% indicated by \*\*\*, \*\*, and \*, respectively.  
Constant added in the regression but not reported.



Table A2: Relogit including  $Famine_{1846-1844}$ 

<i>Dependent variable: Rebel</i>				
	(1)	(2)	(3)	(4)
<i>Famine</i>				
<i>Famine</i>	2.431*** (0.631)	1.942*** (0.595)	1.437*** (0.477)	0.808** (0.384)
<i>Emigration Population</i>		-0.066* (0.036)	-0.086*** (0.025)	0.035 (0.057)
<i>Individual Characteristics</i>				
<i>Age</i>	-0.051*** (0.005)	-0.050*** (0.005)	-0.048*** (0.005)	-0.050*** (0.005)
<i>Female</i>	-2.443*** (0.216)	-2.441*** (0.211)	-2.367*** (0.227)	-2.319*** (0.247)
<i>Readers</i>	0.614*** (0.137)	0.633*** (0.140)	0.638*** (0.147)	0.574*** (0.154)
<i>Catholic</i>	2.703*** (0.516)	2.835*** (0.510)	2.085*** (0.287)	1.708*** (0.226)
<i>Married</i>	0.107 (0.153)	0.099 (0.151)	0.028 (0.137)	0.025 (0.122)
<i>Irish</i>	0.811** (0.356)	0.894*** (0.334)	0.937*** (0.328)	1.055*** (0.285)
<i>Family Size</i>	0.049*** (0.015)	0.051*** (0.015)	0.049*** (0.015)	0.049*** (0.016)
<i>Occupations</i>				
<i>Professional</i>	-0.625** (0.277)	-0.592** (0.272)	-0.499** (0.244)	-0.468* (0.268)
<i>Clerical</i>	-0.087 (0.347)	-0.101 (0.345)	-0.236 (0.298)	-0.287 (0.273)
<i>Sales</i>	-0.407** (0.192)	-0.417** (0.190)	-0.456** (0.190)	-0.546*** (0.188)
<i>Service</i>	-0.426 (0.269)	-0.428 (0.267)	-0.414 (0.261)	-0.386 (0.249)
<i>Agriculture</i>	-1.424*** (0.167)	-1.385*** (0.162)	-1.089*** (0.124)	-0.929*** (0.130)
<i>Production</i>	0.206 (0.153)	0.185 (0.146)	0.121 (0.128)	0.164 (0.146)
<i>County Variables</i>				
<i>Share Male</i>			-1.173 (1.869)	-2.450 (3.780)
<i>Share Catholic</i>			2.280*** (0.484)	1.192*** (0.458)
<i>Share Age 25 – 40</i>			15.062*** (2.926)	8.844 (6.020)
<i>Share Readers</i>			-1.684 (2.180)	-4.835 (3.649)
<i>Connacht</i>				1.200 (0.958)
<i>Leinster</i>				2.545*** (0.845)
<i>Munster</i>				0.788** (0.343)
<i>Dublin</i>				0.570 (0.856)
Number of observations: 2,269,849				

Heteroskedasticity-robust standard errors are clustered at the county level. Significance at 1%, 5% and 10% indicated by \*\*\*, \*\*, and \*, respectively.

Table A3: Relogit including  $Famine_{1846-1844}$ 

<i>Dependent variable: Rebel</i>				
	(1)	(2)	(3)	(4)
<i>Famine Effects</i>				
<i>Famine</i> <sub>1846-1844</sub>	-1.136*	-1.397***	-1.375**	-1.254*
	(0.604)	(0.481)	(0.691)	(0.674)
<i>Emigration</i> <i>Population</i>	0.077	-0.013	0.038	0.072
	(0.069)	(0.048)	(0.054)	(0.066)
<i>Individual Characteristics</i>				
<i>Age</i>	-0.049***	-0.049***	-0.050***	-0.049***
	(0.005)	(0.006)	(0.005)	(0.005)
<i>Female</i>	-2.328***	-2.275***	-2.323***	-2.330***
	(0.243)	(0.264)	(0.245)	(0.242)
<i>Readers</i>	0.597***	0.609***	0.591***	0.599***
	(0.163)	(0.160)	(0.159)	(0.163)
<i>Catholic</i>	1.716***	1.624***	1.701***	1.707***
	(0.231)	(0.233)	(0.224)	(0.229)
<i>Married</i>	0.020	0.005	0.023	0.020
	(0.123)	(0.120)	(0.124)	(0.123)
<i>Irish</i>	1.018***	1.150***	0.994***	1.008***
	(0.300)	(0.266)	(0.308)	(0.306)
<i>Family Size</i>	0.046***	0.051***	0.046***	0.046***
	(0.016)	(0.015)	(0.017)	(0.016)
<i>Occupations</i>				
<i>Professional</i>	-0.457*	-0.401	-0.462*	-0.457*
	(0.260)	(0.255)	(0.262)	(0.260)
<i>Clerical</i>	-0.290	-0.357	-0.286	-0.289
	(0.269)	(0.242)	(0.270)	(0.270)
<i>Sales</i>	-0.527***	-0.442**	-0.545***	-0.529***
	(0.183)	(0.188)	(0.188)	(0.183)
<i>Service</i>	-0.377	-0.344	-0.389	-0.379
	(0.251)	(0.263)	(0.248)	(0.249)
<i>Agriculture</i>	-0.937***	-0.890***	-0.946***	-0.942***
	(0.136)	(0.141)	(0.133)	(0.137)
<i>Production</i>	0.156	0.167	0.174	0.159
	(0.142)	(0.146)	(0.151)	(0.143)
<i>County Variables</i>				
<i>Share Male</i>	-1.442	-1.326	-1.772	-1.362
	(2.966)	(2.713)	(3.239)	(2.932)
<i>Share Catholic</i>	1.114**	1.155**	1.008*	1.061**
	(0.509)	(0.522)	(0.556)	(0.539)
<i>Share Age 25 – 40</i>	8.601	7.506	9.103	8.719
	(5.851)	(6.068)	(5.982)	(5.868)
<i>Share Readers</i>	-3.695	-4.066	-3.810	-3.533
	(3.031)	(3.645)	(3.095)	(2.968)
<i>Connacht</i>	1.297	0.810	1.671	1.394
	(0.993)	(1.032)	(1.090)	(1.010)
<i>Leinster</i>	2.430***	1.450**	3.042**	2.527***
	(0.765)	(0.587)	(1.225)	(0.832)
<i>Munster</i>	0.801*	0.580	1.250**	0.916**
	(0.426)	(0.440)	(0.635)	(0.448)
<i>Dublin</i>	0.699	0.998	0.568	0.702
	(0.797)	(0.731)	(0.830)	(0.796)
<i>Violence 1881</i>		6.367		
		(8.014)		
<i>Property 1881</i>		4.692		
		(5.816)		
<i>Claimant 1798</i>		0.001***		
		(0.000)		
<i>FAO Cereal</i>	-0.000**			-0.000**
	(0.000)			(0.000)
<i>FAO Potato</i>	-0.230			-0.227
	(0.142)			(0.142)
<i>Share Literacy COB</i>			-10.192*	-2.708
			(6.086)	(2.987)
Number of observations: 2,465,948				

Heteroskedasticity-robust standard errors are clustered at the county level. Significance at 1%, 5% and 10% indicated by \*\*\*, \*\*, and \*, respectively. Constant added in the regression but not reported.

Table A4: First Stage: OLS estimates

<i>Dependent variable: Famine</i>			
<i>Temperature Spring 1844</i>	24.24* (13.29)	0.10*** (0.03)	0.10** (0.03)
<i>Temperature Spring 1845</i>	-13.91** (5.68)	-0.25*** (0.05)	-0.25** (0.05)
<i>Temperature Spring 1846</i>	-9.00 (11.64)	0.10*** (0.03)	0.10** (0.03)
<i>Temperature Summer 1844</i>	2.94 (7.87)	24.06*** (7.46)	24.07** (7.43)
<i>Temperature Summer 1845</i>	4.22 (6.15)	-14.23*** (3.16)	-14.29** (3.16)
<i>Temperature Summer 1846</i>	-8.60 (6.27)	-9.22 (6.29)	-9.28 (6.29)
<i>Precipitation Spring 1844</i>	0.10** (0.04)	0.09*** (0.02)	0.09** (0.02)
<i>Precipitation Spring 1845</i>	-0.21** (0.09)	-0.16*** (0.02)	-0.16** (0.02)
<i>Precipitation Spring 1846</i>	0.08 (0.05)	0.08*** (0.02)	0.08** (0.02)
<i>Precipitation Summer 1844</i>	0.06* (0.03)	5.91 (7.02)	6.13 (7.09)
<i>Precipitation Summer 1845</i>	-0.12** (0.05)	0.96 (4.29)	0.90 (4.32)
<i>Precipitation Summer 1846</i>	0.08** (0.03)	-8.01** (3.69)	-8.09** (3.68)
<i>Longitude</i>	-0.03 (0.27)	7.30*** (2.05)	7.24*** (2.06)
<i>Latitude</i>	-0.04 (0.27)		
<i>Longitude * Latitude</i>	0.00 (0.00)		
$R^2$	0.54		
N. of observations	32	2,818,521	2,818,521

Heteroskedasticity-robust standard errors are clustered at the county level. Significance at 1%, 5% and 10% indicated by \*\*\*, \*\*, and \*, respectively. Constant added in the regression but not reported.